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Biological weapon as a tool in the process of reducing the structural power of a state

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Abstract

Objectives: The purpose of this article is to present biological weapon in the process of reducing the structural power of a state. This article answers the following questions: What is the structural power and national economy? What is human capital and agriculture? What is the biological weapon and what is its effectiveness? How does the biological weapon reduce the structural power of a state?

Methods: Analyzing literature and documents.

Results: This article states that a biological weapon is a tool for reducing a state's international potential used by a hostile state. This is the main reason why agriculture is the high-risk target for biological warfare. From the perspective of a biological weapon, a high-risk target as agriculture is human capital that is engaged in the production of goods. This sphere is essential for the national economy as well. The health and vitality of the population is crucial for effective production. All of the above gives the full scope of the country's capabilities in the international sphere which could lead to becoming a power actor in global politics.

Conclusions: From the perspective of a hostile state, the structural power of the targeted state cannot be reached. At this point, it can be stated that a state's structural power can be limited by reducing its relational power (reduction of international power through reduction of production/agriculture). Due to the wide spectrum of potential biological hazards a biological weapon can easily meet the needs of a hostile state.

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Introduction

A weapon of mass destruction (WMD) is a nuclear, radiological, chemical, biological, or any other device that is intended to harm a large number of people (DHS). According to UN, weapon of mass destruction (WMDs) determines a class of weaponry with the potential to:

- "produce in single moment an enormous destructive effect capable to kill millions of civilians, jeopardize the natural environment, and fundamentally alter the lives of future generations through their catastrophic effects;
- cause death or serious injury of people through toxic or poisonous chemicals;
- disseminate disease-causing organisms or toxins to harm or kill humans, animals or plants;
- deliver nuclear explosive devices, chemical, biological or toxin agents to use them for hostile purposes or armed conflict." (UN).

According to D. Franz, C. Parrott, and E. Takafuji, biological weaponry has been used in warfare for ages to create death or disease in human, animals, or plants (Franz *et al.*, 1997, p. 435).

The purpose of this article is to present biological weapon in the process of reducing the structural power of a state. This article answers the following questions: *What is the structural power and national economy? What is human capital and agriculture? What is the biological weapon and what is its effectiveness? How does the biological weapon reduce the structural power of a state?*

This article states that a biological weapon is a tool for reducing a state's international potential used by a hostile state.

For the purpose of this article, the national economy will be limited to human capital and agriculture due to the importance of these sectors for the usage of biological agents.

1. Structural power and national economy

According to Susan Strange global politics is determined by two types of power: relational power, and structural power. Relational power is understood as the physical capabilities, and structural power refers to "shape and determine the structures of the global political economy [or international system] within which other states, their political institutions, and their economic enterprises and (not least) their scientists and other professional people have to operate" (Strange, 1988, p. 24). As was seen by Strange, structural power emerges across the following global structures: production, security, finance, and knowledge. She underlines that there is a close connection between structural power and relational power. Structural power forms production, security, finance, and knowledge in a way in which material relations are regulated to the advantage of a state that gains the structural power. In return, the emerging material fortifies its structural power. Structural power is heavier than relational power and is linked to an ability of a state to shape international order by determining the rules of the game (Strange, 1988, p 178). The above thesis comes to the conclusion that whoever has relational power (i.a. production) can gain

structural power (international power) and without relational power, structural power cannot be provided. At this point, it can be stated that a state's structural power can be limited by reducing its relational power (reduction of international power through reduction of production).

According to PWN Encyclopedia (2023) national economy is recognized as all economic activity conducted within states territory. The national economy includes: industry, construction, agriculture, hunting, forestry, fishing, transport, storage, communications, trade and services, education and science, culture and art, health care and social welfare, finance and insurance, state administration and justice. It is determined by many factors, in particular the level of development, the size of the country and its specific features (such as natural resources, traditions), population, international position and participation in economic agreements (economic integration), participation of the public and the private sector in the national economy, the number and level of qualifications of staff, the development of science, work organization and others. The level of development of a given national economy and its dynamics are determined using synthetic measures, such as: the size and dynamics of national income per capita, the volume and dynamics of consumption, as well as indicators such as: the share of industry and services in creating national income, the structure of foreign trade, employment structure (PWN Encyclopedia, 2023). The entire national economy is divided into two spheres: the area of production and the area beyond material production (intangible services). The area of material production includes: industry, construction, agriculture, forestry, transport, communication, trade, other branches of material production, and municipal economy. The remaining departments are included in the area outside material production. Of course, there are other classifications of the national economy in theory and practice, for example, the three-sector system of the economy: sector I - agriculture, sector II – industry, construction with architecture, and sector III – all services (Noga, 2018, p.12).

2. Sectors of the national economy susceptible to the use of biological weapons

2.1. Human capital

The labor force together with physical capital involved in the processes of manufacturing products or services reflects the potential of a certain economy and at the same time determines the possibilities of its further development. The differentiation of the level of development of economies is explained by the accumulation of physical and human capital. Te mentioned human capital is a broader concept than labor because it does not reflect only the number of employees and their working time. It is treated as a production factor with a certain level of technical knowledge (Gawrycka, 2012, p. 57-68). Human capital is considered a factor in socio-economic development. It determines the future prosperity, potential, and capabilities of the economy in the future (Miczynska-Kowalska, 2017, p. 27). The concept of human capital is linked to the skills, and intellect of the individual and the possibilities of its development. Health and vitality are also important for human capital. The shape of human capital is influenced by many factors, e.g. factors related to education, factors related to science and high technologies, factors related to the health of human capital, and factors related to the labor market (Moczulska, 2013, p.87).

2.2. Agriculture

The agricultural sector, due to the fact that it provides food and gives work, is commonly considered the most important sector of the economy. To a large extent, the development of this sector is influenced by natural conditions and financial outlays (Szczukocka, 2018, p.285). “The agricultural sector is the backbone of any economy as it provides the basic ingredients to mankind and raw materials for industrialization. There is empirical evidence that the agricultural sector plays a strategic role in the process of economic development of a country.” (The Sunday News, 2020). The role of agriculture in the development of any economy is articulated as follows:

- contribution to national income;
- source of food supply;
- prerequisite for raw materials for the agro-based industries;
- provision of surplus for expanding the exports of agricultural products;
- reposition of manpower as agriculture absorbs a large quantity of labor force;
- construction of infrastructure as agriculture requires strong basis such as roads etc for the development of commercial sector;
- relief from deficit of capital as agriculture minimizes the burden of deficit of foreign capital;
- creation of effective demand as agricultural sector would tend to expand the acquire power of agriculturists which will help the growth of the non-agricultural sector of the country;
- support in phasing out economic depression as the industrial production can be shut off or reduced but agricultural production proceeds as it produces basic necessities of life;
- improving rural welfare as the rural economy depends on agriculture and allied occupations in an underdeveloped country;
- extension of market for industrial output as the agricultural progress results in extension of market for industrial products (Praburaj, 2018).

Product contribution (i.a. food/raw materials), market contribution (i.a. offering market for producers of goods and customers in the non-agriculture sector), factor contribution (providing labor and capital to the non-agricultural sector), and foreign exchange contribution were recognized by Simon Kuznets as the types of agriculture contribution to economic growth (Kuznets, 1961).

3. Biological weapon and its effectiveness

Biological weapon is a weapon of mass destruction. According to the World Health Organization, “biological and toxin weapons are either microorganisms like virus, bacteria or fungi, or toxic substances produced by living organisms that are produced and released deliberately to cause disease and death in humans, animals or plants.

Biological agents like anthrax, botulinum toxin and plague can pose a difficult public health challenge causing large numbers of deaths in a short amount of time. Biological agents who are capable of secondary transmission can lead to epidemics. An attack involving

a biological agent may mimic a natural event, which may complicate the public health assessment and response. In case of war and conflict, high-threat pathogens laboratories can be targeted, which might lead to serious public health consequences" (WHO).

As it is stated by the United Nations, "biological weapons disseminate disease-causing organisms or toxins to harm or kill humans, animals or plants". They generally consist of two parts – a weaponized agent and a delivery mechanism. In addition to strategic or tactical military applications, biological weapons can be used for political assassinations, the infection of livestock or agricultural produce to cause food shortages and economic loss, the creation of environmental catastrophes, and the introduction of widespread illness, fear and mistrust among the public. Almost any disease-causing organism (such as bacteria, viruses, fungi, prions or rickettsiae) or toxin (poisons derived from animals, plants or microorganisms, or similar substances produced synthetically) can be used in biological weapons. The agents can be enhanced from their natural state to make them more suitable for mass production, storage, and dissemination as weapons. Biological weapons delivery systems can take a variety of forms. Past programmes have constructed missiles, bombs, hand grenades and rockets to deliver biological weapons. A number of programmes also designed spray-tanks to be fitted to aircraft, cars, trucks and boats. There have also been documented efforts to develop delivery devices for assassinations or sabotage operations, including a variety of sprays, brushes and injection systems as well as means for contaminating food and clothing" (UN).

A biological weapon is not expensive and can be extremely effective compared to its price. It is hypothesized that 1 gram of purified botulinum toxin possibly could kill 10 million people (Debnath et al, 2010, p.495). Additionally, weaponized biological agents can be extremely lethal. It is proved that the most lethal biological toxins are even thousand times more lethal than chemical agents. There are six factors indispensable in the development, production, and use of weaponized biological agents:

- lethality;
- modification variability - selected types of novel biological agents that can be modified by the methods of genetic engineering;
- fertility - biological agents that can activate the increased production of volume of toxin, venom or bioregulator;
- resistivity - biological agents that are resistant to antibiotics, vaccines and therapeutics;
- stability - biological agents with intensified aerosol and environmental passivity;
- avoidance - biological agents with immunological ability to harm identification, detection, and diagnostics (Debnath et al, 2010, p.486).

According to Mousami Debnath, Godavrthi B.K.S. Prasad, and Praksh S. Bisen, "diseases most likely to be considered for use as biological weapons are contenders because of their lethality (if delivered efficiently), and robustness. The biological agents used in biological weapons can often be manufactured quickly and easily. […] Current examples of infectious organisms that are attracting particular attention are hantaviruses; other hemorrhagic fever-causing agents, such as Ebola; and the bacteria invasive Group A

streptococcus (commonly known s flesh-eating bacteria). Once it is well established, the infection is very difficult to control with antibiotics. Although the natural form of these organisms may not have significant potential as an aerosol threat agent, those seeking new infectious agents for military use could investigate its mechanisms of actions" (Debnath et al, 2010, pp. 486-487).

Biological weapon can be classified by target as follows: anti-personnel and anti-agriculture (anti-crop/anti-fisheries/anti-vegetation/anti-livestock) (Wheelis et al, 2006, pp. 284-293).

3.1.Anti-personnel

The United States Center for Disease Control and Prevention (CDC) has split the anti-personnel biological agents that can possibly be used as biological weapons into three categories: category A, B, C.

Category A – the agents that pose the greatest risk to national security:

- can be easily transmitted from person to person;
- result in high mortality rates and have the potential for major public health impact;
- might cause public panic and social disruption; and
- require special action in public health preparedness.

The CDC has categorized the following agents as Category A: Anthrax, Botulism, Plague, Smallpox, Tularemia, Viral hemorrhagic fevers (Filoviruses – Ebola, Marburg; Arenaviruses – Lassa, Machupo).

Category B – the agents that pose medium risk to national security:

- are moderately easy to disseminate;
- result in moderate morbidity rates and low mortality rates; and
- require specific enhancements of special unit diagnostic capacity and enhanced disease surveillance.

The CDC has categorized the following agents as Category B: Brucellosis, Epsilon toxin of Clostridium perfringens; food safety threats (salmonella species, Escherichia coli O157:H7, Shigella), Glanders, Melioidosis, Psittacosis, Q fever, Ricin toxin from Ricinus communis, Staphylococcal enterotxin B, Typhus fever, Viral encephalitis (alphaviruses, such as eastern equine encephalitis, Venezuelan equine encephalitis, and western equine encephalitis), water safety threats (Vibrio cholera, Cryptosporidium parvum).

Category C – the agents that pose low risk to national security:

- availability;
- ease of production and dissemination; and
- potential for high morbidity and mortality rates and major health impact.

The CDC has categorized the following agents as Category C: emerging infectious diseases such as Nipah virus and Hantavirus (CDC, 2018).

3.2. Anti-livestock and anti-fisheries

"Only a small number of viral diseases are capable of inflicting major economic damage. Examples include foot-and-mouth disease (FMD) in cattle and pigs, classical swine fever and African swine fever in pigs, and avian influenza and Newcastle disease in poultry. Some livestock diseases are "zoonotic," meaning that they cause illness in humans as well as animals; examples include anthrax, tularemia, brucellosis, avian influenza, and Rift Valley fever, caused by a mosquito-borne virus" (Capp *et al*, 2004).

The World Organization for Animal Health divided livestock pathogens into two lists: list A, and list B.

List A refers to transmissible diseases that have the potential for very serious and rapid spread, irrespective of national borders, that are of serious socio-economic or public health consequence and that are of major importance in the international trade of animals and animal products. *List A* includes: foot and mouth disease (FMD), swine vesicular disease, peste des petits ruminants, lumpy skin disease, bluetongue, african horse sickness, classical swine fever, newcastle disease, esicular stomatitis, rinderpest, Contagious bovine pleuropneumonia, Rift Valley fever, sheep pox and goat pox, African swine fever, highly pathogenic avian influenza (WOAH).

List B refers to transmissible diseases that are considered to be of socio-economic and/or public health importance within countries and that are significant in the international trade of animals and animal products. *List B* includes:

- multiple species diseases: Anthrax, Aujeszky's disease, Echinococcosis/hydatidosis, Heartwater, Leptospirosis, New world screwworm (*Cochliomyia hominivorax*), Old world screwworm (*Chrysomya bezziana)*, Paratuberculosis, Q fever, rabies, Trichinellosis);
- cattle diseases: Bovine anaplasmosis, Bovine babesiosis, Bovine brucellosis, Bovine cysticercosis, Bovine genital campylobacteriosis, Bovine spongiform encephalopathy, Bovine tuberculosis, Dermatophilosis, Enzootic bovine leukosis, Haemorrhagic septicaemia, Infectious bovine rhinotracheitis/infectious pustular vulvovaginitis, Malignant catarrhal fever, Theileriosis, Trichomonosis, Trypanosomosis (tsetse-transmitted);
- sheep and goat diseases: Caprine and ovine brucellosis (excluding *B. ovis*), Caprine arthritis/encephalitis, Contagious agalactia, Contagious caprine pleuropneumonia, Enzootic abortion of ewes (ovine chlamydiosis), Maedi-visna, Nairobi sheep disease, Ovine epididymitis (*Brucella ovis*), Ovine pulmonary adenomatosis, Salmonellosis (*S.* abortusovis), Scrapie);
- equine diseases: Contagious equine metritis, Dourine, Epizootic lymphangitis, Equine encephalomyelitis (Eastern and Western), Equine infectious anaemia, Equine influenza, Equine piroplasmosis, Equine rhinopneumonitis, Equine viral arteritis, Glanders, Horse mange, Horse pox, Japanese encephalitis, Surra (*Trypanosoma evansi)*, Venezuelan equine encephalomyelitis);

- swine diseases: Atrophic rhinitis of swine, Enterovirus encephalomyelitis, Porcine brucellosis, Porcine cysticercosis, Porcine reproductive and respiratory syndrome, Transmissible gastroenteritis);
- avian diseases: Avian chlamydiosis, Avian infectious bronchitis, Avian infectious laryngotracheitis, Avian mycoplasmosis (*M. gallisepticum),* Avian tuberculosis, Duck virus enteritis, Duck virus hepatitis, Fowl cholera, Fowl pox, Fowl typhoid, Infectious bursal disease (Gumboro disease), Marek's disease, Pullorum disease);
- lagomorph diseases: Myxomatosis, Rabbit haemorrhagic disease, Tularemia),
- bee diseases (Acariosis of bees, American foulbrood, European foulbrood, Nosemosis of bees, Varroosis);
- fish diseases: Epizootic haematopoietic necrosis, Infectious haematopoietic necrosis, *Oncorhynchus masou* virus disease, Spring viraemia of carp, Viral haemorrhagic septicaemia);
- mollusc diseases: Bonamiosis (*Bonamia exitiosus*, *B. ostreae*, *Mikrocytos roughleyi*), Marteiliosis (*Marteilia refringens*, *M. sydneyi*), Mikrocytosis (*Mikrocytos mackini*), MSX disease (*Haplosporidium nelsoni*), Perkinsosis (*Perkinsus marinus*, *P. olseni/atlanticus*);
- crustacean diseases: Taura syndrome, White spot disease, Yellowhead disease);
- other List B diseases: Leishmaniosis (WOHA).

3.3. Anti-crop

"A list of plant pathogens that have been generally considered as potential ant-crop weapons can be compiled from several sources" (Schaad *et al*, 1999). One key source is the list, drawn by the Ad Hoc Group of the Biological and Toxin Weapon Convention, entitled "Plant pathogens important for BWC". This specific list contains: "

a) agents known to have been developed, produced or used as weapons.
b) agents which have severe socio-economic and/or significant adverse human health impacts, due to their effect on staple crops, to be evaluated against a combination of the following criteria:
   - ease of dissemination (wind, insects, water, etc.);
   - short incubation period and/or difficult to diagnose/identify at an early stage;
   - ease of production;
   - stability in the environment;
   - lack of availability of cost-effective protection/treatment;
   - low infective dose;
   - high infectivity;
   - short life cycle" (BWC/AD HOC GROUP, 1997).

The Ad Hoc Group of BWC has recognized the following plants pathogens: Colletotrichum coffeanum var virulans, Dothistroma pini, Erwinia amylovora, Pseudomonas solanacearum, Pyricularea oryzae, Ustilago Maydis, Xanthomonas, Xanthomonas albilineans,

Xanthomonas campestris pv oryzae, Telletia tritici, Sclerotinia Sclerotorium (BWC/AD HOC GROUP, 1997).

Another key source is the Australian Group, an informal group bringing together more than forty countries which, through the harmonization of export controls, seeks to ensure that exports do not contribute to the development of chemical and biological weapons (AG). The list includes:

- *Bacteria* - Xanthomonas albilineans, Xanthomonas citri pv. citri (Xanthomonas axonopodis pv. citri, Xanthomonas campestris pv. citri), Xanthomonas oryzae pv. oryzae (Pseudomonas campestris pv. oryzae), Clavibacter michiganensis subsp. sepedonicus (Clavibacter sepedonicus, Clavibacter michiganense subsp. sepedonicus, Corynebacterium michiganensis subsp. sepedonicum, Corynebacterium sepedonicum), Ralstonia solanacearum, race 3, biovar 2;
- *Fungi* - Colletotrichum kahawae (Colletotrichum coffeanum var. virulans), Bipolaris oryzae (Cochliobolus miyabeanus, Helminthosporium oryzae), Pseudocercospora ulei (Microcyclus ulei, Dothidella ulei), Puccinia graminis ssp. graminis var. graminis/ Puccinia graminis ssp. graminis var. stakmanii (Puccinia graminis [syn. Puccinia graminis f. sp. tritici]), Puccinia striiformis (syn. Puccinia glumarum), Magnaporthe oryzae (Pyricularia oryzae), Peronosclerospora philippinensis (Peronosclerospora sacchari), Sclerophthora rayssiae var. zeae, Synchytrium endobioticum, Tilletia indica, Thecaphora solani;
- *Viruses* - Andean potato latent virus (Potato Andean latent tymovirus), Potato spindle tuber viroid;
- *Genetic Elements and Genetically-modified Organisms* - any gene or genes specific to any listed virus; or any gene or genes specific to any listed bacterium or fungus, and which (a) in itself or through its transcribed or translated products represents a significant hazard to human, animal or plant health, or (b) could endow or enhance pathogenicity (AG, 2022).

Conclusions

A biological weapon as a weapon of mass destruction (WMD) is aimed at harming the highest percentage of selected targets whether it is mankind or agriculture. For strategic or tactical military applications, biological weapons can be used for i.a. the infection of livestock or agricultural produce to cause food shortages and economic loss, the creation of environmental catastrophes, and the introduction of widespread illness, fear, and mistrust among the public.

The agricultural sector plays a strategic role in the process of economic development of a country as it is the backbone of any economy due to its delivery of the basic ingredients to mankind and raw materials for industrialization. Due to the fact that it provides food and gives work, this sector is commonly considered the most important sector of the economy. This is the main reason why agriculture is the high-risk target for biological warfare.

From the perspective of a biological weapon, a high-risk target as agriculture is human capital that is engaged in the production of goods. This sphere is essential for the national economy as well. The health and vitality of the population are crucial for effective production. All of the above gives the full scope of the country's capabilities in the international sphere which could lead to becoming a power actor in global politics.

From the perspective of a hostile state, the structural power of the targeted state that leads to global power cannot be reached. At this point, it can be stated that a state's structural power can be limited by reducing its relational power (reduction of international power through reduction of production/human capital/agriculture).

Due to the wide spectrum of potential biological hazards a biological weapon can easily meet the needs of a hostile state that is willing to achieve the dominant position in the global economy.

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