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The negative influence of armament on ecological security. Can it be reduced?

Abstract

This article looks at the question of the influence of armament and military activity on the environment during peace time. Different types of threats were characterized, posed by the production, storage, testing, liquidation and use of conventional weapons and weapons of mass destruction. The aim of this article is to show some examples of threats for the environment, generated by armaments, and to present possible ways to reduce them.
Except for the general characteristic of the different factors having a negative influence on ecological safety, some historical examples were shown of armaments which had harmed the environment in particular. Then activities will be presented, which have been being conducted by states individually or under international agreements, and strive to reduce this influence. The pure environment is one of human rights and an awareness of the importance of ecological security is growing in societies. That why the question of ensuring safety, especially in such a controversial matter as armament, becomes one of the most important global problems.

Introduction

Any kind of human activity has measurable effects on the natural environment, unfortunately, most of them are negative. It is the same with all kinds of military activities. Their influence on the environment was rather minimal on a global scale until the industrial revolution, but even before then there were great interventions in nature because of military needs, like for example the deforestation in the Mediterranean to develop the fleets of ancient empires, or in medieval England for the production of bows and arrows.

A serious breakthrough in this field was only made in 19th century. The organization of mass armies, the development of artillery and other firearms, the invention of new kind of weapons, including weapons of mass destruction, the engagement and develop of armaments by the heavy and chemical industries: all of these factors had a big influence on the environment, like nothing before.

Research into the influence of military activities on the environment are focused on the effects of warfare. Photographs of exhausted landscape, where battles were fought during World War I and II, are well-known and legendary. The problem of military action in peacetime is discussed less frequently.

The aim of this article is to show some examples of threats for the environment, generated by armaments, and to present possible ways to reduce them. It analyzed threats to ecological security in peacetime, generated by the military industry, weapons tests (including ABC weapons) and research into the military's use of nature. The article also looks at different efforts to reduce the negative influence of military activity on the environment, both at local, national, as well

as international level. Some sources, used in this article, refer only to direct examples of some most representative threats and other treat about general theories of ecological security. The author tries to answer the question of whether it is possible today to reduce the negative influence of armaments on nature and ecological security, and if so, to what extent?

1. Different aspects of armaments as a threat to the environment

Ecological security is one of the dimensions of security studies in which the issues of humans functioning in their natural environment and their influence at local, international and global level have been researched. In practice, it is closely related to question of environmental protection, cultural, social and economic factors also affect it. By analyzing the influence of military activity on ecological security it is possible to differentiate three main approaches:

1. To prevent wars and military conflicts, caused by the shortage of natural resources and environmental degradation;
2. To counteract conflicts other than war, caused by degradation of natural environment;
3. To counteract the destruction of the Earth's renewable resources.

In this analysis the third approach was used first of all, because the article focuses on armament-based threats to the environment and methods to counteract them, what means prevention of the destruction of the Earth's renewable resources also[1].

[1] Smuniewski (2016): 132.

In view of the influence on the environment, it is possible to point out three types of army-generated pollution: physical, chemical and biological.

Physical pollutants include different ranges of ionizing radiation, thermal radiation, noises and other acoustical factors, shock waves, thermal and seismic processes, pressure, vibrations, and mechanical impurities. Chemical pollutants (negative factors) that are different poisoning substances (include war gases), petroleum products and their derivatives, rocket fuel components, degassing, deactivating and disinfecting solutions, surface-active pollutants and fumes, and other toxic substances. This category also includes all combustion products. Biological pollutants include pathogenic microorganisms (viruses, bacteria, rickettsia, fungi), toxins and biogenic pollutants[2].

The everyday use of any kind of weapon involves a lot of environmental pollution. Vehicles produce a lot of pollution, such as operating fluids, exhaust gases, noise; tracked vehicles contribute to soil erosion. Huge amounts of fuel are used by armored vehicles, airplanes and rockets[3].

Military radio stations and radar systems are important sources of electromagnetic radiation. The large amounts of metal of used ammunition also have an impact on nature[4].

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[2] Szudrowicz.

[3] Contemporary tanks used evet to 400 liters of fuel per 100 kilometers, but in the past some vehicles used it to 1000 liters. During the start and work of starting engines of ballistic and space rockets there is release in every second about 3100 kg of toxic combustion products, with the speed between 2800-3000 m/s and temperature about 3000º C.

[4] You can find interesting data about contamination by metals warfare fields of WW I in the article: Radziewicz, URL = http://rme.cbr.net.pl/archiwum/lipiec-sierpie-nr-56/204-ekologia-i-rodowisko/496-rodowisko-naturalne-w-obliczu-wojen-i-konfliktow-zbrojnych.html

Armed forces use a lot of environmentally-harmful chemicals every day.

Serious interventions in environment have been made for military purposes, such as logging, the construction of fortifications and the necessary infrastructure, routes and airfields. Aerodromes are especially dangerous for objects in the natural environment, because of the noise generated, the threats to birds and danger spills of fuel, lubricant and other chemical substances. Potentially-dangerous infrastructure is also developed, such as fuel pipes and tanks. Because of that airports are very difficult areas for possible reclamation[5].

The most serious threat to the natural environment is the use of combat military technics during military conflicts. Having said that, testing in simulated combat conditions, for example during exercises on training grounds, is almost equally harmful. The operation of training grounds, areas where intense military exercises are conducted, is associated with a significant environmental burden. The noise, heavy machines, chemical pollution, functioning of radars and radio stations, problem of waste ammunition and targets, sanitary waste and rubbish - all the typical military pollutants occur there on a much larger scale. What more, accidents often happen during military tests, which may also affect areas outside the training ground. On the other hand, it is necessary to admit, that large, screened and rarely visited areas may become some kind of nature reserves. For example, in Poland the fields of some testing grounds (in Żagań, Bemowo Pilskie or Wędrzyn) have become areas protected by the "Natura 2000" program, because they are habitats of endangered species[6].

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5 Glińska (2012).

6 Ibidem

The use of weapons is not only a threat to the environment. Its production, maintenance and utilization are also a large environmental burden. The military industry is one of main polluter of nature, but for a lot of reasons, it is difficult to get direct data about the pollution generated by it. This data isn't disclosed, usually due to national security issues, but the most harmful industries are used for military production[7]. It is estimated that in the 1980s 25% to 30% of world production was for the arms industry[8]. Military production as well as the functioning of military installations requires the supply of huge amounts of electricity. The chemical and metallurgical industries are especially harmful because they generate many water, atmospheric and soil pollutants. The production of weapons of mass destruction is especially dangerous.

Both in the past and nowadays, the biggest chemical corporations (like American Monsanto and DuPont, or the German IG Farbenindustrie (which no longer exists), from which BASF and BAYER evolved after WWII) were involved in the production of chemical weapons. With chemical weapons there is a problem with dual-use technologies: the same products may be used both as agricultural measures as well as military defoliants, and the same ingredients could be used to synthesize civilian and military substances.

Often, secret production for military purposes is conducted parallel to civilian manufacture at the same plants. However, substances produced for military use are much more harmful than those for the civilian market (which are also very dangerous to the environment). Their release may

7 Gould.

8 Попов, Толстихин.

lead to the pollution of objects, soil, water, atmosphere and cause the death and illness of people and animals. During the production and testing of chemical weapons, incidents occur which are often dangerous to people and the environment. The so-called "Dugway sheep incident" is one such example. It took place in USA in 1968. During a few days the sheep grazing in the meadows died of poisoning. According to the different sources, 3,000 to 6,000 animals died. It is indicated that the cause of their death was poisoning with a V-series agent (military poison agents that affect the nervous system), which were released on a test area just a few dozen kilometers away from grasslands. Furthermore, on the day the sheep died, an F-4 fighter flew over the pastures with a leaking tank of poisonous agents[9].

Another big problem is the question of the used chemical weapons. Until recently, this issue had been solved by singing it at sea. A mass sinking of former German chemical weapons took place after WWII in the Baltic Sea. In areas in the exclusive economic zone of Poland, 15,000 tons of chemical substances and 87,000 tons of chemical ammunition were sunk. Up until the end of 1970, missiles with poisoning agents were thrown onto the beaches and fishing boats were regularly polluted during fishing[10]. The known technologies for utilization of chemical weapons are very expensive and are also very harmful to the environment[11].

For the production of biological weapon there are sufficient small, specialized laboratories, although it can also be produced in large biotechnological industries, in parallel with civilian manufacturing. Although the Biological

9 Norell.

10 Simons, Lynn (2003).

11 *Экологические проблемы военной деятельности в мирное время.*

Weapons Convention (The Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction, BWC) was concluded in 1972, and was adopted by most of the countries on the world, research into biological weapons continued in many states. As with the chemical weapon, the problem is that biotechnology can be used for civilian as well as military purposes and military research is often conducted under the guise of civilian technology. For example, in the former Soviet Union manufactures of the "Biopreparat" network, consisting of 18 research laboratories, mainly in the European part of the Russian Soviet Federative Socialist Republic, were engaged in the production of biological weapons. The official purpose of manufactures was to develop medicines and vaccines, and produce biological components for civilian use. Under this guise, military research was conducted about microorganisms, like smallpox, anthrax, and the plague. One of the most serious incidents with biological weapons took place in 1979 year in Sverdlovsk (today: Yekaterinburg). During local manufacture by the "Biopreparat" network, a combat type of anthrax was released because of the lack of a necessary filter. The disclosure of this incident could confirm, research into biological weapons had been conducted in the USSR so the authorities decided to cover up the case. The official information was that the deaths were caused by rotten meat. According to estimates from different sources, 68 to 100 people died[12].

A nuclear weapon can be considered as one of the most serious threats to the environment. Special installations are necessary to manufacture this kind of weapon, first

[12] Simons, Lynn (2003).

and foremost nuclear reactors to produce the required elements. The construction of these types of reactors is less safe than others.[13] The other problem is how to dispose of nuclear waste. The recklessness of governments and military staff in this matter is really shocking. For a long time this kind of waste was thrown into the sea, which was begun by the USA in 1946. The release of radioactive isotopes into the oceans is very serious threat to their ecosystems[14]. The scale of this problem can be confirmed by the fact that, between 1967 and 1992 alone, the Western countries sank 188,188 containers of nuclear waste in Atlantic Ocean, with total activity more than 1 million Ci. Between 1964 and 1991, the Soviet Union sank around 118,00 containers in the Arctic sea and along its East coast, more than 38 military ships and civilian vessels and over 100 nuclear devices with total activity of tens of thousands Ci. Nuclear waste was also sunk by other countries also, like South Korea and Japan[15].

Radioactive isotopes of caesium, uranium, strontium and other elements, which are products of nuclear reactions, can stay in the soil, atmosphere and water for a long time, and they can also occur in food chains. Radiation is the reason for radiation sickness and cancers. It can induce genetic mutations and foetal damage.

Nuclear tests are very harmful to nature. To date about 2000 nuclear tests have been conducted, most of them (1030)

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13 A RBMK reactor, which burned in Chernobyl, was based on construction of military reactors for manufacturing of plutonium, see: Prokopowicz. Less known, but one of the most serious accident to the time of Chernobyl, there was an accident of British reactor for production of Plutonium in Windscale in 1957 year, see: The 1957 *Windscale Fire*.

14 Woźniak (2003).

15 *Экологические проблемы военной деятельности в мирное время*. 1 Ci i san activity of about 1 g of the radium isotope 226.

by the USA and the former USSR (715). All nuclear explosions induced a release of a lot of radiation, radioactive substances, which, depending on different factors, like the wind and weather, could be spread across distances of several thousands of kilometres. Nuclear test sites became contaminated for a long time[16].

Although nuclear testing areas were located far away from human settlements, there were lot of situations where the local population was contaminated. Many nuclear tests (for example tests by the French in Algeria, the British in Australia, and the US in the Pacific) were conducted with full awareness that indigenous people would be within the range of radiation. Some explosions were combined with general army training, where the soldiers were concentrated close to "ground zero" and their mission was to operate in the contaminated area. The series of explosions during the American operation "Teapot" in 1955, which was conducted at the Nevada Test Site, could be an example of such exercises. The American Institute for Cancer Research estimated, that about 13,000 thyroid cancer cases and at least 650 deaths were directly related to operation "Teapot". At least 41 million civilians from Nevada and the surrounding states (including residents and tourists in Las Vegas, where these explosions could be seen) were exposed to a dangerous dose of radiation[17].

Nuclear explosions in the upper layers of the atmosphere, conducted by the USA and USSR in the 1950's and 60's, were particularly dangerous to the natural environment. These kinds of tests destroyed the ozone layer and disturbed the ionosphere more than other tests. Radioactive dust was

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16 Simons, Lynn (2003).

17 *Operation Teapot, Military Effects Studies – 1954.*

distributed across longer distances after these tests. Unnatural radiation belts were created in the atmosphere as well as large electromagnetic pulses, which were capable of destroying electrical networks over a distance of more than 1000 km from "ground zero"[18]. Because of all of these factors, the possibility to use nuclear explosions in the upper layers of the atmosphere as a meteorological weapon is particularly interesting for world powers. However, not only nuclear bombs can be used as meteorological weapons. Different chemical substances (like silver iodide for example, which is used to make rain) and radio engineering installations are also used for this purpose.

Controlling the processes in the atmosphere could be very important during military operations, and could also provide a lot of possibilities in peace time. It could be used to disseminate radiation in the air, as well as chemical and biological substances. Disorders in the ionosphere can disturb or destroy electronical devices and communication systems. Today, manipulations in the atmosphere make it possible to control the weather, make rain, droughts, hurricanes, local fires, ozone holes and change the chemical composition of the air in the selected areas. A lot of these technologies have been developed since the Cold War[19].

In some states, programs where electromagnetic radiation is released ionosphere have been conducted, which are very interesting in this context. The Russian program "Sura" and the American HAARP (High Frequency Active Auroral Research Program) represent the biggest. The main research centre of HAARP is located in Gakona, Alaska, but there

[18] Użycki (1989): 156.
[19] Ibidem: 72, 174.

are also some smaller stations, which are engaged with it. The official purpose of this program is to research phenomenon in the upper layers of the atmosphere, which could be used, for example, by communication. Most of the research activities of HAARP are open, but some remain classified. The functioning of HAARP was the topic of a letter, prepared by Russia's parliament (the "Duma") to the UN in 2002. Russian members of parliament asked that this program be cancelled because of the possibility to use it for military purposes. In the letter, the members of parliament referred to the Environmental Modification Convention (ENMOD) from 1976, in which such activities were prohibited. According to some opinions and theories, the natural and technical disasters which occurred in some post-Soviet republics in 2002, were caused by research into geophysical weapons. Although official statements have been made concerning their peaceful nature, HAARP and other similar programs remain very controversial, because in fact, these kinds of installations may have a dual function. Moreover, even the conducting of civilian research on such a large scale could be dangerous for the natural environment.

Meteorological weapons (as well as ozone and climatic weapons) could be classified as geophysical weapons. Using this group of arms, manipulating processes in the natural environment should help to conduct other activities against the enemy[20]. Hydrosphere and lithosphere weapons also fall under this category. With the former, the purpose is to control the chemical, biological and electrical characteristics of the water in the ocean, to poison groundwater

[20] Użycki (1989): 87.

and to initiate erosive processes[21]. Water is a substance absolutely necessary to live, so the consequences of its pollution during tests or the combat use of this weapon could be incredible. Even today, the lack of clean water is a serious, global problem[22].

Lithosphere weapons are based on controlling the distribution of energy in the Earth's crust. It can be used to initiate earthquakes, tsunamis, volcanic eruptions, or the displacement of small geological formations[23]. The scale of the impact of lithosphere weapons could be powerful, because of the range and ferocity of the phenomena caused by them. The most useful tool to induce all of these phenomena is a nuclear explosion, which should be conducted in specific points of the Earth's crust.

Research about manipulating the biosphere for military purposes is conducted in some countries (for example, in the USA and UK). This focuses on the use of GMO technology. For example, genetically modified worms could eat and destroy the textile and leather elements of military equipment[24]. Such large-scale interventions in the environment could represent a serious threat to nature. Humans don't know all of the effects of this interventions. The expected results of experiments are based on mathematical, chemical and physical equations, but they are only estimates, because

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21 *Экологические проблемы военной деятельности в мирное время*. Definition of hydrospherical weapon in this article includes also factors, which could make a tsunami, but it is more sensible to treat them as lithospheric weapon: tsunami is usual an effect of earthquakes.

22 Użycki (1989): 92.

23 Ibidem: 93.

24 Litvinovich.

it is impossible to forecast all of the short-term and long-term effects[25].

2. The question of reducing the pollution generated by armaments, in international relations

The progress in military technology, which could impact the natural environment, the scale of nuclear armaments and the stress on nature caused by using weapons have encouraged countries to adopt some solutions, which could regulate these questions.

First of all, they focused on the nuclear armaments. Some regulations concerning this matter were adopted by both superpowers during the Cold War. The SALT 1 and 2, ABM, INF, START 1 and, after the Cold War, START 2, SORT and New START treaties were adopted in order to reduce the nuclear potential of both powers. Some regulations were also adopted at international level. The most important were:

- The Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water, also abbreviated to the Partial Test Ban Treaty (PTBT), the Limited Test Ban Treaty (LTBT) or the Nuclear Test Ban Treaty (NTBT): this was adopted in 1963 and ratified by most countries in the world;
- The Treaty on the Non-Proliferation of Nuclear Weapons, commonly known as the Non-Proliferation Treaty (NPT) from 1968, this has been ratified by 189 states;
- The Comprehensive Nuclear Test Ban Treaty (CTBT), which was adopted in 1996 and was ratified by most

[25] Użycki (1989): 94.

countries (including Russia, the UK and France), but some nuclear powers have still not signed or ratified it.

Other weapons of mass destruction also became subject to international regulations. In 1972, the Biological Weapons Convention (BWC, full name: the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction) was signed and the Chemical Weapons Convention (CWC, full name: Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction) was only signed in 1993[26].

The combat use of defoliants (including the well-known "Agent Orange") during the Vietnam war and of the development of the technology, which could be used as a geophysical weapon, were a stimulus for the international community to adopt the Environmental Modification Convention (ENMOD, full name: Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques) in 1976. The ENMOD was ratified by most states, including both superpowers during the Cold War. Two review conferences were held in 1984 and 1992[27]. According to the Convention, environmental modifications would only be prohibited if they are conducted for military purposes, but peaceful research remained an open option, although these kinds of activities could be dual-use technology. In their letter about HAARP, Russian members of parliament based their arguments on this convention

[26] Śledź (2016).

[27] *Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques.*

The UN also paid attention to the influence of armaments and warfare on the natural environment, but any direct results in this matter were not adopted. However, this question has been discussed regularly, for example it was the theme of the Stockholm Conference in 1972. Members of this conference made a declaration, in which they recognized factors which are harmful to the environment and called for these factors to be counteracted. The 26th rule of this declaration called for the elimination of all kinds of weapons of mass destruction[28].

In 1987, the Brundtland Commission (officially known as the World Commission on Environment and Development, WCED), which was formed in 1983 on the initiative of the Secretary General of the UN Javier Peréz de Cuéllar Guerra, published a report entitled "Our Common Future". The authors of this document warned against the military-industrial complex and recognized that other kinds of weapons, not only WMDs, are also harmful to the environment. The Brundtland Report contributed to the Earth Summit in 1992, held in Rio de Janerio. At this summit, the program "Agenda 21" was adopted, although because of the objections of some countries (including the USA), there were no rules related to the military industry and armaments[29].

Non-governmental organisations (including international NGOs) are also interested in the matter of the influence of armaments on the environment. For example, during the Earth Summit in 1992, NGOs prepared the "Treaty on Militarism, the Environment and Development", in which they called to change information about the impact of any

[28] *The Military's impact on the environment: a neglected aspect of the sustainable development debate* (2002).

[29] *Sustainable Development Knowledge Platform*.

military activities on the environment. A lot of NGOs are engaged in this question, such as the Women's International League for Peace and Freedom or the International Association Of Lawyers Against Nuclear Arms[30].

Independently from international regulations, individual countries and their armies have adopted some activities which aim to reduce the negative influence of armaments on the environment. Although military staff are motivated more by economical or tactical factors, rather than ecological ones, these kinds of activities also have an important impact on nature. An example of such actions could be the American plan to use biofuels in F/A-18 jets in the US Navy. It should reduce fuel consumption by 3%, which would save 7.5 million liters of fuel every year. The US Navy wants to base 50% of its energy consumption on renewable sources by the year 2020[31].

In Poland, the army must comply with environmental regulations, especially concerning testing areas. Testing grounds are often covered by the regulations of State Forests (Lasy Państwowe holding). This obliges the army to maintain strict standards of environmental protection. In order to avoid penalties for polluting the environment, the army has to build sewage treatment plants, to organise the disposal of waste and to reduce noise[32].

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30 International Association Of Lawyers Against Nuclear Arms (official website), Women's International League for Peace and Freedom (official website).

31 *Green Hornet – myśliwiec na biopaliwo.*

32 Glińska (2012).

Summary

Military activity is a serious, multi-dimensional threat to ecological safety, which could in extreme situations cause serious disturbances to the climate or the permanent contamination of the environment. The production and use of any kind of weapon is very harmful for the nature.

Technological progress allows us to create new weapons, whose impact on the environment and power range are much greater than traditional arms. World powers have technology, which gives them the possibility to impact processes in the lithosphere, atmosphere and hydrosphere. They are able to destroy life on the planet. On the other hand, they are trying to adopt and develop international regulations which could reduce the arms race in this field. Because of the scale of the threat, the fear and sense that they are under pressure from societies, the states have decided to reduce their potential and to resign from developing and testing the most dangerous weapons.

Despite the fact that these agreements are sometimes violated by states, in general it represents a functioning law. The possible response from the international community deters other states from activities which could violate these regulations. As a consequence, for example, since the end of 90s nuclear weapons, one of the most powerful weapons ever developed by humanity, have not been tested (except small-scale explosions by North Korea).

The ecological awareness of armies and the military command is also growing. They are introducing more and more solutions, which could help to protect the environment. Of course, environmental protection is not always the sole motivation of military staff. However, it is not important

whether they think about ecological, economical (for example lower fuel consumption), tactical (lower noise means a lower possibility of detection) factors, matters of prestige or any other arguments: the most important thing is that they have been paying attention to this matter and have been trying to reduce the negative impact of military activities on the environment.

Regarding the question at the start of this article of whether it is possible to reduce the negative influence of armaments on ecological security, the answer would be positive. Of course, questions about the scale of this reduction, the dual-use of technology and the possibility that new kinds of environmentally-dangerous weapons could be created, will continue to exist. But the most serious problem is, would states which want to reduce the impact of their armaments during peacetime, be ready to limit their military potential during warfare?

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