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THE ENVIRONMENT IN THE "HANDS" OF TERRORISTS – AN ANALYSIS OF TERRORIST ACTIVITIES WITH PROFOUND ENVIRONMENTAL IMPACT

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Abstract

This paper takes two basic concepts – security and environment – and brings them into relation through the phenomenon of terrorism. We analyze terrorist activities in which the environment was considerably affected, with the goal being to endanger human health and existence and destabilize political systems. Rather than focusing on more conventional means (firearms, bombs, explosives) and targets (humans and material property), we examine single-act terrorist attacks that used less conventional means (biological and chemical weapons, arson), and those that target environmental resources (energy and natural sources), both of which leave more profound and long-term consequences as a result. The empirical analysis includes all terrorist attacks from 1970 to 2018 recorded in the Global Terrorism Database (GTD) and related to biological and chemical weapons, as well as arson / fire attacks, but also those terrorist attacks whose targets include water supply, food supply, oil tankers, and gas, oil, and electric entities. Empirical evidence suggests that there have been many terrorist attacks since 1970 that meet the research criteria. Arson / fire attacks are most commonly used, with a total of 4,200 such terrorist attacks recorded worldwide in the last fifty years, and with a significant increase evidenced in the last decade. This paper emphasizes that while the accessibility and effectiveness of environmental tactics such as starting fires or using chemical or biological weapons, contaminating water supplies, soil, etc., is less conventional, it presents a greater threat to human, national and global security.

Keywords: *arson / fire terrorism, biological terrorism, chemical terrorism, environment, security*

1. INTRODUCTION

Catastrophic fires, such as those witnessed in the past few years, are a constant threat to security, both environmental and human. The weeks-long fires of 2019 and 2020 that were uncontrollably destroying the Amazon rainforest in Brazil, Bolivia and Paraguay (NASA Earth Observatory, 2021) caused numerous reactions around the world mainly due to their large scale but also to the inactivity of Brazilian authorities (Berkowitz, 2020). In late 2019 and early 2020, Australia also faced a large number of uncontrolled fires. According to available data, 34 people died, and the fires devastated an area of more than 100 thousand square kilometers (Statista, 2021). It is estimated that more than a billion animals perished from the bushfires (CDP, 2019).

Besides the destruction caused by these fires, this also opened up discussions among the general public and experts in the field about their causes. A significant observation was made by Dick Mangan, president of the International Association of Wildland Fire, after the great fires in California in 2005, when he noted "the massive increases in the US budget for protection from terrorism" and asked "what about the threat of terrorist-caused wildland fires […]" (Gabbert, 2018). Mangan thus opened up two questions with the first related to the possibility of weaponization of fires by terrorists, and the second being the extent to which the counter-terrorism system and the entire national security system were aware of this threat, and what had been done to mitigate such threat and defend against it. These issues were also raised in other public (expert and political) debates[1] in the subsequent period following the major fire incidents.

Such warnings and suspicions are not ungrounded, and are related to threats coming from terrorist organizations, with Al Qaeda and ISIL as the most striking examples. What is worrying, as Sheppard (2017:3-4) points out, is that "pyro-terrorism is emerging as its own category of attack and pyro-terrorists are becoming sophisticated who take advantage of the unique characteristics of fire as a weapon", and that "terrorists are likely to become more sophisticated in their use of arson." This claim has been confirmed by the terrorist organizations themselves through their public announcements and media where they continuously call for attacks, including setting forest fires. One example is the article "It Is of Your Freedom to Ignite a Firebomb" in Al Qaeda's magazine *Inspire* from 2012 which gave "detailed instructions on how to build an 'ember bomb' in a forest […]" (Gabbert, 2012). Another is ISIL's magazine *Rumiyah* from 2017, in the section "Just Terror Tactics", which praised mass shootings and attacks with vehicles, and also gave a detailed description of "arson attacks" as attacks that throughout history and up until the present day "have played a significant role in modern and guerrilla warfare, as well as in 'lone wolf' terrorism" (Daly, 2017). Such attacks "have been behind the destruction of towns, neighborhoods, and public, private and governmental property,

1 Allan Orr, a counter-terrorism specialist, in speaking of fire strategy, warned that Australia needs to "be prepared for the possibility of terrorists starting bushfires to try and cause mass casualties" (Galloway and Harris, 2019). When fires ravaged Israel in 2016, authorities publicly called the arsonists "terrorists" (Amichai, 2016). In 2017, Croatian MP Miro Bulj stated: "This wave of fires looks like organized burning to me. It seemed so planned that it was like a terrorist attack on Croatia" (AZD, 2017).

while likewise claiming numerous lives" (Daly, 2017). In the *Quraysh* magazine from 2019, ISIL encouraged followers to "ignite fires" of their own, literally setting wildfires across the U.S. and Europe as a means of "waging jihad" (Fedschun, 2019).

This type of threat is called "pyro-terrorism", which Baird defines as "the use of incendiary attacks to intimidate or coerce a government, the civilian population, or any segment thereof, to advance political or social objectives" (Baird, 2006:415). Pyro-terrorism, as Thomas states, "possesses the four generally accepted elements of terrorism: targeting of noncombatants, political motivation, violence with a psychological impact, and organized perpetrators" (Thomas, 2004 in: Baird, 2006:415).

Of course, the threat of terrorism, which leaves significant consequences for humans and the environment, cannot be reduced just to the use of fire tactics. Terrorist attacks on the environment rely on other tactics as well, often with the same goal and equal or even greater extent of damage. This certainly includes the tactics of attacks using chemical and biological weapons, but also attacks on oil and water supply, or gas and oil tankers, which consequently produce large-scale environmental pollution. Besides, "as environmental awareness increases in both the media and in the general public, environmental targets begin to look more and more attractive as their importance to society becomes clearer" (Chalecki, 2001:7).

This paper deals with the analysis of examples of terrorist attacks that use various means and are aimed at targets that leave significant and long-term negative consequences for the environment and natural resources, with the dual goal of presenting an: (1) imminent threat to human health and existence; and (2) indirect threat to groups and systems, destabilization of the group / region / state. Undoubtedly, there is direct devastation of both the living and non-living world in the environment. We analyze cases of terrorist attacks that target the environment (energy and natural resources) and use such means (biological, chemical, arson) that leave more significant and long-term negative consequences for the environment than conventional means (e.g., explosives).

In our analysis we have excluded those cases which can be classified as eco-terrorism according to literature[2], i.e. those where the environment is a goal in itself (environmentally-oriented terrorist groups, with pro-environmental goals) rather than a collateral victim[3].

2 For example, Chalecki (2001:4) defines eco-terrorism as "the violent destruction of property perpetrated by the radical fringes of environmental groups in the name of saving the environment from further human encroachment and destruction […] or to bring public attention to environmental issues […]" The FBI (2002) defines eco-terrorism as "the use or threatened use of violence of a criminal nature against innocent victims or property by an environmentally-oriented, subnational group for environmental-political reasons, or aimed at an audience beyond the target, often of a symbolic nature." It is important to stress that there are differences in the use of this term between Europe and the U.S. In Europe, this type of activism is called extremism, while in the U.S. it is eco-terrorism. On the topic of eco-terrorism, see more in: Amster (2006), Berkowicz (2011), Hirsch-Hoefler and Mudde (2014), Smith (2008), etc.

3 It should be noted here that there are some views on eco-terrorism that differ from those mentioned in the footnote above and which to some extent coincide with the subject of our analysis. For example, Daniel M. Schwartz (1998: 483) states that environmental / ecological terrorism is when: "(1) the act or

It should also be noted that terrorism itself as a phenomenon is a controversial point for which academics and experts have not reached a consensus on the definition. Nevertheless, from numerous attempts to define terrorism, based on quantitative and qualitative analyses of a large number of existing definitions of terrorism (N=373), Lucić (2019) has extracted the key elements of this concept which suggest that terrorism is an "organized use of force and violence or threat to use of violence as a means of intentional spreading fear and terror based on the anticipated reactions of broader psychological effects which seek to achieve political objectives" (Lucić, 2019:108). In other words, the general goal of terrorism is to achieve a specific political goal through violence and intimidation, while terrorist organizations use different *modus operandi* in the implementation of their uncivilized acts. Terrorist attacks are directed at non-identical targets, which affect the individual security and pollution of the environment, both animal and plant life. Although there is a long history of the implementation of terrorist attacks that as a consequence have had an impact on the environment[4], but also the use of biological and chemical weapons in the implementation of terrorist attacks, these issues are very rarely represented in the works of both security and environmental studies[5].

1.1. The environment as a security issue

The issue of the environment was traditionally observed within security discourse, primarily through the analysis of the causes and consequences of a conflict between two countries. With the end of the Cold War, "the security community was looking at new definitions of national security" (Kirchner, 2000:1), and the environment became part of "a conceptual scientific discourse and policy debate on a 'reconceptualization of security'" (Westing, 2013:c).

Representatives of the Copenhagen School, through the re-examination of threats and referent security objects, made a significant contribution to the new approach in defining and understanding security.[6]

They contributed to the deepening and widening of the conceptual definition of security (Buzan, 1983; Buzan, 1991; Buzan et al., 1998) by also including environmental security as one of the sectors of the concept of security.[7]

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threat breaches national and / or international laws governing the disruption of the environment during peacetime or wartime; and (2) the act or threat exhibits the fundamental characteristics of terrorism (i.e. the act or threat of violence has specific objectives, and the violence is aimed at a symbolic target)." Schwartz (1998:483) further emphasizes that "an act of environmental destruction can be termed 'environmental terrorism' when the environment is used by the perpetrator as an authentic symbol that instills fear in the larger population over the ecological consequences of the act."

4 Terrorism with consequences for the environment was recorded more than four thousand years ago in the kingdom of Lagash, during the reign of King Urlam. He diverted the watercourse in order to deny the inflow of water to the neighboring state of Umm (Gleick, 1998:125).

5 Some of the more significant works in this field are: Croddy (1995) Binder (1996); Khan, et al. (2001),; Henretig (2001),; Hoffman (2001).

6 The founders of the Copenhagen School are Barry Buzan, Ole Wæver, and Jaap de Wilde.

7 See more in Collins (2006:182-202) and McDonald (2008:59-73).

Barry Buzan, in his widely acclaimed book *People, States and Fear* (1983), which questions security and its definition, laid down the foundations for a widened concept of security. Alongside military threats which, as he said, "occupy the traditional heart of national security concerns" (Buzan, 1983:75), and political and economic threats, Buzan emphasized that "threats to national security might also come in ecological forms, in the sense that environmental events, like military and economic ones, can damage the physical base of the state […] to threaten its idea and institutions" (Buzan, 1983:82).
Kirchner (2000) argues that environmental security has been understood extensively, including human, physical, social and economic well-being. The environmental sector[8], as defined by Buzan et al. (1998:7), is about the relationships between human activity and the planetary biosphere. The ecosystem was thus introduced as the referent object of "environmental security". Brauch et al. (2011:99) observe that "the environment is considered both as a cause and an object of specific threats, challenges, vulnerabilities, and risks […] to the 'objective' and 'subjective' security of human beings and humankind (human security), of societal groups (societal security), of nation-states (national security), and of association of states (European security)".
Environmental issues and environmental security have been discussed in different contexts, which prompted claims such as that of Rita Floyd that "environmental security is not so much a concept as it is a debate" (Floyd, 2008:51), but also the warning that "as with all concepts, it is in danger of becoming a buzzword; critics would say full of 'politicalese' and rhetoric but with no real substance" (Das, 2013:vi). However, looking back, there was no other option but to involve the environment in security considerations in a widened and deepened concept. As Westing (2013:26) points out, "civilization is rooted in nature, an environment which has shaped human culture and influenced all scientific and artistic achievement […] humans are a part of nature, and life depends on the uninterrupted functioning of natural systems. It is thus inescapable that any concept of international security must in the last analysis be based on this obligate relationship of humankind with its environment." Moreover, as is stated in the *UN Environment Strategy for Environmental Education and Training*, environment encompasses "the natural and built environment, socioecological and economic aspects of environmental issues, and political dimension of environmental protection" (UNEP, 2005). This is an approach where the term refers to the complementarities between the biophysical, social, cultural, political, and economic processes and systems. According to Glenn et al. (1998:15), environmental security is the "relative public safety from environmental dangers caused by natural or human processes due to ignorance, accident,

8 The concept established by Buzan has received its full development through the subsequent cooperation of Buzan with Wæver and de Wilde on the book *Security: A New Framework for Analysis* which defined the widened concept of security with its constituent five sectors – military, environmental, economic, societal, and political (Buzan et al., 1998). The sectors are "views of the international system through a lens that highlights one particular aspect of the relationship and interaction among all of its constituent units" (Buzan, Jones, Little, 1993:31 cit. ac. to Buzan et al., 1998:27).

mismanagement or design and originating within or across national borders." This also includes amelioration of natural resource scarcity, maintenance of a healthy environment, amelioration of environmental degradation and prevention of social disorder and conflict (promotion of social stability) (Glenn et al., 1998:iv).

Shearer and Liotta note that "the environment provides an ecological context to all human activity", but they also warn about the importance of keeping in mind that "because the environment provides an ecological context to all human activity, it can overwhelm, or at least obfuscate, the conventionally thematic focus of security studies on potential or real violence among definable actors" (Shearer and Liotta in: Alpas et al., 2010:2). It is the potential of the ecological threat to endanger the idea and institutions of the state through the interaction of human activity and the biosphere that is an aspect that correlates with the fundamental philosophy and goal of terrorism, comprised in the "use of illegal force and violence […] to attain a political, economic, religious, or social goal through fear, coercion, or intimidation" (GTD, 2019:10), which makes the attacks on the environment a terrorist attack.

In this respect, the assessment given by Chalecki (2001) that a strong argument can be made for linking certain resource and environmental problems in general with the prospects for political tension, or even war and peace is relevant here. Somers (2019) also argues that environmental stress such as unpredictable weather, for example, "catalyzes political violence further undermining weak governments" (Somers, 2019).[9]

In such a situation, the referent security object moves from the environmental sphere to the state, societal groups and individuals as referent objects, which is in line with the claim of Buzan et al. (1998:8) that in order to give the multisectoral approach its full meaning in the analysis, we must also introduce referent objects other than the state. The threat is, therefore, terrorism, and a change in the environment is a tool for the implementation of the threat. The threat, based on the relationship that exists between the environment and politics, or the link between the aspect of environmental security and "the acceptance of political responsibility for dealing with these issues" (Buzan et al., 1998:72), transforms into an attack on the concept of state and institution, or political, economic, religious, or social set up. At the same time, the changes in the environment caused by a terrorist attack are an issue *per se* as it has negative implications for the health of the living and non-living environment in itself. Environmental terrorism, as Chalecki (2001:6) argues, suffers graver consequences than conventional civil terrorism as the potential damage from an environmental attack can be long-lasting and widespread. This type of terrorism is more likely than that of a "weapons of mass destruction" (WMD) attack as it can be carried out using conventional explosives or poisons.[10]

9 For more on the relationship between the state of the environment and conflict, see also Homer-Dixon (1999).

10 In the early 2000s, it was observed that terrorist organizations in Southeast Asia had demonstrated the ability to exploit environmental disasters or degradation to undermine governmental legitimacy and gain popular support (Butts and Turner, 2004). The destruction of a natural resource could now cause more deaths, property damage, political chaos, and other adverse effects than it would have in any previous decade.

Malnar and Matošić (2015:62) state that several conceptual links between environmental degradation and compromised security can be defined. Firstly, they observe the environmental degradation that endangers human lives, which is a security issue in itself. Secondly, they talk about the degradation of the environment as a cause of different types of conflict (individual, groups, states, etc.). And finally, they argue about the destruction of livelihoods that threaten the security of several countries or regions.

1.2. The environment as a terrorist target

In the discussion on environmental threats, Buzan (1983:82-83) specifies natural phenomena such as earthquakes, storms, plagues, floods, droughts, but also those that are the result of competition among people such as trans-frontier and inter-state pollution, attempts at weather modification, greenhouse effects, and melting polar caps. With the exception of those phenomena that are essentially determined solely by nature, such as earthquakes and storms, or the actions of states that exceed the potential of even the most organized terrorist groups, such as attempts at weather modification, greenhouse effects, and melting polar caps, there still remains a wide range of ways terrorists can target the environment. Buzan along with his associates (Buzan et al., 1998) further elaborated on environmental issues within the environmental security sector through six possible threats: disruption of ecosystems, energy problems, population problems, food problems, economic problems, and civil strife.[11]

If we are to talk about plagues, then we also have to consider the possible chemical, radiological and nuclear pollution of water, air and the environment, triggered by the use of WMD or attacks on plants when the result is the release of chemical, radiological or nuclear substances. Other possible threats also include epidemics triggered by the release of biological agents and poison attacks, such as the 2001 terrorist attacks in the United States that used letters to spread anthrax right after the September 11 terrorist attacks, or

11 The key issues, according to Buzan (Buzan et al., 1998:74-75), encompass the following:

- Disruption of ecosystems includes climate change; loss of biodiversity; deforestation; desertification, and other forms of erosion; depletion of the ozone layer; and various forms of pollution;Energy problems include the depletion of natural resources, such as fuel wood, various forms of pollution, including management disasters (related in particular to nuclear energy, oil transportation, and chemical industries); and scarcities and uneven distribution;
- Population problems include: population growth and consumption beyond the earth's carrying capacity; epidemics and poor health conditions in general; declining literacy rates; and politically and socially uncontrollable migrations, including unmanageable urbanization;
- Food problems include poverty, famines, overconsumption, and diseases related to these extremes; loss of fertile soils and water resources; epidemics and poor health conditions in general; and scarcities and uneven distribution;
- Economic problems include the protection of unsustainable production modes, societal instability inherent in the growth imperative (which leads to cyclical and hegemonic breakdowns), and structural asymmetries and inequity;
- Civil strife includes war-related environmental damage on one hand and violence related to environmental degradation on the other.

the 1995 Tokyo subway sarin attack (Sugiyama et al., 2020). One should also keep in mind the intentional causing of fires and floods that can occur as a result of natural processes, but also by the demolition of dams or protective embankments.

In considerations of possible targets of terrorist attacks, special attention should be given to the loss of biodiversity and deforestation in the event of a terrorist attack as a result of causing fire and management disasters (related in particular to nuclear energy, all transportation and chemical industries), attacks on nuclear or chemical plants and consequent pollution. There is also the possibility of epidemics, politically and socially uncontrollable migrations, loss of water resources, especially through the possibility of poisoning the source and distribution system of drinking water, as well as violence related to environmental degradation and various forms of pollution. Cifrić (2012:398) defined environmental pollution as "the introduction of chemical substances or emissions of foreign substances into the environment (or its components: water, air, soil, sea, atmosphere) which by harmful effects increase the risk of decay, endanger the health of humans and other beings and cause qualitative changes in the environment." This definition shows the elements of the environment and methods of its pollution suitable for terrorist attack.

The UN Conference on the Human Environment in 1972, among other threats, identified agro-terrorism (Newcastle disease, Asian Citrus Psylla); biological threats (SARS epidemic, Nipah virus); Weapons of Mass Destruction (WMD) terrorist attacks; attacks on energy infrastructure; maritime resource protection and disaster response; and the destabilizing loss of the natural resource base (Butts and Turner, 2004).

Compared to the other methods employed by extremists, environmental tactics that are used to contaminate water supplies or start fires can be quickly planned and require little technical expertise to execute, making them more difficult to be detected. Water shortages caused by shifting weather patterns increase the vulnerability of these methods with considerable consequences for people, infrastructure, and the economy (Somers, 2019). Even the possibility of water poisoning causes fear and panic among the population. Water or fires thus become weapons. Centralized utilities with large, complex distribution systems, as can be found in all cities in Croatia, are more vulnerable to targeted disruptions with consequences of failure spread across a larger population. Distributed power systems, such as on-site photovoltaics or micro-grid generation, reduce the risk of widespread power failures as well as the cascading effects and economic damage that result (Somers, 2019).

2. METHODS

The analysis of security risk elements in this paper is consistent with the constructivist theoretical concept, which assumes extended understanding of security introduced by the Copenhagen School, as discussed above. Thus, defined risk elements serve as indicators for analysis of the terrorist attacks. The basic goal of this analysis is to determine the type of terrorist attacks, their means and targets, the perpetrators, and the frequency of terrorist attacks related to environmental security.

The empirical analysis rests on secondary data, i.e. that recorded in the Global Terrorism Database (GTD)[12]. The analysis includes all recorded terrorist attacks from 1970 to 2018. More specifically, the analysis includes terrorist attacks involving biological and chemical weapons and fire attacks, but also terrorist attacks whose targets include water supply, food supply, oil tankers, and gas, oil, and electric entities. Since some uncertain / ambiguous cases are registered in the GTD, i.e. those cases that do not meet all of the criteria of terrorist attacks, these cases were excluded from this analysis.

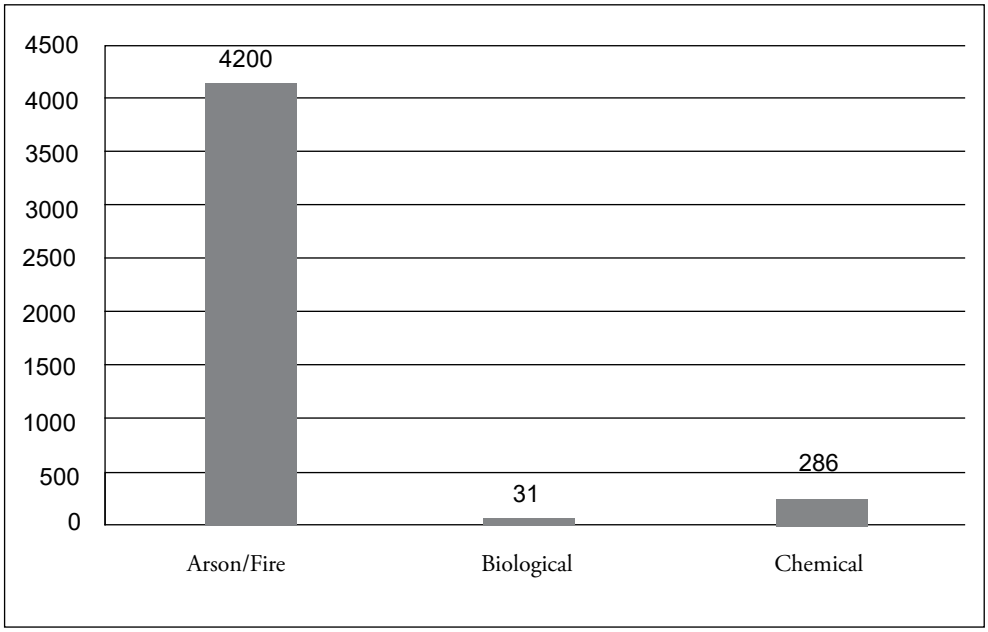

Figure 1. *Number of terrorist attacks included in analysis (by weapon type) (Source: GTD)*

Ultimately, 4,517 cases selected by weapon type (arson / fire, biological, chemical) used by terrorists that leave the most profound and long-term consequences for the environment were included in the analysis. Moreover, this paper includes some findings related to different targets of terrorist attacks. By applying the descriptive analysis and inductive analytical process, this paper also has elements of predictive analytics based on some observed patterns and trends.

12 The GTD is maintained by the National Consortium for the Study of Terrorism and Responses to Terrorism (START) at the University of Maryland and is publicly available to search. The GTD is an open-source database, which provides information on terrorist attacks around the world since 1970. It includes more than 200,000 events with relevant data available for each event, such as: date, location, weapons used, nature of the target, number of casualties, and the group or individual responsible for the event when such is identifiable. For more information, see GTD (2020).

3. RESULTS AND DISCUSSION

Based on the quantitative analysis of terrorist attacks which used arson / fire as recorded in the GTD between 1970 and 2018, terrorists carried out 4,200 such terror attacks (Figure 2). Interestingly, the number of arson / fire terror attacks was in constant increase from 2010 to 2018. During that period, 3,142 arson / fire attacks were detected, respectively 74.8% of all terrorist attacks conducted in the world used arson / fire as their *modus operandi*. Since arson / fire terror attacks are significantly inexpensive and simpler to perform, unlike bomb or explosive strikes, the presented findings are logical and expected (Stewart, 2019). In addition, the ISIL terrorist organization promotes arson / fire attacks not only because of its effortlessness, but because of the direct implications for both the ecology system and social environment. In other words, ISIL is focused on the economic and ecological impact of arson / fire attacks, and their tactic includes, for example, directly targeting agricultural terrain and barley and wheat crops with the goal to wipe them out (Johnson, 2019). These findings undeniably indicate that arson / fire as a *modus operandi* has shifted from a relatively rare terrorist tactic in the period from 1970 to 2000 to a highly used terrorist tactic in the past few years. This is applicable for the shaping of more specific national and international counter-terrorism strategies and policies to more effectively counter terror using arson / fire.

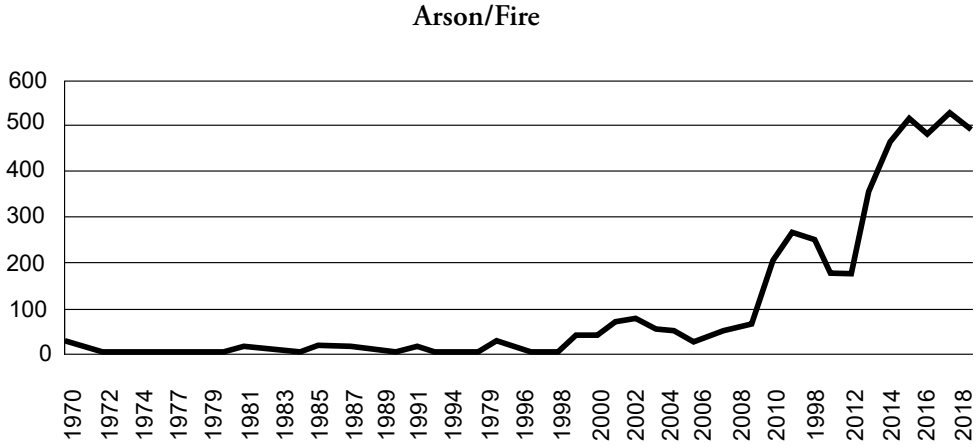

Figure 2. *Chronological overview of arson / fire terrorist attacks from 1970 to 2018 (Source: GTD)*

Analyzing the geospatial distribution of arson / fire terror attacks based on country indicators, most strikes have been recorded in India (681), Afghanistan (318), United States (274), Philippines (244), and Thailand (241) (Figure 3). In other words, attacks using arson / fire are comparable for almost all continents, although Asian countries dominate with more than one hundred attacks. For example, according to the GTD, Pakistan (9,603) and Iraq (9,241) had the most frequent incidences of arson / fire terrorist attacks in the world in 2019 (GTD, 2019:8).

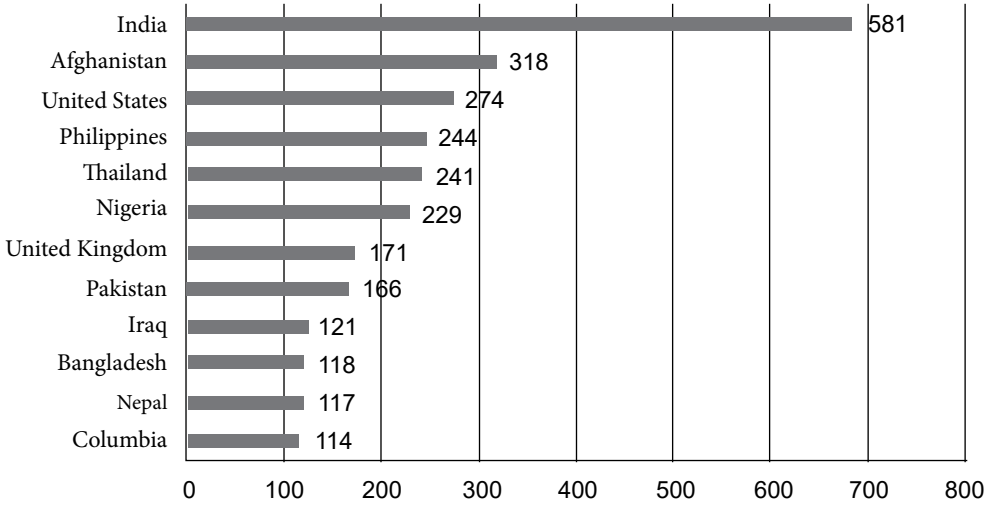

Figure 3. *Number of arson / fire terrorist attacks by countries (Source: GTD)*

In the analyzed period of time, unknown perpetrators conducted most terrorist attacks using arson / fire as a tactic, followed by the Communist Party of India-Maoist (CPI-Maoist) with 261 attacks, the Taliban with 227 attacks, the New People Army terrorist organization from the Philippines with 199 attacks, the Maoist terrorist group with 171 attacks, Boko Haram from Nigeria with 169 attacks, and the globally known terrorist organization the Islamic State (ISIL) with 47 attacks.

Furthermore, biological weapon[13] attacks also represent a terrorist method which has a concrete impact on individual and social security, but also on the natural environment. From 1970 to 2018, according to the GTD, globally there were 31 terrorist attacks using biological weapons (Figure 4). The greatest number of biological terrorist attacks – 17 in total – took place in 2001, with the United States experiencing 12 biological attacks, Kenya three, and Pakistan and Chile one attack each that year. At the same time, the United States is a country with the highest frequency of experienced biological terrorist attacks (27 attacks), followed by Kenya (three attacks), Pakistan (two attacks) and the United Kingdom, Chile, Israel, and Japan each with one biological attack[14]. This indicates that biological attacks are not a primary terrorist *modus operandi*. There are several possible explanations for this. First, this *modus operandi* is not easily manageable, i.e. it is difficult to control. Second, if it is a biological weapon, such as a dangerous virus, it can cause unwanted consequences for the perpetrators as well. Third, many attempted attacks with biological and chemical weapons have proved insufficiently effective due to there being "not enough" casualties. This leads to insufficient media attention, which is an important aspect of terrorism. Therefore, it is logical that terrorists more often opt for bombings and armed attacks which have been proven as efficient methods and

13 A biological weapon attack implies usage of elements which are made of pathogenic microorganisms or toxic biological substances (GTD, 2019:28).

14 For one attack the location was not presented in the GTD.

"cheaper means" (Crenshaw, 2003) that achieve the desired effects, primarily media attention, public fear, and the total number of casualties.

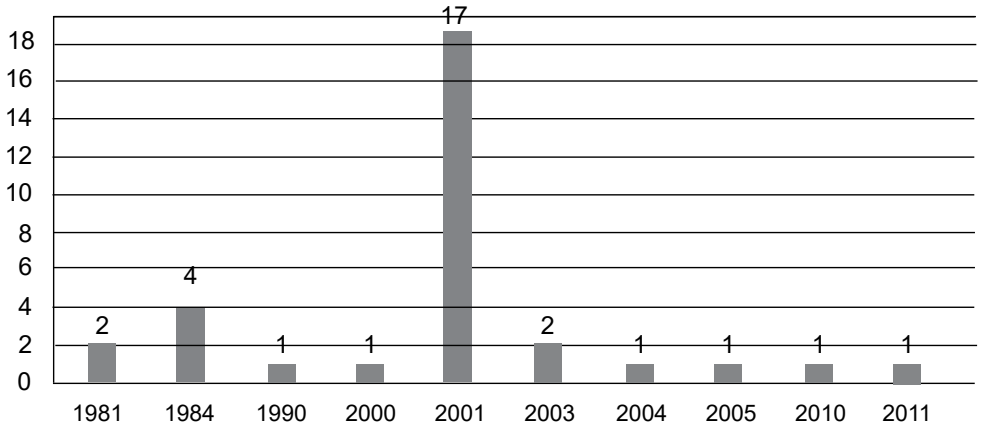

Figure 4. *Chronological overview of biological terrorist attacks in the world from 1970 to 2018 (Source: GTD)*

Since 1981 there have been 31 biological terrorist attacks and only six of them resulted in fatal consequences. The relatively low percentage of mortality due to a biological terrorist attack can be explained by the fact that perpetrators used lower concentrations of lethal substances, primarily the bacterium anthrax (lat. *bacillus anthracis*). Moreover, no biological weapon attacks have been recorded since 2011. These findings again show that biological attacks are not a popular terrorist *modus operandi*. Analyzing biological acts of terrorism, we found that in most cases none of the terrorist organizations took responsibility for the terrorist attacks (N=23). Moreover, four biological terrorist attacks were conducted by the Indian terrorist organization Rajneesh, two attacks were by the terrorist organization Dark Harvest from the United Kingdom, one sarin attack was by Aum Shinrikyo from Japan, and one attack was carried out by the animal rights organization The Justice Department from the United Kingdom.

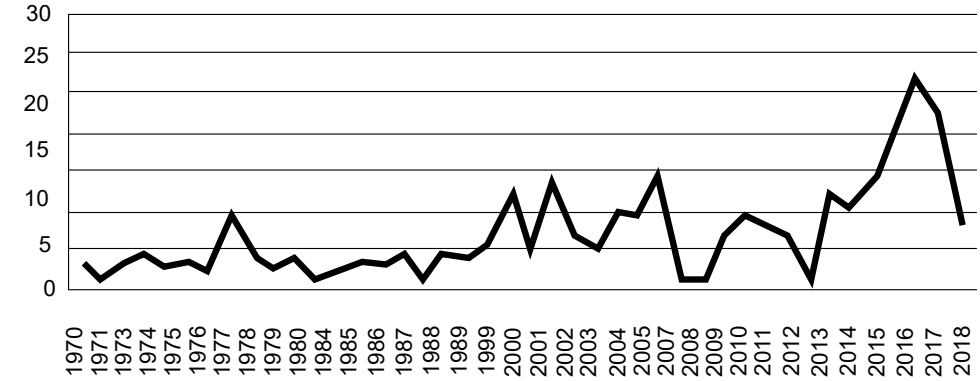

Figure 5. *Chronological overview of terrorist attacks using chemical weapons from 1970 to 2018 (Source: GTD)*

In addition to biological terrorist attacks, terrorist organizations also use chemical weapon attacks, which inevitably affect both the environment through pollution as well as the security of individuals and society as a whole. It is important to note that military intervention by the United States Armed Forces in Iraq in the early 2000s had support in the claim that Saddam Hussein's regime possessed chemical and biological weapons that was planned to be used for political purposes. Meanwhile, non-state actors, i.e. terrorist organizations, have also used chemical weapon attacks in the last forty years, which irrefutably confirms the findings of this research (Figure 5).

In this regard, in the observed period of time, according to available data from the GTD database, 286 terrorist attacks were committed using chemical weapons. Interestingly, this tactic has been most often used in the last decade, more specifically during 2015, 2016 and 2017. Thereby, most attacks using chemical weapons were carried out in Afghanistan (51 attacks), Iraq (38 attacks), United States (18 attacks), Japan (12 attacks), and Colombia (10 attacks). The largest number of acts of terrorism, 146 of them, have no identified perpetrator, while ISIL is the terrorist organization that carried out most of all terrorist attacks using chemical weapons, more specifically, the group used this tactic in 30 attacks. They are followed by the Taliban, who used chemical weapons in 20 terrorist attacks. These findings, therefore, show that most chemical weapon attacks were committed in Afghanistan, where the Taliban are the most active terrorist group, and in Iraq, where ISIL dominates. In 2016, the research organization RAND concluded that members of the ISIL terrorist organization were changing their patterns of action in Iraq and Syria and most often using chemical weapons (Parachini, 2016).

In addition to the above presented results on the weapon type of terrorist attack (arson / fire, biological, chemical), it is relevant to emphasize that there are certain terrorist targets whose endangerment can have a high impact on the environment and therefore on human and national security. Some of those are oil and gas plants and pipelines, oil tankers, water and food supply, etc. In the period from 1970 to 2018 such objects have been targets in 3,094 terrorist attacks.

Table 1. *Number of terrorist attacks from 1970 to 2018 by target*[15] *(Source: GTD)*

Target	**Count**
Oil	1,193
Oil Tanker	16
Water Supply	245
Food Supply	62
Gas	574
Gas / Oil / Electric	1,004
Total	**3,094**

15 The terrorist attacks in this table include different weapons used by terrorists, such as arson / fire, biological and chemical, and the numbers in this table should not be added to the previously stated numbers.

It is especially important to point out that 1,193 terrorist attacks were directed towards the Oil target[16], which target has had continuous incidence from 1971 to 2018. However, in accordance with the geospatial indicators of the location of the attacks, countries with the highest frequency of attacks are characterized by the existence of oil deposits and related infrastructure, i.e. the availability of the target itself. Colombia is a country with the highest frequency of terrorist attacks committed toward an Oil target (513 attacks), followed by Iraq (123 attacks), Nigeria (119 attacks), and Yemen (119 attacks). Analyzing the terrorist groups that carried out most attacks toward an Oil target in the observed period of time, an unknown perpetrator was responsible for 410 attacks, while the terrorist group National Liberation Army of Colombia (ELN) committed 254 attacks, the Revolutionary Armed Forces of Colombia (FARC) committed 129 attacks, and the Niger Delta Avengers (NDA) terrorist organization from Nigeria carried out 43 attacks.

An important determinant of terrorist attacks on an Oil target, in accordance with the *modus operandi*, is their dominant performance using bombs or explosives (N=1029 or 86.3% of all attacks). The next target that terrorist groups predominantly attack, in the context of environmental targets, is that of Gas / Oil / Electric. This target is the most common target in Iraq (170 attacks), followed by Nigeria (91 attacks), Colombia (82 attacks), Pakistan (80 attacks), and India (59 attacks). As with the attacks on the Oil target, terrorist attacks directed toward a Gas / Oil / Electric target are characterized by executing an attack using a bomb or explosives (555 or 55.3%), while 13.8% of attacks (139 attacks) were carried out through an armed attack. Most attacks (405 or 40.3%) toward a Gas / Oil / Electricity target were conducted by an unknown perpetrator, while the ISIL terrorist group is the known perpetrator organization with the most attacks on the Gas / Oil / Electric target (76 attacks), followed by FARC with 31 attacks, ELN with 27 attacks, while three other terrorist organizations (Taliban, Sendero Luminoso, and Movement for the Emancipation of the Niger Delta) committed 26 attacks.

Everything mentioned above irrefutably points to the need for continuous study and monitoring of various strategies, i.e. methods and tactics of terrorist activity, especially those in which there is contamination of the social and natural environment. Knowledge and promptly countering terrorist groups that, as part of their uncivilized activities, carry out terrorist attacks using arson, biological and chemical weapons, etc., diminishes the possibility of far-reaching consequences that such and similar terrorist attacks may generate.

4. CONCLUSION

the extended security concept assumes that threats to human and national security might also come in ecological / environmental forms. Moreover, attacks on the environ-

16 The variables Oil and Gas refer to plants for production or transmission of oil or gas (oil pipelines, gas pipelines, etc.), while the variable Gas / Oil / Electric refers to a business entity engaged in the sale of gas / oil / electricity (GTD, 2019).

ment could be a suitable tool for committing terrorist attacks with a political agenda. The results presented in this paper support this claim.

In the GTD, during the analyzed period from 1970 to 2018, 4,517 terrorist attacks used a weapon type that can be classified as one that leaves quite profound and long-lasting effects on the environment than more conventionally used weapons. The largest number of terrorist attacks that fall into this category were committed by arson / fire. The increased number of such terrorist attacks in the last decade should be of particular concern. Namely, three-quarters of all such attacks worldwide were committed between 2010 and 2018. The availability and efficiency of arson / fire terrorist attacks made them highly used as a terrorist *modus operandi* most often employed by Indian and Afghan terrorist groups. The worrying indicator is that today's active radical groups such as CPI-Maoist, ISIL, or Boko Haram are prone to this type of attack. By influencing some aspects of the environment, biological and chemical weapons could also serve terrorists to jeopardize the security of individuals and states and even global security as well. The data show that such attacks are used to a much lesser extent than fire attacks and are an unpopular method for terrorists. Since 2011 no such terrorist attack has been recorded in the GTD. Terrorist attacks using chemical weapons are somewhat more common than biological ones, and this should also be of particular concern as there has been a recorded increase in the number of such attacks in the last five years.

The environment is a very vulnerable medium and some terrorist attacks target the environment rather than people or material property, such as energy and natural resources (oil and gas plants and pipelines, oil tankers, water and food supply). The environment seems to have been a very suitable target for acts of terrorism, which has been confirmed by 3,264 attacks between 1970 to 2018.

The findings presented in this paper are relevant for both security and terrorism studies, but even more for counter-terrorism strategies. Although chemical and biological weapons are relatively rarely used in terrorist activities, this type of action must never be excluded as a possibility, especially since such weapons have the highest potential to leave unforeseeable and devastating long-lasting consequences for the entire world, including people and nature. Among the analyzed tactics that could leave such consequences, it is evident that terrorists are more focused on effortless and more easily accessible weapons such as fire. Unquestionably, this represents one of the most serious threats that poses a major security challenge for security, both human and natural. In counter-terrorism strategies and the policies derived from them, the possibility of terrorist actions must never be excluded. Security decision makers should always be aware of the fact that the environment is an easily accessible target and a target through which terrorists can reach a wider audience despite the fact that this has not been the case so far. Therefore, counter-terrorism strategies must include and protect the particularly vulnerable parts of the environment and take into account different scenarios, even the worst-case ones, as this is the only way to minimize the risk of a terrorist attack and its unwanted consequences.

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OKOLIŠ „U RUKAMA" TERORISTA – ANALIZA TERORISTIČKIH AKTIVNOSTI S OZBILJNIM POSLJEDICAMA PO OKOLIŠ

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Sažetak

Rad se fokusira na dva ključna pojma – sigurnost i okoliš – koje se dovodi u vezu s fenomenom terorizma. Analiziraju se terorističke aktivnosti koje ostavljaju ozbiljne posljedice po okoliš, s ciljem ugrožavanja zdravlja i egzistencije ljudi te destabilizacije političkih sustava. Pri tome, umjesto fokusa na konvencionalna sredstva (vatreno oružje, bombe, eksplozivi) i mete (ljudi i materijalna imovina), u radu se problematiziraju teroristički napadi koji ostavljaju velike i dugotrajnije posljedice na okoliš poput onih u kojima su korištena manje konvencionalna sredstva (biološko i kemijsko oružje, požari) kao i onih koji izravno ciljaju okolišne resurse (energiju i prirodne izvore). Empirijska analiza uključuje sve terorističke napade od 1970. do 2018. zabilježene u bazi Global Terrorism Database (GTD), a koji se odnose na biološko i kemijsko oružje, napade podmetanjem požara, ali i napade čije su mete bile mjesta za opskrbu vodom, hranom, plinom, naftom ili strujom. Empirijski dokazi sugeriraju da je od 1970. bilo mnogo terorističkih napada koji zadovoljavaju postavljene istraživačke kriterije. Najčešće su korišteni napadi podmetanjem požara s ukupno 4200 takvih napada zabilježenih u posljednjih gotovo pedeset godina, a uočen je i značajan porast takvih napada u posljednjem desetljeću. U radu se ukazuje na to da dostupnost i učinkovitost taktika koje ciljaju okoliš, kao što je podmetanje požara ili uporaba kemijskog i biološkog oružja te zagađivanje zaliha vode, tla itd., iako manje konvencionalne, predstavljaju ogromnu prijetnju ljudskoj, nacionalnoj i globalnoj sigurnosti.

Ključne riječi: *terorizam podmetanjem požara, biološki terorizam, kemijski terorizam, okoliš, sigurnost*

DIE UMWELT „IN DEN HÄNDEN" DER TERRORISTEN – EINE ANALYSE DER TERRORISTISCHEN AKTIVITÄTEN MIT SCHWERWIEGENDEN FOLGEN FÜR DIE UMWELT

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Zusammenfassung

Diese Arbeit legt den Fokus auf zwei Schlüsselbegriffe – Sicherheit und Umwelt – die mit dem Phänomen des Terrorismus in Verbindung gebracht werden. Es werden terroristische Aktivitäten analysiert, die schwerwiegende Folgen für die Umwelt hinterlassen und ihr Ziel ist, menschliche Gesundheit und Existenz zu gefährden und politische Systeme zu destabilisieren. Statt sich mit den konventionellen Mitteln (Feuerwaffen, Bomben, Explosive) und Zielscheiben (Menschen und materielles Vermögen) zu befassen, werden in der Arbeit Terrorangriffe zur Diskussion gestellt, die schwerwiegende und langanhaltende Folgen auf die Umwelt hinterlassen, wie diejenigen wo weniger konventionelle Mittel eingesetzt wurden (biologische und chemische Waffen, Brände) und diejenigen, die direkt auf Umweltressourcen gerichtet sind (Energie und natürliche Energiequellen). Die empirische Analyse schließt alle Terrorangriffe von 1970 bis do 2018 ein, die in der Datenbank Global Terrorism Database (GTD) eingetragen sind und die sich auf biologische und chemische Waffen beziehen, auch auf Brandstiftung und Angriffe auf Wasser-, Nahrungsmittel-, Gas-, Erdöl- oder Stromversorgung. Die empirischen Beweise legen nahe, dass es seit 1970 viele Terrorangriffe gegeben hat, die den gesetzten Forschungskriterien entsprechen. Am meisten handelt es sich um Brandstiftung, es wurden insgesamt 4.200 solche Angriffe in den letzten fünfzig Jahren registriert, es wurde auch eine signifikante Zunahme von solchen Angriffen in der letzten Dekade verzeichnet. In der Arbeit wird darauf hingewiesen, dass die Zugänglichkeiut und Effizienz der Taktiken, die gegen die Umwelt gerichtet sind, wie

Brandstiftung oder Einsatz von chemischen und biologischen Waffen und Wasser- oder Bodenverpestung, obwohl weniger konventionell, eine große Bedrohung für die menschliche, nationale und globale Sicherheit darstellen.

Schlüsselwörter: *Terrorismus durch Brandstiftung, Bioterrorismus, Terrorismus mit chemischen Stoffen, Sicherheit, Umwelt*