

COOPERATION BETWEEN THE U.S. AND VIETNAMESE GOVERNMENTS TO
ADDRESS THE AGENT ORANGE ISSUE IN VIETNAM

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fulfillment of the requirements for the
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Military History

by

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ABSTRACT

COOPERATION BETWEEN THE U.S. AND VIETNAMESE GOVERNMENTS TO ADDRESS THE AGENT ORANGE ISSUE IN VIETNAM, by Captain Hieu Van Pham, 105 pages.

This thesis researches how the U.S. and Vietnamese Governments have cooperated to deal with the consequences of Agent Orange in Vietnam.

Between 1962 and 1971 during the Vietnam War, the U.S. military conducted Operation Ranch Hand to spray around 19 million gallons of herbicides, of which over 11 million was Agent Orange, over South Vietnam. As many as four million Vietnamese people have exposed to Agent Orange. The toxic chemical has also effected the local environment and ecology so far. Decades after the war, Agent Orange has still remained among the most sensitive issues between the U.S. and Vietnam, which has also continued to impact the bilateral relations.

Since 2000, the U.S. and Vietnamese Government have made joint efforts to address this issue. Their cooperative work has spread out from statements by their leaders to scientific discussions and joint research to dioxin remediation programs and healthcare activities to Vietnamese Agent Orange victims. These efforts have led to a common focus, allowing the progress to date and creating momentum to the progress in the future, considerably contributing to strengthening the U.S.-Vietnam comprehensive partnership relationship.

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ACRONYMS

CDC	Centers for Disease Control and Prevention
CRS	Congressional Research Service
DOD	Department of Defense
DOS	Department of State
DRV	Democratic Republic of Vietnam
EPA	Environmental Protection Agency
IOM	Institute of Medicine
IPTD	In-Pile Thermal Desorption
JAC	Joint Advisory Committee
MND	Ministry of National Defense
MOH	Ministry of Health
MONRE	Ministry of Natural Resources and Environment
NIEHS	National Institute for Environmental Health Sciences
POW/MIA	Prisoners of war/missing in action
ppt	part per trillion
RVN	Republic of Vietnam
USAID	United States Agency for International Development
VA	Department of Veterans Affairs
VRC	Vietnam Red Cross

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CHAPTER 1

INTRODUCTION

When the last U.S. forces left Vietnam, I was just 13 years old. . . . At the same time, many people in this country are much younger than me. Like my two daughters, many of you have lived your whole lives knowing only one thing - and that is peace and normalized relations between Vietnam and the United States. So I come here mindful of the past, mindful of our difficult history, but focused on the future - the prosperity, security and human dignity that we can advance together. . . . We are also continuing to help remove Agent Orange/dioxin so that Vietnam can reclaim more of your land.

— U.S. President Barack H. Obama’s remarks at
National Convention Center, Hanoi, Vietnam, 2016

Background

The early 1990s witnessed progress between the U.S. and Vietnam on the way to normalizing bilateral relationship. They started working together to gradually settle some remaining issues between the two countries, such as resolving the Vietnam’s military involvement in the Cambodian conflict, and the U.S. prisoners of war/missing in action (POW/MIAs) during the war in Vietnam.¹ In 1994, the U.S. lifted the embargo on Vietnam, paving the way for an eventual reconciliation between the two countries.²

In 1995, two decades after the end of the Vietnam War and reunification of Vietnam, the U.S. and Vietnam officially announced the formal normalization of diplomatic relations. That same year, Vietnam opened an embassy in Washington, D.C.,

¹ Robert G. Sutter, IB93081, “Vietnam – U.S. Relations: The Debate Over Normalization,” *Congressional Research Issue Brief*, accessed April 24, 2017, https://digital.library.unt.edu/ark:/67531/metacrs215/m1/1/high_res_d/IB93081_1995Nov08.txt, 1.

² *Ibid.*, 11.

and the U.S. opened its embassy in Hanoi. In 2000, U.S. President Bill Clinton paid a historic visit to Vietnam. In 2006, the U.S. Congress passed the permanent normal trade relations (PNTR) status for Vietnam. In 2013, Vietnam and the U.S. launched a comprehensive partnership to strengthen the bilateral relationship during an official visit to the U.S. by Vietnamese State President Truong Tan Sang. In 2016, U.S. President Barack Obama visited Vietnam and announced a decision to completely lift a ban on lethal weapons sale to Hanoi. These important milestones demonstrated efforts from the two countries to turn from foes to friends.

However, there are still consequences from the war in Vietnam, which Vietnam and the U.S. have not finished addressing. Among the most important is Agent Orange and its lingering effects in Vietnam. Between 1962 and 1971, the U.S. aerial defoliation and crop destruction program in South Vietnam, under Operation Ranch Hand, sprayed around 19 million gallons of so-called herbicides, of which over 11 million gallons were Agent Orange, on more than five million acres (or 12 per cent of total area of South Vietnam).³ That potentially exposed as many as four million Vietnamese people to the toxins found in the defoliate.⁴ These chemicals have also had effects on the local environment and ecology that continue to the present time.

Although the two sides have reached agreements on some issues, they have not yet reached consensus on the issue of Agent Orange. The people and government of

³ Arthur H. Westing, "The Environmental Aftermath of Warfare in Viet Nam," *Natural Resource Journal* 23, no. 2 (April 1983): 375.

⁴ Jeanne M. Stellman, et al., "The Extent and Patterns of Usage of Agent Orange and Other Herbicides in Vietnam," *Nature* 422 (April 2003): 685.

Vietnam have long sought U.S. liability over this problem. For its part, the U.S. has on one hand provided humanitarian assistance to the healthcare and education sectors in Vietnam through the Agency for International Development (USAID); on the other hand, Washington has continuously disclaimed any connection between Vietnam's medical and ecological problems related to Agent Orange. Thus, the Agent Orange issue has been a hindrance for the two countries in improving relations and cooperation.

Decades after the U.S. military stopped spraying herbicides in Vietnam, remaining questions on U.S. responsibility and assistance for the environmental and health effects of Agent Orange contamination in Vietnam still impacts on this bilateral relationship. In recent years, the U.S. has more actively cooperated with the Vietnamese side on some aspects of the problem, especially the Agent Orange clean-up programs on airbases used by the U.S. for storing, handling, and distributing herbicides during the Vietnam War. Though the number of these projects is still modest, the U.S.-Vietnam's cooperation in this issue will contribute considerably to these two countries' better relationship.

Research Question

The thesis question is, "How have the U.S. and Vietnamese Governments dealt with the effects of Agent Orange in Vietnam in the years since the war ended?" The scope of this research is from 2000 to present. This research question guides the analysis of the two countries' cooperation in dealing with the post-war legacy over the past time.

In order to support the primary question, the research will also answer three secondary questions: (1) How was Agent Orange used during the Vietnam War? (2) What are the after-war consequences caused by Agent Orange in Vietnam? (3) What are

the efforts of the U.S.-Vietnamese Governments in dealing with the effects of Agent Orange in Vietnam? (4) How has their cooperation in addressing the effects of Agent Orange contributed to further promoting relations between the two governments? The intent of the first question is to explain the use of Agent Orange in the war in Vietnam. The second question is to identify specific medical and environmental effects of the toxin in Vietnam. The third question seeks to analyze the two governments' formal coordination activities to resolve this lingering issue. The final question shows the prospect of the U.S.-Vietnam relationship becoming stronger through their joint efforts in solving the Agent Orange problem in Vietnam.

Thesis Outline

This thesis is organized into five chapters. Chapter 1 provides an introduction to the topic, identifies the research question, and outlines the research. The purpose of Chapter 2 is to explore the use of Agent Orange during the Vietnam War. It gives an overview of the war and the U.S. involvement, and examines how the U.S. military conducted Agent Orange spraying missions in the war. Chapter 3 will examine the consequences of Agent Orange left behind in Vietnam, particularly in people's health problems, environment, and socio-economy. Chapter 4 will analyze how the U.S.-Vietnamese Governments have dealt with the Agent Orange issue in Vietnam to date. It initially explains the two administrations' formal activities discussing in State-level meetings, the U.S. providing financial assistance, and their joint programs to mitigate the post-war effects caused by Agent Orange. The essay concludes with Chapter 5 that makes recommendations to the U.S.-Vietnamese Governments' cooperation efforts on medical

and environmental assistance, and their co-research and discussions in the future in order to reduce the impact of Agent Orange in Vietnam.

Limitations and Delineations

This thesis focuses primarily on the medical and ecological effects of Agent Orange in Vietnam, and the measures taken by the U.S. to assist Vietnam to gradually overcome the post-war aftermath. From these points, the study will evaluate the two countries' cooperation in addressing the Agent Orange issue in Vietnam, and how their outcomes make contributions to building up bilateral ties.

In fact, besides the Vietnamese people, nearly three million U.S. personnel who had offshore Vietnam service; those who directly handled, mixed, sprayed and cleaned up herbicides; and also others who had “boots on the ground” in Vietnam between 1962 and 1975 might have been potentially exposed to dioxin-contaminated herbicides including Agent Orange.⁵ However, the thesis will not deal with Agent Orange effects on U.S. Vietnam veterans.

Additionally, the thesis will not include activities by Vietnam alone in resolve Agent Orange. Apart from assistance from abroad, Vietnam has been making efforts internally to remove Agent Orange out of the country as soon as possible, and support local Agent Orange victims.⁶

⁵ Institute of Medicine, *Veterans and Agent Orange: Update 2014* (Washington, DC: The National Academies Press, 2016), 70-76.

⁶ Radio The Voice of Vietnam World Service, “Meeting to mark 55th anniversary of Agent Orange/ Dioxin catastrophe in Vietnam,” August 2016, accessed October 10, 2016, <http://vovworld.vn/en-US/News/Meeting-to-mark-55th-anniversary-of-Agent-Orange-Dioxin-catastrophe-in-Vietnam/460351.vov>.

Literature Review

In researching this thesis, a wide range of sources was reviewed. These included books, research papers, and other sources to include various governmental documents. A number of works were cited in this research; yet, several sources were more complete than others, and thus were utilized more frequently.

There were several challenges posed in completing this thesis. First, most of the research projects conducted on diseases and medical conditions related to exposure of Agent Orange have been on American war veterans mainly due to the availability of testing resources in the U.S. The results of these projects will be included in this thesis, as well as others conducted on Vietnamese veterans and civilians by international scholars and scientists. Meanwhile, the U.S. Government continues to assert Agent Orange illnesses in Vietnam are less in number and may relate to other causes such as environmental and malnutrition reasons. The second challenge involved is determining the validity of the research sources. While many papers have emerged in regards to the use of Agent Orange in the Vietnam War, there are few books or formal documents written on the two countries' efforts in dealing with the Agent Orange issue in Vietnam. As a result, the author will use reports and articles which present the most accurate and detailed information.

The first book reviewed was William A. Buckingham Jr.'s *Operation Ranch Hand: The Air Force and Herbicides in Southeast Asia, 1961-1971*. Published for the first time in 1982 by the Office of Air Force History, this book is one of the first and most complete studies of the U.S. military's herbicidal spraying program during the Vietnam War, and also provides a detailed history of the U.S. Air Force role in the program. The

author connects policy to this operation, showing how pressure from scientists and disagreements among government policymakers and military leaders imposed limitations on spraying missions. It helps readers understand the entire story of how Agent Orange and other chemicals came to be used in Vietnam. As such, the book was the first source for this thesis' research.

Alvin L. Young's *The History, Use, Disposition and Environmental Fate of Agent Orange* is a must read for anyone interested in this subject. Young's book explains the controversy that surrounded the tactical use of herbicides. The author analyzed thousands of pages of written government and scientific documents, spraying records, medical records, illustrations, and photos. This blend of data is useful in exploring the comprehensive history and the use of Agent Orange by the U.S. forces during the Vietnam War and its consequences in Vietnam. The book also provides a discussion of the U.S.'s willingness and very first activities of the U.S.-Vietnam to deal with the Agent Orange issue in Vietnam. Hence, *The History, Use, Disposition and Environmental Fate of Agent Orange* was another primary source for the research. Young, who has devoted a major portion of his professional career to the subject over 40 years, has also written many additional books and peer-reviewed publications on herbicides and Agent Orange such as *Agent Orange and its associated dioxin: assessment of a controversy* (with G. M. Reggiani from Switzerland).

Australian journalist John Stapleton's *Agent Orange: The Cleanup Begins* is a valuable work on cooperation between the U.S. and Vietnamese Governments to address the Agent Orange issue in Da Nang International Airport. This location is an Agent Orange hot spot, where tons of the herbicide were stored, loaded, and reloaded for the

herbicidal spraying missions by the U.S. military during the Vietnam War. *Agent Orange: The Cleanup Begins* records the events, which led up to the year when the problems of the past were finally dealt with in joint efforts by the two governments in order to rid Vietnam of the legacy of Agent Orange.

The National Academy of Sciences' Institute of Medicine (IOM)'s *Veterans and Agent Orange: Update 2014*, the tenth and last congressionally mandated biennial update, presents a comprehensive evaluation of scientific and medical information regarding possible health effects of exposure to Agent Orange and other herbicides in Vietnam veterans. Furthermore, the book also describes research areas of continuing concern and offers recommendations for further research on the health effects of Agent Orange exposure among Vietnam veterans.

Stanley Karnow's *Vietnam: A History* spans a very important era in Vietnam's history, from the process of independence from French colonialism to the fall of South Vietnam. Particularly, the book is one of the most thorough histories of American involvement in Vietnam. With a career reporting on Vietnam that dated back to the 1950s, the author presents a look at the unbiased truth of the war and how things went on through different U.S. administrations. The *Vietnam: A History* details how the war began and what the main events that triggered it were.

George C. Herring's *America's Longest War: The United States and Vietnam, 1950-1975*, is considered a comprehensive coverage on the Vietnam War. Since its original edition in 1979 (and now in the fifth), the book has remained the standard starting point for those who want to study or understand the war. The book provides a balanced history of the war, as it focuses on both the American side of the equation and

provides the sufficient consideration of the Vietnamese side to make the event comprehensible. Herring also explains the U.S. attitudes in the global competition with the former Soviet Union in the past and how this affected the U.S. diplomatic strategies in Southeast Asia.

The preceding books formed the basis for the bulk of information included in this thesis. However, in addition to these sources, an array of other works was studied. These also included additional books, reports, government documents, and articles. The sources analyzed in this literature review are primarily representative of the information included within this research.

While there was plenty of other information available regarding Agent Orange, these sources were not considered because they did not assist in answering the primary and secondary questions. Much remains unanswered in regards to this herbicide. It is certain that further information surrounding health problems associated with exposure to Agent Orange, or other herbicides during military service among both American and Vietnamese victims, will continue to be developed in the foreseeable future.

CHAPTER 2

THE USE OF AGENT ORANGE IN THE VIETNAM WAR

Overview of the Vietnam War and the U.S. involvement

Vietnam experienced thousands of years under numerous feudal dynasties. In September 1858, France attacked the port of Tourane (present day Da Nang city) and then occupied the city, signaling France's intervention in Vietnam. It took the French from 1858 to 1893 to conquer all of Vietnam, Cambodia, and Laos. In 1940, Japan occupied Vietnam. Between 1940 and 1945, Vietnamese nationalists struggled for independence from the French and the Japanese. During this time, they formed the League for the Independence of Vietnam (subsequently abbreviated to the Viet Minh) to gather all patriotic elements under the leadership of Ho Chi Minh.⁷ When Japan surrendered to the Allied Powers in August 1945, Ho Chi Minh ordered a general uprising, seized Hanoi, and announced the independent Democratic Republic of Vietnam (DRV). At that time, Ho Chi Minh made several unsuccessful appeals to U.S. President Harry S. Truman for U.S. support to the fledgling nation in its battle with French colonialists.⁸

However, Vietnam was unsuccessful at maintaining total independence from France because the Fountainebleau conference, held near Paris in 1946, failed to resolve

⁷ Federal Research Division of the Library of Congress, *Vietnam: A Country Study* (Washington, DC: U.S. Government Printing Office, 1989), 47.

⁸ National Archives Catalog, "Letter from Ho Chi Minh to President Harry S. Truman," National Archives Identifier 305263, Record Group 226, accessed October 15, 2016, <https://catalog.archives.gov/id/305263>.

problems between France and Vietnam on the Cochinchina.⁹ At the end of that year, the First Indochina War began. In 1949, France backed former Vietnamese Emperor Bao Dai and established the State of Vietnam (South Vietnam) within the French Union with Saigon as its capital. Under the military aid package program, the U.S. directly financed France most of the cost of the war because the U.S. was fighting the Cold War against Communism and considered the DRV a satellite of the Soviet Union.¹⁰ However, in 1954 the Vietnamese defeated the French at Dien Bien Phu, ending the First Indochina War. After that, the U.S., France, China, Great Britain, Laos, Cambodia, the DRV, and the State of Vietnam gathered at the Geneva Conference in Switzerland. Though not all signed the agreement, the Geneva Accords set a temporary administrative separation at the 17th parallel (lat. 17°N). The North would be governed by the Viet Minh, and the South by Bao Dai; the conference attendees called for general elections for national reunification in 1956. Nonetheless, in 1955 Ngo Dinh Diem, a strongly anti-communist figure, pushed Bao Dai aside to become the first President of the Government of the Republic of Vietnam (RVN or South Vietnam).

With the intensification of the Cold War, the U.S. gradually increased its policies against allies of the Soviet Union. In order to block the spread of Communism into Vietnam, under what was known as the “domino theory,” U.S. President Dwight D.

⁹ Stanley Karnow, *Vietnam: A History* (New York: Viking, 1983), 154-155.

¹⁰ *Ibid.*, 169-175.

Eisenhower pledged to support South Vietnam.¹¹ Meanwhile, the establishment of the Southeast Asia Treaty Organization (SEATO) on September 8, 1954, aiming to prevent the communist expansion in the region, was considered a legal basis for the involvement of the U.S. in Vietnam.¹²

The Eisenhower Administration stepped up assistance by sending military advisors to train the South Vietnamese Army, and went along with Diem's refusal to hold the general election results in 1956 as called for at the Geneva Conference.¹³ Ho Chi Minh saw that his plan of national reunification was under threat and started operations against South Vietnam by means of infiltration in combination with southern insurgents, who later formed the National Liberation Front (NLF) in South Vietnam (or the Viet Cong) in 1960.

As President John F. Kennedy took office in 1961, the U.S. took another step forward by dispatching more military advisors, Green Berets, and Central Intelligence Agency agents to South Vietnam to instruct the South Vietnamese troops. Noticeably, the number of advisors reached to over 16,000 by the end of 1963. In 1962, the U.S. established the Military Assistance Command, Vietnam (MACV) under the command of General Paul D. Harkins in response to the increasing military assistance by the U.S. to

¹¹ Eisenhower National Historic Site, "The Quotable Quotes of Dwight D. Eisenhower," accessed November 14, 2016, <https://www.nps.gov/features/eise/jrranger/quotes2.htm>.

¹² George C. Herring, *America's Longest War: The United States and Vietnam, 1950-1975* (Ohio: McGraw-Hill Higher Education, 2001), 55.

¹³ *Ibid.*, 38.

Vietnam.¹⁴ Additionally, Kennedy approved the chemical warfare plan that included the use of Agent Orange.¹⁵ Agent Orange was used in Vietnam between 1965 and 1971.

After President Kennedy was assassinated in November 1963, his successor, Lyndon B. Johnson, increased U.S. involvement in the war. Following the Gulf of Tonkin incidents in 1964, the U.S. Congress empowered the President to use armed forces against communists in Vietnam. In February 1965, Johnson authorized sustained bombing of targets north of the 17th parallel. On March 8, 1965, the first U.S. ground combatants landed on Red Beach near Da Nang City. The U.S. was now at war. In that year, the U.S. started to increase the use of Agent Orange in South Vietnam. In January 1968, the Viet Cong, in association with the North Vietnamese army, launched the massive Tet Offensive throughout South Vietnam to spark a general uprising against the Saigon regime and its American backers.¹⁶ This campaign challenged the Johnson Administration's assurance of success, and caused many Americans to question the costs of the war and whether or not the U.S. would be able to win over Vietnamese communists. In 1968 alone, nearly 17,000 Americans were killed in action, the highest annual number of U.S. battle deaths in the controversial war.¹⁷

¹⁴ Federal Research Division, *Vietnam*, 61.

¹⁵ William A. Buckingham Jr., *Operation Ranch Hand: The Air Force and Herbicides in Southeast Asia, 1961-1971* (Washington, DC: Office of Air Force History, 1982), 9.

¹⁶ Karnow, *Vietnam*, 523.

¹⁷ National Archives, "Statistical Information about Fatal Casualties of the Vietnam War," accessed October 25, 2016, <http://www.archives.gov/research/military/vietnam-war/casualty-statistics.html>.

Richard M. Nixon, with a pledge to bring the conflict in Vietnam to an end, won the race for the White House in 1968. In mid-1969, Nixon introduced his “Vietnamization” policy, which was meant to gradually transfer all military operations to the South Vietnamese Government. The Nixon Administration started to reduce troop levels stationed in Vietnam.¹⁸ By the end of 1971, the number of U.S. military personnel in South Vietnam had decreased to nearly 156,800. In August 1972, the U.S. withdrew the last combat units in Vietnam; only 40,000 American soldiers, mostly support, artillery, and air units, remained in country.¹⁹ Since 1968, the U.S. and the DRV had commenced peace talks in Paris, but the negotiations remained deadlocked due to high demands on both sides.²⁰ In order to put pressure on and force concessions out of the DRV at the peace table, Nixon ordered intensified bombings against North Vietnam, called Operation Linebacker II - the largest U.S. air campaign by B-52 bombers - between December 18 and 30, 1972. In spite of destroying a lot of economic facilities and infrastructure in Hanoi and Hai Phong during the operation, the U.S. military received heavy loss.²¹ As many as 26 aircraft, among them 15 B-52s, were shot down by the North Vietnamese forces. When the North Vietnamese government agreed to resume peace discussions with the U.S., Nixon ordered a halt to bombings on December 30. On January 15, 1973, Nixon suspended the offensive activities against North Vietnam. On

¹⁸ UPI, “1971 Year in Review: The Pentagon Papers,” accessed October 19, 2016, <http://www.upi.com/Archives/Audio/Events-of-1971/The-Pentagon-Papers/>.

¹⁹ James E. Westheider, *The Vietnam War* (Westport, CT: Greenwood, 2007), 27.

²⁰ Karnow, *Vietnam*, 581.

²¹ *Ibid.*, 654.

January 27, 1973, the warring parties – the DRV, the RVN, the U.S., and the NLF, came up with the Paris Peace Accords.²² Following the agreement, the last American service members departed from South Vietnam by March 1973.

The conflict continued until April 30, 1975, when the North Vietnamese defeated the South Vietnamese, captured Saigon, and reunified the whole country. One year later, Saigon merged with the surrounding province of Gia Dinh, and was officially renamed Ho Chi Minh City.

Agent Orange used in the Vietnam War

What are Agent Orange and dioxin?

The first use of a chemical for killing weeds was recorded in 1896 by a French farmer.²³ Until the 1940s, it was found that some compounds, when applied at high doses, killed certain plants but did not harm others; two of the most potent compounds were 2,4-dichlorophenoxy acetic acid (2,4-D) and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T).²⁴ During World War II and after, military research on these chemicals and other substances was conducted at Fort Detrick, Maryland. Though defoliants were not used in World War II because the chemicals were still under study, potential for militarily usable herbicides was further researched.²⁵

²² Ibid.

²³ National Academy of Sciences, “The Effects of Herbicides in South Vietnam,” II-1, accessed November 14, 2016, <https://www.nal.usda.gov/exhibits/speccoll/files/original/a60451fccdcede2554597d92fb5961b5.pdf>.

²⁴ Ibid.

²⁵ Buckingham, *Operation Ranch Hand*, 5-6.

The U.K. was the first country in the world to use 2,4,5-T in chemical warfare against communist insurgents in the Malayan Emergency from 1948 to 1960. The toxin proved its capability in targeting food supplies of the Malayan National Liberation Army (MNLA) that were being grown in inaccessible parts of the jungle. Hence, this case paved the way for the U.S. to further develop it for use in Vietnam.

The name Agent Orange comes from the color bands painted on 55-gallon drums in which the mixture was stored. Agent Orange is an equal mixture of two herbicides, 2,4-D and 2,4,5-T, which are two very common components in most herbicides.²⁶ The U.S. military used other herbicides called Agent Blue, Agent Green, Agent White, Agent Pink, and Agent Purple during the Vietnam War. Most of Agent Orange for the war was produced by U.S. Monsanto Corporation and Dow Chemical. The production of 2,4,5-T ceased in 1979 following the decision to terminate the chemical by the U.S. Environmental Protection Agency (EPA) because of the concerns about Agent Orange among Americans.

The chemical name of dioxin is 2,3,7,8-tetrachlorodibenzo para dioxin (2,3,7,8-TCDD or TCDD), which is contained in Agent Orange.²⁷ Among the herbicides used in Vietnam, only those containing 2,4,5-T were combined with dioxin. The 2,4-D, which appeared in other chemical agents used in the Vietnam War, is still widely used worldwide to control weeds and unwanted vegetation.

²⁶ U.S. Department of Veterans Affairs, "Facts About Herbicides," Public Health, accessed October 17, 2016, <http://www.publichealth.va.gov/exposures/agentorange/basics.asp>.

²⁷ Institute of Medicine, *Blue Water Navy Vietnam Veterans and Agent Orange Expose* (Washington, DC: The National Academies Press, 2011), 48.

According to scientists, dioxin is the most toxic chemical known by mankind.²⁸ For instance, only 80 grams of dioxin mixed into water source in New York City could kill the entire city's population.²⁹ Dioxin is a persistent organic pollutant that is toxic over many decades, is not water-soluble, and does not degrade easily. Clinging to soil particles carried by water runoff from spills or sprayed areas downstream into the sediments of lakes or streams, it is consumed by mollusks, fish and waterfowl, easily entering the human food chain.³⁰

Road for the military use of herbicides in Vietnam

After taking office in January 1960, President Kennedy raised U.S. aid from \$220 million to \$262 million under the Counterinsurgency Plan for South Vietnam to strengthen the RVN armed forces in an attempt to help them control the Viet Cong.³¹ However, as the late 1950s and early 1960s progressed, the Viet Cong grew stronger. With the skillful application of guerrilla tactics, especially in rural and mountainous areas, the Viet Cong continuously launched attacks and ambushes against RVN troops. Accordingly, South Vietnam needed new tactics to combat the growing communist-led

²⁸ Vitali Lipik, "Dioxin becomes most dangerous man-made poison," Pravda Report, June 2005, accessed November 14, 2016, <http://www.pravdareport.com/science/tech/01-06-2005/8345-dioxin-0/>.

²⁹ Cathy Scott-Clark and Adrian Levy, "Spectre Orange," *The Guardian*, March 2003, accessed October 17, 2016, <https://www.theguardian.com/world/2003/mar/29/usa.adrianlevy>.

³⁰ Aspen Institute, "Health Effects of Agent Orange/dioxin," accessed October 17, 2016, <https://www.aspeninstitute.org/programs/agent-orange-in-vietnam-program/health-effects/>.

³¹ Buckingham, *Operation Ranch Hand*, 9.

insurgency, and aerial herbicide spraying was on the list of methods. This method was believed to expose North Vietnamese and Viet Cong troops that were using the jungle as cover to move men and material into South Vietnam.

In 1961, President Diem asked the Kennedy Administration to open an aerial defoliant spraying campaign in his country. Immediately, there was a conflict over the issue in the White House between the U.S. Departments of Defense and State (DOS). The Department of Defense (DOD) believed in the potent capacity of defoliants to effectively and economically destroy forests in order to deny the enemy's concealment and cover advantages. Meanwhile, the DOS had doubts about the efficiency of the program and stressed that the program would result in adverse effects. Additionally, the diplomats argued that if the U.S. conducted the project, the international community would blame Washington for launching a form of chemical warfare.³² Some influential figures in the DOS, including Roger Hilsman and Averell Harriman, strongly raised their voices against the project. They held that it was impossible to guarantee that the herbicides only targeted the Viet Cong's crops and trees. They also added that unavoidable side effects caused by the project would inflame 'Americanophobia' among the Vietnamese people.³³

In May 1961, U.S. Vice President Lyndon B. Johnson visited Saigon. At a meeting with President Diem, he agreed to set up a joint Combat Development and Test

³² Ibid., iii.

³³ William A. Buckingham Jr., "Operation Ranch Hand: Herbicides in Southeast Asia," *Air University Review* (July-August 1983), accessed October 6, 2016, <http://www.au.af.mil/au/afri/aspj/airchronicles/aureview/1983/jul-aug/buckingham.html>.

Center, which was designated to develop new weapons and further test herbicides.³⁴ The center, under the U.S. DOD's Advance Research Project Agency (ARPA), was soon constructed and started toxic chemical tests. President Diem also worried about the food supply of the Viet Cong and even directed some tests in areas in the Central Highlands that he believed were supporting the insurgents.

President Kennedy authorized aerial defoliation and crop destruction missions by signing National Security Action Memorandum (NSAM) No. 115, "Defoliant Operations in Viet Nam," on November 30, 1961.³⁵ The Kennedy Administration signaled its commitment to the South Vietnamese Government to use even new and untried means in order to stop the spread of the Communism from the entire nation.

In early 1962, the White House allowed the U.S. military to begin limited spraying of defoliants under Operation Ranch Hand. The three-phase project aimed to eradicate crops that were feeding the Viet Cong, defoliate jungle used for cover by the insurgents, and defoliate routes and border areas used by the guerrillas to transport arms and supplies.

The detachment initially carrying out the project was set up with six C-123 airplanes and 69 personnel from Pope Air Force Base (AFB), North Carolina. The six C-123s then moved to Olmsted AFB, Pennsylvania to equip with spray tanks.³⁶ To reach

³⁴ Alvin L. Young, *The History, Use, Disposition and Environmental Fate of Agent Orange* (New York: Springer, 2009), 15.

³⁵ Federation of American Scientists, "National Security Action Memorandums (NSAM) [Kennedy Administration, 1961-63]," accessed October 6, 2016, <http://fas.org/irp/offdocs/nsam-jfk/>.

³⁶ Buckingham, *Operation Ranch Hand*, 23.

the final destination of South Vietnam, they flew from November 28 to December 6, 1961 to Travis AFB in California, then to Hickam AFB in Hawaii, and then Clark AFB in the Philippines.³⁷ The detachment secretly arrived in Saigon on December 9 because the military did not want the media to report the U.S. involvement in chemical warfare in Vietnam.

Nearly two-thirds of the herbicides were shipped to Saigon, while the remaining to Da Nang, in 55-gallon drums.³⁸ The drums were then moved to and stored in Tan Son Nhat (later stored in Bien Hoa), Da Nang, Phu Cat, and Nha Trang airbases to serve spray missions.³⁹

The number of assigned aircraft for Operation Ranch Hand changed over the course of time. For example, at the peak of the operation in 1967-1969, the unit included 25 spray aircraft of different types, mostly C-123s.⁴⁰ The expansion of the spraying program was directly proportional to the deeper involvement of the U.S. forces in the war in Vietnam.

³⁷ Ibid., 24-25.

³⁸ Young, *The History, Use, Disposition and Environmental Fate of Agent Orange*, 74.

³⁹ Ibid.

⁴⁰ John T. Correll, "The Lingering Story of Agent Orange," *Air Force Magazine* (January 2015), 50.

Spray missions of Agent Orange in the Vietnam War

The first recorded test for spraying crops was carried out on August 10, 1961, by the RVN Air Force's helicopters around Dak To village, Dak To district, Kon Tum province.⁴¹

On January 12, 1962, Ranch Hand pilots began the conduct of the first experimental flights on selected targets along Route 15 to the northwest of Saigon. These tests lasted until March 20, 1962, when they were terminated for evaluation.

Subsequently, the testing team recommended that Agent Purple, Agent Pink, and Agent Green were the most effective chemicals for tactical uses. On October 2, 1962, the White House gave the green light for selective crop spraying. Between November 21 and 23, 1962, they flew the first spraying flights to destroy about 300 hectares of rice, beans, and cassava fields in Phuoc Long province (now part of Binh Phuoc province). In 1962 alone, they conducted a total of 60 sorties and sprayed 49,240 gallons of herbicides.⁴²

From 1963 to 1965, the U.S. continued to spray target areas in South Vietnam, especially in the Ca Mau Peninsula in the southern tip of the Mekong Delta region, where they believed Viet Cong soldiers were hiding. Noticeably, they tested the first night mission on December 8, 1963 with the aim at carrying out flexible spray operations, and

⁴¹ Buckingham, *Operation Ranch Hand*, 69.

⁴² Vietnam Center and Archive of Texas Tech University, "Defoliation and Ranch Hand in the Republic of South Vietnam," *Paul Cecil Collection*, accessed April 24, 2017, <http://www.virtual.vietnam.ttu.edu/cgi-bin/starfetch.exe?opxe5.cc8ZfFHKj4oE6YGW5L LUQ4sJfYI5X2PLbxH3YEnh2MlAdOMY3c8Gh@NNMbuJ9sod9f6HCSZ@vsIYjCavY UCNKQSVI0vx4NEV5yF7PzscMI8RLkaw/2520306028.pdf>, 4.

taking the enemy by surprise.⁴³ In May and June 1964, Operation Ranch Hand moved to Da Nang to spray roads along the shared border with Laos, and then returned to Saigon in July for targets in the Mekong Delta. During this period, the Saigon Government began to request increasing defoliation and crop destruction missions to force local people to move to the government-occupied areas in order to prevent the residents from assisting the Viet Cong.⁴⁴

In March 1965, the U.S. selected Agent Orange because this newly-chosen chemical was seen as less volatile than others.⁴⁵ From that time, Agent Orange was the most widely-used herbicide in South Vietnam. Also in mid-1965, several reports noted Operation Ranch Hand was considered successful by denying the Viet Cong food supplies. The U.S. Ambassador to South Vietnam, Henry Lodge, asked the U.S. DOS to allow expansion of the target area, to include the Mekong Delta and the Central Highlands. Hence, Ranch Hand aircraft started flying missions in Kon Tum, Binh Dinh, Quang Tri, and Thua Thien provinces. In November 1965, the detachment received three more aircraft to raise the number of its planes to seven.⁴⁶ Also by the end of that year, Ranch Hand aircraft departing from Tan Son Nhat and Da Nang airbases began secret aerial spraying missions in areas of Laos and Cambodia to undermine the Ho Chi Minh Trail, a key North-to-South supply route for the Viet Cong.

⁴³ Buckingham, *Operation Ranch Hand*, 92.

⁴⁴ Ibid., 109.

⁴⁵ Young, *The History, Use, Disposition and Environmental Fate of Agent Orange*, 66.

⁴⁶ Buckingham, *Operation Ranch Hand*, 114.

As the use of Agent Orange rose, Ranch Hand received seven new aircraft in August and September 1966. They also moved to Bien Hoa airbase in December. The operating scale of Operation Ranch Hand gradually broadened and climbed to its peak in 1967 when the U.S. Air Force sprayed defoliants on an area of nearly 1.7 million acres.⁴⁷ In June 1968, Ranch Hand aircraft used Nha Trang airbase to load fuel and herbicides. The aircraft flew from Bien Hoa to conduct spray missions, landed at Nha Trang, and then continued to spray in other selective areas before coming back to Bien Hoa. During this same period, spray aircraft also began to use Phu Cat airbase to support missions around Nha Trang. In the period of 1968 and 1969, the U.S. still used a high amount of defoliants and herbicides - mostly Agent Orange - dumped in South Vietnam, reaching around 5 million and 4.6 million gallons respectively.⁴⁸

However, Operation Ranch Hand had resulted in increasing protests inside and outside the U.S. Both journalists and scientists voiced their concerns over environmental and health problems caused by herbicides used in South Vietnam. The first criticism came from some broadcasting stations such as Radio Moscow and Radio Hanoi, after the first Ranch Hand missions were launched in early 1962. They claimed that the sprayed chemicals caused local residents to lose consciousness, but these claims received light response from the international community. On response, the South Vietnamese

⁴⁷ Ibid., 129.

⁴⁸ Young, *The History, Use, Disposition and Environmental Fate of Agent Orange*, 108.

authorities held meetings to prove the harmlessness of the chemicals.⁴⁹ As mentioned previously, after taking the office in late 1969, President Nixon pledged to reduce the U.S. military presence in South Vietnam. These above issues contributed to the gradual reduction of Ranch Hand operations.⁵⁰

With the public's strong protests on the use of Agent Orange in the Vietnam War, the U.S. ended the use of all herbicides containing 2,4,5-T, which was a component in Agent Orange, in Vietnam. However, the U.S. forces continued to use other chemicals, Agent White and Agent Blue.⁵¹ On January 7, 1971, Ranch Hand carried out the last herbicide spraying in Ninh Thuan province. Several days later, the U.S. announced its immediate cessation of all defoliant missions in South Vietnam.⁵²

Overall, from 1962 to 1971, the U.S. military sprayed around 19 million gallons of herbicides, of which over 11 million gallons were Agent Orange. Almost all large-scale spray missions during Operation Ranch Hand were carried out by airplanes and helicopters. However, some were sprayed from boats or trucks, and some were even conducted by soldiers with backpack sprayers.

After Operation Ranch Hand ended, the U.S. DOD launched Operation Pacer Ivy on September 13, 1971. This involved immediately transporting the remaining stocks of Agent Orange (nearly 1.39 million gallons in 25,200 drums) back to the U.S. for

⁴⁹ Paul F. Cecil, *Herbicide Warfare: The Ranch Hand Project in Vietnam* (New York: Praeger, 1986), 59.

⁵⁰ Buckingham, *Operation Ranch Hand*, 160.

⁵¹ Cecil, *Herbicide Warfare*, 76.

⁵² Buckingham, *Operation Ranch Hand*, 175.

disposition. The stockpile was completely transferred by a cargo ship to Johnston Island in the Central Pacific Ocean on April 28, 1972.⁵³ From July 27 to August 23, 1977, the toxic stocks that included Agent Orange were incinerated at sea off of Johnston Island on the Dutch-owned ship M/T Vulcanus.⁵⁴ In 1979, the U.S. terminated all 2,4,5-T production, after its EPA released an emergency suspension of production because of the increasing concerns of the American public about the exposure to Agent Orange and its related health problems since the phase-out of Operation Ranch Hand.⁵⁵

⁵³ Young, *The History, Use, Disposition and Environmental Fate of Agent Orange*, 121.

⁵⁴ Alvin L. Young, "The History of the US Department of Defense Programs for the Testing, Evaluation, and Storage of Tactical Herbicides," (Paper submitted for Office of the Under Secretary of Defense, December 2006), 68, accessed March 29, 2017, https://www.researchgate.net/publication/235111766_The_History_of_the_US_Department_of_Defense_Programs_for_the_Testing_Evaluation_and_Storage_of_Tactical_Herbicides.

⁵⁵ Young, *The History, Use, Disposition and Environmental Fate of Agent Orange*, 2.

CHAPTER 3

CONSEQUENCES OF AGENT ORANGE IN VIETNAM

The U.S. military knew the damaging effects of Agent Orange before and during the use of this chemical in the Vietnam War. In 1952, the Monsanto Chemical Company, later one of major suppliers of Agent Orange to Vietnam, informed the Army about a poisonous substance in 2,4,5-T.⁵⁶ In 1963, the Army reported the increasing risk of chloracne⁵⁷ and respiratory infections by 2,4,5-T.⁵⁸ That same year, the President's Science Advisory Committee reported to the Joint Chiefs of Staff that the use of these chemicals might cause possible health dangers.⁵⁹ Additionally, the Air Force also knew that Agent Orange was far more hazardous to the health of humans than anyone would admit at the time. In a letter to Senator Tom Daschele of South Dakota in 1988, Dr. James Clary, an Air Force scientist in Vietnam who helped write the history of Operation Ranch Hand wrote:

When we initiated the herbicide program in the 1960s we were well aware of the potential for damage due to dioxin contamination in the herbicide. We were even aware that the military formulation had a higher dioxin concentration than the civilian version, due to the lower cost and the speed of manufacture. However,

⁵⁶ Peter H. Schuck, *Agent Orange on Trial: Mass Toxic Disasters in the Courts* (Cambridge, MA: The Belknap Press of Harvard University Press, 1988), 17.

⁵⁷ According to the U.S. Department of Veteran Affairs, chloracne is a rare skin eruption of blackheads, cysts, and nodules, which has linked directly to dioxin exposure.

⁵⁸ Schuck, *Agent Orange on Trial*, 17.

⁵⁹ Ibid.

because the material was to be used on the enemy, none of us were overly concerned.⁶⁰

Although herbicides were widely used in the U.S., they usually were heavily diluted with water or oil. However, in Vietnam the U.S. military applied these chemicals at the rate of three gallons per acre; it was sprayed six to 25 times higher than the rate suggested by the manufacturer.⁶¹ The half-life of dioxin depends on its location. In human bodies, the half-life can be as high as 20 years.⁶² In the environment, the half-life varies depending on the type of soil and the depth of penetration. The sun will break down dioxin; so on leaf and soil surfaces, it will last from one to three years, depending on conditions. Dioxin that is buried, or leached under the surface or deep in the sediment of rivers and other bodies of water, can have a half-life of more than 100 years. The following map, made by the U.S. Department of Army, illustrates the U.S. military's aerial herbicide sprayings in Vietnam between 1965 and 1971. It shows the most heavily sprayed localities. However, the map does not include the first three years of Operation Ranch Hand (1962-1965).

⁶⁰ Robert L. Zimdahl, *A History of Weed Science in the United States* (Amsterdam, Holland: Elsevier, 2010), 98.

⁶¹ Special Assistant to Admiral Elmo R. Zumwalt Jr., "Report to Secretary of the Department of Veterans Affairs on the Association between Adverse Health Effects and Exposure to Agent Orange," 1990, accessed March 29, 2017, <http://www.gulfwarvets.com/ao.html>, 5.

⁶² In science, a half-life is the amount of time it takes for half of a substance or entity to undergo some specified process.

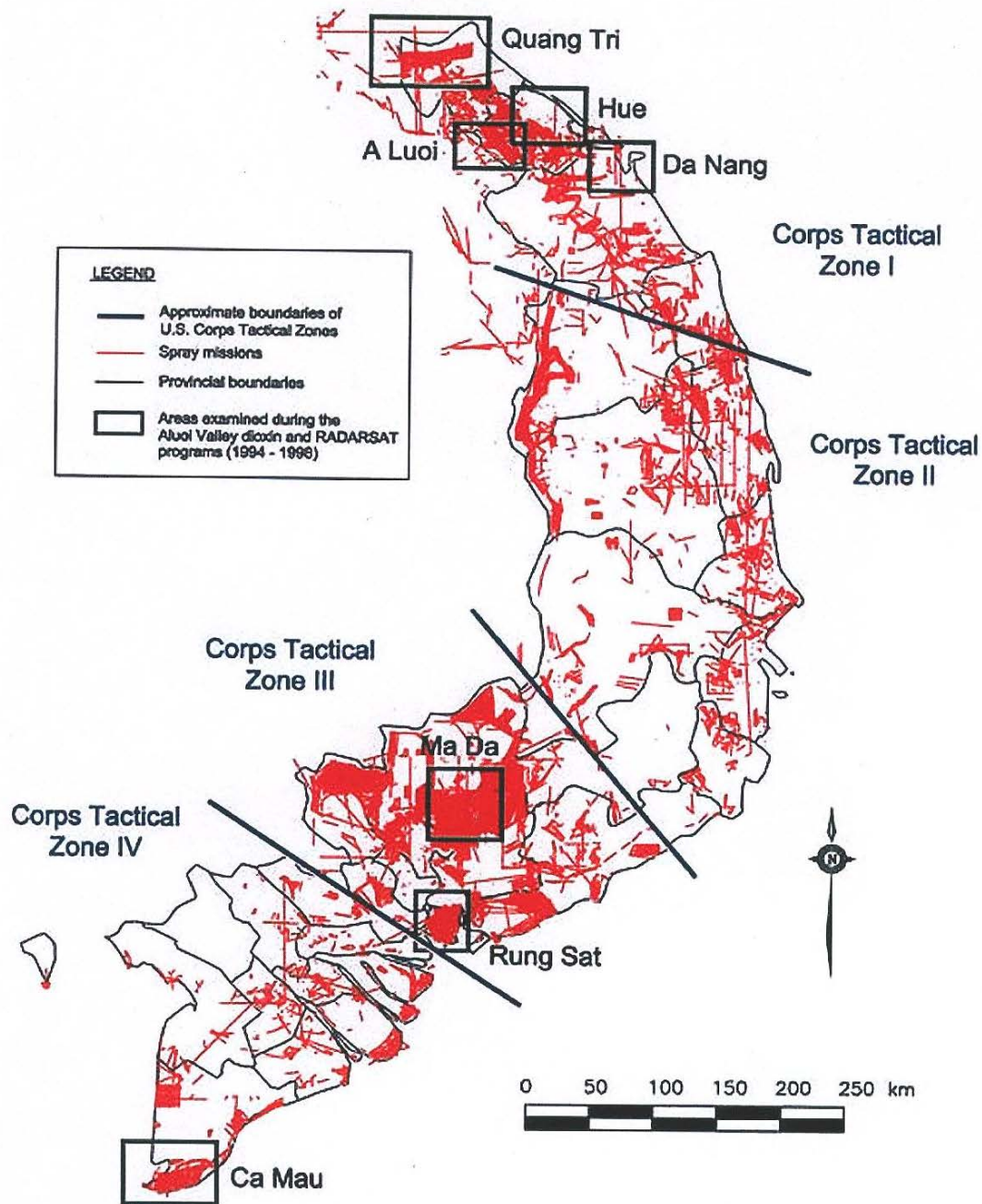


Figure 1. Aerial herbicide spray missions in South Vietnam, 1965-1971

Source: College of Computing at Georgia Tech, "Aerial herbicide spray missions in South Vietnam, 1965-1971," accessed April 24, 2017, http://www.cc.gatech.edu/~tpilsch/AirOps/Images/RanchHand/Map-spray_msns-RVN-65-71.jpg.

Medical effects

People have raised strong concerns about the health effects of Agent Orange exposure since the 1970s. After returning home, many Vietnam veterans reported increased diseases such as skin rashes, cancers, psychological symptoms, and birth defects in their offspring. Some were concerned that their exposure to Agent Orange during the war might have contributed to these problems.⁶³ In Vietnam, reports on the health effects and symptoms of Agent Orange exposure to Vietnamese people and veterans were revealed to the public later than their American opponents did because of the limitations of the media. These concerns gradually helped initiate an array of scientific studies and healthcare programs directed to the exposed veterans.

During the Vietnam War, around three million Americans had boots on the ground in Vietnam and nearby areas. Although the U.S. does not have an accurate account of Vietnam veterans exposed to Agent Orange, the U.S. Department of Veterans Affairs (VA) presumes that any of those who had served in Vietnam may have come in contact with herbicides, to include Agent Orange. As mentioned in Chapter 1 the Vietnamese Government claimed that Operation Ranch Hand exposed an estimated four million Vietnamese spanning three generations to Agent Orange. Currently, about three million Vietnamese suffer from the effects of Agent Orange. To date, Agent Orange has

⁶³ American Cancer Society, “Agent Orange and Cancer,” accessed October 11, 2016, <http://www.cancer.org/cancer/cancercauses/othercarcinogens/intheworkplace/agent-orange-and-cancer>.

led to 500,000 children being born with birth defects.⁶⁴ However, the U.S. Government believes that the number of Vietnamese victims is fewer; and that there is no connection between Agent Orange and illnesses, which are claimed by the Vietnamese counterpart.⁶⁵

By 1998, the Vietnam Red Cross (VRC) published a list of diseases associated with Agent Orange in Vietnam. These included acute, chronic and subacute peripheral neuropathy, Chloracne, Diabetes Type 2, Hepatoma, Hodgkin's Disease, Lipid Metabolism, Malignant (non-Hodgkin's) Lymphoma, Multiple Myeloma (Kahler's disease), Porphyria Cutanea Tarda, Prostate Cancer, Reproductive Abnormalities, Respiratory Cancers (bronchial, tracheal, and laryngeal), Sarcoma, and Spina Bifida.⁶⁶ In 2008, the Vietnamese Ministry of Health (MOH) also reported 17 diseases and deformities presumed to be related to the herbicide exposure.⁶⁷

Meanwhile, the U.S. VA announced a list of diseases related to the toxic herbicide, including AL Amyloidosis, Chronic B-cell Leukemia, Chloracne, Diabetes Mellitus Type 2, Hodgkin's Disease, Ischemic Heart Disease, Multiple Myeloma, Non-Hodgkin's Lymphoma, Parkinson's Disease, Peripheral Neuropathy Early Onset, Porphyria Cutanea Tarda, Prostate Cancer, Respiratory Cancers, and Soft Tissue

⁶⁴ Geoffrey York and Hayley Mick, "Last Ghost of the Vietnam War," *The Globe and Mail*, July 2008, accessed November 14, 2016, <http://www.theglobeandmail.com/incoming/last-ghost-of-the-vietnam-war/article1057457/?page=all>.

⁶⁵ Michael F. Martin, RL34761, *Vietnamese Victims of Agent Orange and U.S.-Vietnam Relations* (Washington, DC: Congressional Research Service, August 2012), 3.

⁶⁶ *Ibid.*, 21.

⁶⁷ *Ibid.*, 22.

Sarcomas.⁶⁸ Moreover, the list may expand in the future as the agency is studying more illnesses such as bladder cancer, hypothyroidism, and Parkinson's-like symptoms.⁶⁹ This consideration comes right after a report of the IOM held that these three diseases might be more strongly connected to the exposure of Agent Orange than earlier thought. Noticeably, the lists of the VRC and the VA named many of the same diseases. Clearly, medical effects of Agent Orange experienced by the Vietnamese people and American veterans are quite similar.

Up to now, almost all studies on diseases and medical conditions associated with Agent Orange have been conducted on Vietnam veterans in the U.S., Korea, New Zealand, and Australia because of their availability of testing resources.⁷⁰ However, recent studies in Vietnam also showed the link between Agent Orange and cancers such as soft-tissue sarcomas and non-Hodgkin lymphomas.⁷¹

Many North Vietnamese veterans were exposed to Agent Orange during their service in South Vietnam. For instance, Le Quang Chon, who is a native in Hoang Trinh commune, Hoang Hoa district, Thanh Hoa province, affirmed that he came in contact

⁶⁸ U.S. Department of Veterans Affairs, "Veterans' Diseases Associated with Agent Orange," accessed October 23, 2016, <http://www.publichealth.va.gov/exposures/agentorange/conditions/>.

⁶⁹ Patricia Kime, "List of Agent Orange-related diseases may expand," *Military Times*, April 2016, accessed October 8, 2016, <http://www.militarytimes.com/story/military/benefits/veterans/2016/04/08/list-agent-orange-related-diseases-may-expand/82793396/>.

⁷⁰ Institute of Medicine, *Veterans and Agent Orange*, 147.

⁷¹ Eva Kramarova, et al., "Exposure to Agent Orange and Occurrence of Soft-Tissue Sarcomas or Non-Hodgkin Lymphomas: An Ongoing Study in Vietnam," *Environmental Health Perspectives* 106, sup. 2 (April 1998): 671.

with the chemical while fighting in the Central Highlands. As a result, in three pregnancies, his wife gave birth to three disabled children: Le Thi Thoa (congenital amputation), Le Quang Chien (disabled and deformed), and Le Quang Chuong (disabled left leg, cannot move). For himself, Chon has contracted various diseases: poor eyesight, losing most of his lower jaw's teeth, gastrectomy of three-fourths of his stomach, gangrene of 40 centimeters of his intestine, rheumatic limbs, and neurasthenia.⁷²

In South Vietnam, there are more Agent Orange victims due to results of the intense spray missions in the South. Between May and December 2001, the Tu Du Obstetrics Hospital in Ho Chi Minh City reported 372 babies born with birth defects, whose mothers came from Agent Orange-sprayed localities in the South.⁷³ Also, according to the case study, female Agent Orange victims in South Vietnam are fourteen times more likely to have deformed babies than other women who were not exposed to the chemical in the region.⁷⁴

At present, so-called Peace Villages that are located in big cities like Ho Chi Minh City, Da Nang, and Hanoi are taking care of thousands of children with a variety of deformities and mental disorders, whose parents are also Agent Orange victims across the country.⁷⁵ Moreover, there are a number of victims from families with three generations

⁷² Fred A. Wilcox, *Scorched Earth: Legacies of Chemical Warfare in Vietnam* (New York: Seven Stories Press, 2011), 173.

⁷³ Vo Minh Tuan and Nguyen Thi Ngoc Phuong, "The Effects of Dioxin Exposure on the Occurrence of Birth Defects: A Case Control Study at Tudu Hospital," *International Journal of Epidemiology* 14, no. 5 (September 2003): 235.

⁷⁴ *Ibid.*, 237.

⁷⁵ Wilcox, *Scorched Earth*, 145-153.

affected by Agent Orange. In the Quynh Phu district of Thai Binh province alone, 129 of 8,000 Agent Orange victims are the third generation.⁷⁶

The final matter that should be clarified is the removal of the remaining stocks of Agent Orange under Operation Pacer Ivy. One of the contractors hired hundreds of Vietnamese women to conduct activities at Da Nang, Tuy Hoa, and Bien Hoa airbases for the shipment preparation to Johnston Island. However, because of the large sizes of safety equipment such as boots, aprons, and gloves, many of those women did the job with their bare hands.⁷⁷ There is no study about this, but according to research on Agent Orange, these women were probably exposed to the chemical.

Environmental effects

Toxic chemicals, including Agent Orange, used by the U.S. military in Operation Ranch Hand, also impacted the environment in Vietnam. During the war, many military installations throughout South Vietnam, including Bien Hoa, Da Nang, and Phu Cat airbases, were used for storing and supplying Agent Orange for defoliant missions. Accordingly, there were two primary sources of Agent Orange contaminations to the local environment: the spray activities by aircraft, and the facilities where the herbicide was stored, dispensed, and potentially spilled.

At a Washington conference in February 1970, Arthur W. Galston, a plant biologist from Yale University, offered the word “ecocide” to describe the massive

⁷⁶ Ibid., 45.

⁷⁷ Young, *The History, Use, Disposition and Environmental Fate of Agent Orange*, 125-128.

amount of chemical defoliants and the environmental harm by the defoliants sprayed in South Vietnam.⁷⁸ Scientists agreed that the general clean standard is a dioxin level that does not exceed 1,000 parts per trillion (ppt) in soil.⁷⁹ However, about 66 percent of the affected region was sprayed with 110mg/ha; some areas were even hit up to five times this amount.⁸⁰ After the war, researchers found dioxin concentrations up to 185,000ppt in Bien Hoa, 236,000ppt in Phu Cat, and 365,000ppt in Da Nang airbases.⁸¹

Before 1965, the Ma Da forest reserve in Dong Nai province (former Phuoc Long province), located 75 kilometers north of Ho Chi Minh City, covered an area of about 114,000 hectares or 68 percent of the province. However, the forested portion of the reserve sharply decreased to 53,000 hectares in 1973 primarily due to Agent Orange spray missions.⁸² Additionally, long-term effects of Agent Orange on indigenous freshwater fish were proved thorough a study in 1981 and 1982 in previously-sprayed A

⁷⁸ David Zierler, *The Invention of Ecocide: Agent Orange, Vietnam, and the Scientists Who Changed the Way We Think about the Environment* (Georgia: University of Georgia Press, May 2011), 15.

⁷⁹ Renate D. Kimbrough et al., “Human uptake of persistent chemicals from contaminated soil: PCDD/Fs and PCBs,” *Regulatory Toxicology and Pharmacology* 57, no. 1 (June 2010): 43-54.

⁸⁰ Westing, *The Environmental Aftermath of Warfare in Viet Nam*, 371.

⁸¹ Hatfield Consultants, “Summary of Dioxin Contamination at the Bien Hoa, Phu Cat and Da Nang Airbases, Viet Nam” (Research Report prepared for Meeting of the U.S.-Vietnam Dialogue Group on Agent Orange/dioxin, Washington, DC, June 2, 2009), 14-16.

⁸² Arthur H. Westing, *Herbicides in War: The Long-term Ecological and Human Consequences* (Sweden: Stockholm International Peace Research Institute, 1984), 31-32.

Luoi Valley in A Luoi district, Binh Tri Thien province (former Thua Thien province).⁸³

Results from the research showed that a decade after the spray missions, Agent Orange still caused a reduction in fish species diversity, and a reduction in fish biomass and productivity.⁸⁴

Noticeably, between 1965 and 1970, the spraying of Agent Orange destroyed nearly half of the mangrove trees in South Vietnam. International scientists estimated that it could take more than 100 years for full recovery of the mangrove forests to their former state.⁸⁵ Certain birds and animals also suffered from habitat destruction and might soon face extinction.⁸⁶

One of the purposes of Operation Ranch Hand was to destroy any agricultural areas thought to be under the Viet Cong control. However, Agent Orange and other toxins killed crops belonging to civilians, destroying their abilities to produce plants, and prevent future crop success because of contaminated and eroded soil lacking nutrients. The routine spray missions affected an estimated 400,000 hectares of farming lands in South Vietnam, causing the immediate destruction of over 300,000 tons of food leading to local people's starvation due to lack of food sources.⁸⁷

⁸³ Ibid., 91.

⁸⁴ Ibid., 93.

⁸⁵ Westing, *The Environmental Aftermath of Warfare in Viet Nam*, 377.

⁸⁶ Ibid.

⁸⁷ Ibid., 382.

Witnessing the Agent Orange effects in Vietnam, Hatfield Consultants, Ltd., based in Vancouver, Canada, has closely worked with the Vietnamese Government and its bodies to verify the extent of dioxin contaminations at an array of former U.S. military facilities in South Vietnam. The company's previous research so far concluded that the former U.S. airbases at Da Nang, Bien Hoa, and Phu Cat are the most contaminated of the airbases studied. These bases should be considered significant dioxin hot spots, and be remediated as soon as possible.⁸⁸ These three hot spots have very high dioxin levels due to storage, use, and spillage of Agent Orange during the war, and they were key airbases for conducting the Operation Ranch Hand. These studies have paved the way for further projects in South Vietnam, where there may be other dioxin-contaminated areas posing threats to human health.⁸⁹

Socio-economic effects

Consequences of Agent Orange have also impacted directly and indirectly the local socio-economy. These include the decrease of income and resources. While American victims of Agent Orange receive an average of \$1,500 a month, their

⁸⁸ Hatfield Consultants and Vietnam-Russia Tropical Center, *Evaluation of Contamination at the Agent Orange Dioxin Hot Spots in Bien Hoa, Phu Cat and Vicinity, Vietnam*, June 2009, 1, accessed March 29, 2017, https://www.hatfieldgroup.com/wp-content/uploads/AgentOrangeReports/UNDP1391/UNDP1391_Final_VRT_%20Report_and_Appendices.pdf.

⁸⁹ Hatfield Consultants and National Committee for Investigation of the Consequences of the Chemicals Used during the Vietnam War (Vietnam's Ministry of Health), *Identification of New Agent Orange/dioxin Contamination Hot Spots in Southern Vietnam*, January 2006, 3-6, accessed March 29, 2017, https://www.hatfieldgroup.com/wp-content/uploads/AgentOrangeReports/VN1071/VN1071_Final_Ford_Report_Jan_2006.pdf

Vietnamese counterparts only get around \$20 monthly subsidies by the Vietnamese Government, not enough for healthcare expenses.⁹⁰ Furthermore, those Vietnamese households often have several sick members because of the dioxin-caused genetic mutations, further making their situations worse.⁹¹

A field survey of 30 Agent Orange-affected and 30 unaffected households in the Central province of Quang Tri (formerly in South Vietnam) shows that those who were exposed to the chemical have experienced a decrease in productivity.⁹² In order to pay treatment expenses of diseases they caught after the Agent Orange spraying, they had to sell cattle, borrow money, and consume less food. The lack of resources and crop productivity resulted in an economic and health decline to affected Vietnamese people.⁹³

Not only burdened with bills, they also have lower education levels. Up to 50 percent of the affected adults and about 50 percent of children have no ability to work or study; this further lowers their ability and chance of earning living.⁹⁴ Furthermore, as exposure to dioxin through fish consumption was determined, families in Agent Orange-contaminated areas with low income ate fewer meat dishes and consumed more fish per

⁹⁰ Sean Kimmons, "Agent Orange Legacy Scourges Vietnam," *The Diplomat*, July 2014, accessed October 26, 2016, <http://thediplomat.com/2014/07/agent-orange-legacy-scourges-vietnam/>.

⁹¹ Institute of Medicine, *Veterans and Agent Orange*, 12-18.

⁹² Michael G. Palmer, "The Legacy of Agent Orange: Empirical Evidence from Central Vietnam," *Social Science & Medicine* 60, no. 5 (March 2005): 1066.

⁹³ *Ibid.*

⁹⁴ *Ibid.*

week.⁹⁵ So that, these factors might indicate a lower socio-economic status and might also be related to higher dioxin intake via fish consumption in the country.

In addition, *Where War Has Passed*, filmed by the U.K.'s Journeyman Pictures, explains the Agent Orange effects to local people in Thai Binh province, who had joined the Vietnam War and were exposed to the chemical. All of them gave birth to disabled children.⁹⁶ The documentary compares the opportunities of Agent Orange victims to schooling and disability care within the U.S. and Vietnam. Accordingly, the Vietnamese victims have limited access to social services, wheelchairs, and other services for the disabled. In spite of receiving assistance from the Vietnamese Government and other organizations, they still have to day by day face both socially and economically the aftermath of Agent Orange.

Conclusion

Operation Ranch Hand was a way to take action by the Diem Administration and the U.S. military. Spraying herbicides over selective areas in South Vietnam aimed to deprive the Viet Cong and North Vietnamese troops of food and vegetation cover, surely mitigating the growing threats against South Vietnam. However, Operation Ranch Hand left behind a problem after the war, Agent Orange and its aftereffects. Recent years have witnessed progress in accessing effects of Agent Orange in Vietnam. Research projects

⁹⁵ Marie-Catherine Ha and Sylvaine Cordier, "Agent Orange and the Risk of Gestational Trophoblastic Disease in Vietnam," *Achieves of Environmental Health* 51, no. 5 (1996): 369.

⁹⁶ Youtube, *Where War Has Passed*, accessed on December 26, 2016, <https://www.youtube.com/watch?v=-Ug0btt9aoU>.

and statistics identified the severe consequences of the chemical on people and environment in the country. Assistance is needed to support those were exposed to Agent Orange, as well as clean up the environment to prevent future generations from Agent Orange-related issues. The next chapter will explain how the U.S. and Vietnamese Governments have worked together to address Agent Orange in Vietnam.

CHAPTER 4
THE U.S.-VIETNAMESE GOVERNMENTS' JOINT EFFORTS
TO ADDRESS AGENT ORANGE

Agent Orange in the U.S.-Vietnam bilateral relations

The U.S. and Vietnam have enjoyed an increasing development in their bilateral ties. The two countries have gradually addressed their remaining problems to include the Agent Orange issue. Since the U.S. and Vietnam normalized relations in 1995, the issue of Agent Orange has been usually tabled in their scheduled meetings. Different stances on this issue from both sides continues to be barrier to fully develop relationship between the two countries.

As for Vietnam, Agent Orange at first was not the high priority issue, though the Vietnamese Government began to take notice of the abnormal diseases in people living in Agent Orange-hit areas.⁹⁷ After the Vietnam War, the Agent Orange issue was generally pushed into the background because of many contentious points, including the emotional issue of American POW/MIAs, the increasing migration of Vietnam's so-called boat people to the U.S., Vietnam's invasion of Cambodia in 1978, and Vietnam's border conflict with China in 1979.⁹⁸ Then, the Vietnamese Government also hesitated to talk about Agent Orange while seeking support from the U.S. in economic matters such as the removal of the economic embargo against Vietnam and Vietnam's membership in the World Trade Organization (WTO). Moreover, the aggression of China in the South China

⁹⁷ Martin, *Vietnamese Victims of Agent Orange and U.S.-Vietnam Relations*, 1.

⁹⁸ Ibid., 4.

Sea pressed Vietnam to further promote security relations with the U.S.⁹⁹ Having these issues above gradually extricated, Agent Orange again has emerged as a regular topic in bilateral discussions in recent years.

The U.S. Government in the past denied legal responsibility for illnesses linked to Agent Orange in spite of funding selective activities in accessing and testing for Agent Orange in Vietnam.¹⁰⁰ The U.S. provided millions of dollars for Vietnamese disabled people, but was unwilling to offer assistance to programs directly aimed at Vietnamese Agent Orange victims. On the other hand, the U.S. Government said that the actual number of people affected by Agent Orange in Vietnam is much lower than Vietnam announced previously. Also the birth defects among Vietnamese children originally connected to Agent Orange might actually be caused by other reasons including malnutrition and environmental factors.¹⁰¹

In recent years, the U.S. and Vietnamese Governments have reached consensus on programs designated to deal with Agent Orange in Vietnam. These humanitarian programs included holding seminars on Agent Orange, providing dollars for Vietnamese Agent Orange victims, and cleaning up hot spots where the herbicide was previously stored during the war.

⁹⁹ Ibid., 33.

¹⁰⁰ Ibid., 34.

¹⁰¹ Ben Stocking, "Agent Orange's catastrophic legacy still lingers," *NBC News*, May 2010, accessed November 22, 2016, http://www.nbcnews.com/id/37263424/ns/health-health_care/t/agent-oranges-catastrophic-legacy-still-lingers/#.WDSD5tUrLIU.

Agent Orange is a sensitive issue within the relationship between the U.S. and Vietnam. It is one of the post-war consequences impacting both American and Vietnamese people. Regarding Agent Orange victims, it should not be said the Vietnamese are suffering from Agent Orange much more than the Americans do. The point is how the two governments join hands to deal with the aftermath of Agent Orange in Vietnam.

Statements at State-level meetings

President William J. Clinton made a historic visit to Vietnam between November 16 and 19, 2000, the first visit by a serving American President since the end of the Vietnam War. Notably, President Clinton previously announced the formal normalization of diplomatic relationships with Vietnam in 1995.¹⁰² In conferences, Vietnamese leaders asked the U.S. to pay due attention to detoxifying former military bases and offering assistance to Vietnamese victims facing untold effects of Agent Orange. For his part, President Clinton stressed bilateral cooperation for further research on impacts of Agent Orange on the environment and people of Vietnam.¹⁰³ These were the first formal statements by the highest officials of the two countries on the Agent Orange issue in Vietnam, paving the way for their further joint activities in settling the post-war aftermath.

¹⁰² American Presidency Project, “Remarks Announcing the Normalization of Diplomatic Relations with Vietnam,” accessed November 23, 2016, <http://www.presidency.ucsb.edu/ws/?pid=51605>.

¹⁰³ Embassy of the Socialist Republic of Vietnam in the United States of America, “President Clinton welcomed in Vietnam,” accessed November 23, 2016, <http://vietnam.embassy-usa.org/relations/president-clinton-welcomed-vietnam>.

Five years later, Phan Van Khai was the first Vietnamese Prime Minister to visit the White House since the war ended in 1975. As Vietnam was desiring to join the WTO and achieve permanent normal trade relations with the U.S., during the talks between Khai and the host, President George W. Bush, the two sides only applauded the good progress in dealing with various issues left behind by the past.¹⁰⁴ The leaders mapped out cooperation on a range of other common concerns such as economic and commercial ties, shared interests in regional peace and stability, human rights in Vietnam, and especially accounting for Americans who remain missing in action from the Vietnam War.¹⁰⁵

In November 2006, President Bush paid his official visit to Vietnam, while he would also attend the 14th Asia-Pacific Economic Cooperation (APEC) Economic Leaders' Meeting in Hanoi. The talks between President Bush and Vietnamese President Nguyen Minh Triet marked a new step in the two countries' coordination to address Agent Orange in Vietnam. In a joint statement, the U.S. and Vietnam agreed to further joint efforts to resolve the environmental contamination near former dioxin storage sites used by the U.S. military in the Vietnam War.¹⁰⁶

¹⁰⁴ White House, "President Welcomes Vietnamese Prime Minister to the White House," June 2005, accessed December 18, 2016, <https://georgewbush-whitehouse.archives.gov/news/releases/2005/06/20050621.html>.

¹⁰⁵ White House, "Joint Statement Between the United States of America and the Socialist Republic of Vietnam," June 2005, accessed December 18, 2016, <https://georgewbush-whitehouse.archives.gov/news/releases/2005/06/20050621-2.html>.

¹⁰⁶ White House, "Joint Statement Between the Socialist Republic of Vietnam and the United States of America," November 2006, accessed December 18, 2016, <https://georgewbush-whitehouse.archives.gov/news/releases/2006/11/20061117-4.html>.

In June 2007, President Triet visited the U.S. at the invitation of President Bush. Triet is the first Vietnamese President visited the U.S. since the two fought on separate sides of the battlefield. Agent Orange issue continued to be one of bilateral topics put on the agenda. The host announced that for the first time the U.S. Congress appropriated \$3 million to clean up dioxin in and around a former military base in Da Nang used as a distribution center of Agent Orange in the Vietnam War. Some of the funds were also used to provide healthcare for local residents near the base.¹⁰⁷ This was considered a turning point in the U.S. policy concerning the Agent Orange issue in Vietnam.

At an official meeting at the White House in June 2008, Vietnamese Prime Minister Nguyen Tan Dung and President Bush once again emphasized the two countries' coordination and cooperation in dealing with the post-war issues including the American and Vietnamese MIA issue, mine clearing actions, and Agent Orange remediation in Vietnam.¹⁰⁸

The year of 2013 saw a new effort in furthering the diplomatic relations between the U.S. and Vietnam with a trip to Washington, DC, by Vietnamese President Truong Tan Sang. U.S. President Barack H. Obama and his Vietnamese counterpart formed a U.S.-Vietnam Comprehensive Partnership, which created mechanisms for cooperation in

¹⁰⁷ White House, "President Welcomes President Nguyen Minh Triet of Vietnam to the White House," June 2007, accessed December 18, 2016, <https://georgewbush-whitehouse.archives.gov/news/releases/2007/06/20070622-2.html>.

¹⁰⁸ White House, "President Bush Meets with Prime Minister Dung of Vietnam," June 2008, accessed December 18, 2016, <https://georgewbush-whitehouse.archives.gov/news/releases/2008/06/20080624-2.html>.

war legacy issues among other key areas.¹⁰⁹ President Obama and President Sang stressed the U.S. and Vietnamese Governments' cooperation and efforts in dealing with consequences left behind the Vietnam War, particularly in the cleanup of dioxin contamination at the Da Nang International Airport (former U.S. military airbase) and a plan to assess dioxin contamination at the Bien Hoa airbase.¹¹⁰

In July 2015, one of Vietnam's top leaders, General Secretary Nguyen Phu Trong made a historic trip to the U.S. Mr. Trong is the first General Secretary of the Communist Party of Vietnam to visit the U.S. During his visit, the U.S. and Vietnam adopted a Joint Vision Statement, in which President Obama and General Secretary Trong concurred on enhancing exchange and cooperation in settling consequences left from the war.¹¹¹

Last but not least, at the invitation of General Secretary Trong, President Obama visited Vietnam in May 2016. At meetings of President Obama with Vietnamese top leaders, the two sides once again underlined their common interests in further boosting cooperation in war legacy issues, including the Agent Orange decontamination in Vietnam.¹¹²

¹⁰⁹ White House, "Joint Statement by President Barack Obama of the United States of America and President Truong Tan Sang of the Socialist Republic of Vietnam," July 2013, accessed December 18, 2016, <https://www.whitehouse.gov/the-press-office/2013/07/25/joint-statement-president-barack-obama-united-states-america-and-preside>.

¹¹⁰ Ibid.

¹¹¹ White House, "United States – Vietnam Joint Vision Statement," July 2015, accessed December 18, 2016, <https://www.whitehouse.gov/the-press-office/2015/07/07/united-states---vietnam-joint-vision-statement>.

¹¹² White House, "Joint Statement: Between the United States of America and the Socialist Republic of Vietnam," May 2016, accessed December 18, 2016, <https://www>.

In general, leaders of the U.S. and Vietnamese Governments have been attaching importance to the continued bilateral cooperation in handling consequences of the Agent Orange issue. Their statements paved the way for fostering the progress of Agent Orange removal from Vietnam. The collaboration has the following features.

Agent Orange/dioxin cleanup efforts

About two dozen sites across central and southern regions of Vietnam (former South Vietnam), used by the U.S. military during the war, remain polluted with an especially toxic strain of dioxin. On the other hand, the increasing concern about the impact of Agent Orange in Vietnam has created pressure on the U.S. to help remove the chemical from Vietnam and assist local victims. Environmental remediation is the most feasible starting point for the two governments to work together on the long-term effects of Agent Orange. They are now conducting dioxin treatment at the Da Nang airport and completing an environmental assessment at the Bien Hoa airport. These activities pave the way for the U.S.-Vietnam's further cooperation in addressing all dioxin-contaminated hot spots in Vietnam.

Table 1. Congressional Appropriation for Agent Orange/dioxin Remediation and Health-Related Activities in Vietnam (in Millions of U.S. Dollars)

Congress	Public Law	Date Enacted	Fiscal Year	Total Amount	Environmental Remediation	Health-Related Activities
110 th	P.L. 110-28	May 2007	2007	3.0	n.a.	n.a.
111 th	P.L. 111-8	March 2009	2009	3.0	n.a.	n.a.
	P.L. 111-117	December 2009	2010	3.0	n.a.	n.a.
	P.L. 111-212	July 2010	2010	12.0	n.a.	n.a.
112 th	P.L. 112-10	April 2011	2011	18.5	15.5	3.0
	P.L. 112-74	December 2011	2012	20.0	15.0	5.0
	P.L. 112-175 ^a	September 2012	2013			
113 th	P.L. 113-6	March 2013	2013	19.3	14.5	4.8 ^b
	P.L. 113-46 ^c	October 2013	2014			
	P.L. 113-73 ^d	January 2014	2014			
	P.L. 113-76	January 2014	2014	29.0	22.0	7.0
	P.L. 113-235	December 2014	2015	22.5	15.0	7.5
TOTAL				130.3	82.0	27.3

Source: Michael F. Martin, R44268, *U.S. Agent Orange/Dioxin Assistance to Vietnam* (Washington, DC: Congressional Research Service, November 2015), 4.

Note: Table does not include \$3.9 million allocated for these purposes by the State Department out of funds appropriated for more general uses, such as the Economic Support Fund (ESF). Appropriation made in the 110th and 111th Congress did not allocate amounts between environmental remediation and health-related activities.

- Superseded by P.L. 113-6.
- Amount based on sequestration rate of 3.3%; USAID reported a preliminary figure of \$3 million.
- Allowed for the continuation of funding at levels approved by P.L. 113-6 through January 15, 2014.
- Allowed for the continuation of funding at levels approved by P.L. 113-6 through January 18, 2014.

Table 1, published by the Congressional Research Service (CRS), displays the total of \$130.3 million appropriated by the Congress since 2007 for the environmental remediation of Agent Orange/dioxin and health activities in localities of Vietnam sprayed with or contaminated by the herbicide.

In May 2007, the 110th Congress passed the U.S. Troop Readiness, Veterans' Care, Katrina Recovery, and Iraq Accountability Appropriations Act. The President then signed the bill into law, P.L. 110-28.¹¹³ For the first time, the U.S. provided \$3 million for assistance to Vietnam to remediate dioxin-contaminated storage sites and to support health programs in communities near those sites. In June 2008, the U.S. Embassy to Vietnam announced that this \$3 million budget was officially disbursed and would be handled by USAID. Accordingly, the funds were spent to hire and support a full-time environmental health and remediation advisor for two years (filled in December 2008), and to conduct environmental containment and remediation planning at the Da Nang airport.¹¹⁴ These tasks were carried out by USAID in concert with the Vietnamese Ministry of National Defense (MND), the Vietnam Academy of Science and Technology (VAST), and the Office of National Steering Committee for the Overcoming of the Consequences of Toxic Chemicals used by the United States in the War in Vietnam (Office 33 in short) under the Vietnamese Ministry of National Resources and Environment (MONRE). In February 2009, Office 33 held a discussion on remediation standards and technology, gathering representatives from the U.S. DOS, USAID, and the EPA. The participants underlined necessary programs to immediately decontaminate

¹¹³ Michael F. Martin, R44268, *U.S. Agent Orange/Dioxin Assistance to Vietnam* (Washington, DC: Congressional Research Service, November 2015), 4.

¹¹⁴ Martin, *Vietnamese Victims of Agent Orange and U.S.-Vietnam Relations*, 9-10.

dioxin at Bien Hoa, Da Nang, and Phu Cat, and a longer-term goal to completely remove dioxin from contained soil and sediment in Vietnam.¹¹⁵

In 2009 and 2010, the 111th U.S. Congress appropriation included \$18 million to clean up dioxin in Vietnam.¹¹⁶ This included \$3 million in the Omnibus Appropriations Act, 2009 (P.L. 111-8), \$3 million in the Consolidated Appropriations Act, 2010 (P.L. 111-117), and \$12 million in the Supplemental Appropriations Act, 2010 (P.L. 111-212). Additionally, the State Department and USAID designated \$1.9 million in Development Assistance funds for Fiscal Year 2010 for environmental remediation at the Da Nang airport.¹¹⁷

In April 2011, the 112th Congress continued to pass the Department of Defense and Full-Year Continuing Appropriations Act, 2011 (P.L. 112-10), which consisted of \$15.5 million and \$3 million to respectively help the Vietnamese Government conduct dioxin remediation at hot spots in Vietnam and deal with health-related programs.¹¹⁸ It was the first time the Congress explicitly divided the funds between the two uses. At the end of that year, the Consolidated Appropriations Act, 2012 (P.L. 112-74), passed by the Congress, appropriated an additional \$20 million to decontaminate dioxin at the Da Nang and Bien Hoa airbases and other hot spots and to hold health/disability programs in

¹¹⁵ Ibid., 10.

¹¹⁶ Martin, *U.S. Agent Orange/Dioxin Assistance to Vietnam*, 5.

¹¹⁷ Matthew Palmer, *Agent Orange in Vietnam: Recent Development in Remediation*, Testimony, 111th Cong., 2nd sess., July 2010, accessed December 18, 2016, <https://www.state.gov/p/eap/rls/rm/2010/07/144702.htm>.

¹¹⁸ Martin, *Vietnamese Victims of Agent Orange and U.S.-Vietnam Relations*, 11.

Vietnam's localities which remain contaminated with dioxin.¹¹⁹ P.L. 112-74 was the first legislation to explicitly allocate funds for dioxin-contaminated areas apart from the Da Nang airport. Noticeably, P.L. 112-74 assigned USAID, in association with the U.S. DOS, the Vietnamese Government, and other interested parties to develop, within 180 days after enactment of this act, a comprehensive multiyear plan for Agent Orange-related activities in Vietnam. The act also urged the U.S. administration to include funding in future budget requests.¹²⁰

In 2013 and 2014, the 113th Congress continuously appropriated an additional \$60.8 million to Agent Orange-related programs in Vietnam.¹²¹ These funds were included in three acts namely the 2013 Consolidated and Further Continuing Appropriation Act (P.L. 113-6), the 2014 Consolidated Appropriation Act (P.L. 113-76), and the 2014 Consolidated and Further Continuing Appropriation Act (P.L. 113-235). These funds were separately divided to the environmental dioxin decontamination, and health and disability programs in Vietnam.

However, from then, the U.S. Congress has not appropriated funds for Agent Orange/dioxin environmental remediation and health related programs yet.

In the 1990s, the Vietnamese MND constructed some facilities to control the spread of dioxin at the Da Nang, Bien Hoa, and Phu Cat bases, but they could only cover

¹¹⁹ Ibid.

¹²⁰ U.S. Congress, Senate Committee on Appropriations, "*Department of State, Foreign Operations, and Related Programs Appropriations Act*," 2012, S. 1601, 112th Cong., 1st sess., September 22, 2011, 47.

¹²¹ Martin, *U.S. Agent Orange/Dioxin Assistance to Vietnam*, 6.

a part of dioxin-contaminated areas. In 2006, the Vietnamese Government estimated a cost of \$10 million for the dioxin detoxification in Da Nang and Bien Hoa. In 2008, the amount of funds was raised to \$14 million.¹²²

Located in the heart of central region of Vietnam, Da Nang is now a socio-economic hub in the area and is also a tourist attraction amongst local and international tourists. The Vietnamese Government is conducting a plan to expand the Da Nang airport in order to meet increasing development demands. As a result, the city highlights the need to remove dioxin as soon as possible. As requested by the Vietnamese Government and suggested by experts, the U.S. and Vietnamese Governments started to focus first remediation efforts on the Da Nang airbase.¹²³ In 2012, the initial cost was over \$40 million. However, in order to complete the treatment plan for this project, the cost is now increased to \$88 million.¹²⁴

¹²² U.S. Congress, Subcommittee on Asia, the Pacific and the Global Environment of the House Committee on Foreign Affairs, Statement of Vice Chairman of the Foreign Affairs Committee of the Vietnamese National Assembly, “*Completing the Task: What Should We Do to Address the Impact of Agent Orange in Vietnam?*” 111th Cong., 1st sess., S. No. 111-39, June 4, 2009.

¹²³ John Stapleton, *Agent Orange: The Cleanup Begins*, (Australia: A Sense of Place Publishing, 2013), 1.

¹²⁴ Martin, *U.S. Agent Orange/Dioxin Assistance to Vietnam*, 10.

Table 2. USAID Obligation and Planned Obligations of Agent Orange/dioxin Appropriations (type and recipient, as of June 2012, in U.S. Dollars)

Recipient	Obligated	Planned Obligation
<i>Environmental Remediation</i>		
CDM International, Inc.	\$10,542,276	
TerraTherm International	\$1,336,486	\$19,957,238
To Be Determined:		
• Excavation and Construction		\$13,400,000
• Environmental Assessment at Bien Hoa		\$2,304,000
<i>Related Health Activities</i>		
East Meets West	\$500,000	
Save the Children	\$1,199,980	
Vietnam Assistance for the Handicapped	\$1,288,408	
USAID Global Health Technical Assistance	\$103,000	
To Be Determined		\$8,000,000
<i>Administration and Oversight</i>		
USAID	\$1,537,449	\$1,400,000
TOTAL	\$16,507,559	\$45,061,238

Source: Michael F. Martin, RL34761, *Vietnamese Victims of Agent Orange and U.S.-Vietnam Relations* (Washington, DC: Congressional Research Service, August 2012), 12. Note: Table does not include contracts awarded after June 25, 2012.

According to Table 2 published by CRS from information provided by USAID, as of June 2012, the association disbursed more than \$16.5 million for the dioxin removal project in Da Nang. Of the obligated funds, \$11.9 million was used to remediate the environment, \$3.1 million for health-related activities, and \$1.5 million for administrative expenses. USAID awarded CDM International, Inc. (CDM Smith) as the main contractor for services associated with the project. The development of an environmental assessment

process, conducted by this Massachusetts-based company from October 2009 to June 2010, identified that the use of In-Pile Thermal Desorption (IPTD) is the most effective and proven technology to treat dioxin at the Da Nang airport, with total estimated cost of \$43 million.¹²⁵ In December 2010, the U.S. and Vietnamese Governments inked a memorandum of intent (MOI) for the dioxin remediation project in Da Nang.¹²⁶ Following the MOI, USAID signed a \$1.3 million contract with TerraTherm International, also a Massachusetts-based company, in 2012 to design IPTD systems.¹²⁷

Also, USAID planned to obligate an additional \$45 million. These funds would be divided into \$33.4 million for IPTD activities at the Da Nang airport, \$2.3 million for an environmental assessment at the Bien Hoa airport, \$8 million for health-related programs, and \$1.4 million for administration and oversight.

On August 9, 2012, the U.S. and Vietnamese Governments jointly commissioned an IPTD system that would treat dioxin-polluted soil on part of the Da Nang airport, marking the first time Washington has been involved in cleaning up Agent Orange in Vietnam.¹²⁸ The lingering impacts of Agent Orange were finally to be removed, 37 years after the end of the Vietnam War. The event was attended by a U.S. Congressional delegation including Senator Patrick Leahy, Senator Richard Shelby, Senator Michael

¹²⁵ Martin, *Vietnamese Victims of Agent Orange and U.S.-Vietnam Relations*, 12.

¹²⁶ U.S. Embassy and Consulate in Vietnam, “Remarks by U.S. Ambassador Michael W. Michalak,” accessed December 25, 2016, <https://vn.usembassy.gov/amb/speech123010.html>.

¹²⁷ Martin, *Vietnamese Victims of Agent Orange and U.S.-Vietnam Relations*, 12.

¹²⁸ Stapleton, *Agent Orange*, 1.

Crapo, Representative Jim Cooper, and Representative Peter Welch. Senator Leahy, Vietnam's Deputy Minister of National Defense Lieutenant General Nguyen Chi Vinh, U.S. Ambassador to Vietnam David Shear, and Vice Chairman of Vietnamese National Assembly's Foreign Relations Committee Ha Thuy Thong switched on the thermal treatment system with senior U.S. and Vietnamese government officials and media representatives in attendance.¹²⁹ Addressing the opening ceremony, U.S. Ambassador David Shear said:

This morning we celebrate a historic milestone for our bilateral relationship. Today's ceremony marks the start of a project between Vietnam's Ministry of National Defense and the U.S. Agency for International Development, USAID, to clean up dioxin contaminated soil and sediment at the airport left from the Vietnam War... We have worked together closely over many years in a spirit of mutual respect and cooperation to reach this point... There's a lot of expertise present here today to make sure this job gets done right... As Secretary of State Hillary Clinton remarked while visiting Vietnam in October 2010, the dioxin in the ground here is "a legacy of the painful past we share," but the project we undertake here today, hand-in-hand with the Vietnamese, is "a sign of the hopeful future we are building together." We are both moving earth and taking the first steps to bury the legacies of our past. I look forward to even more successes to follow.¹³⁰

The project was estimated at the beginning by the U.S. Government to cost over \$40 million and \$1.3 million of reciprocal capital funds from the Vietnamese side. The Vietnamese Government designated its MND to be the project owner/partner on the

¹²⁹ U.S. Embassy and Consulate in Vietnam, "Vietnam and the United States Turn on Treatment System to Clean Up Dioxin in Danang," accessed December 25, 2016, <https://vn.usembassy.gov/vietnam-and-the-united-states-turn-on-treatment-system-to-clean-up-dioxin-in-danang/>.

¹³⁰ USAID, "Remarks by U.S. Ambassador David B. Shear at the Environmental Remediation of Dioxin Contamination at Danang Airport Project Launch Ceremony," August 2012, accessed December 25, 2016, <https://www.usaid.gov/news-information/speeches/remarks-us-ambassador-david-b-shear-environmental-remediation-dioxin>.

Environmental Remediation of Dioxin Contamination at the Da Nang airport project, while USAID, the implementing agency for the U.S. Government, would closely associate with the MND to implement the project. As part of Vietnam's contribution to the cleanup, the MND is to clear unexploded ordnance from the airport site and construct a power substation to supply electricity for the remediation process.¹³¹

This two-phase project, which will finish by mid-2017, will treat an estimated 90,000 cubic meters of dioxin-contaminated soil and sediments at the Da Nang airport; the dioxin concentration was expected to fall below the level of 150ppt - the Vietnamese Government cleanup standards.¹³² The treatment structure is 70 meters in width, 100 meters in length, and eight meters in height; it was constructed by Tetra Tech, a California-based company. Additionally, the company is also in charge of managing construction of access roadways, excavating and dewatering dioxin-contaminated soils and sediments, placing the soils and sediments into the pile containment structure for treatment by others, and restoring the site.

Using the IPTD technology, the contaminated soil and sediments will be excavated and placed in an enclosed containment structure built on the grounds of the Da Nang airport. Once there, they will be treated using thermal desorption technology, which involves heating the soil and sediment to a high temperature (approximately 335 degrees Celsius) to destroy dioxin. Following treatment, soil and sediments will be tested to

¹³¹ Ibid.

¹³² USAID, "Key Facts on Environmental Remediation of Dioxin Contamination at Danang Airport," April 2017, accessed April 24, 2016, <https://www.usaid.gov/vietnam/key-facts-environmental-remediation-dioxin-contamination-danang-airport>.

ensure it is no longer contaminated with dioxin. The treated soil and sediments will then be removed from the containment structure and used as fill material on site at the airport.¹³³ In order to ensure contamination is not released outside of the project site and to ensure workers and employees are protected from exposure to contaminants, USAID contractors implemented an array of measures including (but not limited to) regular dust monitoring and air sampling for dioxin, surface water monitoring via turbidity, and groundwater sampling of wells outside the project area.

At the beginning of May 2016, USAID and the Vietnamese Government announced that the first phase of the project to treat 45,000 cubic meters of dioxin-polluted soil and sediments at the Da Nang airport had been completed.¹³⁴ That volume of treated soil and sediments were handed over to the Airports Corporation of Vietnam for being reused as fill material for a project to expand the Da Nang International Airport. U.S. Ambassador to Vietnam Ted Osius, and Deputy Minister of Defense Nguyen Chi Vinh told the ceremony to mark the first phase's success in the presence of Vietnamese Deputy Prime Minister Vu Duc Dam.

In mid-October 2016, USAID and Vietnamese Government started work on the second and final phase of thermal treatment of dioxin contamination at the Da Nang airport.¹³⁵ Ambassador Osius and General Vinh attended the ceremony to turn on the

¹³³ Ibid.

¹³⁴ USAID, "Vietnam: Environmental Remediation of Dioxin Contamination at Danang Airport, Progress Report: April 1, 2016 to June 30, 2016," accessed December 25, 2016, https://www.usaid.gov/sites/default/files/documents/1861/AO_Progress_Report_31_Q2-2016.pdf.

¹³⁵ U.S. Embassy and Consulate in Vietnam, "United States and Vietnam Start Second Phase of Dioxin Contamination Treatment at Danang Airport," October 2016,

IPTD system. This phase aims to conduct the remediation of the second batch of 45,000 cubic meters of dioxin-polluted soil and sediments under the project. It is expected to be finished in mid-2017 while site restoration and demobilization works are expected to be finished in 2018. Once being finalized, the long-term goal of the remediation project is to eliminate potential health risks associated with dioxin exposure from the treated site.¹³⁶

While the dioxin remediation project at the Da Nang airport was progressing, the U.S. and Vietnamese Governments continued to consider their next project - the removal of dioxin at Bien Hoa airbase. The Da Nang dioxin remediation project is the starting point, not the end one. Bien Hoa was the largest airbase in terms of the number of C-123 aircraft and volume of herbicides used by the U.S. military during the war. According to a joint investigation between the United Nations Development Program (UNDP), and the Vietnamese Office 33 and the MONRE, about 250,000 cubic meters of dioxin-contaminated soil and sediments will required cleanup with an estimated cost of \$250 million - almost triple the cost of Da Nang.¹³⁷ Dioxin contamination at the Bien Hoa airbase resulted from the storage, loading, spillage, and handling of Agent Orange and other herbicides, especially in the 1965-1971 period. In an attempt to protect local people from exposure to dioxin from the airbase, the MND excavated and placed about 43,000 cubic meters of contaminated soil in a safe site in 2009.¹³⁸

accessed December 25, 2016, <https://vn.usembassy.gov/20161018-us-vietnam-start-second-phase-dioxin-contamination-treatment-danang-airport/>.

¹³⁶ Ibid.

¹³⁷ Michael F. Martin, *U.S. Agent Orange/Dioxin Assistance to Vietnam*, 14.

¹³⁸ Stapleton, *Agent Orange*, 4.

In July 2013, President Obama and his Vietnamese counterpart Sang announced the launch of an environmental assessment at the Bien Hoa airbase as part of the U.S.-Vietnam comprehensive partnership. Following their statement, USAID awarded a contract to CDM Smith in September 2013, in association with the Vietnamese MND, to carry out an assessment to find the best ways to destroy dioxin at that location. Data and information gathered during the assessment process, which was completed in May 2016, were used to develop several potential treatment alternatives for the airbase with regard to effectiveness, implementability, cost, and environmental and social impacts.¹³⁹ The alternatives follow:

1. Alternative 1: No Action (baseline; for comparison purposes).
2. Alternative 2: Provide containment of all soil and sediment above the MND-approved dioxin limits established for the various areas of the Airbase:
 - Alternative 2A: Contain in a Passive or Active Landfill.
 - Alternative 2B: Contain using Solidification/Stabilization.
3. Alternative 3: Treat all soil and sediment above 2,500 ppt; contain the soil and sediment between MND-approved dioxin limits and 2,500 ppt.
4. Alternative 4: Treat all soil and sediment above 1,200 ppt; contain the soil and sediment between the MND-approved dioxin limits and 1,200 ppt.
5. Alternative 5: Treat all soil and sediment above the MND-approved dioxin limits established for the various areas of the Airbase:
 - Alternative 5A: Treat using Incineration/Ex Situ Thermal Treatment.
 - Alternative 5B: Treat using Ex Situ Thermal Conductive Heating (TCH).
 - Alternative 5C: Treat using Mechano-Chemical Destruction (MCD).¹⁴⁰

Except for Alternative 1, all alternatives would comply satisfactorily with the Vietnamese Government regulations and the land use, based on the Vietnamese MND-

¹³⁹ CMD Smith and Hatfield Consultants, “*Environmental Assessment of Dioxin Contamination at Bien Hoa Airbase, Environmental Assessment in Compliance with 22 CFR 216 – FINAL*,” accessed March 29, 2017, https://www.usaid.gov/sites/default/files/BH-Final-EA-2016-05-03_EN-reduced.pdf, 3.

¹⁴⁰ Ibid., 14.

approved dioxin limits, and achieve acceptable environmental and social impacts.¹⁴¹

During his visit to Vietnam in May 2016, President Obama announced a U.S. commitment to partner with Vietnam to make a significant contribution to cleaning up dioxin contamination at the Bien Hoa airbase. The two governments are now reviewing the detailed technical recommendations in the report and developing a plan to proceed.

U.S.-Vietnam collaborative programs

First joint research programs and discussions

First cooperative efforts to deal with the Agent Orange issue in Vietnam from the U.S. and Vietnamese Governments started in 2000. In March, then U.S. Defense Secretary William Cohen visited Hanoi. This was the first trip of an American head of the Pentagon to Vietnam after the fall of Saigon, in preparation for the official visit to Vietnam in November by President Clinton.¹⁴² During his tours to the Da Nang and Bien Hoa airbases, accompanied by U.S. DOS personnel, the two sides signed an agreement for a collaborative research on Agent Orange effects in Vietnam. Upon their return to the U.S., the U.S. National Institute for Environmental Health Sciences (NIEHS) was assigned to coordinate with Vietnamese professionals and government officials to begin planning for a research program financed by the U.S.¹⁴³

¹⁴¹ Ibid.

¹⁴² Martin, *Vietnamese Victims of Agent Orange and U.S.-Vietnam Relations*, 5.

¹⁴³ Susan M. Booker, "Dioxin in Vietnam: Fighting a Legacy of War," *NIEHS News* 109, no. 3 (April 2001): 116.

Following the program, a workshop took place in Monterey, California, on August 18, 2000, with the participation of U.S. chemical experts.¹⁴⁴ At the workshop, the participants agreed that scientific concerns should be solved in any such study on Agent Orange exposure. The event's outcomes paved the way for a second meeting four months later.

Between November 27 and December 1, 2000, U.S. and Vietnamese scientists gathered for the first of many meetings in Singapore.¹⁴⁵ The U.S. side was led by the NIEHS Director, Kenneth Olden, with scientists from the NIEHS, the EPA, the Centers for Disease Control and Prevention (CDC), and the Fogarty International Research Center of the National Institutes of Health (NIH). The Vietnamese delegation was headed by Deputy Minister of the MONRE, Pham Khoi Nguyen, accompanied by experts from the MONRE, the National Environment Institute, the National Center for Natural Science and Technology, the Ministry of Health (MOH), Hanoi Medical University, Ho Chi Minh City University of Medicine and Pharmacology, and the Vietnam-Russia Tropical Research Center. The two countries' delegates mapped out three major fields of study namely human health effects, environmental effects, and building an Agent Orange/dioxin research capability in Vietnam. Next they met in specific groups for discussions focused on particularly identifying contamination hot spots in Vietnam, remediation technologies, data exchanges, training for Vietnamese scientists, and constructing a Vietnamese laboratory capability in measuring dioxin. At the end, the

¹⁴⁴ Ibid.

¹⁴⁵ Ibid., 117.

participating scientists reached an implementing agreement to facilitate research on this herbicide. At this point, nothing was finalized and no funds were decided, but the two sides laid the groundwork for financial assistance from the U.S. Government and their future actions to remove dioxin from Vietnam.¹⁴⁶ Notably, recommendations from these talks were submitted to President Clinton, and then he would hold these recommendations with Vietnamese leaders during his visit to Vietnam.¹⁴⁷

At the beginning of March 2002, the NIEHS and the MONRE co-organized a Scientific Conference on Human Health and Environmental Effects of Agent Orange/dioxin in Hanoi under the auspices of the U.S.-Vietnam Cooperative Research Program on the Health and Environmental Effects of Agent Orange and Dioxin.¹⁴⁸ The goals of this government-to-government conference were to share scientific information on Agent Orange/dioxin effects to the human health and environment, exchange scientific information on remediation measures, and consider future research projects. Experts from the NIEHS, the EPA, the CDC, and the Vietnamese MOH discussed to propose a process to guide research and obtain funding for further studies on Agent Orange and dioxin.¹⁴⁹ The meeting ended with a Memorandum of Understanding (MoU), signed by Director of the NIEHS Division of Extramural Research and Training, Dr. Anne Sassaman, and

¹⁴⁶ Ibid.

¹⁴⁷ Alvin L. Young, "Vietnam and Agent Orange Revisited," *ESPR – Environ Sci & Pollut Res* 9, no. 3 (2002): 160.

¹⁴⁸ Young, *The History, Use, Disposition and Environmental Fate of Agent Orange*, 11-12.

¹⁴⁹ Ibid., 12.

General Director of the National Environmental Agency of Vietnam, Dr. Nguyen Ngoc Sinh. Attending the signing ceremony, U.S. Ambassador to Vietnam, Raymond Burghardt, said:

This agreement and the scientific conference that preceded it mark a new step forward in our relations with Vietnam. It is too soon to predict what the eventual benefits will be, but it is certain that Americans and Vietnamese working together in pursuit of a common interest can achieve a great deal, as we have shown once again today. The scientists from both countries who hammered out this agreement deserve a great deal of credit for keeping their common goal clearly in focus as they worked to craft a document in which they can all take pride.¹⁵⁰

However, though the progress of resumption of diplomatic normalization between the U.S.-Vietnamese Governments was going on during the Bush Administration, their joint studies on Agent Orange effects in Vietnam disconnected because both sides claimed each other were not acting in good faith. In February 2003, the U.S. Government asserted that the Vietnamese Government was not accepting internationally recognized scientific methods that did not benefit their claims of Agent Orange effects to human health and environment. Meanwhile, the Vietnamese Government claimed that the U.S. Government was preventing the completion of the exposure studies.¹⁵¹ As a result, the U.S. decided to abandon the joint project in March 2005.¹⁵²

¹⁵⁰ NIEHS, “Press Statement on Joint Research on Agent Orange/Dioxin,” March 2002, accessed December 30, 2016, <http://www.niehs.nih.gov/news/newsroom/releases/2002/march10/index.cfm>.

¹⁵¹ Martin, *Vietnamese Victims of Agent Orange and U.S.-Vietnam Relations*, 6.

¹⁵² Ibid.

Agent Orange and Dioxin Remediation Workshop

Since those discussions in 2002 mentioned earlier, the only activity to be agreed and conducted by the both sides was a program to identify dioxin contamination in former tactical herbicides storage and loading sites in South Vietnam.¹⁵³ In order to institute this program, relevant units of the two governments were summoned to the Agent Orange and Dioxin Remediation Workshop; this was held in Hanoi in 2005 and 2007.

The first workshop took place between August 16-18, 2005 with the participation of 51 experts from the Vietnamese MND. Five U.S. participants to the event included the Ambassador and the Defense Attaché from the U.S. Embassy to Vietnam, and three members of the U.S. Technical Team.¹⁵⁴ The meeting targeted to:

1. share the scientific and engineering studies conducted in the United States at former Herbicide Orange storage and/or loading sites;
2. open a dialogue with Vietnamese scientists and engineers on how to evaluate the present status of former herbicide storage/loading sites; and,
3. provide guidelines on how to determine the most appropriate use of soil stabilization actions or applications of available remediation technologies.¹⁵⁵

¹⁵³ Young, *The History, Use, Disposition and Environmental Fate of Agent Orange*, 12.

¹⁵⁴ *Ibid.*, 311.

¹⁵⁵ *Ibid.*, 312.

In opening speeches, U.S. Ambassador to Vietnam, Michael Marine, and Head of the Vietnamese delegation, Lieutenant General Do Trung Duong, Vice Chief of the General Staff of the Vietnam People's Army (VPA), underlined the importance of bilateral cooperation in determining the issues of potential dioxin contamination and suggesting measures to advance the work. They also stated that currently-contaminated areas might be addressed by combining technologies and scientific approaches, adding that the event would focus on remediation and not on health effects.¹⁵⁶

The major concern on the Vietnamese side was the details of locations where Ranch Hand spray missions were conducted during the Vietnam conflict and where dioxin residues still remained. However, the U.S. Technical Team only delivered logistics information of former bases where the U.S. military had stored and re-drummed tactical herbicides, and where they conducted Ranch Hand flights. At last, the participants also discussed technologies applicable to dioxin decontamination progress in Vietnam. At the end of the workshop, they inked the minutes of the meeting and concurred to hold the next conference.¹⁵⁷

The second Agent Orange and Dioxin Remediation Workshop, organized on June 18-19, 2007 in Hanoi, saw the attendance of 40 Vietnamese military officers and civilians, and six American participants.¹⁵⁸ At the beginning of the event, a representative from the U.S. DOD handed over to the Head of the Vietnamese delegation a special

¹⁵⁶ Ibid., 311.

¹⁵⁷ Ibid., 312.

¹⁵⁸ Ibid., 313.

report on Operation Ranch Hand activities, which was a concern from the first meeting.

The U.S. DOD report provided:

1. Detailed information on the quantities of tactical herbicides used or spilled in Southern Vietnam;
2. Detailed information on the types and quantities of dioxins in Herbicide Orange;
3. Maps of the Air Bases used in Operation Ranch Hand and Operation Pacer Ivy detailing the sites where loading, storage and re-drumming operations had occurred; and
4. An update on remediation and environmental studies.¹⁵⁹

For its part, the Vietnamese side gave a presentation on their detailed results of studies at the Da Nang airport, results of studies on cleaning dioxin-contaminated soil by an active landfill bioreactor, and results of research on the adsorption efficiency of activated carbon for dioxin-like toxicities from aqueous solutions.¹⁶⁰

After delivering presentations, the participants discussed specific information and research on dioxin that was of mutual interest. In the meeting minutes signed at the end of the workshop, the U.S. and Vietnamese sides agreed to continuously share study information and experience. They both also made recommendations to follow-on activities including a joint project to sample potential dioxin contamination at other

¹⁵⁹ Ibid., 314.

¹⁶⁰ Ibid.

former airbases in South Vietnam, and a joint project to progress reliable remediation programs.¹⁶¹

U.S.-Vietnam Joint Advisory Committee on Agent Orange

The MoU signed in March 2002 by the Governments of the U.S. and Vietnam also led to the establishment of a Joint Advisory Committee (JAC) to observe such cooperation on Agent Orange/dioxin.¹⁶² It is a technical binational committee of the two governments composed of government officials and experts from the Vietnamese MONRE, the MND, the MOH, the Ministry of Foreign Affairs (MOFA), and the VAST from Vietnam. The U.S. representatives included the CDC, the EPA, the DOD, the DOS, and USAID.

The JAC is the official body responsible for the bilateral efforts to deal with the environmental and health effects of Agent Orange/dioxin in Vietnam.¹⁶³ The committee is to explore possible areas of scientific cooperation, technical assistance, and environmental remediation of dioxin in Vietnam through discussions in order to recommend the two governments on dioxin contamination cleanup and research on health issues associated with dioxin. However, at the first instance, the U.S. and Vietnam had different points of view about the role of the committee. While the U.S. Government wanted the JAC to work with scientific cooperation, the Vietnamese counterpart preferred to do environmental remediation plans. As a result, the JAC did not run its first

¹⁶¹ Ibid., 320.

¹⁶² Martin, *Vietnamese Victims of Agent Orange and U.S.-Vietnam Relations*, 5.

¹⁶³ Ibid., 24.

gathering until 2006.¹⁶⁴ The U.S. Embassy in Hanoi and the Vietnamese Office 33 are in charge of co-organizing the JAC meetings. During these meetings, committee members discussed and identified three priority hot spots at the Da Nang, Bien Hoa, and Phu Cat airbases where Agent Orange was loaded, stored, and transferred by the U.S. forces during the Vietnam conflict.

The first meeting in Hanoi on June 6, 2006 focused on technical sharing for environmental and health research.¹⁶⁵ That meeting also served to document achievements, cooperative relationships, and potential avenues for progress. After the success of the first exchange, the two sides agreed to convene this meeting annually.

The next meeting was organized in Hanoi on August 14-15, 2007.¹⁶⁶ The Vietnamese Government scheduled a fact-finding visit to the Da Nang airport for the JAC's American members to review environmental remediation efforts. During this meeting, the two sides continued to hold technical exchanges focused on on-going activities. Earlier in April, seven officials - specializing in chemical engineering and toxicity from the Vietnamese MND and the Office 33 toured the U.S. and conducted meetings with the EPA, the United Nations Development Program (UNDP), colleges, and others.

¹⁶⁴ Ibid.

¹⁶⁵ Public Library of US Diplomacy, "*Second Joint Advisory Committee on Agent Orange Dioxin*," Canonical ID 07HANOI1235_a.

¹⁶⁶ Ibid.

The third meeting was held in Hanoi on September 8-11, 2008.¹⁶⁷ The JAC members reviewed the U.S.-Vietnamese discussion results on Agent Orange issues over the past time, debated on-going remediation and health programs, and recommended future activities. In particular, representatives from the U.S. EPA and the Vietnamese MND discussed specific calculations of soil volume for remediation, evaluated the MND's bioremediation activities at the Bien Hoa airbase, and suggested how to develop those remediation efforts. Notably at this meeting, the JAC established two task forces, one for environmental remediation and one for health areas.¹⁶⁸ These two forces would effectively formulate the committee's joint works on different areas of mutual concern. The environmental working group would outline programs and identify priorities pertaining to defining dioxin levels and scope of contamination, selecting appropriate remediation methods, and building projects to stamp out dioxin contamination at hot spots. Meanwhile, the working group on healthcare would draw up a roadmap and recommend solutions to minimize the number of the offspring of parents who are believed to be exposed to Agent Orange.

The JAC convened its fourth meeting in Hanoi on September 8-11, 2009.¹⁶⁹ The meeting made good progress in shifting from dialogue to specific activities. Through the

¹⁶⁷ Public Library of US Diplomacy, "*Third Joint Advisory Committee on Agent Orange Dioxin*," Canonical ID 08HANOI1088_a.

¹⁶⁸ U.S. Congress, House Subcommittee on Asia, the Pacific, and the Global Environment of the Committee on Foreign Affairs House of Representatives, "*Agent Orange: What Efforts are Being Made to Address the Continuing Impact of Dioxin in Vietnam?*" 111th Cong., 1st sess., S. No. 111-39, June 4, 2009.

¹⁶⁹ Talk Vietnam, "US and Vietnamese Governments continue to join efforts to deal with AO issues," September 2009. accessed January 7, 2017, <https://www.talk>

meeting, JAC members better understood the impact of the toxic chemicals on the environment and human health in Vietnam. They continued to discuss short-and long-term cooperation plans aimed at resolutely solving dioxin contamination at the Da Nang, Bien Hoa, and Phu Cat airbases, and assisting local Agent Orange victims. Having acknowledged the implementation of projected proposed at the meeting last year, U.S. Ambassador to Vietnam, Michael Michalak, underlined that Agent Orange is a sensitive issue but the two countries could address this through open and frank dialogue such as has occurred in the three previous JAC meetings.¹⁷⁰ Meanwhile, Deputy Minister of the Vietnamese MONRE, Nguyen Xuan Cuong, asked the committee to continuously put forward specific proposals to realize Vietnam's priorities to cleaning up dioxin and providing healthcare services to victims.¹⁷¹ Following the meeting, in December 2009, the U.S. and Vietnamese Governments signed a MOU on Agent Orange.¹⁷² The document served as a framework for future cooperation on health and cleanup research activities on Agent Orange in Vietnam between the two sides.

vietnam.com/2009/09/us-and-vietnamese-governments-continue-to-join-efforts-to-deal-with-ao-issues/.

¹⁷⁰ Talk Vietnam, "Progress remains limited in AO/dioxin recovery," September 2009, accessed January 7, 2017, <https://www.talkvietnam.com/2009/09/progress-remains-limited-in-aodioxin-recovery/>.

¹⁷¹ Ibid.

¹⁷² Palmer, *Agent Orange in Vietnam*.

The fifth and sixth JAC committees continued to take place in Hanoi in July 2010 and September 2011, respectively.¹⁷³ JAC members shared the available cooperation and determination of the two governments in handling the Agent Orange issue in Vietnam, and discussed further scientific studies on the herbicide's impacts on human health and the environment. They also made recommendations to the Vietnamese Government's National Action Program on overcoming the consequences of Agent Orange/dioxin until 2015 and the vision towards 2020. Then U.S. Ambassador to Vietnam, David Shear, affirmed that those JAC meetings so far offered opportunities for the U.S. and Vietnamese Governments to review and acknowledge the achievements made by the committee over the past years of operations.¹⁷⁴

The seventh JAC meeting in Hanoi on September 20-21, 2012 was considered a more meaningful event as the U.S. and Vietnamese Governments kicked off the treatment project of dioxin-contaminated soil at the Da Nang airport.¹⁷⁵ The delegates spoke highly of this project and hoped that the progress would finished as scheduled, paving the way for next cleanup programs in other hot spots in Vietnam. During the meeting, JAC members continuously reviewed the handling of environment in hot spots and humanitarian activities in Vietnam, and dioxin remediation technologies.

¹⁷³ Vietnam Breaking News, "Vietnam, US cooperate in overcoming AO consequences," September 2011, accessed January 7, 2017, <https://m.vietnambreakingnews.com/2011/09/vietnam-us-cooperate-in-overcoming-ao-consequences/>.

¹⁷⁴ Ibid.

¹⁷⁵ Talk Vietnam, "Consequences of AO/dioxin to be solved by 2020," September 2012, accessed January 7, 2017, <https://www.talkvietnam.com/2012/09/consequences-of-aodioxin-to-be-solved-by-2020/>.

The JAC convened its eight meeting in Da Nang city on December 4-5, 2013.¹⁷⁶ This two-day meeting allowed Vietnamese and U.S. scientists to exchange views and expand dialogue on current issues related to Agent Orange in Vietnam, then to provide scientific advice to the governments of Vietnam and the U.S. on dioxin contamination cleanup and research on health issues associated with dioxin. At the meeting, representatives from USAID and the Vietnamese MND highly valued the progress of the on-going dioxin remediation project at the Da Nang airport, and stressed that the project will help consequently eliminate risk of dioxin exposure to the surrounding community. At his speech, U.S. Ambassador to Vietnam, David Shear, said:

This event serves as a reminder of the level of cooperation and trust that exists between our two countries, and comes only months after President Sang and President Obama signed the U.S.-Vietnam Comprehensive Partnership at the White House. Both of our Presidents agreed that extensive cooperation in addressing war legacy issues has allowed us to develop a relationship that looks to the future. Today we come together again to advance this forward-looking relationship and work toward our shared goal of overcoming the legacy of Agent Orange.¹⁷⁷

During the meeting, the Vietnamese MND also presented a Master Plan for Remediation of the Bien Hoa airbase. Participants shared their experience in dealing with persistent organic pollutants, exchange views on Vietnam's health policy related to Agent Orange, and the impacts of this agent on Vietnamese children's development. Additionally, they reviewed the results of a recent workshop organized by the

¹⁷⁶ USAID, "U.S.-Vietnam Joint Advisory Committee highlights bilateral cooperation on Agent Orange," December 2013, accessed January 7, 2017, <https://www.usaid.gov/vietnam/news-information/press-releases/us-vietnam-joint-advisory-committee-highlights-bilateral>.

¹⁷⁷ Ibid.

Vietnamese MONRE on lessons learned in dioxin pollution assessments and remediation in Vietnam.

Since the eighth meeting in 2013, the JAC has not convened because of cuts in funding from supporters.¹⁷⁸

U.S.-Vietnam Dialogue Group on Agent Orange/dioxin

While the dioxin remediation activities have made first moves, the U.S. and Vietnamese Governments continued to support the establishment of a new joint organization, the U.S.-Vietnam Dialogue Group on Agent Orange/dioxin. It was formally formed in February 2007 and funded by the U.S. Ford Foundation to work on dimensions of the Agent Orange issue in Vietnam that the two governments have found difficult to address.¹⁷⁹ The group is co-chaired by the President and CEO of the Aspen Institute, Walter Isaacson, and the Vice Chairman of the Vietnamese National Assembly's Foreign Affairs Committee, Ngo Quang Xuan. The convener of the group is the former President of the Ford Foundation, Susan Berresford. The group gathers representatives from the U.S. American Association for the Advancement of Science, the Aspen Institute, the Ford Foundation, and the National Organization on Disability; while the Vietnamese representatives are from the Ngoc Tam Hospital Corporation, the Vietnamese Communist Party's External Relations Commission, the Vietnamese National Assembly, the Vietnam

¹⁷⁸ David Devlin-Foltz, Aspen Institute, e-mail correspondent with author, January 22, 2017.

¹⁷⁹ Aspen Institute, "The U.S.-Vietnam Dialogue on Agent Orange and dioxin," accessed January 15, 2017, <https://www.aspeninstitute.org/programs/agent-orange-in-vietnam-program/the-u-s-vietnam-dialogue-group-on-agent-orange-and-dioxin/>.

National University, and the Vietnam Veterans Association. The group has five priorities to:

1. establish treatment and education centers for Vietnamese with disabilities,
2. cooperate with the U.S. and Vietnamese governments to contain and clean up dioxin, beginning at three priority airport “hot spots” (Da Nang, Bien Hoa, and Phu Cat),
3. set up a modern dioxin testing laboratory in Vietnam,
4. foster programs for training of trainers in restoration and management of damaged landscapes, and
5. educate the U.S. public on the issues.¹⁸⁰

In order to realize these priorities, the U.S.-Vietnam Dialogue Group on Agent Orange/dioxin has approved a 10-year Declaration and Plan of Action paper in June 2010 that specifies ways and recommends joint cooperation between the U.S. and Vietnamese Governments to address the remaining Agent Orange in Vietnam, and their required finance. It would be conducted over ten years from 2010 to 2019 with an estimated cost of \$300 million. The plan suggests the U.S. Government should play the key role in meeting the costs, along with supplementing an appropriate continuing investment from the Vietnamese Government.

The plan focuses on two goals namely cleaning dioxin-contaminated soils and restoring damaged ecosystems; and expanding services to people with disabilities linked

¹⁸⁰ Ibid.

to dioxin and to people with other forms of disability (hereinafter referred to as people with disabilities), and to their families.¹⁸¹ The first goal aims to ensure protection of people living near dioxin hot spots and restore the productivity of damaged landscapes with a series of priorities such as immediately containing, removing, and remediating dioxin-contaminated soil and sediments to complete cleanup at the northern end of the Da Nang airport; applying Da Nang experience to conduct cleanup of the Phu Cat and Bien Hoa airbases and surrounding lakes by December 2015; apply best practices to remaining hot spots so as to complete their cleanup/mitigation by January 2020; and conducting joint U.S.-Vietnam research to evaluate damaged lands, creating a reforestation, diversification or repurposing plan to ensure the optimum future use of such lands.¹⁸² The another goal focuses on assisting Vietnam to develop a system for maternal surveillance and screening, monitoring of child development and early-childhood intervention in order to improve services to affected people in or near the three major hot spots; expanding access to and improving quality of medical care for those suffering from cancers, diseases and other medical conditions associated with exposure to dioxin; and developing comprehensive evaluation of all medical and social service intervention to guide future interventions.¹⁸³

¹⁸¹ U.S.-Vietnam Dialogue Group on Agent Orange/dioxin, “*Declaration and Plan of Action 2010-2019*,” (Aspen Institute: Washington and Hanoi, 2010), 12-13, accessed March 29, 2017, <https://assets.aspeninstitute.org/content/uploads/2016/06/2010-6-16USVietnamDialogueGroupDeclarationandPlanofAction.pdf>.

¹⁸² Ibid.

¹⁸³ Ibid., 13-15.

Annually, the group releases a report to review its achievements and map out future activities as well as challenges. By working closely with relevant bodies of the U.S. and Vietnamese Government and other organizations from the two countries, the U.S.-Vietnam Dialogue Group on Agent Orange/dioxin has achieved following considerable results according to a report of the Aspen Institute.¹⁸⁴

First, rehabilitation centers were constructed for people affected by Agent Orange in Vietnam. These centers help restore local Agent Orange victims' abilities, support their families, and create favorable conditions for them to enjoy education and training. Health care and vocational training programs are operating in Thai Binh and Quang Ngai provinces, and Da Nang within the "Support Network for People with Disabilities" program of the East Meets West Foundation. The Children of Vietnam Association is working with local authorities in Da Nang on its "Hope System of Care" program. The Vietnam Veterans of America Foundation provides health care, vocational training, and social inclusion programs to raise living standards for people with disabilities and residents of dioxin hotspots in six central provinces: Nghe An, Ha Tinh, Quang Binh, Quang Tri, Thua Thien-Hue, and Quang Ngai. The Vietnam Assistance for the Handicapped upgrades community-based care in Binh Dinh and Kon Tum provinces, and Da Nang.

¹⁸⁴ Aspen Institute, "U.S.-Vietnam Dialogue Group on Agent Orange/dioxin," accessed January 22, 2017, <http://vietnamreportingproject.org/wp-content/uploads/2011/05/AOVII-Fact-Sheet-About-the-Dialogue-Group.pdf>.

Secondly, cooperation between the U.S. and Vietnamese Governments has expanded on efforts to contain and clean up dioxin at three priority airport hot spots, which were discussed in previous part of the chapter.

Thirdly, funding has been obtained for a high-resolution dioxin laboratory. The U.S.-Vietnam Dialogue Group on Agent Orange/dioxin attracted support from the Atlantic Philanthropies and the Bill and Melinda Gates Foundation to create a state-of-the-art Vietnam Persistent Organic Pollutants Laboratory worth totally \$6.75 million. It is a cornerstone of Vietnam's environmental management efforts, allowing accurate assessment of dioxin and similar organic pollutants in soil, sediments, and human tissue.

Fourthly, programs for training of trainers in restoration and management of damaged landscapes have begun. The dialogue group backed the idea of training programs on ways to restore and reuse lands degraded by the herbicide spraying. The Center for Resources and Environment Studies at the Hanoi National University successfully introduced this approach with farmers, technical experts, and officials in Quang Tri province and is now extending it to Thua Thien-Hue province. This initial work may be replicated in more areas across Vietnam when new support is available.

Last but not least, a humanitarian approach to Agent Orange/dioxin is gaining supporters in the U.S. The group has convened several meetings that have yielded reports on various aspects of the situation in Vietnam. The U.S. side of the group are working to educate U.S. policymakers, Members of Congress, international organizations, businesses, and others who might provide financial resources and expertise.

Conclusion

Since the end of the Vietnam War in 1975, the U.S. and Vietnam have enjoyed a gradual warming of bilateral relations. Many but now all of major issues causing tensions between the two countries have been addressed. One major consequence of the war that remains unresolved is Agent Orange and its accompanying dioxin in Vietnam.

The Vietnamese Government has struggled in dealing with the adverse effects of Agent Orange. After the war, Vietnam no longer could afford to support its Agent Orange victims or address the environmental damage. Meanwhile, the U.S. Government was slow to respond to the Agent Orange issue in Vietnam. But since the normalization of bilateral relations in 1995, the U.S. Government has gradually aided Vietnam and associated with the country to deal with the consequences of the herbicide. Receiving assistance from the U.S. Government, the Vietnamese Government is now economically strong enough to take steps on the Agent Orange issue.

Both parties realized the importance of collaboration works in addressing Agent Orange in Vietnam. The cooperation between the U.S. and Vietnamese Governments has spread out from statements by their leaders to discussions and joint research to dioxin remediation programs and healthcare activities to Vietnamese Agent Orange victims. These efforts have led to a common focus, allowing the progress to date and creating momentum to the progress in the future.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

Conclusion

During the Vietnam War, the U.S. military sprayed about 19 million gallons of herbicides, mostly Agent Orange, over parts of southern Vietnam.¹⁸⁵ The Agent Orange was contaminated with dioxin, a deadly compound that has continued to poison the land and affected the people in Vietnam.¹⁸⁶

Accordingly, dozens of dioxin hot spots with varying levels of contamination have been pinpointed in South Vietnam. The most affected areas are surrounding the Da Nang, Bien Hoa, and Phu Cat airports, where the herbicides were stored, leaked, and spilled during handling.¹⁸⁷ Approximately four million Vietnamese were exposed to Agent Orange, resulting in hundreds of thousands of deaths and disabilities, and a half million children born with birth defects.¹⁸⁸

Although the U.S. and Vietnamese Governments have been moving toward a normal bilateral relationship, the issue of Agent Orange and dioxin contamination still

¹⁸⁵ Westing, “The Environmental Aftermath of Warfare in Viet Nam,” 375.

¹⁸⁶ Institute of Medicine, *Blue Water Navy Vietnam Veterans and Agent Orange Expose*, 48.

¹⁸⁷ Hatfield Consultants, “Summary of Dioxin Contamination at the Bien Hoa, Phu Cat and Da Nang Airbases, Viet Nam,” Research Report prepared for Meeting of the U.S.-Vietnam Dialogue Group on Agent Orange/dioxin, Washington, DC, June 2, 2009, 14-16, accessed March 29, 2017, https://assets.aspeninstitute.org/content/uploads/files/content/upload/Hatfield_Consultants_0509.pdf.

¹⁸⁸ York and Mick.

remains a contentious topic. The U.S. Government continues to deny legal liability for damages caused by Operation Ranch Hand spraying missions during the Vietnam War and medical conditions believed to be linked with exposure to Agent Orange.¹⁸⁹

Nonetheless, the Vietnamese Government continues to ask its U.S. counterpart for cooperation to help resolve the Agent Orange issue in Vietnam.¹⁹⁰

As the hard feelings between the two countries have softened, so, too, has the U.S. stand on Agent Orange. In recent years, the U.S. Government has showed willingness to work with the Vietnamese Government in addressing the Agent Orange issue in Vietnam. The two countries' formal cooperation activities evolved from public statements of their leaders to joint discussions between the countries' representatives, and follow-on practical Agent Orange/dioxin cleanup programs.

At meetings in Washington, DC, and Hanoi, highest officials of the two governments pledged joint efforts to gradually resolve the consequences of Agent Orange in Vietnam. These statements were seen as motivation and inspiration for further practical programs initiated and launched by the U.S. and Vietnamese Governments.

Since 2000, the U.S. and Vietnamese Governments have cooperated to deal with Agent Orange through joint research and seminars involving both sides' specialized scientists, officials, and lawmakers. Notably, they established forums to include the Agent Orange and Dioxin Remediation Workshop, the U.S.-Vietnam Joint Advisory Committee, and the U.S.-Vietnam Dialogue Group on Agent Orange/dioxin. These

¹⁸⁹ Martin, *Vietnamese Victims of Agent Orange and U.S.-Vietnam Relations*, 3.

¹⁹⁰ Ibid.

forums provided guidance on scientific cooperation, technical assistance, and environmental remediation related to Agent Orange and dioxin contamination, and health-related activities for communities adjacent to dioxin hot spots and Agent Orange victims in Vietnam.

Following the results of these discussions and additional guidance from their top leaders, the U.S. and Vietnamese Governments have taken a remarkable step in dealing with Agent Orange in Vietnam by launching dioxin cleanup and dioxin assessment activities. Most of the expense for those programs was financed by the U.S. Government. A major project to remove dioxin at the Da Nang airport marks the first time America has got involved in Agent Orange cleanup in Vietnam since the end of the war over four decades ago. The project, which was kicked off in 2012 and is set for completion in mid-2017, will create a safe and clean environment for residents of the area. Furthermore, the long-term objective of the project is to raise Vietnam's capacity in treating dioxin and other organic pollutants at the contaminated airport and other sites. In addition, the U.S. and Vietnamese Governments also considered their next joint project to decontaminate dioxin at the Bien Hoa airbase.

In brief, Agent Orange still remains among the most sensitive issues after the Vietnam War between the U.S. and Vietnam, which has also continued to impact the U.S.-Vietnam relationship. However, the U.S. engagement and the two governments' joint efforts in addressing the issue has succeeded in changing the tone of dialogue. The cooperation between the two governments on this issue is a good start; however, more work needs to be done. It is time for the U.S. and Vietnamese Governments to do more to

address the issue of Agent Orange and its victims so that the last tragic chapter of the Vietnam War can be finally closed.

Recommendations on medical assistance

Vietnamese people in herbicides-sprayed areas during Operation Ranch Hand have been exposed to Agent Orange/dioxin for five decades. They suffer from cancer and an array of diseases. Their children and grandchildren have serve physical deformities and mental disabilities. Though the victims have received medical support but the assistance is still modest. It is necessary for cooperation between the U.S. and Vietnamese Government to provide more medical assistance to the Vietnamese Agent Orange victims.

As a result, the first recommendation is that there must be further cooperation between the two governments to complete the list of illnesses from exposure to Agent Orange. The Vietnamese MOH reported 17 diseases presumed to be related to the herbicide exposure.¹⁹¹ The U.S. VA also announced dozens of diseases related to Agent Orange, which include many of the same name in comparison with the MOH's list.¹⁹² However, there may still be other diseases and deformities not diagnosed but also associated with Agent Orange. This work needs to be speeded up in order to ensure that veterans and victims receive benefits they deserve. Accordingly, those who have suffered from these health problems so far are recognized as victims of Agent Orange by the

¹⁹¹ Martin, *Vietnamese Victims of Agent Orange and U.S.-Vietnam Relations*, 22.

¹⁹² U.S. Department of Veterans Affairs, "Veterans' Diseases Associated with Agent Orange."

Vietnamese Government. They will be able to get free healthcare and monthly financial assistance from the Vietnamese Government, and enjoy other health programs co-organized by the U.S. and Vietnamese Government.

The next recommendation is that the U.S. and Vietnamese Governments directly boost providing financial assistance and medical support to Vietnamese veterans and people who had exposed to Agent Orange, and their affected children. As stated in “Socio-economic effects” of Chapter 3, almost all Vietnamese families with members who have suffered from Agent Orange are facing financial difficulties and living with poor standards. The Vietnamese Government has granted allowance to these families but the support has amounted to a pittance. Hence, additional support and medical care from the U.S. side in association with resources from the Vietnamese Government are needed to Vietnamese Agent Orange victims. Once the victims receive financial assistance from both governments, they can afford to daily demands and further treatment.

Another recommendation is that the two governments finance rehabilitation and reproductive counseling to Vietnamese disabled people and victims because of Agent Orange/dioxin. Many localities of Vietnam have centers for rehabilitation of Agent Orange victims; however, there are not enough facilities and other resources for the number of victims who need them. These centers would help gradually rehabilitate disabled Agent Orange victims’ capability in order to return them to society functioning at the highest possible levels. For instance, among 35,000 people exposed to Agent Orange in Quang Ngai province, about 4,600 and 360 victims are respectively the second and third generations, who need rehabilitation programs. However, the province’s rehabilitation center can only accommodate one tenth of them at one time. Additionally,

most hospitals in Vietnam do not have sufficient equipment to test pregnant women for birth defects; many are former female veterans and spouses of veterans who had fought in Agent Orange-sprayed areas of South Vietnam during the war. Many couples exposed to Agent Orange but do not know their health conditions. Their offspring are suffering from disabilities and disorders caused by Agent Orange. They continued to give more births with the hope to have a normal child; however, their next children continued to be suffered from malformations because of the toxic chemical. As a result, more modern equipment and further increase of reproductive counseling jointly carried out by the two governments are recommended.

Last but not least, the collaborative efforts between the U.S. and Vietnamese Governments should focus on education and vocational training to Vietnamese children with Agent Orange. The two governments can fund current Friendship Villages across Vietnam, which are home to disabled children and children of those who exposed to Agent Orange.¹⁹³ These villages provide medical treatment, physical therapy, and schooling to Agent Orange survivors. After finishing the special schools, they can find appropriate jobs and make a better life for themselves. Caring for these children helps many parents to be able to work to develop living standards.

Recommendations on environmental assistance

Also as mentioned in the “Environmental effects” part of Chapter 3, herbicides in general and Agent Orange/dioxin in particular caused severe damages to Vietnam’s

¹⁹³ Arrin Hawkins and Argiris Malapanis, “Friendship Village in Vietnam treats Agent Orange Victims,” *The Militant*, April 2005, accessed February 21, 2017, <http://www.the.militant.com/2005/6913/691353.html>.

environment. Millions of gallons of Agent Orange were sprayed during the Vietnam conflict. The chemical destroyed natural vegetation, made forests to become desert areas, and still remains in soil. To date, most of the environmental remediation effort has been focused on the cleanup of the Da Nang airport. With this cleanup program well underway, the U.S. and Vietnamese Governments are examining possible cooperation in dioxin removal operations at the Bien Hoa airbase, and possibly the Phu Cat airbase in the coming time. However, more work is required the combined efforts from the two governments to deal with the Agent Orange consequences impacting the environment.

First, the U.S. and Vietnamese Governments continue to allocate funds for dioxin remediation activities in Vietnam. At present, both governments are only conducting dioxin decontamination project in Da Nang. Meanwhile, there are dozens of dioxin hot spots discovered in central and southern Vietnam. The need for dioxin remediation is urgent because dioxin is reaching communities surrounding the hot spots and poisoning local people's food chain as discussed in the "Socio-economic effects" part of Chapter 3. The sooner these hot spots are addressed, the safer local residents can live.

In addition, the joint efforts should invest in expanding reforestation in Vietnam. The Vietnamese Government has already launched activities to reforest hundreds of thousands of acres across the country, especially in defoliated localities. That plan aims to nourish damaged soil and bring it to original conditions by planting species with high economic value and capability to grow in damaged land. An increase in income to local people will reduce the financial burden that has been put on the Vietnamese Government by the Agent Orange issue. For instance, Ma Da forest in Dong Nai province was heavily deforested by herbicides according to the "Environmental effects" part of Chapter 3. The

Vietnamese foresters planted a shade crop of acacia and eucalyptus trees in Ma Da, and then after three years, they were able to reintroduce native dipterocarp species in this area.¹⁹⁴ As the area has been gradually reforested over time, birds and animals have returned to the forest, helping natural reforestation by spreading seeds from the reintroduced trees. The lessons learned from Ma Da will be applied to improve the quality of forests in A Luoi of Thua Thien-Hue province, an area that was also heavily deforested by Agent Orange.¹⁹⁵ The Vietnamese Center for Natural Resources and Environmental Studies (CRES) and the Forest Inventory and Planning Institute of Vietnam have developed a plan to make the A Luoi Valley a ‘laboratory’ for addressing the ecological impacts of Agent Orange/dioxin. Those models are believed to pave the way for further reforestation programs to heal land damaged by Agent Orange in Vietnam.¹⁹⁶

Another recommendation is that the U.S. and Vietnamese Governments continue to identify other dioxin hot spots. Over five million acres of South Vietnam were sprayed with herbicides by the U.S. military in the war. Up to now, two dozen sites in South Vietnam have been found polluted with Agent Orange/dioxin at different levels. However, there may be many other defoliated places that the relevant forces have not set

¹⁹⁴ U.S.-Vietnam Dialogue Group on Agent Orange/dioxin, “*Declaration and Plan of Action 2010-2019, Second Year Report*” (Aspen Institute: Washington and Hanoi, 2012), 18, accessed March 29, 2017, <https://assets.aspeninstitute.org/content/uploads/files/content/docs/agent-orange/2012-5-30DialogueGroup2ndYearReportwithFocusonUSAIDComprehensivePlan.pdf>

¹⁹⁵ Ibid.

¹⁹⁶ Ibid, 19.

foot on, or have not identified yet. At the same time, these unknown sites are poisoning the land and threatening life of local residents.

Recommendations on joint scientific research and discussions

A high- resolution dioxin testing laboratory was built in Hanoi with the investment of the Atlantic Philanthropies and the Bill and Melinda Gates Foundation.¹⁹⁷ Under the management of the Vietnamese MONRE, the laboratory gathers scientists from Vietnam and other countries such as the U.S., Canada, Germany, and Japan to research and access dioxin and similar organic pollutants in soil, sediments, and human tissue in Vietnam. It is recommended that the U.S. and Vietnamese Governments invest more cutting-edge technologies and provide funding to the laboratory to further carry out research on issues related to Agent Orange and dioxin in Vietnam. Particularly, the laboratory will be home to U.S. and Vietnamese specialists to examine environmental health risk of dioxin in foods, soil, and sediments at the pinpointed dioxin hot spots and other suspected areas in Vietnam. Results from tests can considerably support the two governments to locate new potential hot pots, and review and approve their dioxin decontamination activities in these dioxin-polluted areas in the coming time.

In addition, the joint efforts from both governments should encourage and fund formal meetings of American and Vietnamese chemical experts and scientists. Forums like the Agent Orange and Dioxin Remediation Workshop, the U.S.-Vietnam JAC, and the U.S.-Vietnam Dialogue Group on Agent Orange/dioxin contributed to dealing with the Agent Orange issue in Vietnam. Through discussions, the participants from both sides

¹⁹⁷ Aspen Institute, “U.S-Vietnam Dialogue Group on Agent Orange/dioxin.”

have made considerable recommendations to their two governments in working together to decontaminate dioxin and support victims of Agent Orange in Vietnam.

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