The Long Shadow of Wartime Chemical Pollution: Reflections on the Vietnam War and Contemporary Conflicts

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War produces not only immediate destruction but also deep, persistent environmental consequences. This article offers a scholarly reflection on Kenneth R. Olson's book "Agent Orange: Environmental and Human Health Impacts of Herbicide Use During and After the Vietnam War" and evaluates its relevance in understanding present-day ecological risks arising from the war in Ukraine. By integrating historical, ecological, and scientific analysis, the article underscores the long-lasting effects of chemical contamination and the urgent need for environmental accountability during an armed conflict.

Keywords: Agent Orange, dioxin, Vietnam War, Ukraine war, wartime pollution, environmental contamination, ecocide, soil science

Introduction

War leaves many kinds of scars. Typically, discussions of warfare focus on ruined territories, shattered lives, and the immediate humanitarian consequences. Yet wars also produce a more insidious and far less discussed legacy: long-term environmental contamination. The Vietnam War—an epochal conflict of the twentieth century—illustrates this neglected dimension with particular clarity. While volumes have been written about its military and political aspects, far less attention has been paid to the toxic ecological aftermath that persists to this day.

This paper is an analytical and personal reflection on the book *Agent Orange: Environmental and Human Health Impacts of Herbicide Use During and After the Vietnam War* (*Olson & Tornoe, [2025]*). It is not a review in the strict formal sense, but rather a scientific and emotional response to events that occurred in Vietnam and draw unsettling parallels to the ongoing war in Ukraine. Politics have shifted, ideologies have faded, but chemical pollution remains—a silent, lasting reminder of the conflict. Understanding this legacy is crucial, both to assess historical responsibility and to anticipate the environmental costs of present-day wars.

The Book, Its Author, and Its Focus

Kenneth R. Olson, the lead author of the book, is a professor emeritus of soil science at the University of Illinois. He is internationally recognized for his extensive work on soil conservation, soil degradation, environmental impacts of warfare, and long-term changes in soil carbon. His scholarly background lends strong scientific credibility to the book's analyses.

At the center of Olson and Tornoe's work is Agent Orange, the most notorious of the herbicides deployed by the U.S. military during the Vietnam War. Between 1961 and 1971,

approximately 20 million gallons of herbicides—including Agent Orange, Agent Purple, and Agent Blue—were sprayed over Vietnam's forests, croplands, and settlements. Agent Orange contained the highly toxic and persistent contaminant dioxin (TCDD). Dioxin remains in soils and sediments for decades, bioaccumulates in the food chain, and continues to contaminate local ecosystems and food supplies.

The long-term effects on human health are severe. Elevated rates of cancers, birth defects, congenital heart disease, and other chronic disorders have been documented in exposed populations, including warm-blooded animals and humans. The Vietnamese Red Cross estimates that more than three million people have suffered health consequences from dioxin exposure, including over 150,000 children born with profound disabilities.

Structure and Content of the Book

The structure of the book is as enlightening as its content. It comprises 11 chapters, each delving into a specific aspect of herbicide use and its aftermath. These chapters, contributed by Olson and colleagues (many of whom are fellow scientists and Vietnam veterans), collectively paint a comprehensive picture of the Agent Orange legacy. The Table of Contents reveals the breadth of the inquiry:

- *Chapter 1* traces how agricultural herbicides were repurposed into "military and environmental chemical weapons," providing historical context for their use.
- *Chapters 2 and 3* explore less-discussed theaters: the locations of Agent Orange and Agent Purple manufacturing plants in the United States and Canada, and the long-term environmental impacts of herbicide testing in the Panama Canal Zone.
- *Chapters 4 and 5* investigate the fate of herbicides in specific locales, such as whether commercial 2,4,5-T (the active component of Agent Orange) was used on U.S. base perimeters in Panama, and how dioxin-contaminated soils in Vietnam's "hotspots" have behaved over time.
- *Chapters 6 and 7* discuss the persistence of dioxin in southern Vietnam's environment and pathways of exposure (for instance, links to congenital heart disease), as well as the use of Agents Purple, Orange, and Blue on Thai Air Force bases during the war.
- *Chapters 8 and 9* shed light on the "secret wars" in Laos and Cambodia, examining the consequences of herbicides and chemical weapons used outside Vietnam's official battlefields.
- *Chapters 10 and 11* provide overarching analyses and lessons learned: they review scientific studies conducted during the war and evaluate the overall impacts and consequences of using agricultural herbicides as tools of war.

This systematic coverage underscores that the herbicide campaign's impact was not confined to Vietnam's borders; it spread across neighboring countries and even back to the domestic sphere (through manufacturing, transport, and handling of the chemicals). Such an extensive compilation is possible because the book essentially consolidates a series of research studies published from 2019 to 2025 by the authors *(Olson et al [2019-2025]).* By bringing these studies together, the book allows readers to grasp the full magnitude of the environmental catastrophe that unfolded.

Particularly striking are the book's Dedication and Postscript. The Dedication emphasizes that the misery inflicted by herbicides remains with humanity fifty years after the war's end and urges nations to draw hard lessons from this legacy.

The Postscript introduces the *Merry Band of Retirees Research Committee*, composed of Vietnam veterans, U.S. Army veterans, and agricultural scientists. Their mission is to

conduct scientific research on soil, water, agriculture, and environmental consequences of war. Their work underscores that the legacy of the Vietnam War extends beyond front-line soldiers: it includes civilians and workers who manufactured, stored, transported, and handled contaminated herbicides, as well as Vietnamese citizens who continue to live and work in polluted landscapes.

Such dedication illustrates a rare and commendable scientific commitment to justice, memory, and environmental truth.

Reflection: Vietnam and the War in Ukraine

Intensified Reading of Kenneth Olson's Book During the War in Ukraine

It is significant that this work is being written in Kyiv. War is not only a matter of the past—it is part of daily reality. Alongside power outages, nightly air-raid sirens, and regular trips to bomb shelters, there exist long-term consequences that will persist for decades. These consequences include chemical contamination of soil and freshwater resources. This dimension of war stretches far into the future. It is not only the past and present of Vietnam—it is also the present and future of Ukraine.

For residents of Kyiv, the reality of ecological catastrophe is familiar. The most profound example is the Chernobyl disaster. The 1986 explosion at the Chernobyl nuclear power plant released large quantities of radioactive materials (including isotopes such as iodine-131 and cesium-137) into the atmosphere, causing immediate ecological devastation and long-term contamination. A nearby pine woodland, the so-called "Red Forest," was killed by acute radiation exposure and remains one of the most contaminated sites on the planet. The 30-km exclusion zone around the plant remains largely uninhabited. Radioactive fallout spread across Europe, bioaccumulating in plants and animals and contaminating food chains.

Among human populations, dozens of workers and firefighters died from acute radiation syndrome shortly after the accident. Exposure to radioactive iodine caused thousands of thyroid cancer cases among those who were children at the time of exposure. Research continues to monitor potential genetic effects (including DNA mutations), though no widespread heritable consequences in humans have been confirmed.

Professor Olson's book is exceptionally important for contemporary Ukraine. The war began in 2014, and since February 24, 2022, it has escalated into a full-scale invasion. There is no doubt that this war constitutes an environmental catastrophe. There is also no doubt that it will have very long-term consequences. Even decades from now, the topic of wartime contamination of Ukrainian territory will remain relevant. Its consequences will be diverse and far-reaching.

The Vietnam War demonstrates that chemical pollution is among the most enduring consequences of conflict. Political systems collapse, ideological battles fade, and territorial borders shift—but toxins remain in the soil, water, and food chain for generations.

These lessons resonate strongly today against the backdrop of the ongoing war in Ukraine. Although herbicides have not been deployed as weapons in this conflict, large-scale environmental damage has already occurred: contamination from explosives, destruction of industrial sites, pollution from burning fuel depots, and the catastrophic environmental consequences of the Kakhovka Dam breach. Olson has studied this event as well, demonstrating the long-term ecological risks it poses.

Ukraine may face its own "long shadow" of environmental degradation. The Vietnam experience warns us that such damage may manifest long after the war ends—silently, gradually, and persistently.

Forgotten Facts and Scientific Reminders: A Perspective from the Natural Sciences

Works that introduce new factual data on wartime environmental contamination hold exceptional value. The book by Professor Kenneth R. Olson belongs precisely to this category. Despite the long period that has passed since the Vietnam War, many facts about it remain classified or poorly known. As a result, they rarely become subjects of scientific reflection on the war's environmental consequences.

The reasons for such obscurity vary. For example, Ukraine is currently at war. This conflict has produced numerous cases of environmental contamination and acts of overt ecocide committed by the Russian army. Recording and analyzing these events requires enormous time and effort, leaving little opportunity to simultaneously revisit the Vietnam War. Yet the topic remains critically important. The Vietnam War provided some of the clearest and most striking examples of chemical wartime contamination. Decades later, long-term consequences of those events have emerged. These historical lessons must be taken into account—and Olson's works greatly assist in this.

Millions of people continue to live in cultural landscapes that may have been repeatedly contaminated during past military activity. A vivid example is the Mekong Delta, home to millions of people. To what extent do past episodes of contamination manifest today? How do they influence current disease patterns in the population? What impact do they have on the agricultural products cultivated there? How did the war affect the region's water resources?

Many questions remain unanswered. However, troubling information suggests anomalies in public health indicators among populations living in landscapes that once experienced wartime ecological disruption. Numerous publications document the health consequences of the Vietnam War—particularly in the field of public health.

Such "concerned" publications share a particular feature: they are overwhelmingly written by experts with medical training. Physicians can accurately record health-related data but often lack deep knowledge of natural sciences. The processes of wartime contamination and their effects on warm-blooded organisms are frequently unclear from a purely medical perspective. The concept of ecological impacts becomes limited to humans. Medicine is an inherently anthropocentric science—its focus is the human being. Yet the ecological consequences of war involve systemic transformations in the natural environment and systemic impacts on all warm-blooded organisms.

Even if definitive answers cannot always be provided, the questions must be formulated precisely and comprehensively.

A distinctive strength of Professor Olson's work lies in his introduction of new data on chemical contamination that occurred during the Vietnam War. This is extremely difficult: the field is highly specialized and requires exceptional scientific expertise. Moreover, it is a field that has been largely "forgotten." Much information remains classified, and many topics remain unspoken even when no official secrecy is imposed. But the events occurred—they created unprecedented environmental contamination which consequences are unfolding today. Professor Olson is one of the very few scholars attempting to change this situation.

It is likely that wartime contamination will cease to be a taboo subject in modern science. The main reason lies in humanity's evolving understanding of the Earth's nature: not as something stable and controllable, but as a dynamic system capable of creating and extinguishing biological species. Several mass extinctions have been documented, and there is reason to believe another may be unfolding now.

If one recognizes that the Earth's nature is not inherently friendly or manageable by any single species, then there is no justification for hiding information about wartime contamination. War leaves behind a "chemical minefield," often overlapping with densely

populated cultural landscapes. The cost of living on this minefield is a distinct disease structure among warm-blooded organisms—especially humans.

From World War I to Vietnam and Ukraine: Wartime Chemical Contamination

Reading Kenneth Olson's book raises numerous questions about chemical contamination and the challenges of studying it.

Photo 1–2. A British machine-gun team during the Battle of the Somme (June 1916). A wartime landscape (Ypres, 1917). Homo sapiens engaged in their traditional activity: attempts to redraw territorial boundaries. Chemical weapons offer the possibility of achieving more desirable borders. One might try to destroy all enemies at once. Source: https://www.youtube.com/watch?v=xiHvu2T4Vls

Photographs from World War I often resemble dystopian scenes rather than the reality of the early twentieth century. With the passage of time, some images may seem almost unbelievable—leading future generations to insist that they were generated by artificial intelligence or similar technologies.

War and the Scientific Community

This book is not only about Agent Orange—it is also about the scientific community. Modern warfare is impossible without the direct or indirect participation of scientists. Scientific communities contribute to military activity long before a war begins. Once a war starts, they do not remain on the sidelines. Depending on their specialization, scientists may cooperate with their state to varying degrees. Here a crucial distinction emerges: there is a state–aggressor and a state–victim. This distinction fundamentally shapes the role and responsibility of scientific communities.

These issues are articulated with particular clarity in Kenneth Olson's book. Many "white-collar" researchers claim neutrality, insisting that science stands apart from contemporary conflict. Olson challenges this assumption. Neutrality in the face of aggression is not a morally or intellectually defensible position.

The example of Dmitry Nikolaenko is illustrative. Immediately after the full-scale invasion of Ukraine, he shifted his research agenda entirely. His new works focus exclusively on the war in Ukraine—primarily on its environmental consequences. Equally important is his research on the role of the Russian geographical scientific community in preparing the aggression against Ukraine. Dozens of publications on this subject have appeared, many of which are available on ResearchGate. His most recent articles provide especially valuable insights *(Nikolaenko [2025]).*

Silence regarding the behavior of the scientific community during wartime is unacceptable. This is a vast and critically important field for scholars in science studies. Understanding how scientists behave in times of war—and how their knowledge is used or misused—is essential for evaluating scientific responsibility.

The Scientific and Educational Value of Kenneth Olson's Book

Kenneth Olson's new book is essential reading. It is not merely about historically distant events; rather, it addresses processes that occur during a war and remain impossible to eliminate even decades later. A book must rise above a collection of separate articles—it must create new context. When the individual fragments of knowledge presented in separate publications are brought together, a deeper and more integrated understanding of the research subject emerges. Olson's work fully meets this criterion. It is more than a compilation of previously published studies.

The scientific significance of Olson's contribution is considerable. His book serves as an important reference point for scholars studying environmental consequences of war, chemical contamination, and long-term ecological transitions.

Olson's book should be recommended for specialized academic libraries across Ukraine. Students in Ukrainian universities who study geography, ecology, and environmental sciences increasingly rely on English-language sources. For them, English proficiency is not optional—it is essential. Breaking with the Soviet legacy requires genuine, practical engagement with international scientific literature.

Reading Olson's account of the Vietnam War provides valuable insights for Ukrainian scholars and students seeking to understand how to address contemporary challenges. The book is written in clear, accessible, high-quality English—significantly better than the language found in many scientific articles. It is genuinely readable and aimed at those who care deeply about what happens to the environment and society during and after war. Its language is not narrowly specialized, making it ideal for broad academic and educational use.

Conclusion

The environmental legacy of the Vietnam War, as documented in Olson and Tornoe's book, is a stark and unforgettable reminder of the long-term ecological consequences of an armed conflict. This legacy includes not only immediate destruction but also decades of contamination, illness, and intergenerational suffering.

The book is both a scientific contribution and a moral appeal. It urges the global community to acknowledge the environmental dimensions of war, prevent future ecological catastrophes, and ensure that such tragedies are never repeated. As contemporary conflicts unfold, the lessons of Agent Orange remain painfully relevant.

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