A Realistic Review of Chemical, Biological, Radiological and Nuclear Terrorist Risks in Europe

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Summary - High Risks in the European Context

Western countries are currently facing two main terrorist threats. First, the “returnee issue” - foreign terrorist fighters trained in Syria who are able to carry out complex attacks when they come home. Second, the influence and radicalization capability of self-styled Islamic State (IS) and other Salafi jihadist groups among large numbers of young people, some of whom may go on to carry out lone wolf attacks.

Despite the continuous loss of territories and assets by IS and the current “quiet underground” rebranding and adaptation of al-Qaeda, the global jihadist strategy aims at shifting the West’s focus from the Middle East to their own countries. In fact, contemporary jihadist propaganda calls on sympathizers to carry out attacks in their own countries when they cannot perform

hijra (migration)[1].

In this context, the possibility that a jihadist group might carry out a terrorist attack using chemical, biological, radiological or nuclear (CBRN) agents remains one of the gravest threats to homeland security in the world. It is definitely not a new phenomenon, given that in the past terrorist organizations tried to purchase and weaponize CBRN materials to exploit the mass casualties and the psychological and sociological impacts linked to this type of terrorist incident.

To contextualize the importance of weapons of mass destruction in strategic threat assessments, it is sufficient to remember that the 2003 Iraq conflict was driven by reports of the presence of CBRN materials in Iraq[2]. Similar issues arose in connection with Iran's nuclear development program, leading the international community to impose economic sanctions until IAEA inspectors were allowed into the country[3].

In addition, the feasibility of CBRN attacks is directly linked to the high number of potential targets. Soft targets are, by definition, not prepared to handle a CBRN event and its medical, containment and investigative consequences.

In this regard, in 2017 the European Union produced a CBRN Action Plan to enhance preparedness. The document followed the 2009 Action Plan to standardize hazardous material lists, procedures, capacities and sharing of good practice among EU member states. That plan's implementation has not been uniform in all areas and there have been shortfalls, especially in the fields of medical capacity, personnel preparedness and equipment.

This report provides a general overview of the different risks associated with CBRN agents, aiming to enhance knowledge and preparedness in the population. Another goal is to highlight the current vulnerabilities related to the risk of a jihadist CBRN attack. Finally, possible scenarios of terrorist incidents involving CBRN agents will be addressed to summarize how we can minimize the threat.

The Historical Course of Unconventional Attacks

The use of unconventional weapons against an enemy has been known and practiced since ancient times.

Poisoned arrows were among the first weapons used by men. Chinese and Assyrian fighters

[1] Video message from the Islamic State's Al Hayat Media Center "Inside the Caliphate #8" released on October 30, 2018. Accessed through Aaron Zelin Jihadology website at https://jihadology.net/2018/10/30/new-video-message-from-the-islamic-state-inside-the-caliphate-8/

[2] D. Hayes, M. Guardino, "whose views made the news? Media coverage and the march to war in Iraq", pp.59-87, in "Political Communication" vol.27 n.1, *Taylor & Francis Group*, 2010, https://www.tandfonline.com/doi/abs/10.1080/10584600903502615

[3] "IAEA and Iran: Chronology of Key Events", International Atomic Energy Agency official website, updated to September 2018, https://www.iaea.org/newscenter/focus/iran/chronology-of-key-events

used sulfur in war campaigns in the first millennium BCE[4]. The Roman army used toxic substances during the first century BCE, even equipping their horses with protective cloths, a precursor of present day gas masks. Ancient literature recognized the use of weapons of mass destruction during military operations, with mentions in war treatises such as the *Stratagematon*. Many centuries on, even Leonardo da Vinci wrote about chemical weapons[5].

The unique perceptions of horror are ancient too - prohibitions of the use of toxic substances appeared centuries before the Common Era in the *Mahabharata* and *Ramayana* epics.

In 1346, the world witnessed the first biological attack when the small Crimean seaport town of Kaffa (the ancient name of today's Feodosia) was besieged by a Mongol army whose soldiers were reportedly suffering from the plague. The Mongols catapulted plague-ridden corpses over the city walls, infecting the inhabitants. Those who fled to Europe may have carried and spread the disease[6].

It is however in the twentieth century that CBRN agents were most widely used, especially during the world wars. Chemicals such as chlorine, sulfur mustard, and phosgene were developed and utilized against enemy trenches in World War I and the devastating effects of nuclear weapons brought an end to World War II[7]. Nerve agents were produced and tested during the Cold War and in recent decades DNA recombination accelerated the production of modified germs, viruses and toxins.

The advent of the current century was marked by the use of depleted uranium (DU) projectiles by NATO forces during the conflicts in Bosnia-Herzegovina and Kosovo. They penetrate tank armor and fortified bunkers, but they also leave contaminated terrain afterwards[8].

Modified chemical agents have also been utilized by different states in reaction to asymmetrical threats. For example, in the Moscow incident in 2002, when Chechen terrorists had taken control of a crowded theater, the Russian authorities released an undisclosed

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[4] The Mahabharata and Ramayana are the two major Sanskrit epics of ancient India. The Mahabharata is an epic legendary narrative of the Kurukṣetra War and its origins probably fall between the 9th and 8th century BCE. The Ramayana epic narrates the life and wars of Rama, the legendary prince of the Kosala Kingdom and its origin is traced between the 6th and 3d century BCE.

[5] Sextus Julius Frontinus was a prominent Roman civil engineer, author, and politician of the late 1st century CE. He was a successful general under Domitian, commanding forces in Roman Britain, and on the Rhine and Danube frontiers. He was the author of Stratagematon, a collection of examples of military stratagems from Greek and Roman history, for the use of generals. Leonardo da Vinci's chemical weapons included chalk, arsenic sulfur and verdigris to be launched at enemy vessels to asphyxiate people.

[6] M. Wheelis, "Biological warfare at the 1346 siege of Caffa", *Centers for Disease Control and Prevention – CDC*, Vol.8 n.9, September 2002, https://wwwnc.cdc.gov/eid/article/8/9/01-0536_article

[7] S. Everts, "When chemicals became weapons of war", *Chemical & Engineering News*, February 27, 2015, http://chemicalweapons.cenmag.org/when-chemicals-became-weapons-of-war/; C.V. Glines, "the bomb that ended the war" HistoryNet, June 12, 2006, http://www.historynet.com/world-war-ii-second-atomic-bomb-that-ended-the-war.htm

[8] M. Simons, "1999 U.S. documents warned of depleted uranium in Kosovo", *The New York Times*, September 1, 2001, https://www.nytimes.com/2001/01/09/world/1999-us-document-warned-of-depleted-uranium-in-kosovo.html

incapacitating agent to subdue them[9]. In the ongoing Syrian conflict, Syrian forces have used nerve agents (possibly sarin) against enemy forces and civilian population in Ghouta, Idlib, Douma and several other locations[10]. Chemical weapons have also been used by IS in possibly 37 discrete attacks in Syria and Iraq. The weapons of choice for IS were toxic industrial chemicals (TICs), chlorine gas and sulphur mustard. In a post incident investigation, analysts revealed that the latter was produced by IS operatives themselves[11].

Two recent developments in particular have alarmed security agencies worldwide - jihadist plots were disrupted before chemical and biological agents were used in a terrorist attack. Apart from the Tokyo sarin attack in 1995, this marks unprecedented progress, signaling that terrorists may have bridged the knowledge gap to assemble and handle CBRN weapons.

In the first incident, in July 2017 a plot to take down an airplane with an explosive device was disrupted in Sydney. During the investigations, it was discovered that the perpetrators also tried to create an improvised chemical device to release hydrogen sulfide into crowded public areas[12]. In the second incident, a plot was disrupted in Germany in 2018 when a Tunisian national was prevented from using ricin, a highly dangerous biological toxin, that was found in his apartment[13].

The concern that jihadi terrorists have secured the required know-how and instruments to handle CBRN agents to be used in a terrorist attack is truly worrisome. It is now necessary to plan and enhance controls on various soft targets that could be hit by such weapons, employing both general understanding of the terrorist threat and specific knowledge of CBRN agents' effects and risks related to specific events. Domestic security should focus on two strands - professional training and specialization on the one hand and public preparedness and awareness on the other.

Concerns and Vulnerabilities

Jihadist actors constantly explore new and unexpected tactics to be used in their hybrid conflicts. They adapt and evolve their strategies, forcing law enforcement agencies to react to any changes. Jihadist leaders have also produced theological and jurisprudential justifications for the use of WMD's, so our task is to counter this possibility by addressing our vulnerabilities [14].

Major concerns related to three sectors are raised by intelligence agencies in the case of a

[9] P. Kozakiewicz, "Moscow theater crisis: unknown chemical agent revisited" *CBRNe portal*, March 10, 2014, https://www.cbrneportal.com/moscow-theater-crisis-unknown-chemical-agent-revisited/

[10] D. Kimball, K. Davenport, "Timeline of Syrian chemical weapons activity, 2012-2018", Arms Control Association, updated June 2018, https://www.armscontrol.org/factsheets/Timeline-of-Syrian-Chemical-Weapons-Activity

[11] M. K. Binder, J. M. Quigley, H. F. Tinsley, "Islamic State chemical weapons: a case contained by its context?", in *CTC Sentinel* vol.11 n.3, March 2018, p.28, https://ctc.usma.edu/march-2018/

[12] J. Williams, "Australia details 'sophisticated' plot by ISIS to take down plane", *The New York Times*, August 4, 2017, https://www.nytimes.com/2017/08/04/world/australia/sydney-airport-terror-plot-isis.html

[13] J. Huggler, "Islamist extremist ricin plot foiled by German police", *The Telegraph*, June 14, 2018, https://www.telegraph.co.uk/news/2018/06/14/islamist-extremist-ricin-plot-foiled-german-police/

[14] S. Al Ansari, "The takfiri position on Weapons of Mass Destruction (part 1)" *Quilliam International*, November 1, 2018

CBRN terrorist incident.

The first concern is related to the number of victims. A CBRN attack - for instance the explosion of a dirty bomb - could inflict mass casualties in the attack. But the consequences don't end there. In the longer term, the victims will also include individuals who survived the attack but were exposed to CBRN agents. This can result, in the worst hypothesis, in severe health problems, as in the cases of hemorrhagic fever outbreaks[15] or massive radio-exposure causing ARS (Acute Radiation Syndrome) with consequential DNA or other cellular structure damage[16].

The second sector of concern is psychological. Any terrorist attack, especially one carried out against a soft target, will foster fear in the population due to the "proximity" of the target to the average citizen's life. A successful CBRN attack will heighten this fear, possibly leading to psychosis and alienation of people who are suspected of being contaminated. CBRN substances are usually not perceptible by human senses, creating a special fear in the absence of recognizable threats[17].

The third concern is sociological - our daily behavior. In the wake of terrorist attacks against music venues, stadiums, churches or restaurants, many people will decide to avoid such places. Long term effects can lead to behavior and routine changes, where lifestyles are adapted to new threats and fears. In the 1950's, for example, people fearing an imminent nuclear conflict bought private shelters[18].

In addition, there are logistical and operational problems to consider. CBRN substances released in an urban area will lead to prolonged emergency situations in time and space. Metropolitan areas contaminated with biological, chemical or radiological agents will be forbidden for long periods, influencing the resumption of institutional, economic and normal day to day activities.

Generally speaking, risk is understood as the probability of the damage that an event could cause due to the vulnerability of people and structures exposed to it. This should be the focus of CBRN threat assessment. Relevant weaknesses are in fact similar to those encountered in "normal" terrorism, with some significant differences:

- Cooperation and intelligence sharing is paramount in this field of expertise. We should be

[15] B. Ratner, "Death toll from West Africa's Ebola outbreak passes 10000: WHO", *Reuters*, March 12, 2015,http://www.reuters.com/article/us-health-ebola-toll-idUSKBN0M82CM20150312

[16] Radiation injury is caused by massive energy released against a human body, promoting free-radical formation, which may lead to large number of cells being killed or rapidly divided causing malignant transformation. VV.AA., "Medical Treatment of Radiological Casualties: Current Concepts" in *Annals of Emergency Medicine*, Vol. 45 n.6, June 2005, p.644

[17] S. Wessley, "Don't panic! Short and long term psychological reactions to the new terrorism. The role of information and the authorities", pp.1-6 in "Journal of Mental Health", vol.14 n.1, *Taylor & Francis Group,* 2005, https://www.tandfonline.com/doi/abs/10.1080/09638230500048099

[18] L. Huddy, S. Feldman, T. Capelos, C. Provost, "The consequences of terrorism: disentangling the effects of personal and national threat", pp.485-510, in Political Psychology, vol.23 n.3, Blackwell Publishing Inc., 2002, https://you.stonybrook.edu/leonie/files/2018/03/Huddy-Feldman-Capelos-and-Provost-2002-The-Consequences-of-Terrorism-rpyn7l.pdf

aware and professionally prepared to counter this threat. But in the current situation the majority of law enforcement and intelligence personnel have few clues about how to handle CBRN events and the ways this threat can present itself.

- Another weakness to be addressed is the incomplete mapping and control of terrorist routes to and from jihadi battlefields. These routes can also be used to smuggle CBRN materials, exploiting porous borders, weak political cooperation among neighboring states, and systematic avoidance of action against jihadists by "transit" countries[19].

- Additionally, lack of CBRN agent detection and identification systems on police, paramedic and firefighting vehicles will inevitably result in greater risks of contamination for the exposed personnel. After a CBRN terrorist incident, due to non-perceptibility of these substances by our senses, first responders will probably suffer the same fate as the victims [20].

Can Terrorists Obtain CBRN Agents?

Apart from motivation to commit violence, the prerequisites for a terrorist attack with CBRN agents are access to materials, the knowledge to build a device, and access to a target.

Nowadays, soft targets are attractive to terrorist organizations because of their unsophisticated operational features, easily exploited even by untrained jihadists. Moreover, loose connections with a structured jihadist group can encourage individuals pursuing their own private jihad, adding personal grievances to general Salafi-jihadist ideology. The outcome is a target list compiled according to personal motives, technical know-how, criminal experience, paramilitary training levels, and so forth.

Soft targets are generally considered as non-fortified, easily accessible, massively frequented locations that are vulnerable and easy to exploit by their very nature, ensuring higher chances of success and extensive media coverage[21].

Consequentially, the most important factor to evaluate is if and how terrorist groups can purchase, store, handle and weaponize CBRN agents. This makes it necessary to assess possible vulnerabilities in the scientific, academic and industrial sectors that employ CBRN materials in order to better protect infrastructures and the population.

Technology is in play here. The recent cyber-attack on the Chernobyl radiation monitoring system highlighted how a terrorist group with the necessary know-how could threaten international safety and security by hacking the automated control systems of various critical

[19] N. G. Spagna, "from Nuclear and Radiological smuggling to nuclear terrorism: understanding the threat to the European cities", in Sicurezza, Terrorismo e Società, *Educatt – Università Cattolica del Sacro Cuore*, n.4, 2016 www.sicurezzaterrorismosocieta.it/?p=364

[20] On March 20, 1995, Aum Shinrikyo cult members released sarin gas in the Tokyo subway, killing twelve people and injuring nearly 5,000 more. First responders were among the intoxicated due to unpreparedness to face this kind of event.

[21] A. Boncio, "The terrorist logic behind the choice of targets*", European Eye on Radicalization*, March 21, 2018, https://eeradicalization.com/the-terrorist-logic-behind-the-choice-of-targets/

infrastructures[22].

Weaponization know-how is particularly important. Chemical products can be simply mixed to obtain lethal agents, but storage and effective dispersal systems are more difficult to achieve, as the 1995 sarin attack in Tokyo confirmed[23]. Biological weapons are even harder to isolate and use for a terrorist attack. Even though bacteria and pathogens can be obtained, their handling is very risky and can result in spreading diseases in terrorist camps and among people living nearby[24].

Therefore, the biggest danger is probably radiological dispersal devices (RDD), or dirty bombs. This is especially the case for so-called "orphan sources"[25], usually found, stolen or mishandled by several people, or willingly considered ordinary waste by careless companies, giving terrorists a chance to acquire them. More than 150 cases of trafficking of radioactive materials are reported annually to the International Atomic Energy Agency (IAEA)[26]. In this context, the Interpol STONE project was launched in 2016 to counter RN smuggling and identify individuals involved in RN materials trafficking[27].

Jihadist networks usually have three possible ways to acquire CBRN substances. The first channel is official programs that have been discontinued. For example, chemical, radiological, biological and nuclear materials originating from former Soviet programs are rumored to be in the hands of organized crime groups[28]. The same concern applies to the former Libyan chemical storage sites raided by various extremist factions after the overthrow of the Qaddafi regime[29].

Another channel is the usage of CBRN substances from peaceful civilian activities, bypassing the difficulties of smuggling substances into a country. Examples include the failed plans to strike a nuclear power plant developed by the cell responsible for the March 2016 terrorist attacks in Brussels [30] and the June 2015 IS-inspired attack by a French individual who rammed his vehicle into a gas factory in order to detonate gas tanks[31].

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[22] M. Ilyushina & E. Levenson, "Chernobyl monitoring system hit by global cyber-attack" CNN, June 28, 2017, http://www.cnn.com/2017/06/27/europe/chernobyl-cyber-attack/index.html

[23] The sarin (in its liquid form) was contained in plastic bags perforated with umbrella tips into subway train coaches. Leaking out and evaporating, the gas affected passengers and rescuers, but due to its dilution, its lethality was lowered.

[24] A. Amiga & R. Schuster, "EU report: ISIS could commit chemical or biological attack in the West", *Haaretz*, December 13, 2015 http://www.haaretz.com/wwwMobileSite/middle-east-news/isis/1.691157

[25] An orphan source is a self-contained radioactive source that is no longer under proper regulatory control due to abandonment, loss, misplacement or theft.

[26] B. Immenkamp, "ISIL/Da'esh and non-conventional weapons of terror", *European Parliamentary Research Service*, December 2015, p.4 http://www.europarl.europa.eu/RegData/etudes/BRIE/2015/572806/EPRS_BRI%282015%29572806_EN.pdf

[27] https://www.interpol.int/Crime-areas/CBRNE/Radiological-and-nuclear-terrorism/Project-Stone

[28] P.J Smith, "The terrorism ahead: confronting transnational violence in the Twenty-first Century", *Routledge*, 2015, p. 104

[29] A. S. Hatita, "Libya militias capture chemical weapons: army official", *Asharq al-Awsat*, February 21, 2015 https://english.aawsat.com/abdul-sattar-hatita/news-middle-east/libya-militias-capture-chemical-weapons-army-official

[30] K. Vick, "ISIS attackers may have targeted nuclear power station" *Time.com*, March 25, 2016 http://time.com/4271854/belgium-isis-nuclear-power-station-brussels/

[31] A. Faiola & V. Demoustier, "explosion hit French factory; terrorism probe opened", *The Washington Post*, June 26, 2015 https://www.washingtonpost.com/world/europe/explosions-hit-french-factory-terrorist-probe-opened/2015/06/26/442b08da-1be7-11e5-93b7-5eddc056ad8a_story.html

The digital communication age has facilitated the development of a third channel - black markets with encrypted transactions and virtual payments. The use of the dark web to purchase CBRN substances is in fact steadily increasing due to the low traceability of communications and the secure procedure of payment without material exchange of money.[32] In 2014, Kuntal Patel bought the deadly toxin Abrin through a US dark website for a bitcoin exchange value of £950[33]. In April 2016, speaking to a group of heads of state and foreign ministers, US President Obama described how a terrorist group had bought radioactive isotopes through brokers on the dark web[34].

Even if they can tap supply channels, what jihadist networks still seem to lack is the operational know-how to assemble a CBRN explosive device. This can be the next vulnerability to assess, as various suspected terrorists have already tried to infiltrate chemical, biological, and nuclear laboratories to acquire methodological, technological and instrumental knowledge to handle weapons of mass destruction.

A recent episode in Germany noted earlier confirms this trend. A Tunisian national with connections in the radical islamist milieu was arrested in Cologne on June 14 after he manufactured 84.3 milligrams of ricin, a deadly biological toxin obtained from castor bean seeds, allegedly for use in a terrorist attack[35]. This is the first known successful attempt to weaponize biological substances for terrorist purposes in Europe.

In France, on May 18 two Egyptians were arrested for allegedly plotting a terrorist attack using the very same biological agent[36]. They were found in possession of instructions for the manufacturing of ricin.

CBRN Medical Capacity in Europe

Since the September 11 attacks in the United States, both the United States and the European Union have embraced and strengthened strategies to increase their preparedness and capabilities related to CBRN terrorist attacks.

In 2009, the EU released the CBRN Action Plan as part of this strategy, setting out 124 actions related to specific sectors - chemical, biological, nuclear and radiological - as well as

[32] Press release, "a primer on DarkNet marketplaces", *Federal Bureau of Investigation*, November 1, 2016, https://www.fbi.gov/news/stories/a-primer-on-darknet-marketplaces

[33] "Breaking bad inspired murder plot by daughter" *BBC News*, September 22, 2014, http://www.bbc.co.uk/news/uk-england-london-29312281

[34] G. Weimann, "terrorist migration to the Dark Web", Perspective on Terrorism, Vol. 10 No. 3 (2016), http://www.terrorismanalysts.com/pt/index.php/pot/article/view/513/html

[35] C. Andrew, "Islamists have fled the battlefield… to plot mass murder with a dirty bomb", The Times, June 24, 2018, https://www.thetimes.co.uk/article/islamists-have-fled-the-battlefield-to-plot-mass-murder-with-a-dirty-bomb-8qtfsww82

[36] S. Louet, R. Lough, "France foils possible ricin attack by Egyptian-born brothers", Reuters, May 18, 2018, https://af.reuters.com/article/topNews/idAFKCN1IJ0Y6-OZATP

horizontal actions to be implemented by the member states[37]. The Plan's three main strands are prevention, detection and preparedness/response to CBRN incidents.

A crucial role is played by immediate medical responses to such incidents. The EU Action Plan identified some actions directed at determining medical countermeasures and vulnerabilities among Member States, as well as providing an exchange of best practices in the field of CBRN medical responses[38]. In 2010, the EU also established the CBRN Centre of Excellence initiative, seeking to improve the capacities of countries to mitigate CBRN risks.

In 2014, the EU adopted a Communication on a new approach to detect and mitigate CBRN-E[39] risks. The 2016 Action Plan Second Progress Report reviewed the implementations made, including the opening of the EU Nuclear Security Training Facility, the development of a database of the CBRN-E glossary, and the organization of numerous training courses and exercises[40].

In 2017, the new CBRN Action Plan was published, mainly focusing on reinforcing resilience against CBRN threats in terms of prevention, preparedness and response, and stressing the importance of closer cooperation at the EU level to better understand and be prepared for the CBRN threat[41]. The Directive on Combating Terrorism included for the first time provisions on all strands of CBRN terrorism, imposing obligations on member states to respond to a terrorist attack, including an obligation to provide medical assistance to all victims[42].

An EU Council Report of February 2017 highlighted gaps in the European Emergency Response Capacity, especially in the field of CBRN search and rescue operations in contaminated environments and decontamination of patients exposed to CBRN agents[43]. The majority of CBRN-CoE projects rely on training, e-learning, raising awareness and best practice sharing in order to reach a standardized level of preparedness; and increasing

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[37] Council conclusions on strengthening chemical, biological, radiological and nuclear (CBRN) security in the European Union - an EU CBRN Action Plan - Adoption http://register.consilium.europa.eu/doc/srv?l=EN&f=ST%2015505%202009%20REV%201

[38] S. Jackson, "European Union CBRN medical countermeasure preparedness", *cbrnportal.com*, May 26, 2014 http://www.cbrneportal.com/european-union-cbrn-medical-countermeasure-preparedness/

[39] The acronym is related to Explosive devices capable of releasing CBRN agents in the environment.

[40] "annual Progress Report on the implementation of the European Union strategy against the proliferation of Weapons of Mass Destruction (2016)", *Council of the European Union - European External Action Service (EEAS)*, January 17, 2017, p.12, http://data.consilium.europa.eu/doc/document/ST-5361-2017-INIT/en/pdf

[41] European Commission, "Action Plan to enhance preparedness against chemical, biological, radiological and nuclear security risks", October 18, 2017, https://ec.europa.eu/home-affairs/sites/homeaffairs/files/what-we-do/policies/european-agenda-security/20171018_action_plan_to_enhance_preparedness_against_chemical_biological_radiological_and_nuclear_security_risks_en.pdf

[42] Official Journal of the European Union, "Directive (EU) 2017/541 of the European Parliament and of the Council of 15 March 2017 on combating terrorism and replacing Council Framework Decision 2002/475/JHA and amending Council Decision 2005/671/JHA", March 31, 2017, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017L0541&from=EN

[43] Report from the Commission to the European Parliament and the Council on progress made and gaps remaining in the European Emergency Response Capacity, Council of the European Union, February 17, 2017 http://www.europarl.europa.eu/RegData/docs_autres_institutions/commission_europeenne/com/2017/0078/COM_COM(2017)0078_EN.pdf

operational capacity in terms of field equipment and specific treatments to be employed.

First responders and paramedics should be aware of the basic principles and procedures of self-protection when reacting to a terrorist incident, including the use of CBRN protective equipment and masks, radioactive shielding and the reduction of individual exposure time.

Protection of airways is the most important self-protective factor in the presence of chemical or biological agents. Moreover, while chemical agents tend to have an immediate and visible effect on victims, many biological substances will manifest their effects days after an incident. This is why it is important to isolate the incident area and assess the possible presence of such agents in order to plan the rescue operations strategically. On the other hand, RN agents released as a consequence of a terrorist attack should be treated with specific counter measures due to the risk of long term contamination.

Threat identification is the basis for a correct response after a CBRN terrorist incident, so detection instruments are essential to assess the presence and concentration of CBRN agents in the environment. The health effects of CBRN agents should also be known by all first responders in order to produce a preliminary assessment of a possible CBRN attack and prevent further casualties. Strategic planning plays a crucial role in medical assistance - safe medical triage procedures, immediate specific treatments to minimize the effects of CBRN exposure, and management of hospitalized individuals are part of a correct medical planning response to an emergency situation.

CBRN Terrorist Attack Scenarios

Terrorist organizations and lone actors have not used CBRN agents in Europe. However, as noted earlier, credible indications suggest that the acquisition process for such materials is developing, as is the required knowledge and capacity to weaponize them[44].

In addition, the number of jihadist propaganda messages and tutorials addressed to lone actors and proposing easy-to-implement scenarios for small scale CBRN attacks has increased compared to previous years; notably in social media channels that in 2017 released knowledge about chemical weapons and related terror tactics[45]. The foiled Cologne and Paris terrorist attacks mentioned earlier are the outcome of such propaganda.

In light of the information we have, some worst case scenarios are illustrated in the following paragraphs in order to deepen the analysis of possible shortfalls in the EU CBRN Action Plan and suggest some operational recommendations to better harmonize its implementation.

- Making an explosive device linked to pure chemical agents is not simple, but Toxic Industrial Chemicals (TICs) provide an alternative to terrorists. They are poisonous agents used for a variety of industrial purposes. Their toxicity is lower compared to pure chemical weapon agents (between 10 to 100 times) but there are approximately 70,000 TICs

[44] S. Al Ansari, "The takfiri position on Weapons of Mass Destruction (part 1)", op. cit.

[45] European Union Terrorism Situation and Trend Report (TE-SAT), Europol, 2018, p.14 file:///C:/Users/304711bl/Downloads/tesat_2018_1.pdf

available, compared to some 70 chemical weapon agents[46]. TIC production sites are usually not heavily protected and could become targets of attacks to release agents into the environment. Furthermore, transport tanks could be blown up or even hijacked and driven into crowded urban areas to cause mass casualties. Jihadist propaganda also suggests food and water contamination as an easy way to use chemicals.

- A biological terrorist incident could be linked to laboratories and research sites infiltrated by terrorists to release biological agents in the environment. Contamination of water or food supplies with salmonella or other simply obtainable pathogens could also lead to the poisoning of large numbers of individuals in enclosed environments such as college campuses, factories, or hospitals. A much less feasible hypothesis, but not to be excluded, could be to include infected individuals, for instance with a modified virus, among the masses of migrants moving towards European shores.

- Radioactive material can either be dispersed in the environment (Radiological Dispersal Device – dirty bomb) or directly irradiate people (Radiation Emission Device), resulting in exposure to alpha, beta or gamma rays. Polonium poisoning has already been employed. Orphan sources could easily be attached to explosive devices to spread ionizing radiations that can be inhaled, ingested or expose skin and clothes to contamination. The most dangerous incidents should be foreseen for nuclear power plants, with the risk of leaks or explosions resulting in a large contaminated area and people affected by ARS who will need specific medical treatment.

Conclusions

The efforts to prevent a CBRN terrorist attack are undermined by remaining gaps, particularly regarding information sharing among various countries, harmonized implementation of CBRN Action Plans, and medical capacity improvements to mitigate risks and casualties. A comprehensive strategy should focus on three different but interconnected components:

- Containing and reducing threats through combined efforts of information analysis and counterterrorism investigation featuring cooperation between intelligence and law enforcement agencies.

- Preventing the acquisition of CBRN materials and limiting the flow and possible purchase of dual use substances by establishing shared international policies to limit proliferation and the movement of such materials.

- Responding to crises through the creation and maintenance of national and international preparedness and response capabilities that can serve both as a deterrent for terrorists and as a tool to handle attacks for governments.

At the political level, deepening cooperation among national and international actors is advisable and in the foreseeable future a specialized body in charge of managing top-down actionable information with national law enforcement agencies should be launched. It is

[46] B. Immenkamp, “ISIL/Da'esh and non-conventional weapons of terror”, Op. Cit., p.5

fundamental that we stop treating weapons of mass destruction issues as if they were a special case to be handled distinctly from other national security issues[47]. Whether we like it or not, this topic will be an integral part of our future national security risk assessments and should be addressed accordingly.

Governments and institutions should also consider the possibility of periodically addressing the public to raise awareness and preparedness, including by way of a digital communication strategy[48].

At the operational level, two main paths should be followed. First, new technologies could play an important role in protecting critical infrastructure and urban areas. National security policies should integrate WMD risks into their evaluations, augmenting their preparedness with stationary and mobile CBRN agent detection systems to monitor contamination and alert the authorities in case CBRN agents are present in the environment[49].

Second, it would be wise to establish an international working group in the CBRN area with people from different professional backgrounds (medics, law enforcement and military officials, researchers, etc.), all focused on providing operational proposals to improve cooperation, share best practices and enhance medical capabilities to adequately respond to emergencies. In particular, the lack of specific treatments for large scale CBRN incidents and the existing gaps in the various emergency response capacities should be prioritized in addressing our needs. We must recognize that WMD terrorism risks rise and fall based on many factors, including the effectiveness of global efforts to secure chemical, biological and radiological weapons-grade materials and reduce the risk of proliferation[50].

Finally, with regard to the "digital world", cybersecurity should be enhanced to safeguard critical infrastructures from being hacked and an awareness campaign highlighting these threats should be directed at personnel directly involved in such working places. As digital communication is essential nowadays, a CBRN software application could also be implemented on the basis of the existing EU CBRN-E glossary digital app[51]. Adding city maps and linking them to CBRN detection devices, the software could be useful to alert the population about possibly harmful areas, promote CBRN knowledge and provide basic principles for surviving a CBRN incident.

The goal of this short paper is essentially to raise consciousness of the evolving terrorist threat related to the use of CBRN agents. It does not assess all the possible scenarios and

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[47] A. J. Mauroni, "A counter-WMD strategy for the future", *United States Army War College*, July 1, 2010, p.58, http://ssi.armywarcollege.edu/pubs/parameters/articles/2010summer/mauroni.pdf

[48] A. Niglia & C. Veraza "Building resilience through social media after an attack on critical infrastructure" in "Critical infrastructure protection against hybrid warfare security related challenges", *IOS Press*, 2016, p.11

[49] A feasible example was the BONAS (Bomb factory detection by Networks of Advanced Sensors) EU funded project; https://cordis.europa.eu/project/rcn/98486_it.html

[50] R. Mowatt-Larssen, M. Duffy Toft, "Recommendations to the new President on countering WMD and terrorism", *The Belfer Center for Science and International Affairs*, November 17, 2016, https://www.belfercenter.org/publication/recommendations-new-president-countering-wmd-and-terrorism

[51] https://play.google.com/store/apps/details?id=eu.europa.publications.cbrne

outcomes, as many other factors and elements should be considered for this purpose. The author's hope is that this document will be useful in shaping a priority list for the international community as it adopts a more proactive approach to the CBRN threat to better protect the population and the environment.

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