

## **ENVIRONMENTAL AND ECOLOGICAL CONSEQUENCES OF WAR**

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### **Contents**

1. Introduction
  2. Peacetime (Pre-war and Post-war) Impact of the Military Sector
  3. Environmental Manipulations
    - 3.1. Unintentional Manipulations
    - 3.2. Intentional Manipulations
    - 3.3. Intentional Manipulations to Release Dangerous Forces
  4. Forest Clearing
  5. Explosive Remnants of War
    - 5.1. Anti-personnel Land Mines
    - 5.2. Anti-personnel Cluster Bomb Submunitions (Bomblets)
  6. Nuclear, Chemical, and Biological Warfare
  7. Beneficial Environmental Effects of War
  8. Conclusion
- Acknowledgements  
Glossary  
Bibliography  
Biographical Sketch

### **Summary**

The environmental consequences of war are for the most part deleterious. The adverse impacts of armed conflict can be the unintentional (collateral) result of most routine hostile military actions; or else they can be intentional. Intentional disruption of the environment can be carried out especially in order to deny an enemy force cover and concealment or local sources of sustenance. The release of dangerous forces resulting from attacks on dams, chemical factories, or nuclear facilities (often referred to as 'environmental warfare') can lead to severe environmental disruption of a widespread and long-term nature. The use of land mines, as well as of cluster bombs that leave a residue of unexploded submunitions (bomblets), leads to a long-term impediment to rural post-war reconstruction, moreover, with tragic human ramifications. Unconventional warfare (chemical, biological, or nuclear) is likely to cause extraordinary levels of environmental devastation. Preparations for war also result in a certain level of environmental damage. The environmentally beneficial effects of warfare derive primarily from the sparing of habitats, and the wildlife they contain, by

virtue of becoming temporarily inaccessible to human exploitation. Inasmuch as the global biosphere has come under severe threat from the ever expanding needs of the civil sector of society, it is concluded that environmental damage being brought about by the military sector of society must now be recognized as a significant threat to global sustainability.

## **1. Introduction**

Warfare is by its very nature deadly and destructive. The present Section outlines primarily the extent of environmental disruption that can be associated with conventional warfare (i.e., for the most part, warfare that does not involve nuclear or other weapons of mass destruction). Of particular concern here from the standpoints both of nature and of human health and safety are the employment of: (1) environmental manipulations (modifications), especially those that release dangerous forces; (2) forest clearing chemicals and devices; and (3) anti-personnel land mines and cluster bomb submunitions (bomblets). Unconventional warfare (nuclear, chemical, or biological) is dealt with only briefly. Beneficial effects of war and preparations for war are also touched upon, but again only briefly.

The adverse effects on nature and humans just alluded to are associated not only with the actual pursuit of conventional warfare, but to some extent also with the pre-war and post-war periods. Thus there is included a preliminary summary of this aspect of the problem.

## **2. Peacetime (Pre-war and Post-war) Impact of the Military Sector**

Hundreds of wars have been fought in this century alone, several dozen of them always being in progress somewhere or other in the world. However, whether at war or peace, most nations maintain armed forces. Such armed forces are maintained by states for various reasons, among them: (a) to deter an attack from outside their borders or, failing that, to defend against such an attack; (b) to threaten an attack on another state in support of some foreign-policy objective or, failing that, to carry out such an attack; and (c) to deter or quell internal uprisings. In fact, most wars in recent decades have been internal (non-international) ones, so-called civil wars fought between government and insurgent forces.

The social and environmental ramifications for states to maintain armed forces for any or all of the above reasons result from: (a) establishing military fortifications and other military facilities; (b) equipping and supplying armed forces with weapons and other military needs, and in turn disposing of these once they become obsolete or otherwise unwanted; (c) training armed forces and testing the weapons they use; and (d) routine deployment of armed forces nationally, in other nations, and in areas beyond any national jurisdiction.

The social and environmental impacts of peace-time military activities are very roughly proportional to the fraction of gross domestic product they represent in a nation, which is now of the order of 2% or 3% for both industrialized and non-industrialized countries. However, it must be recognized that were the military sector in a country made smaller,

the human, material, financial, and intellectual resources made available thereby would largely be shifted to the civil sector — presumably to carry out socially more useful activities — but the environmental impact would remain more or less comparable.

### **3. Environmental Manipulations**

Environmental manipulations in wartime can be (a) unintentional, (b) intentional, or (c) intentional for purposes of amplification through the release of so-called dangerous forces.

#### **3.1. Unintentional Manipulations**

Unintentional (ancillary, incidental, collateral) environmental manipulations in wartime can result from the often profligate employment of high-explosive munitions against enemy personnel and matériel. Another frequent source of such unintentional manipulations is the use of tanks and other heavy off-road vehicles. Both of these forms of ancillary environmental damage can be especially disruptive of local habitats and the creatures that depend upon those habitats. The construction of base camps, fortifications, and lines of communication can add to the environmental disruption. Battle related activities can also lead to certain amounts of local air and water pollution. Further ancillary wartime environmental damage derives from the often heavy exploitation by armed forces in the field of timber, food, and feed, both within the theater of military operations and beyond.

#### **3.2. Intentional Manipulations**

The pursuit of war often involves the intentional destruction of field or forest as a specific means of denying to the enemy the benefits of such components of the environment. The benefits being denied to the enemy include access to water, food, feed, and construction materials. Often even more important, the denied benefits include access to cover or sanctuary, as noted below under 'Forest Clearing'. The long-term environmental impacts of denial (or barrier) operations through the employment of mines is also discussed under a separate heading below.

A number of important rivers flow through more than one country, providing an opportunity for a nation upstream to divert or befoul the waters before they reach a downstream nation with which it is at war, a major calamity in an arid region.

The Gulf War of 1991 has gone down in history as the conflict providing the most spectacular example of intentional oil releases, by Iraq in Kuwait, for various hostile purposes. Some of the oil that was caused to escape remained in liquid form; and some was or became ignited, to produce dense clouds of dark soot-laden smoke. Some of the liquid oil was released on land and some into the Persian Gulf. The oil releases into the environment resulted primarily from the sabotaging of about 730 oil wells (of which circa 630 were torched), of 20 or so collecting centers, and of 3 or more oil tankers; various storage tanks and pipelines were also breached. Numerous of the sabotaged oil wells continued to discharge oil for many months. The huge resulting releases ultimately amounted to perhaps 10 million cubic meters (60 million barrels). On land,

some 200 small lakes of oil were created, leading to the death of much wildlife and to diverse other environmental problems, including the contamination of groundwater. Of the escaping oil, of the order of 1 million cubic meters (6 million barrels) was released into the Persian Gulf, severely contaminating Kuwaiti offshore waters and about 400 kilometers of coastline, primarily Saudi Arabian, thereby disrupting marine habitats and killing much migratory marine wildlife (avian, mammalian, and reptilian). The huge amounts of smoke released into the atmosphere (soot plus various combustion gases) produced a pall that persisted for several months, leading particularly to adverse human health effects especially for those already suffering from respiratory ailments or who were otherwise in a frail condition.

### **3.3. Intentional Manipulations to Release Dangerous Forces**

Under certain conditions, it is possible to manipulate some component of the natural or built environment for hostile military purposes in a way that is intended to result in the release of dangerous pent-up forces. This sort of military effort — which is often referred to as environmental warfare — becomes especially tempting when the hostile manipulation involves a relatively modest expenditure of effort (i.e., of triggering energy) leading to the release of a substantially greater amount of directed destructive energy. Environmental manipulations (modifications) of particular concern with reference to magnified destructive potential involve fresh-water impoundments, nuclear power stations, and to a lesser extent forest lands. Attacks upon certain industrial facilities could also release dangerous forces, in the form of toxic chemical clouds, over a considerable area.

Many hundreds of major dams have been constructed in recent decades throughout scores of countries that impound huge quantities of water. A significant fraction of those dams could be breached with relative ease, either through direct attack or sabotage, releasing the impounded water to cause immense levels of death and destruction. Hostile actions of this nature have been spectacularly successful in various past wars (notably so in such recent conflicts as World War II and the Korean War of 1950-1953); and their social and environmental impacts can take many decades to recover from. Indeed, the most devastating example of a single military — or any other — human action throughout history appears to have been the intentional release during the Sino-Japanese War of 1937-1945 of Yellow River waters. In order to stop the Japanese advance, in June 1938 the Chinese dynamited the Huayuankow dike near Chengchow. Several thousand Japanese soldiers drowned, and the Japanese advance into China along this front was halted. However, in the process, the flood waters also ravaged major portions of Henan, Anhui, and Jiangsu provinces. Several million hectares of farmland were destroyed as were 4000 villages and 11 cities; at the same time several hundred thousand (and perhaps many more) Chinese drowned. The river was not brought back under control until 1947.

Almost 200 clusters of nuclear power stations have now become essentially permanent additions to the human environment, plus a number of additional nuclear reprocessing plants and nuclear waste repositories, distributed in over 30 countries. These sites are amenable to assault, again either through overt attack or sabotage, with the possible attendant release into a surrounding area measurable in thousands to millions of hectares

of iodine-131, cesium-137, strontium-90, and other radioactive elements. The most heavily contaminated inner area would become life threatening, an outer zone of lesser contamination would become health threatening, and a still greater zone would become agriculturally unusable. A radioactively polluted area such as this defies effective decontamination. Indeed, it is known especially from the Pacific islands used for testing in the 1940s and 1950s and from the Chernobyl accident of April 1986 that the health-threatening degradation of the land will take centuries to recover.

Under certain habitat and weather conditions, forest fires can be initiated that are subsequently self-propagating and enormously destructive of the forest resource itself, of human artifacts, and of the enmeshed flora and fauna. In killing the vegetation of a forest ecosystem (its autotrophic component), such incendiary warfare leads to substantial damage to the wildlife (its heterotrophic component) as well as to the nutrient budget — the latter via soil erosion and nutrient dumping (the rapid loss of nutrients in solution). Substantial recovery from such unbalancing of a forest system must be measured in decades. Incendiary warfare in grassland (prairie) and tundra ecosystems could, under special conditions, be equally or even more damaging.

The quite widely adopted 1977 Protocols I and II on the Protection of Victims of Armed Conflicts (UNTS 17512 & 17513) include some important specific constraints on the destruction of the environment as outlined above, whereas the less widely adopted 1977 Environmental Modification Convention (UNTS 17119) provides some more or less ineffectual constraints of relevance. The 1998 Statute of the International Criminal Court (UNTS 38544) establishes excessive intentional environmental destruction as a war crime.

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### **Biographical Sketch**

**Arthur H. Westing** is trained as a forest ecologist (Yale University, M.F., 1954, Ph.D., 1959). He served as a combat officer in the United States Marine Corps from 1950 to 1952, has been a Research Forester with the United States Forest Service, and has taught forestry, ecology, and conservation at several colleges and universities. From 1983 to 1990, under contract with the Stockholm International Peace Research Institute (SIPRI) and then the Peace Research Institute Oslo (PRIO), Westing directed the United Nations Environment Programme project on 'Peace, Security, and the Environment', a position which took him to many countries throughout the world. He is the author of numerous publications in that subject area. Westing was on the faculty of the European Peace University from 1989 to 2002. Among the organizations that have recognized his achievements are the New York Academy of Sciences, the Government of Bulgaria, and the United Nations. Westing was named a 'Peace Messenger' by the Secretary-General of the United Nations in 1987, and in 1990 became one of the 500 individuals worldwide to have been appointed to the United Nations Environment Programme 'Global 500 Roll of Honour'. Since 1990, he has been a Consultant in Environmental Security, providing his services to several branches of the United Nations, including UNESCO and the International Bank for Reconstruction and Development (World Bank), to the International Committee of the Red Cross, to the Government of Eritrea, to the World Conservation Union (IUCN), and to various other national and international agencies. He is Vice-President of the International Society of Naturalists and is also a member of or advisor to a number of environmental nongovernmental organizations and scholarly journals.