DOI: 10.5937/vojdelo1704126K

ECOLOGICAL CONSEQUENCES OF WARFARE

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During 20th century several wars were conducted in the world. It can be claimed that these wars caused serious ecological consequences, which affected the quality of the environment, the health and life of people, a decrease in population, slowing down the development of economy and many others.

Four wars were waged solely at the territory of the Republic of Serbia: from the Balkan Wars via World War I and II to the NATO aggression in 1999. The NATO bombing caused the most severe consequences for the environment.

Due to a rather negative effect of warfare on the environment, such effect is visible at the beginning of most famous wars. However, it was present in some wars and remained the threat for many years. This paper deals with the examples of warfare in the world that data and concrete indicators exist for and it focuses public attention to problems and consequences of warfare.

Key Words: *environment, warfare*, *consequences of warfare, environment protection*

Introduction

In the history of mankind people have suffered more from consequences of conflicts – wars than natural disasters. Therefore, it can be said that war is a phenomenon, which has constantly been present in the history of human society. It is assessed that more than one hundred million people lost their lives in the warfare during last century.

The question can be asked whether the passion, which people use to research, construct and progress is of the same intensity as the one, which they use to wage wars and destroy. It seems that war is a part of human existence and according to many people the response to the abovementioned question would be affirmative.

War as the phenomenon has been studied from many aspects. Many great thinkers have implied and justified war. Ancient Greek philosophers thought that war had been the natural phenomenon used by slaveholder class to fulfill its interest. The church had sometimes justified war by God willing. There is also understanding that war is a conse-

quence of self-sustaining human kind, psychological characteristics of people and effects of geographical factors. The decision to wage war is made on the basis of faith in a positive outcome and benefit. However, there are numerous opponents of war, conscious of its, often global, consequences, especially the consequences on the state of the environment. Many think that all people lose in war.

The other aspect, as the consequence of war is the harmful effect on other forms of life and on the planet Earth. These are, among others: destruction of forests, other plants and the animal world, water and air pollution. Finally, the question arises: are a man and the society that they belong to conscious of their connection with the whole of life and will their future be sustainable?

War in general

According to the definition, war is an organized conflict of states, military alliances or different social powers of a state in which aggression and armed struggle is applied in an organized manner in order to reach political, economic, military and other objectives. According to theatre and use of military equipment and weapons, war can be total, local and restricted. According to its character, war can be liberation, defensive, civil, imperialist, colonialist, ethnic and religious. According to the type of weapons it can be conventional and unconventional. According to mobility, it can be manoeuvring and position, offensive and defensive. Wars can be fought on the ground, at sea, in the air and space. The special types of war are: cold, special (media, psychological, war against terrorism, hybrid war, IT war, etc.), customs, economic, etc. The unconventional wars include guerrilla, asymmetric, nuclear, biological and chemical (NBC) and ecological war.

In 20th century the use of contemporary weapons, mainly nuclear one, brought massive annihilation and forced many people to consider the negative effects of warfare and negative attitude to war. According to the rule, only defensive war is justified. However, there are such people, who think that war is a negative phenomenon and that not even defensive war should be waged, that is, war and warfare would not exist if there were not armed resistance.

When the doctrine about peace and non-violence is studied, as well as the history of non-violent movements, it is obvious that it is not easy to win a victory. The conqueror-adversary is extremely strong and powerful; such state seeks non-violence actors, true paragons of sacrifice, steady and persistent actions. Gandhi called this way and method "double blessed because it releases both perpetrator of evil and victim". It is harder to be a good man and an objective person. Gandhi left the only oath to followers of peace: to follow the path of non-violence and truth and thus give hope to the ones who have to live in this world of violence, hopes, utopia and many veils of evil.

Nowadays many people think that only the so-called just war is legitimate, that is, they believe that it can be conducted solely through international organizations such as the United Nations (UN), which should stop wars and unjust aggression. However, the others think that international organizations are burdened by the same ethical problems like sovereign states, having in mind their practice in recent decades. Therefore, they do not have any right to judge what is, and what is not just war (Jovanović and other authors. 2012).

Ecological warfare

All wars result in environmental degradation to different extent. Ecological warfare is the process of devastation and pollution of the environment (water, air, land, plants and animals) in order to create unfavourable conditions for life of population and fight of the armed forces of adversary (Pavlović. 2012). The term ecocide is used as the synonym to ecological warfare and is derived from the Greek word *oikos* which means house, habitat, residence and Latin word *occidere* – to kill, destroy.

As an analogy to the classification of warfare, ecological warfare can be strategic and tactical, which is related to scope of action and consequences to the environment. In relation to the type of openness there is an open and secret ecological warfare, that is, the means of special war and subversive activities. The term "*ecological subversive*" is most often understood as the efforts of the developed countries to export their "*dirty technology*", whose damage to the environment has been proved, to the developing countries (which includes disposal of "hazardous waste" outside country such as nuclear and chemical waste, which are very dangerous). Combat activities can focus on biological and abiotic components of the environment.

Depending on the type of weapons in use, ecological warfare can be:

– biological warfare, which includes the use of biological weapons – pathogens (bacteria, viruses or other organisms which cause diseases) or toxins, which can be found in the environment as weapons in war for the sake of killing, incapacitating or seriously damaging combat ability of enemy;

– chemical warfare focused on incapacitating enemy by chemical substances such as chemical agents, herbicide, defoliant and desiccant;

– nuclear warfare, which represents a conflict in which nuclear weapons is used, and nowadays this term also involves every armed conflict in which opposing parties are equipped with nuclear weapons;

– geophysical and meteorological warfare, which involves the use of means, methods and procedures for military purpose that can cause changes to physical characteristics or processes in the atmosphere, lithosphere and hydrosphere of the Earth. These weapons include meteorological and climatic means, storms, artificial waves, etc.

Therefore, various types of geophysical warfare can be classified according to the type of primary effects into three categories: seismological, climatic meteorological and hydrological forms.

Contemporary warfare involves the mass use of conventional weapons. Classic bombing from the air and artillery effects have rather ecocide character. In addition to destructive effects of conventional weapons, devastation of the environment can be done indirectly if industrial plants and facilities containing dangerous substances are destroyed. Thus, a large quantity of toxins and pollutants gets into the environment. It is possible to evaluate the scope and consequences of such phenomena in the environment only by application of the scientific approach, the so-called ecological risk assessment (Bakrač 2012, p. 296-305). The ecological security of a state or wider space represents the additional consequence of contemporary warfare, which is directly connected to environmental contamination (Bakrač 2010, p. 314-28).

Despite adoption of the United Nations Conventions on the environment protection in the second half of 20th century wars which have rather ecocide character are waged. Some military analysts (in the USA and Russia) have realized and included advantages of "*ecological warfare*" (particularly the so-called geophysical warfare) in their strategies. According to those opinions, the advantages of such warfare (globally) are numerous. It is possible to create vast energy by relatively small and cheap resources. The preparatory works, even experiments, can be covered as research for peaceful purposes, and potential mistakes can be attributed to natural disasters.

Examples of ecological consequences of warfare

The Vietnam War (the first: 1945-1954 against French colonialism and the second: 1955-1975 for the unification of North and South Vietnam in which the USA were the main enemy) is an example of conscious devastation of the ecosystem. The US Armed Forces used Vietnam as the range to try out the latest weapons at that time including various types of chemical agents. The bomb called "Commando Vault" is a conventional warfare agent which had rather negative effect on the environment. It kills all living organisms under great pressure in around 1km diameter, and it flattens the surface of the ground at 60m distance from the epicentre, making it suitable for a helicopter landing zone. The *CBU-55* bomb binds oxygen at the area of about 1 km^2, and thus kills the majority of living beings. According to many analysts, the programme "Rome plough" using a tractor with two double ploughs had the greatest efficiency in the environment destruction. More than 500,000 hectares of forests in South Vietnam were destroyed by it. The use of chemical agents, herbicides and defoliants has the significant place when it comes to the effects to the environment in Vietnam (Vuruna and other authors. 2012). The most famous one among them is "Agent Orange". This chemical was sprayed across Vietnam jungles and had the effect of abscission. Despite this, nature was more resistant than many US soldiers, who later proved that this agent was the cause of cancer. Weather warfare was used for the first time during the Vietnam War. More than 50,000 rain bombs were used, which caused downpour and consequently great floods that had wiped out the whole of the countryside along with the population from the face of the Earth. The experiments with the so-called "firestorms" were conducted, as well. Large fires were generated in which vortices, vacuums and shocks were created that rocked the trees from the roots, demolished the buildings and consumed oxygen on large surfaces.

Ecocide was committed in this war by destruction of the environment with the objective to incapacitate adversary. The confirmation of this attitude can be found through the following consequences of ecocide: the natural conditions have been changed; population of many plants and animals has become scarce; rich forest ecosystems have lost their biodiversity; many animal species have come to the verge of extinction. In short, ecological consequences were catastrophic.

Picture 1 – *A detail from the Vietnam War*

The Gulf War was conducted in the Persian Gulf since the beginning of August 1990 until the end of February 1991 (540 air strikes were focused on oil plants and transport). The bombs destroyed the important dams, the majority of oil rigs and many wastewater treatment plants. More than 700 oil rigs were set on fire and burned more than 8 months. These were the catastrophic fires, which resulted in the environment pollution.

Picture 2 – *US planes above oil rigs set on fire*

During withdrawal the Iraqi Armed Forces dropped 11 million tons of crude oil into the Gulf and made the greatest oil spill so far, which polluted 800 miles of the coastal area of Kuwait and Saudi Arabia. The ecosystems were damaged in such a way that a long period is necessary to establish a balance. The use of munitions with depleted uranium had negative effects on the health of people. After the war, the number of malignant, respiratory and cardiovascular diseases increased (Žakula 2001).

The War in Bosnia and Herzegovina started on 1st March 1992 and lasted until 14th December 1995. An unprecedented ecocide was executed. Endemic plant and animal species were destroyed to a great extent. Forests were used in military purposes and for heating of civilian population. The vast areas of forests are still polluted by unexploded ordnance, whose clearance will last half a century. The great areas were polluted by unwanted substances, which have been incorporated into the food chain that includes a man, which seriously disturbs the ecological balance. During bombing NATO used munitions with depleted uranium (Picture 3), whose consequences are disastrous. During this war the living space on the Balkans was turned into "large world experiment landfill" (Nedović 2001).

Picture 3 – *Munitions with depleted uranium*

NATO bombing of FRY

NATO began air strikes on the Federal Republic of Yugoslavia on 24th March 1999 by cruise missiles and aviation in several areas under the code name "Operation Allied Force" (UNEP 2001). The name of these strikes in the USA was „Operation Noble Anvil", and in Serbia „ Merciful Angel" or „NATO aggression".

Picture 4 – *Bombing of oil refinery in Novi Sad*

During 79 days of the aerial bombing 2,300 strikes on 995 facilities across the country were launched causing irreversible consequences to the environment. In addition to proven locations and the quantity of the used munitions with depleted uranium there were other great consequences (Marinković and Nešić 2014). For instance, devastation and the environment pollution were rather high during the bombing of the following industrial locations: the oil refinery in Novi Sad, heating plant "New Belgrade" in Belgrade, TPP "Kolubara" – Veliki Crljeni in Poljane village in the vicinity of Belgrade, mineral fertilizer plant "HIP-Azotara", "HIP-Petrohemija", oil refinery in Pančevo, "Jugopetrol" warehouse in Prahovo, oil derivatives storage "Jugopetrol" and power substation "Elektroistok" in Bor, automobile factory "Zastava" in Kragujevac, warehouse "Beopetrol" in Bogutovac in the vicinity of Kraljevo and power substation "Elektroistok" in Niš.

Much more space would be required to detail the scope and consequences of the NATO bombing of the FRY for the environment (Marinković and Nešić 2014) than it is allowed by the subject and content of this paper. Thus, there remains an obligation to dedicate special research time and space to analyze the environmental consequences and damage inflicted in that war.

Picture 5 – *Bombing of the heating plant in New Belgrade*

It should be pointed out that the awareness of the need for environmental protection started to develop only in the second half of the twentieth century. Regulations on environmental protection in armed conflicts were clearly defined for the first time in the '80s. More specifically, one of the first international environmental agreements known as the ENMOND Convention (The **En**vironmental **Mod**ification Convention) or the Convention on the prohibition of military or any other hostile use of environmental modification techniques, was signed in 1976.

Conclusion

In wartime, enormous amounts of various dangerous substances affect the environment. Many of them, in their unchanged or modified, but often not less harmful forms, can persist for years. The harmful substances, affecting the ecosystems through food chains, disturb the natural balance and seriously endanger the lives of future generations.

In wars waged in the past, especially in the 20th century, plenty of harmful substances were used, which have significantly affected the environment. Some of them came directly from chemical weapons, while others were released from the destruction of industrial plants and warehouses.

On the basis of the established and presented facts, we can arrive at the conclusion that all wars: past, current, and possible future wars have had and will have serious consequences for the environment, posing a threat to its survival and sustainability.

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