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CONTEMPORARY WMD PROLIFERATION AND TERRORIST THREAT CONCERNS

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Introduction

Lawrence H. Keeley, a professor at the University of Illinois in *his "War before Civilization: The myth of the Peaceful Savage"* says, that approximately 90 – 95% of societies known throughout history were engaged in at least occasional warfare, and that many fought constantly. An absence of war is commonly defined as "peace", and if we look back in our past, during this peacetime states have usually prepared for war by creating the more effective ways to destroy their adversaries. The human society witnessed the use of chemical, biological and more recently nuclear weapons (today referred to all as weapons of mass destruction) in its wars. Engaging this kind of warfare caused tremendous number of causalities in some cases, like the spread of plague in 1347, when one quarter of the European population (more than 25 million people) had died by 1349 from the "Black Death"[1]. Smallpox pathogen played a significant role in conquest of the North America which resulted in the decimation of Native American population. First massive, systematic chemical attacks in the WW I killed over a million people during the war campaign. Poisonous gas showed its non-discriminatory policy by killing the defender as well as the attacker during the attack[2]. The improved type of weapon that ended the WW II – thermonuclear one, is the most powerful man-made weapon until today and it is capable of destroying whole cities at once, leaving

1 In 1346, Mongol Tatars catapulted plague-infested corpses into the beleaguered city of Caffa (Feodosia in Crimea). Several survivors fled to Genoa and pestilence broke out, later spreading the disease throughout Europe. Source: Ole J. Benedictow, *The Black Death: The Greatest Catastrophe Ever*. Published in History Today, Volume 55, Issue 3, March 2005. See more at: http://www.historytoday.com/ole-j-benedictow/black-death-greatest-catastrophe-ever#sthash.oubAX5xY.dpuf [accessed on 30.05.2016].

behind horrifying scars – the radioactive contamination[3]. Combining the conventional chemical explosives with radioactive materials have created a "radiological weapon", which cannot produce a nuclear yield, but can spread radioactive contamination and fear.

The ethical principles of the warfare have evolved and people have also become more aware of potential danger and consequences, which led to some successful and less successful attempts in international community's outlawing the WMD. After WW II, the will to stop the destruction and avoid further global conflicts appeared, now stronger than ever. However, the Cold War brought upon us the arms race, and with the emergence of the globalization and worldwide market, new challenges are brought upon the states. The fall of the Soviet Union has left huge stockpiles of unused weapons waiting to be used in the continuous low-intensity conflicts all over the planet. New adversaries – terrorist organizations, are not complying with the international laws and customs of war and usually target non-military objects in order to fulfill their goals. These threats combined with afore mentioned challenges cause vast concerns. Dual use of technology and materials used by radical groups and "lonely wolves" with the perfect tool for creating terror leave countries with a little room for prompt response. Taking all of this into concern, while regarding the complexity of contemporary international relations and environment, a few questions arise out of many others: Are the counter-proliferation mechanisms succeeding in their goals facing the new challenges, especially the phenomenon of globalization and rapid industrialization? What kind of assets are left for radical groups' arsenal on their path of terror?

WMD and WMD Proliferation

2 Although it was the British who chiefly suffered on 25 September 1915 when the wind shifted and quantities of the released smoke and gas were blown back into the British trenches during the chemical attack at the Battle of Loos, all three chief armies – Britain's, France's and Germany's – suffered similar self-inflicted gas reversals during 1915.

3 The Soviet Tsar Bomb was the most powerful nuclear weapon ever detonated. Its test on October 30, 1961, remains the most powerful man-made explosion in human history. It was a three-stage bomb, with a yield of 50 Mt (some say it was 57 Mt). This is equivalent to about 1,570 times the combined energy of the bombs that destroyed Hiroshima and Nagasaki and 10 times the combined energy of all the conventional explosives used in WW II. The bomb design was capable of yielding approximately 100 Mt, but the Soviets have not used it because of the fallout and safety precautions, https://en.wikipedia.org/wiki/Tsar_Bomba [accessed on 25.05.2016].

While the weapons of mass destruction themselves, or at least a part of them as we know them today, existed and were used for centuries in history of conflicts, the first mention of the term "WMD" appeared in the 20th century. It was William Cosmo Gordon Lang, the Archbishop of Canterbury, who used this term in 1937, referring to the aerial bombardment with chemical explosives of Guernica, Spain. The First World War provided humanity with the first systematic large-scale chemical attacks while the Second one presented it with contemporary biological warfare as well as the atomic weapons, all accompanied by their upsetting destructive effects. After above-mentioned events, the term came to refer more to non-conventional weapons.

At first, the acronym "NBC" cataloged the main types of mass destruction: nuclear, biological, and chemical weapons. More recently, other means of mass destruction or mass disruption effects entered the lexicon: radiological weapon, completing the modern CBRN abbreviation. At the present time, a weapon of mass destruction (WMD), by US definition, is considered as "chemical, biological, radiological, or nuclear weapons capable of a high order of destruction or causing mass casualties and exclude the means of transporting or propelling the weapon where such means is a separable and divisible part from the weapon"[4]. The commonly used symbols for afore-mentioned weapons are shown in figure

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Source: www.chemistry.about.com [accessed on 16.05.2016].

Figure 1. Commonly used symbols for nuclear, biological and chemical weapons (ordering from the left to the right-hand side)

Chemical weapons expert Gert G. Harigel considers only nuclear weapons as true weapons of mass destruction, because only nuclear

4 JP 1-02 *Dictionary of Military and Associated Terms*, Department of Defense, 8 November 2010, p. 258.

weapons are completely indiscriminate by their explosive power, heat radiation and radioactivity, and only they should therefore be called a weapon of mass destruction. He prefers to call chemical and biological weapons "weapons of terror" when aimed against civilians and "weapons of intimidation" for soldiers[5]. Nevertheless, the scope and application of the term have evolved and been disputed, often signifying more politically than technically.

Even though forbidden by a number of international conventions and legislation mechanisms, in some countries, development and production of the nuclear (atomic weapons, radiation weapons), chemical (poison gases) and biological weapons (natural toxins and pathogens) never actually stopped. Comparatively, the development and procurement of the delivery means (ballistic missiles, cruise missiles and in recent times unmanned aerial vehicles) are typically also conducted. With the great power always comes the great responsibility, implying that this kind of weapon possesses a huge threat falling in the wrong hands. Keeping in mind the potential of WMD as a means of deterrence and its ability of destroying a large number of adversary personnel and vast areas in short time, there has been always an attempt among nations to obtain and own such an instrument of power. Nonetheless, not only the nations are interested in holding such assets, since the WMD have preferred characteristics for terrorist purposes.

WMD proliferation can be defined as the spread of WMD material and technology. This means that proliferation does not only involve the development or purchase of "ready-to-use" WMD and their means of delivery, but also purchasing or obtaining (procuring) in the other way the necessary resources and knowledge required for WMD development.

The availability of materials and technologies in industrialized countries, now more than ever, offers the possibility of proliferation. Much of these materials and production technologies can be used for both military and civilian purposes (dual use) and this can provide a perfect screen for obtaining the necessary resources for producing the WMD. This justifies the necessity of monitoring and controlling the movement of dual use materials and technology worldwide.

International law regarding the WMD and contemporary WMD proliferation concerns

5 G. G. Harigel, *The concept of WMD: Chemical and biological weapons, use in warfare, impact on society and environment*, paper presented at the seventh ISODARCO-Beijing Seminar on Arms control, Xi'an, China, 8-13 October 2000, p. 2.

Recognizing the gravity of WMD threat, there were numerous attempts of banning the non-conventional means of war through history of conflicts, even in the ancient times. Some of the oldest prohibitions were regarding the poisonous weapons, and therefore was the motto of the Roman Senate that the war should be waged by weapons and not poisons (*Armis bella, non venenis, geri debere*), comparable to the Brahmanic Laws of Manu, a code of Hindu principles first articulated in the fifth century B.C., which forbade the use of arrows tipped with fire or poison. Similar prohibitions are mentioned later on, also in many national and international documents. One of them is the Strasbourg Agreement, the first "modern" international agreement banning the use of chemical weapons (poisoned bullets in that time). The treaty was signed between France and the Holy Roman Empire in 1675.

At the end of the 19th century, there was a concern from the possible danger of chemical agent impact and destruction in a future conflicts. Consequently, the Hague I Convention of 1899, among other issues, addressed the use of chemicals as weapons. The states agreed "not to use projectiles whose sole purpose was the diffusion of asphyxiating or deleterious gases". The Hague II Convention in 1907 confirmed the regulations on chemical weapons usage and widened the limitations by prohibiting the use of poison or poisoned weapons. From the historic aspect, both Hague I and Hague II showed awareness and presence of will to stop the creation of new, possibly more horrific weapons and to evade unnecessary suffering. The first convention was signed by delegates from all attending states (except the US) and Hague II was signed by all of the future belligerents except the US, Italy and Turkey. Unfortunately, the lack of enforcement mechanisms and no precise provisions led to differed interpretations between countries, resulting in the wide use of chemical warfare during the WW I (see figure 2). The nations were witnessing the development and deployment of a various range of chemicals and new efficient methods of deploying them. Over 12000 tons of different poisonous gases were produced during the war. In 1918, about one grenade out of three was filled with chemical agents. Despite the fact that the casualties of the conflict attributed to the use of gas were estimated around 1-3% of total losses in WW I, the psychological effect on troops had a much greater impact.

Upon the conclusion of "The Great War" and after seeing all the destruction and devastation, as well as the number of casualties that has been created by the chemical warfare, the international community tried, through the international agreements and by adopting various conventions and treaties, to remedy the many shortcomings of the previous agreements and to eventually ban the deployment of such weapons in the future conflicts. The Treaty of Versailles, which prohibited poison gas in Germany,

was followed by the Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or other Gases, and of Bacteriological Methods of Warfare, usually called "The Geneva Protocol". This agreement was signed in Genève in 1925 and it was one of the most significant treaties prohibiting the use of chemical and biological weapons in international armed conflicts. Although it prohibited the use of aforementioned methods of warfare, it was understood that it presents a general prohibition on chemical weapons and biological weapons, but has nothing to say about production, storage or transfer. Furthermore, numerous countries declared that they only regarded the non-use obligations and that those obligations would cease to apply if the prohibited weapons were used against them.

Source: Bundesarchiv, Bild 183-F0313-0208-007/CC-BY-SA 3.0; Agence Rol - Bibliothèque nationale de France, département Estampes et photographie, EI-13 (531).

Figure 2. On the left-hand side is World War I German gas attack on the eastern front, photographed from the air. On the right is the Football team of British soldiers with gas masks, Western front, 1916 because of persistent danger of gas attack. Photo perfectly describes the psychological effect of chemical weapons

Due to that fact, numerous countries continued their work on developing the new types of non-conventional weapon agents. Germany, the leading nation of Central Powers in WW I had synthetized its first nerve agents in 1936.[6] But the other countries as well have prepared or even deployed chemical and bacteriological weapons in spite of the treaty: Italy used mustard gas against Abyssinia in 1935 and Japan developed and used both chemical and biological weapons against China from 1938 to 1941.[7] Only the fear from retaliation stopped the US, Great Britain and Nazi Germany from using the prepared stockpiles of newly produced

6 Tabun, the first of G-Series nerve agents, was accidentally discovered in Germany on December 23, 1936, by a research team headed by Gerhard Schrader working for IG Farben. After demonstration of Tabun effectiveness, the Nazi government employed Schrader who also synthetized Sarin nerve agent later on in 1938, prior the WW II.

chemical agents. In conclusion, the Genève Protocol did not manage to make an end to the non-conventional warfare, but it made a solid base for future international laws.

Source: AP Photo.

Figure 3. On the left-hand side there are the leftovers of Hiroshima after the Japanese city was hit by an atomic bomb by the U.S., on August 6, 1945, during World War II. About 140000 people were killed or died within months after the attack. The photo was taken on Sept. 5, 1945. On the right there is an atomic bomb mushroom cloud over the Japanese port town of Nagasaki, on August 9, 1945. More than 70000 people were killed instantly, with ten thousands dying later from effects of the radioactive fallout

After deployment of nuclear weapons and ending the WW II (see figure 3), starting the Cold War arms race, countries such as US, Great Britain and The Soviet Union continued the development of substantial chemical and nuclear weapon programs. Two things started to emerge right after the WW II – globalization and proliferation. According to H. H. Gaffney, globalization is a phenomenon, *an interconnectedness of the world, especially through trade, but in a new and intricate ways that constitute a qualitative change on a scale that far outstrips previous episodes of globalization*[8]. While the globalization brings the states together in an eventual "super community", it makes the proliferation – an increasing number of states possessing the WMD and means of delivery, more possible. Easier mobility and communication possibilities of people at the same time aggravate monitoring of the technology, materials and information transfer flows.

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7 Unit 731 was a covert medical experiment unit of the Imperial Japanese Army, researching biological warfare through human experiments during the Second Sino-Japanese War (1937 – 1945) and World War II.

8 H. H. Gaffney, *Globalization and nuclear proliferation* in *Globalization and WMD proliferation – Terrorism, transnational networks, and international security*, 2010, p. 14.

In the years after WW II, aiming to prevent any potential danger, the UN and international community with the leading nations of the world made an effort, formed different groups and initiatives and conducted a large number of activities achieving important treaties regarding the WMD in order to mitigate the risks of its proliferation and make a world a safer place.

The most significant treaties and conventions:

- *The Outer Space Treaty* (1967) bars states from placing WMD in orbit of the Earth. As of September 2015, 104 countries are parties to the treaty, while another 24 have signed the treaty but have not completed ratification[9].
- *The Treaty on the Non-Proliferation of Nuclear Weapons* (1968), commonly known as the Non-Proliferation Treaty or NPT, is an international treaty whose objective is to prevent the spread of nuclear weapons and weapons technology, to promote cooperation in the peaceful uses of nuclear energy, and to further the goal of achieving nuclear disarmament and general and complete disarmament[10]. The International Atomic Energy Agency (IAEA) is responsible for the implementation of the treaty. Four countries besides the five recognized Nuclear Weapons States have acquired, or are presumed to have acquired, nuclear weapons: India, Pakistan, North Korea, and Israel. None of these four is a party to the NPT (North Korea was in NPT from 1985 to 2003, and after withdrawal conducted a series of announced nuclear tests in 2006, 2009, 2013 and 2016).
- *Seabed Arms Control Treaty* (1972) is a multilateral agreement between the United States, Soviet Union (now Russia), United Kingdom, and 91 other countries[11] banning the emplacement of nuclear weapons or WMD on the ocean floor beyond a 12-mile (22.2 km) coastal zone.
- *The Strategic Arms Limitation Talks between US and the Soviet Union on the issue of armament control.* (SALT I in1969 and SALT II in 1979).
- *Strategic Arms Reduction Treaty between the US and the Russian Federation on the reduction and limitation of strategic offensive arms* (START I, II, III and New START: 1991- 2010).
- *The Biological Weapons Convention* (1972) prohibits the parties to develop, possess and produce biological and toxic weapons and to

9 http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties.html [accessed on 15.05. 2016].

10 https://www.un.org/disarmament/ [accessed on 15.05.2016].

11 http://www.un-documents.net/seabed.htm [accessed on 15.05.2016].

transport these weapons to third countries. The Convention has been signed by 144 countries.

- *The Chemical Weapons Convention* (1993) prohibits the development, production, stockpiling, transfer and use of chemical weapons. The Chemical Weapons Convention came into effect on 29 April 1997. At present it has 192 Member States. As of October 2015, about 90% of the world's declared stockpile of chemical weapons had been destroyed. The Hague-based Organization for the Prohibition of Chemical Weapons (OPCW) is responsible for the implementation of the Chemical Weapons Convention.

The most significant groups, initiatives and resolutions:

- Nuclear Suppliers Group (NSG) is a multinational body concerned with reducing nuclear proliferation by controlling the export and re-transfer of materials that may be applicable to nuclear weapon development and by improving safeguards and protection of existing materials. It was created following the explosion in 1974 of a nuclear device by a non-nuclear-weapon State (India), which demonstrated that nuclear technology transferred for peaceful purposes could be misused and turned to weapons development. Initially the NSG had seven participating governments, and now that number of member states reached 48[12].
- The Australia Group is an informal group of countries established in 1985 (after the use of chemical weapons by Iraq in 1984) to help member countries to identify those exports which need to be controlled so as not to contribute to the spread of chemical and biological weapons. The group, initially consisting of 15 members, held its first meeting in Brussels, Belgium, in September 1989. Now it has a total of 42 members. The members of the group maintain export controls on a uniform list of 54 compounds, including several that are not prohibited for export under the Chemical Weapons Convention, but can be used in the manufacture of chemical weapons[13].
- The Wassenaar Arrangement (on Export Controls for Conventional Arms and Dual-Use Goods and Technologies) is a multilateral export control regime (MECR) with 41 participating states including many former COMECON (Warsaw Pact) countries. The Wassenaar Arrangement was established to contribute to regional and international security and stability by promoting transparency and greater responsibility in transfers of conventional arms and dual-use goods and technologies, thus preventing

12 http://www.nuclearsuppliersgroup.org [accessed on 16.05.2016].

13 http://www.australiagroup.net [accessed on 16.05.2016].

destabilizing accumulations. The aim is also to prevent the acquisition of these items by terrorists. Participating States seek, through their national policies, to ensure that transfers of these items do not contribute to the development or enhancement of military capabilities which undermine these goals, and are not diverted to support such capabilities. It is the successor to the Cold War-era Coordinating Committee for Multilateral Export Controls (COCOM), and was established on 12 July 1996, in Wassenaar, the Netherlands. The Wassenaar Arrangement is focusing primarily on the transparency of national export control regimes and not granting veto power to individual members over organizational decisions. It is not a treaty, and therefore is not legally binding[14].

- The Proliferation Security Initiative (PSI) is a global effort that aims to stop trafficking of weapons of mass destruction (WMD), their delivery systems, and related materials to and from states and non-state actors of proliferation concern. It is launched by United States President George W. Bush in May 2003 at a meeting in Krakow, Poland. The PSI initially started with 11 "core" states and has now grown to include the endorsement of 103 nations around the world. The idea of the PSI came after 15 Scud missiles found on board an unflagged North Korean freighter, the So Sen, heading towards Yemen had to be released when it turned out that international law did not allow them to be confiscated (see figure 4). Endorsing states are developing a formal set of tools called Critical Capabilities and Practices (CCP) for use by all PSI partners to aid in their ability to interdict WMD. Critics of PSI, such as China, Iran and the Democratic People's Republic of Korea (DPRK), argue that the declared intent of PSI members to stop ships on the high seas is a violation of international law guaranteeing freedom of the seas[15].

14 http://www

15 http://www.psi-online.info [accessed on 17.05.2016].

Source: http://www.news.navy.mil [accessed on 17.05.2016].

Figure 4. So San assault by Spanish Special Forces. On board there were found: 23 containers containing 15 complete Scud ballistic missiles, 15 high-explosive warheads, and 23 nitric acid containers

- United Nations Security Council resolution 1540 was adopted on 28 April 2004 regarding the non-proliferation of weapons of mass destruction. The resolution establishes the obligations under Chapter VII of the United Nations Charter for all Member States to develop and enforce appropriate legal and regulatory measures against the proliferation of chemical, biological, radiological, and nuclear weapons and their means of delivery, in particular, to prevent the spread of weapons of mass destruction to non-state actors[16].

Compliance with international law and regulations

Unfortunately, many international conventions and agreements are not respected. It is not an unreasonably pessimistic assessment that the conventions do not, as previously neither did the Geneva Convention, stop mutual collision in the development of WMD weapons, but only obscured work on these studies. Studies have continued, as evidenced by periodic accidents. An example of this is the biological accident – the most deadly anthrax epidemic known, which occurred at a Soviet biological weapons facility located in Sverdlovsk (now Ekaterinburg, Russia) in 1979, where at least 68 people died (see figure 5). The exact number of infected people is not known, but according to some sources the "fugitive" anthrax bacillus has infected up to 2,000 people[17]. Because of its large scale impact, this accident is sometimes called "biological Chernobyl".

16 http://www.un.

17 R. Biočanin, B npublished material.

Source: Jeanne Guillemin, The 1979 Anthrax Epidemic in the USSR: Applied Science and Political Controversy.

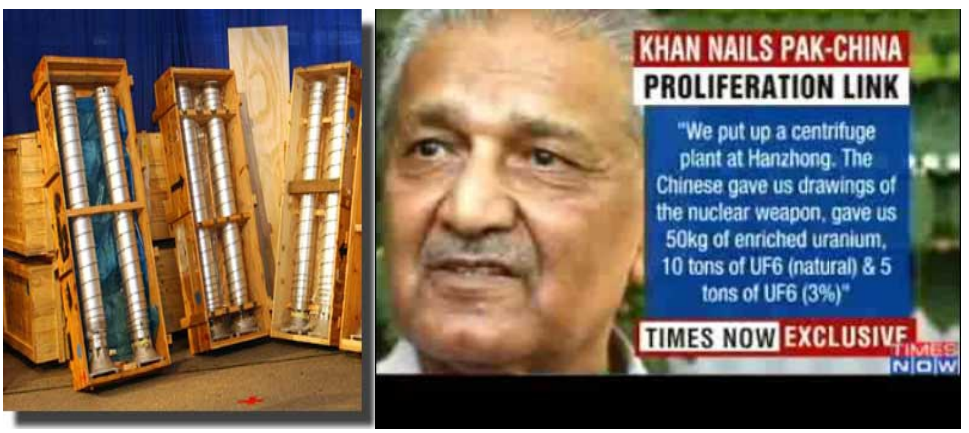
Figure 5. The spread of anthrax spores and victims location in Sverdlovsk. The map of the daytime locations of 62 victims in the southeastern area of the city. Four additional locations are outside this map's boundaries to the north and west. The irregular areas outlined in white indicate the two military bases. Compound 19 to the north was the source of the 2 April anthrax emission; Compound 32 is to the south

Data on these issues are scarce in the scientific and professional literature, because the testing of this kind of weapon itself would encounter unreserved condemnation of the international community. The Soviets replied angrily to accusations, claiming that the deaths in Sverdlovsk were the result of eating black-market infected meat. In the spring of 1992, 13 years after the accident, president of the Russian Federation, Boris Yeltsin, took steps to address the long-standing Soviet denial of a biological weapons program and the Sverdlovsk anthrax outbreak. A team of investigators led by Harvard biologist Matthew Meselson was allowed to conduct inspection on the scene in June 1992 (with a follow-up visit in August 1993). The wind pattern at the time showed that identified victims were within the trail of deadly anthrax spores, which led investigators to conclusion that infection had spread from the "Compound 19", a part of a vast military project called the Biopreparat. In the figure 5 the irregular areas outlined in yellow indicate the two military bases. Compound 19 to the north which was the source of the 2 April anthrax emission and Compound 32 which is to the south. The red dots represent the confirmed casualties by KGB[18]. The US intelligence position was also supported by Ken Alibek, who said Compound 19 was involved in the "industrial" production of anthrax. Regarding the actual cause of the release, information later obtained from people involved with the Soviet biological warfare effort revealed that the cause of the anthrax release in Sverdlovsk was the failure by maintenance personnel to replace a critical filter in a vent serving the anthrax production facility. However, the Russian defense establishment still denies the Sverdlovsk story. This accident, standing side-by-side with the Iraq's chemical attacks in Iran (during the war in the

18 J. Guillemin, *The 1979 Anthrax Epidemic in the USSR: Applied Science and Political Controversy*, 2002, p. 24.

1980s) and another time against Kurdish residents of Halabja (in Northern Iraq, 1988), followed by the Syrian chemical attacks in the city suburbs of Damascus and Aleppo in 2013, among many others, displays that countries are still working on the development and testing of non-conventional weapons, notwithstanding the provisions of international law.

Similarly, it is clear that states to some extent have obtained methods to gain WMD capabilities through procurement networks, regardless of the determination of leading nations to control the flow of material and technologies. The most well-known example of nuclear technology procurement was administered from Pakistan and it was led by a Pakistani scientist Abdul Qadeer Khan, "the father of the Pakistani atomic bomb", who manufactured and delivered nuclear centrifuges and centrifuge designs to Iran and Libya while closely collaborating with China (see figure 6). It is strongly supposed that Khan approached Iraq in the early 1990s and that he also cooperated with North Korea. Another example comes after the Gulf War against Iraq in 1990 – 1991, when it was revealed that Iraqi government institutions procured dual use materials for their WMD program in the Western countries, where the technicians and scientists training also took place. The companies and scientific institutions usually were oblivious of the fact that they contributed to the WMD programs of these countries. A.Q. Khan acquired his knowledge through a research and a study in "The URENCO Group", a nuclear fuel company operating in the Netherlands. These examples made clear that procurement networks run by countries such as Iran, Iraq, Libya and Pakistan have proven flexible and incredibly effective in obtaining the preferred means to obtain the WMD capabilities, using the organizations which are subjected to different non-proliferation mechanisms.



Source: http://en.wikipedia.org/wiki/ Abdul_Qadeer_Khan [accesed on 19.05.2016]; http://www.youtube.com/watch?v=G-FL5S3jgjY [accessed on 19.05.2016].

Figure 6. Submitted Libyan gas-ultra centrifuges in 2003, an early models that Abdul Qadeer Khan developed in the 1980s, known as PakSat-I and Abdul Qadeer Khan after his proliferation network was revealed

Before the end of the Cold War, experts used the term "loose nukes" to describe the imminent danger of poorly guarded nuclear weapons in the former Soviet Union. After the Cold war, the term started to refer not only to nuclear weapon, but also to nuclear material and knowledge (underpaid Russian scientists from the former Soviet nuclear program who would now work for the highest bidder). Knowing the fact that before its collapse in 1991, the Soviet Union had more than 27000 nuclear weapons and enough weapons-grade plutonium and uranium to triple that number and also that Russia today has over 40 nuclear sites dispersed around the country, we can conclude that these concerns are not to be disregarded[19]. The International Atomic Energy Agency (IAEA) has reported more than a hundred nuclear smuggling incidents since 1993, 13 of which involved highly enriched uranium (HEU). Some of these incidents involved attempts to sell or traffic these materials across international borders[20]. James A. Russel says that proliferation can be separated in three phases: vertical, horizontal, and subnational (or the third-tier proliferation)[21]. The main criteria of separation is the nuclear weapons and weapons and missile technology direction of the transfer:

- Vertical Proliferation: from a nuclear weapons state or from a nuclear supplier group country to a less industrialized non weapons state (US to France, France to Israel, Soviet Union to PR China, etc.);
- Horizontal proliferation: from a nonnuclear weapons state possessing a clandestine weapons program to another non-weapons state (Japan to Libya, DPRK to Pakistan, Iran, Libya, Syria, Yemen, etc.);
- Third-Tier Proliferation: from a weapons state or from a non-weapons state possessing a clandestine WMD program to a subnational group or terrorist organization.

Third-tier proliferation can be carried out through acquisition of weapons from unprotected military stockpile in a weapons state or a take-

19 http://www.cfr.org/weapons-of-mass-destruction/loose-nukes/p9549 [accessed on 19.05.2016].

20 *IAEA Incident and Trafficking Database – Incidents of nuclear and other radioactive material out of regulatory control*, 2015 Fact Sheet, p. 2.

21 *Globalization and nuclear proliferation* in *Globalization and WMD proliferation – Terrorism, transnational networks, and international security*, ISBN 9780415433945, 2010, p. 10.

over of weapons stockpile of a failed state with a WMD program under crisis situation ("loose nukes"). Also, a deliberate transfer to a smuggling organization or to a terrorist organization (in a different country) for use against a third party country while maintaining deniability (state-sponsored terrorism) can be a way to achieve a WMD capabilities. The detection and interception of goods and knowledge assets in third-tier proliferation is very challenging and because of that, third-tier proliferation causes high concerns and it is understood as the utmost dangerous contemporary threat of a global character.

Potential danger of WMD terrorist attack

Advanced ideas combined with modern weapons provides the phenomenon of terrorism with necessary tool for its evolution. Historical overview shows that terrorists do not lack ideas in efforts to fulfil aims and that they are completely aware of the sensational events value which can be used to accelerate desired change of national policies and regional security arrangements. Obscure issues can now be quickly projected into an international spotlight due to instant global information access, or as someone calls it a "CNN effect". Rapid technological advance of the world and globalization that enabled the fast and continual flows of its products (material and knowledge) is providing the opportunity for the terrorists to obtain WMD or capabilities of producing it. That scenario is a practical concern in contemporary times, but what would the "WMD weapon of choice" be for radical groups and in what way would they use it to achieve their goals?

Nuclear weapon as a terrorists' choice?

A nuclear weapon is an explosive device that takes its destructive force from nuclear reactions, either fission (fission bomb) or a combination of fission and fusion (thermonuclear weapon). Both reactions release enormous amounts of energy from relatively small amounts of matter. With its devastating power nuclear weapon presents the ultimate weapon for terrorist groups, but getting one is, in fact, challenging. Terrorists can obtain it in four possible ways:

- through third-tier proliferation mechanisms (state-sponsored terrorism);
- by procuring the nuclear weapon – the "loose nukes" scenario;
- by procuring the nuclear fuel material and constructing the nuclear weapon on their own;

- by producing the nuclear fuel material and constructing the nuclear weapon on their own.

Main problem for terrorists would represent gaining of nuclear device main compound: a sufficient quantity of fissile material. The fissile material is a material capable of sustaining a nuclear fission chain reaction (U-235, U-233 and Pu-239), and it can only be produced through the complicated process of enriching the uranium (usually using the gas centrifuges) or obtaining the plutonium from nuclear reactors. Clearly, the producing of the nuclear fuel material is the lowest possible scenario simply because of the technical complexity and the cost of the process. However, with the appropriate amount of nuclear fission fuel in their hands, the way of producing the effective weapon for terrorists would be nearer. The elementary information needed to produce an effective weapon of mass destruction can be found in college textbooks, engineering books, magazines and periodicals, and even the Internet provides the elementary information for constructing and producing rudimentary weapon of mass destruction. The example of Aristotle Philips, a junior undergraduate who designed a nuclear weapon using publicly available books and papers in 1976, while attending Princeton University, vividly describes in what way the "know-how" can be achieved. The estimated cost of building the Aristotle's bomb was 2000 $ (without nuclear fuel – Plutonium) and it would have had a one third of the nuclear bomb used in Hiroshima. Aristotle was even contacted later on by a Pakistani official trying to purchase his bomb design, after the story was published. The most severe concern presents a "loose nukes" scenario, but then again the built-in safeguards and self-destruction mechanisms of an assembled nuclear weapon would pose a serious challenge to detonating the weapon. If we analyze the possibility of a nuclear state-sponsored terrorism – yet it is not likely that a state would deliver a nuclear weapon to radical groups. First of all, a question of controlling the actions of fundamentalists is of a high concern, and then there is always a condemnation and potential of international community's extreme retaliation. With these calculations the state would not risk with handling over control of such responsibility.

Another important part of nuclear weapons are means of distribution: traditionally, ballistic missiles and aerial bombs are the main means of nuclear weapons delivery, but they represent another challenge for terrorist groups. Nuclear weapon used as a radical group tool of terror is likely to be detonated in the highly populated urban areas – probably in the capital city of targeted country. Assembling this kind of weapon clandestinely within the country is almost impossible, considering the intelligence mechanisms and the size of assembled rudimentary nuclear weapons makes them hard to transport covertly. The highest level of threat regarding the question of transport would represent a suitcase designed nuclear devices which are

thus far only known to be possessed by the United States and the Soviet Union/Russian Federation, countries with highly developed nuclear weapons programs (see figure 7).

The highest-ranking GRU defector Stanislav Lunev claimed, that such Russian-made devices exist and that *it is surprisingly easy to smuggle nuclear weapons into the US* across the Mexican border[22]. Vahid Majidi, the assistant director of the FBI's Weapons of Mass Destruction Directorate claims that "no one has been able to truly identify the existence of these devices." Nonetheless, acquiring that kind of weapon through a "loose nukes" development of events and breaking all of its built-in safe-guards would make the threat of nuclear terrorist attack highly possible, while considering the ways to import the weapon through the Mexican border to the US or using current migration crisis for introducing it in Europe.

Radiological weapon as a terrorists' choice?

Radiological weapon, also known as a "dirty bomb", is an easier choice for the radical groups than a nuclear one. By using the conventional high explosives to disperse any type of radioactive material, thus eliminating the hard-to-get nuclear fissile material and complex design of a nuclear weapon, terrorist may cause the wanted outcome in densely populated areas. This result would not be measured by the mass destruction and lost human lives but by the massive psychological effect on population and immense disruption. Apart from that, the verification of the weapon use may prove to be problematic due to its nature, accompanied by the high cost of decontamination. Taking all of this into concern, a "weapon of mass disruption" expression is more suitable for this kind of weapon. On the technical side, the radiation contamination effects are questionable, depending of the amount and quality of a source (energy and type of radiation, half-life, longevity, availability, shielding and transportability) and the environment conditions of deployment can be very limiting in some situations.

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Source: AP Photo/Dennis Cook [accessed on 19.05.2016]; https://en.wikipedia.org/wiki/Special_Atomic_Demolition_Munition [accessed on 19.05.2016].

Figure 7. Photo on the left hand side shows Peter Pry displaying a model of what a nuclear suitcase bomb "might look like" during a hearing on Capitol Hill in Washington on Oct. 26, 1999. On the right is the US Army H-912 transport container for Mk-54 Special Atomic Demolition Munition – SADM.

A radioactive element can be obtained from a radioactive medical waste or from the spent fuels from nuclear power plants, or just any radiological material manufactured, used, transported, or stored by industrial, medical, or commercial processes (toxic industrial radiological – TIR) which possesses required properties. Radioisotopes that pose the greatest security risk include: ^{137}Cs, used in radiological medical equipment, ^{60}Co, ^{192}Ir, ^{238}Pu, ^{90}Sr, ^{226}Ra and ^{238}U. A study by the James Martin Center for Nonproliferation Studies found an alarming 170 incidents where nuclear or radiological material was lost, stolen or outside regulatory control in 2014 alone. One of the most illustrious radiological incidents was the contamination that occurred in Goiania, Brazil in 1987. Local residents obtained a piece of equipment containing Cesium-137 from an abandoned teletherapy unit resulting in unintentional contamination of property, personal injury and death. It has been estimated that at the time of incident, due to Caesium-137's 30-year half-life, there were 19g of cesium in the source and it emitted 1370 Curies. Over 100000 people were screened for radioactive contamination and more than 50 people were

hospitalized with many people developing radiation associated illnesses[23]. Extensive decontamination and medical treatment occurred over the course of several years. This was not an act of terrorism, but the incident demonstrates the potential disruption and damage that even a small radioactive source can cause.

Nonetheless, there have been only two recorded cases of "dirty bomb" terrorism attempts so far and both of them involved Chechen rebels. The first attempt took place in 1995 by a group of Chechen separatists, who buried a Caesium-137 source wrapped in explosives at the Izmaylovsky Park in Moscow (see figure 8). The media was alerted, but bomb was not detonated.

Source: http://www.pbs.org [accessed on 21.05.2016].

Figure 8. The cesium-filled package uncovered in a Moscow park, 1995

The same Chechen separatist group was suspected to be involved in another of radiological terror attempt, this time near a railway line in the suburban area of Argun in 1998, when a Chechen Security Service discovered a container filled with radioactive materials attached to an explosive mine[24].

As an alternative to the explosive device for radiological contamination, terrorists can simply insert the radioisotopes into the food and water or try to attack and damage the nuclear power plant reactor in order to cause contamination. The Chernobyl catastrophe (1986) or Fukushima disaster (2011) illustrate possible consequences of a successful attack.

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23 http://www.veneermagazine.com/01-18/01/the_group/goiania.html [accessed on 21.05.2016].

24 http://www.pbs.org/wgbh/nova/dirtybomb/chrono.html [accessed on 21.05.2016].

Relative availability of radiological isotopes and simple construction of disperse device is what this weapon marks as a potential threat worth concerning, but then again the actual effect and fact that for assembling the high-impact radiological weapon and its transport would cause severe radiation damage and possible death of the perpetrators involved. Shielding the source effectively would make it almost impossible to transport and a lot less effective if detonated. Evidently, the source should be sufficiently dispersible to effectively contaminate the area around the explosion, but then again making a gas or aerosol with appropriate radioactivity requires complex chemical work. Sohier and Hardeman in their *Radiological dispersion devices: are we prepared?* (2006) consider this constraints being the main reason of RDDs definition as "high-tech" weapons resulting in not using them up to now. High security measures prevent attack on nuclear power plants.

Chemical weapon as a terrorist's choice?

Chemical agents with their proven efficiency in taking lives and causing substantial psychological effect present yet another dangerous instrument of the radical groups. Like we have seen so far, despite the non-proliferation efforts, globalization provides an opportunity of getting a hold of dual use materials, and the universities, institutions and internet provide the other part of the equation – basic knowledge. Easy synthesis with minimal special equipment commonly purchased on the open market could be combined with a way of dispersion limited only by terrorist's imaginations. The main characteristics of chemical agents which would be put into concern and would determine the choice of the agent are: lethality, persistence (depending of volatility), mechanisms of influencing the human body and physical characteristics.

The effectiveness of a chemical weapon is described as the "capacity of an agent to produce the maximum number of casualties or amount of disruption of operations with the least amount of agent." There are many factors that can influence the effectiveness of a chemical agent; such as the amount of the agent released, environmental factors, target population size, etc. The duration of effectiveness for a chemical agent depends on several meteorological factors which can be seen in the following table (see figure 9):

Factor	Effects
Winds	Winds can allow chemical agents to disperse rapidly in certain topographical areas. Lack of winds can cause a buildup in the concentration of certain chemical agents.
Tempera-ture	High temperatures tend to decrease the persistency while cold temperatures tends to increase the persistency of some agents.
Rain	Rain effects chemical agents by disposing some, diluting others, or by promoting hydrolysis in some agents. Overall rain may dispose of some particular agents but others will most likely still be able to be used.
Atmos-pheric Stability	When the temperature of the air is higher than that of the ground, chemical agents in a vapor state tend to stay persis-tent for longer periods of time. However when the tempera-ture of the air is lower than that of the ground, chemical agents in the vapor state tend not to persist as long as they usually do.

Source: Self-study.

Figure 9. Influence of meteorological factors on effectiveness of a chemical agent

Synthesis of multiple precursor chemicals, high-temperature processes and existence of hazardous by-products, makes nerve agents more difficult to produce, limiting them to advanced laboratories. Blister agents such as mustard can be manufactured with relative ease, but also require large quantities of precursor chemicals. The most effective agent's form for disseminating is aerosol or vapor, supported by sprayers or explosive devices. Depending on the physical characteristics, from the table we can see that agents are relatively vulnerable to temperature, moisture and wind. Due to these factors, indoor use would be the most effective, although effect-limited by dimensions of the area and therefore a number of causalities.

The Aum Shinrikyo provides an example of such use in their coordinated sarin attack at the peak of the morning rush hour in Tokyo subway system in 1995 (see figure 10). Only ten men carried out the attacks: five released the sarin, while the other five served as getaway drivers. Liquid sarin, which is highly volatile, was contained in plastic bags

wrapped in newspaper. Each committer had two packets totaling approximately 0.9 liters of sarin, except one, who carried three bags totaling approximately 1.3 liters. The perpetrators boarded their appointed trains and at planned stations, the sarin packets were dropped and punctured several times with the sharpened tip of the especially prepared umbrella. By leaving the punctured packets on the floor, the sarin was allowed to leak out into the train car and stations and to affected passengers, subway workers, and those who came into contact with them resulting in killing 12 and severely injuring more than 50 people, leaving nearly 1000 people with vision problems.

Source: JIJI PRESS/Getty Images; http://www.algemeiner.com/wp-content/uploads/2014/09/Tokyo-subway-attack-Photo-screens hot.jpg [accessed on 21.05.2016].

Figure 10. Subway passengers collapse on the streets of Tokyo waiting to receive medical attention after inhaling the sarin gas and action of specialized teams

On the day of the attack, ambulances transported 688 patients and nearly five thousand people reached hospitals by other means[25]. Most of those reporting to hospitals were the "worried well", who had to be distinguished from those who were ill. The psychological impact was colossal, but eventually, the attack which was meant to divert police from the Aum Shinrikyo group resulted in huge simultaneous raids on cult compounds across the country and arrests of the cult members.

Used nerve agent, sarin, presents an immediate but short-lived threat, due to its volatility. In general, nerve agents are all extremely dangerous, with no odor or with just a faint, sweetish smell, being clear and colorless,

25 https://en.wikipedia.org/wiki/Tokyo_subway_sarin_attack [accessed on 26.05.2016].

they can enter the body through the air, skin and eyes or with food and water and to perform immediate impact. On the other hand, to produce even more powerful psychological effect, terrorists could use blister agents, such as mustard gas, whose delayed effects are visible only after 12-24 hours after attack. Mustard agent, as a persistent one, would present insidious danger during that period until display of the victim's first symptoms and awareness of the attack, creating mass panic throughout.

Other than synthesizing "military-grade" chemical agents, terrorists can avoid unnecessary risks by targeting manufacturing plants, storage depots and hazardous materials transportation infrastructure releasing the toxic industrial chemicals (TIM). Chlorine or phosgene, which is a major industrial chemical used to make plastics and pesticides, are easily available and also do not require great expertise to be converted into chemical weapons. Moreover, the same chemicals proven themselves as military used agents in WW I. The potential consequences of such an occurrence are graphically demonstrated in Bhopal, India in 1984. A release of methyl isocyanate into the atmosphere killed over 2000 people and injured 100000, of whom an estimated 50000 suffered permanent disabilities[26].

Biological weapon as a terrorists' choice?

Biological weapon consists of pathogenic microbes, toxins[27] or bio-regulator compounds and the means of delivery. Depending on the specific type of vector, these weapons can incapacitate or kill people and animals, destroy plants or food supplies. Biological agents belong to the "silent and insidious" weapons, waging the war without material destruction, with particularly severe consequences for the population (or animals and crops as agricultural targets). The production and storage of these weapons is kept in utmost secrecy due to the conventions, international community reactions and high possibility of retaliation. The type of targets being attacked determines the choice of agents and dissemination systems. Biological warfare agents can be applied overtly or covertly, usually in the form of aerosols, by rocket shells, air bombs, or by planting agents among the people, animals, food or water. A scale of biological attack by time and space is not always predictable, because it is the only weapon that

26 *Bhopal Disaster Spurs U.S. Industry, Legislative Action*, United States Chemical Safety and Hazard Investigation Board.

27 Some authors consider toxins as a biological, and other as a chemical agents. We will elaborate them afterwards as a separate entity.

reproduces itself – it is a living substance that is replicating, so it is highly possible for a biological agent to be spread out of the attack zone (primary area) and transmitted to new areas (supplemental regions). At a very low price, the impact could affect the whole country, with the uncertain duration and reopened possibility of contamination of the territory (the phenomenon of renewed infection). The beginning of the era of genetic engineering (in 1973) sharply decreased interest in professional circles for bacterial and fungal agents to the visible increase in interest for viruses, offering unimagined possibilities for application of biological weapons. There are several reasons for this: the possibility of faster, easier and safer manipulation and culturing viruses, increasing their storage stability and survival in the external environment. Then their narrow specificity of action, difficulty in identifying and treating affected population while reducing the risk of retroactive effect by creating new effective vaccines and immunological products.

The nuclear weapon state-sponsored terrorism constraints are no longer valid with biological agents, since it is difficult to determine the difference between the use of biological weapons and spontaneous infections, making this weapon extremely effective for use in special wars and for terrorist purposes. Biological terrorism has become a global threat to world peace and security for the reason that it is available for less developed countries or even groups. For instance, distinguishing legitimate biological, medical, or commercial production plants from a weapons production facility proves very difficult – biological agents can also be produced in minor laboratories with no signature to identify the facility or their production. Legitimate civilian purposes such as the production of vaccines or even food production facilities after some modifications could produce biological warfare agents. In fact, any nation with a modestly sophisticated pharmaceutical industry is capable of producing ones. Biological warfare research facilities can easily be represented as legitimate bio-technical and medical research facilities, as seen in WW II by Japan's Unit 731.

Biological agents are relatively easy to obtain as compared to nuclear material. They are small, cheap and difficult to detect and in terms of weight possess greater potential power in several orders of magnitude (see figure 11).

The amount (dose) of chemical agent needed for causing effect in human is measured in micrograms (10^{-6}g), and in biological weapons in pictograms (10^{-12}g), e.g. *Francisella Tularensis*, which is listed as "Category A select agent" by the US government, is very infectious because it is capable of causing a "debilitating or fatal disease with doses as low as 10 colony-forming units" and if the disease is left untreated, the mortality rate

can be as high as 30 to 60% of the cases[28]. From the point of production capacity and transportation, a significant advantage of biological weapons is the fact that they are more lethal in comparison with other WMD agents or material. Furthermore, the delivery system for a biological agent can be literally anything – from remotely controlled UAVs (drones), spray cans, to contaminated hands or shoes, which is practically impossible to detect. Another dangerous property of a biological attack is that the symptoms are not immediately expressed.

Delivery Method		
Scud-type missile		

Source: Draft General Report Chemical and biological weapons.

Figure 11. Casualty Estimates for Various WMD Delivered on Washington, D.C. The casualty figures are based on the "medium" case, where the weather would be overcast and winds would be moderate

The time from entry of the pathogen into the body to the first signs of illness is called the "incubation", and during that time a person is usually contagious to other people and unaware of infection (or attack). Evidence of a biological attack may not show up for days after the actual use of the weapon.

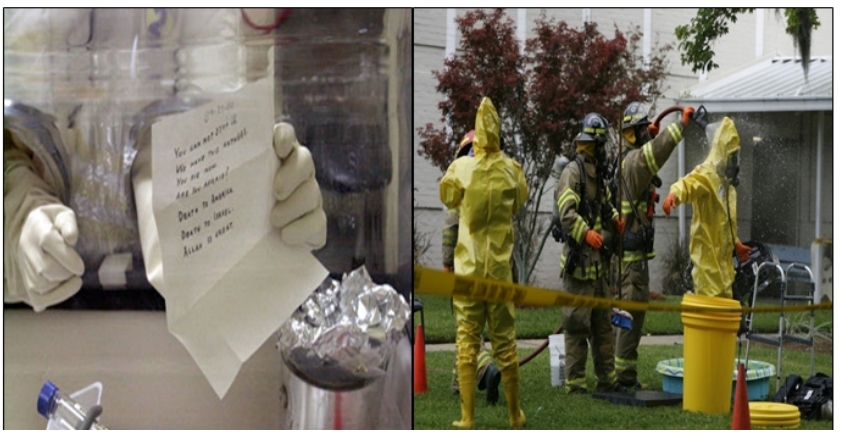
That no state is immune on bio-terrorism proves the case of anthrax letters, also known as "Amerithrax", occurred in the US after the 9/11 attacks in 2001 (see figure 12).

Letters containing anthrax spores were mailed by members of Al-Qaeda terrorist network to several news media offices and two Democratic U.S. Senators, killing five people and infecting 17 others[29]. There is no need to say that the desired psychological effect was achieved.

28 P. Oyston, A. Sjostedt, R. Titball, *Tularaemia: bioterrorism defense renews interest in Francisella tularensis*, Nat Rev Microbiol 2 (12): 967-78, 2004.

Other than attacking population, biological weapons can be used against targets in agriculture, which is the easiest and cheapest way of causing enormous economic damage, in more than one reason facilitated in comparison to human targets:

- First, handling human pathogens is extremely dangerous and the perpetrator exposes himself to danger. Animal and plant pathogens generally do not affect people.
- Second, the psychological barrier of causing mass casualties is much higher than when targets are animals or plants. Killing of plants or animals is not ethical as well as killing people.
- Finally, agricultural objectives of the so-called "soft targets", or those who have a very low level of security so that terrorist's attack could be carried out unnoticed.



Source: www.fbi.gov/about-us/history/famous-cases/anthrax-amerithrax [accessed on 27.05.2016].

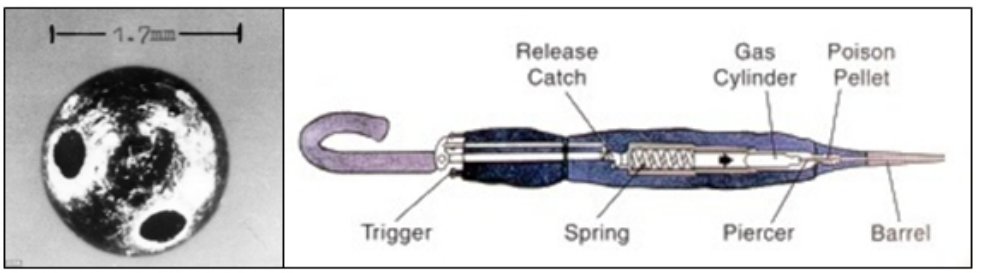
Figure 12. Anthrax letters- the worst biological attack in U.S. history

Biological agents as a primary means of bio-terrorism, with their relatively easy production and delivery, and above all unpredictability, present a huge challenge and threat to states and international community at present times. The Convention of the prohibition of bacteriological (biological) weapons does not, as previously neither the Geneva Conventions, stop mutual collision in the development of biological weapons, but only obscure work on these studies. Studies have continued, as evidenced by periodic biological accidents or bioterrorism – as aforementioned Sverdlovsk accident.

29 Available from: https://www.fbi.gov/about-us/history/famous-cases/anthrax-amerithrax [accessed on 2016-05-27].

Toxin weapons as a terrorists' choice?

In the middle between the chemical and the biological agents stands toxins. Toxins differ significantly from replicating agents (viruses and bacteria) because they cannot reproduce themselves and from classic chemical agents by source and physical characteristics. They are biological agents that are produced by living organisms: bacteria, plants, or animals, and vary as to their source of production, molecular structure and size, and mechanism of action[30]. The simplicity of production- whether natural or synthetic – is obviously an important factor in evaluating a toxin threat, but a toxin's method of production does not change its molecular structure or mechanism of action. In addition, a phenomenon that may confound diagnosis and delay treatment a significantly different clinical picture when the route of exposure is changed. Toxins were used as a weapon by some secret services. The most famous case is the Georgi Markov assassination, a Bulgarian dissident writer who was assassinated on a London street in 1978, by Bulgarian secret police assisted by the KGB. The event is recalled as the "Umbrella Murder" because the kill was preformed using a micro-engineered pellet containing a highly toxic ricin toxin[31], fired into his leg via specially designed umbrella (see figure 13).



Source: https://thevieweast.wordpress.com [accessed on 27.05.2016].

Figure 13. The micro-engineered pellet filled with ricin and delivery mean – the modified umbrella used for Georgi Markov assassination

Note that some of the most toxic compounds known to man are bacteria originated toxins, including the botulinum toxin which is the most

30 We can distinguish bacterial toxins, marine toxins, fungal toxins, plant toxins or venom toxins by their origin, or neurotoxins and membrane-damaging toxins by the mechanisms of action.

31 The median lethal dose (LD50) of ricin is around 3.0 micrograms per kilogram of body weight if the exposure is from injection or inhalation (1.78 milligram for an average adult), https://en.wikipedia.org/wiki/Ricin [accessed on 27.05.2016].

toxic compound per weight of agent, with Ld_{50} of 0.001μg/kg (0,001 microgram per kilogram of body weight will cause death to 50 percent of the animals studied). This makes the botulinum toxin 15000 times more toxic than VX and 100000 times more toxic than Sarin nerve agent[32].

Because toxins are not volatile, as are chemical agents, and with erratic exceptions, do not directly affect the skin, the terrorist would have to present toxins to target populations in the form of respirable aerosols. This makes the attack complicated by limiting the number of toxins suitable for weaponizing. The other route of intoxication is through the gastrointestinal tract by contamination of food or water supplies. The water contamination would be difficult in chlorinated water and the dilution effect in rivers, lakes, or reservoirs prevents the danger of effective concentrations. A toxin that cannot be produced in sufficient quantity or is too unstable to survive as an aerosol after delivery cannot be an effective WMD agent. Slightly less toxic toxins that are easy and inexpensive to produce and deliver, and that are stable as aerosols, could be real threats, especially in a confined space such as a building; delivery could be into the filtration, heating, and air-conditioning systems, similar to the use of chemical agents. But, unlike chemical agents, who might be detectable for hours, toxins might be detectable in the air at one location only for a few minutes, which makes the real-time detection of an attack almost impossible, at least with present state of technology.

Conclusions

WMD as an expression has existed for almost 80 years, but WMD as a mean of war is as old as human conflicts and with evolution of conflicts and weapons used in it, the WMD evolved as well. The advance of ethical principles and more "humanitarian" approach to war caused various attempts throughout human history for avoiding the unnecessary suffering, many of them regarding the WMD and limiting WMD agent deployment. After all of these attempts were proven to be failed in both of the World Wars and many other local conflicts, the UN and international community put effort to limit the flows of WMD throughout the world with numbers of treaties, conventions and initiatives. With globalization, a new phenomenon linking and binding the entire planet, the challenge for successful counter proliferation measures is enormous.

It seems that states have always managed to find the way to procure the knowledge, materials and technology. But the state can be deterred

32 http://www.blessedquietness.com/journal/theworld/toxins.htm. [accessed on 27.05. 2016].

due to the fact that states control population and territory, among other things. The "balance of terror" between the Soviet Union and the West created also stability and predictability in the historical Cold War. For Waltz, this period of no military conflicts between Great Powers presents the ultimate proof that the logic of "mutually assured destruction" (MAD) should work in all security environments. This was, he argues, because nuclear weapons promote caution in decision-makers, making belief that to be no reason why this effect would not occur in all circumstances[33]. On the other hand, a new threat, terrorists, while not obeying the customs of war and international laws, do not possess things of value and have nothing of value against which to make deterrent threats. In addition, terrorists can choose time and place of an attack when targeting the state and usually its civilian population, while state cannot often locate and engage terrorists. The aforementioned superpower “balance of terror”, could be replaced by super-terrorism. Furthermore, the main goal of radical groups is creating an environment of fear, and WMD is a perfectly tailored weapon for that, thanks to its horrifying effects and far-reaching consequences. Terrorist access to these weapons can also be through a state sponsor, or given the increasing sophistication of terrorist groups, can also be manufactured in laboratories that terrorists have financed and established, like the Aum Shinrikyo cult has showed us. Some precursor materials, equipment, or production processes are low-cost and legal to acquire or possess, and if they are not, there will always be a way to procure them through theft, false documentation, and other techniques that can overcome many of the normal regulatory control procedures. Simple decision on the appropriate agent and its delivery or an attack with a conventional weapon on a nuclear power plant, industrial complex or a means of transportation near a densely populated area could also cause desired goal or effect. A WMD caused crisis can result in a loss of public confidence in related industries, like Fukushima disaster caused abandoning the nuclear power plants technology in some countries, and also has a negative effects on the economy worldwide.

WMD today presents a persistent threats to human life, the environment and the global economy. The effect of WMD use has great psychological impact and long-term consequences with urbanization increasing the chance of mass fatalities in the case of an attack. With progresses in science and rapid technology transfer, new paths of proliferation are opening for nations, terrorist groups and even “lone wolf” parties. Transnational criminal organizations could be the networker that might link some of these actors together, bringing up a new challenges to

33 S. D. Sagan, K. N. Waltz, *The Spread of Nuclear Weapons A Debate Renewed*, W W Norton and Company, New York 2003, p. 24.

the world as we know it, with ethical boundaries of conflicts fading. All of this does not mean that the WMD attack is inevitable, but that all the pieces of puzzle are here, creating favorable conditions. Now more than ever.

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WSPÓŁCZESNE OBAWY DOTYCZĄCE ROZPRZESTRZENIANIA BRONI MASOWEGO RAŻENIA I ZAGROŻENIA TERRORYSTYCZNEGO

Abstrakt: Celem tej publikacji jest zaprezentowanie współczesnych obaw dotyczących rozprzestrzeniania broni masowego rażenia oraz zagrożenia terrorystycznego. Część pierwsza wprowadza definicje oraz terminy w kontekście historycznym, pokrótce wspominając o wybranych aspektach oddziaływania globalizacji na wysiłki skierowane przeciw rozprzestrzenianiu wyżej wymienionych zagrożeń. Kolejna sekcja odnosi się do prawa międzynarodowego, które dotyczy broni masowego rażenia i współczesnych obaw dotyczących rozprzestrzeniania tej broni. Można tutaj znaleźć, także w kontekście historycznym, opis wysiłków międzynarodowych w celu zakazania badań nad bronią masowego rażenia, opis jej rozwoju oraz spis użytkowania. Następnie znajduje się analiza skuteczności tych mechanizmów zaprezentowana przy użyciu przykładów. Okres po drugiej wojnie światowej omówiony jest w bardziej szczegółowy sposób, przez zestawienie najbardziej istotnych traktatów i konwencji, jak również grup, inicjatyw oraz rezolucji dotyczących omawianego tematu. Dalsza część tego rozdziału dotyczy stosowania się do międzynarodowego prawa oraz przepisów przez kraje, grupy oraz jednostki, co pokazuje typowe sposoby rozprzestrzeniania broni masowego rażenia. Ostatnia sekcja zajmuje się potencjalnym zagrożeniem ze strony ataku terrorystycznego przy użyciu broni masowego rażenia, analizując każdą możliwą broń w arsenale broni masowego rażenia z punktu widzenia terrorystów. Zostały omówione trudności związane z uzyskaniem i produkcją takiej broni, zalety i wady powszechnie stosowanych metod jej użycia oraz jej skutki wywołane w wyniku hipotetycznego ataku terrorystycznego. Zostały także wzięte pod uwagę

ataki na cele miękkie w celu wytworzenia „efektu użycia broni masowego rażenia”. Podsumowując, publikacja ta analizuje skuteczność wysiłków wspólnoty międzynarodowej w celu kontroli przepływu broni oraz materiałów masowego rażenia, umieszcza globalizację w kontekście rozprzestrzeniania tej broni a działania radykalnych grup we współczesnej perspektywie, wyliczając sposoby użycia, które mogłyby one wykorzystać i badając wszystkie aspekty możliwego ataku.