ASSESSING THE RISK OF A TERRORIST ATTACK AGAINST A SOFT TARGET: THE USE OF EXPERT OPINION IN THREAT ASSESSMENT

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Abstract: The article reviewed the methods for assessing the risks of a terrorist attack against a soft target. Considering the number of factors affecting the choice of a target by a terrorist group or individual terrorists and the limited usability of historical data on previous terrorist attacks, the article further focuses on the possibility of using expert opinion on the importance of criteria for identifying soft targets. For this purpose, a questionnaire survey was conducted at the regional police directorates of the Police of the Czech Republic. Based on the survey results, the level of security, the number of persons, and its symbolic significance were identified as the most important criteria for selecting a soft target as a target of a terrorist attack.

Keywords: expert opinion, multicriteria decision making, risk, soft targets, terrorist attack, threat assessment

1 Introduction

Soft targets or crowded places (from now on referred to only as "soft targets") are usually understood to be places vulnerable to a violent or terrorist attack, where large numbers of people congregate (Australia-New Zealand Counter-Terrorism Committee, 2017a, European Commission, 2017). Thus, soft targets can potentially include a disparate group of spaces, events, or objects such as churches, restaurants, gatherings, music festivals, hospitals, schools, means of transport, and many others that can become the target of a terrorist attack. Given the sheer number of potential soft targets, it is virtually impossible to harden all of these possible targets adequately. In such a situation, a suitable solution is to perform a risk assessment to identify and prioritize the most vulnerable soft targets. Identifying the most endangered soft targets could be potentially very useful, as the terrorists themselves usually deliberately choose the targets of their attacks (for review, see Gill et al., 2020, or Marchment & Gill, 2022). Unfortunately, assessing the risks of a terrorist attack against a potential soft target runs into several fundamental issues.

The fundamental problem is estimating the probability of a terrorist attack on a specific soft target. In 2004, Garrick et al. (2004) recommended the use of quantitative risk assessment consisting of threat and vulnerability assessment. Garrick et al. (2004, p. 136) defined the threat as *"the intention of a terrorist to inflict harm or damage to a specific asset or target by a specific means or weapon"* and the vulnerability as *"the response of an asset or target to a terrorist attack, including the consequences of the attack."* Several other studies have also recommended using methods based on probabilistic risk assessment to assess the risks of a terrorist attack, e.g. Paté-Cornell & Giukema (2002), Kujawski & Miller (2007), Ezell et al. (2010), Chatterjee & Abkowitz (2011) or Grant & Stewart (2017).

Problems associated with estimating the probability of a terrorist attack have, however, led to some controversy regarding the appropriate methodology for assessing terrorism risks. Several studies, e.g. Cox (2008), Brown & Cox (2011), or Aven & Guikema (2015), argued that probabilistic risk assessment, although very useful when assessing natural hazards or accidents, is not an appropriate solution for assessing the risks of a terrorist attack. Both Cox (2008) and later Brown & Cox (2011) pointed out several methodological flaws, including the fact that the vulnerability of the target of a terrorist attack, i.e. the probability that an attack on this target will be successful, also indirectly affects the probability that the target will become the target of this attack, as the attacker usually tends to choose targets with the highest probability of success.

As Aven & Guikema (2015) noted, the problem is that once a soft target is considered a likely target of a terrorist attack, measures are usually taken to increase its security level. On the other hand, the success of a terrorist attack depends substantially on choosing a vulnerable soft target. Therefore, it can be reasonably assumed that some attackers may intentionally choose such soft targets that are not considered likely targets of a terrorist attack (Kennedy et al., 2011). This link led Aven & Guikema (2015) to question the usefulness of probability estimation in assessing the risks of a terrorist attack. As Aven & Guikema (2015, p. 2163) noticed, *"any probability assessment is conditioned on future choices made by both the attacker(s) and defender(s)"*.

Guikema & Aven (2010) delimited and reviewed several alternative approaches to probability risk analysis that may be used for terrorism risk: a) risk management based on highest valued systems, b) game theory, c) probabilistic risk analysis based on expert knowledge, or d) a semi-quantitative risk analysis. At least the latter two approaches rely on expert opinion, which can also be problematic. Garrick et al. (2004) advocated the use of "subjective" probability based on expert opinion in the case of a lack of data on the frequencies of occurrence of individual scenarios, but some others were far more skeptical. Aven (2007) criticized the use of "subjective" probability, as there is no clear link between it and objective probability, which can lead to fundamental bias. According to Aven & Guikema (2015), subjective probability often tells more about the knowledge of the expert(s) involved than about the objective probability of the analyzed scenario of a terrorist attack.

Regardless of the method used to estimate the probability of the realization of a terrorist attack scenario and the probability of its success, even estimating the consequences of a terrorist attack is far from being without problems. The severity of consequences, especially lethality, of a terrorist attack scenario depends on several factors. In addition to the attacker's preparedness, his decisions and actions during the attack (for details see Alakoc, 2017, or Turner et al., 2021), and the existing security measures, how threatened persons in the soft target react to the attack is also of high importance. For example, Cuesta et al. (2019), in their method for assessing the risks of a terrorist attack, also consider the probability that people will manage to evacuate before the attack. The need to estimate the probability of successful evacuation during a terrorist attack introduces another source of uncertainty into the risk assessment process. Although several models, e.g. Yu et al. (2022) or Liu et al. (2024), have been developed for crowd evacuation during a terrorist attack, individual models still have limitations due to the complexity and variability of crowd behavior during panic.

Given the above, the possibility of using data on previous terrorist attacks to estimate the probability of future attacks and

the probability of success of these attacks is generally limited, as pointed out by Fagel & Hesterman (2017). Terrorists' target preferences change significantly over time, depending on several factors, especially the ideology of the attackers and the presence or absence of support from the local civilian population, as has been repeatedly documented (e.g. Becker, 2014, Ahmed, 2018, Polo, 2019, or Schmeitz et al., 2022). As a result, there are significant regional differences in the choice of targets for terrorist attacks, as evidenced by some studies (e.g. Anarumo, 2011; Zeman et al., 2022). Given these circumstances, the possibility of obtaining a sufficiently reliable estimate of the probability of carrying out a terrorist attack against a specific soft target is at least uncertain in most cases. Nevertheless, historical data is still commonly used for terrorism risk assessment (e.g. Grant & Stewart, 2017, or Li et al., 2017).

Due to the limited usefulness of historical data on terrorist attacks in risk assessment, this article focuses on the possibilities of using expert opinion in threat assessment concerning the risk of a terrorist attack on a soft target. The threat is perceived here as the probability of a terrorist selecting the assessed soft target as the target of a terrorist attack. Given the regional differences in the tactics of carrying out terrorist attacks, as described above, the article builds on the assumption that the included group of experts must have extensive knowledge of the security situation and extremist groups in the given region. Considering the above, this article aims to determine the criteria and their weights for assessing the threat of a terrorist attack on soft targets in the Czech Republic based on an expert assessment by police officers responsible for ensuring the protection of soft targets in the country. The defined criteria and their weights can be used not only as part of risk assessment for a soft target but especially for identifying soft targets in the Czech Republic and their ranking according to the threat level.

2 Methods

The criteria for identifying soft targets were chosen so that they were easy to assess and, at the same time, closely related to the essential characteristics of soft targets. The following criteria were selected (a detailed description of the individual criteria is given in Tab. 1):

a)   the number of persons in the soft target,
b)   the symbolic significance of the soft target,
c)   the level of security,
d)   the presence of mass media,
e)   the availability of information about the soft target,
f)   the layout of the building.

The symbolic significance of a soft target and its security level are considered essential factors in the attractiveness of a soft target for attackers, which is also described by the other soft target identification tools (e.g. Australia-New Zealand Counter-Terrorism Committee, 2017b, Karlos & Larcher, 2020). The symbolic significance is closely related to the accessibility of the soft target for the public and the predictability of the presence of a high number of people. The predictability of the presence of a high number of people is also significantly influenced by the interest and presence of the mass media (Australia-New Zealand Counter-Terrorism Committee, 2017b). The importance of the presence of mass media as a factor increasing the attractiveness of a soft target for an attacker has also been emphasized by the last Czech *Framework for Soft Targets Protection* (Ministry of the Interior of the Czech Republic, 2017).[1] The availability of soft target information was included among the criteria because it is a potential indicator of public accessibility, predictability of the presence of a large number of people, and vulnerability to simple attack techniques. Although the Czech *Framework for Soft Targets Protection* does not mention the availability of information about a soft target as a risk factor, it is assessed as a risk factor, for example, in the *Crowded Places Self-Assessment Tool* (Australia-New Zealand Counter-Terrorism Committee, 2017b). The last criterion, i.e., building layout,

assesses the vulnerability of soft targets to simple attack techniques and the security level of soft targets, as the choice of the target of a terrorist attack can also be determined by its vulnerability, as reviewed above.

Tab. 1: Description of used criteria.

Criterion	Description
Number of persons	Expresses the maximum number of people expected to be in the building or at the event site at any one time.
Symbolic significance	Includes the religious or social importance of the soft target. A soft target with symbolic significance is one that is widely known or receives regular media attention and is perceived by a significant segment of the population or a particular religious group to be important to society or a particular religion because of its historical, cultural, institutional, or other significance in terms of the values with which the soft target is associated.
Level of security	Includes the level of security of a building or event site, in particular police presence, security presence and access control to the building or event site.
Mass media presence	Mass media presence means the presumed presence of mass media, particularly television, within a soft target, whilst information about their presence is publicly known or can be assumed due to the nature of the event.
Availability of information	Expresses a condition where information is publicly available, e.g., on the Internet, which can be used to prepare a terrorist attack against a soft target, e.g., a detailed building plan.
Building layout	Includes the properties of a building, particularly construction and operational features that can be used to carry out a terrorist attack, e.g., the accumulation of people outside a protected zone or the possibility of a vehicle attack.

Based on the defined criteria, a questionnaire was created for pairwise comparison of these criteria. For each pairwise comparison, respondents were asked to comment on the importance of the compared criteria in relation to the likelihood of a terrorist attack on a scale of integers from 1 to 9, where one expresses the equal importance of both criteria and nine the extreme importance of the preferred criterion compared to the non-preferred criterion, as recommended by Saaty (2004, p. 6). The questionnaire was subsequently distributed to 14 regional police directorates of the Police of the Czech Republic. The questionnaire was filled in and returned by 23 respondents at the regional police directorates responsible for ensuring the protection of soft targets within individual regions.

The weights of the individual criteria were determined using the technique described by Saaty (2004). First, a matrix of pairwise comparisons was constructed for each respondent based on their responses. The consistency index (CI) and consistency ratio (RI) were then calculated for each pairwise comparison matrix using the procedure according to Saaty (2008, pp. 263-265). Only pairwise comparison matrices that did not show a high level of inconsistency ($CR \leq 0,2$) were included in the subsequent analysis. The matrices that were not excluded as inconsistent were then used to calculate the overall pairwise comparison matrix A, with each element of this matrix calculated as the geometric mean of the corresponding elements of the original pairwise comparison matrices. Based on matrix A, the criteria weights were determined through an iterative process recommended by Saaty (1990, p. 19). The following steps were performed as part of each iteration:

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[1] Although this is a framework for 2017-2020, a newer one has not been published in the Czech Republic at the time of submitting this article.

1) The B_i matrix was calculated as the i-th power of the matrix A;
2) The vector v_i was calculated as row sums of matrix B_i;
3) The normalized vector w_i was obtained as vector v_i divided by the sum of its components;
4) For $i > 1$, the vector d_i was calculated as the difference between the normalized vector w_i and the normalized vector from the previous iteration w_{i-1}. The iteration process was completed if all the components of the vector d_i were less than 10^{-4}. The resulting vector w_i was then used as the final vector of criteria weights.

All calculations were performed in the R software (R Core Team, 2023).

3 Results and Discussion

The obtained pairwise comparisons of criteria were burdened by significant inconsistency in the evaluation of the importance of the criteria by individual respondents. Only 8 out of 23 respondents met the required level of consistency (CR ≤ 0,2). The ratings given by these respondents were subsequently used to determine the criteria weights. The high level of inconsistent answers testifies, in addition to the higher number of compared criteria, to the complexity of the problem of identifying the most endangered soft targets.

First, criteria weights were calculated separately for the opinions of 8 respondents whose answers were sufficiently consistent. Standard deviations were then calculated for individual criteria to measure variability in the respondents' assessment of the importance of the criteria. For most of the criteria, the differences between respondents were relatively low, as can be seen in Tab. 2. However, the respondents differed considerably in their assessment of the importance of the symbolic significance of a soft target in relation to the probability of a terrorist attack. This may be caused by the fact that the importance of symbolic significance in the selection of a soft target as a target of a terrorist attack is closely linked to the ideology of terrorists, which shows marked regional differences, as noticed by Anarumo (2011).

Tab. 2: Standard deviations (SD) for criteria weights calculated based on the answers of eight respondents with a low degree of inconsistency.

Criterion	SD
Number of persons	0.07
Symbolic significance	0.17
Level of security	0.1
Mass media presence	0.06
Availability of information	0.09
Building layout	0.08

Subsequently, the overall matrix of pairwise comparisons was calculated based on the answers of all eight respondents, and the weights of the individual criteria were determined. The obtained matrix of pairwise comparisons is presented in Tab. 3. The matrix proved to be sufficiently consistent with CR < 0.01.

Tab. 3 Overall matrix of pairwise comparisons based on the answers of eight respondents with a low degree of inconsistency.

	NP	SS	LS	MMP	AI	BL
NP	1	0.904	0.825	3.174	2.225	1.622
SS	1.107	1	0.825	3.424	2.128	1.167
LS	1.212	1.212	1	4.338	2.29	2.087
MMP	0.315	0.292	0.231	1	0.413	0.397
AI	0.45	0.47	0.437	2.42	1	0.613
BL	0.616	0.857	0.479	2.517	1.631	1

Note: NP – number of persons, SS – symbolic significance, LS – level of security, MMP – mass media presence, AI – availability of information, BL – building layout

The calculated weights of individual criteria are shown in Tab. 4. The respondents considered the level of security in the soft target, the number of people in the soft target, and its symbolic significance to be the most important criteria.

Tab. 4: Criteria weights calculated based on the answers of eight respondents with a low degree of inconsistency.

Criterion	Weight
Number of persons	0.21
Symbolic significance	0.21
Level of security	0.26
Mass media presence	0.06
Availability of information	0.11
Building layout	0.15

The high importance of the security level is consistent with the assumption that attackers try to avoid targets with a high security level to increase their chances of successfully executing an attack, as several studies have pointed out (e.g. Brown & Cox, 2011, Kennedy et al., 2011, or Aven & Guikema, 2015). Respondents' assessment is also consistent with the latest Czech *Framework for Soft Targets Protection* (Ministry of the Interior of the Czech Republic, 2017), which considers the absence or a low level of security as one of the two essential characteristics of a soft target.

According to the respondents, the second most important criterion was the number of people in the soft target. The high priority assigned to that criterion is not surprising since a high number of people is considered an essential feature of a soft target by strategic documents in the Czech Republic (Ministry of the Interior of the Czech Republic, 2017) and at the level of the European Union (European Commission, 2017), but also by strategic documents of other countries (e.g. Australia-New Zealand Counter-Terrorism Committee, 2017a). However, it is very interesting that the respondents considered the number of people a less important criterion than the level of security in the soft target.

The most interesting finding was the high priority assigned by the respondents to the symbolic significance of the soft target. Neither the latest Czech *Framework for Soft Targets Protection* (Ministry of the Interior of the Czech Republic, 2017) nor the definition of the European Commission (2017) include symbolic significance among the basic features of soft targets. The Czech Framework ranks the symbolic significance of a soft target only among the properties that can increase the attractiveness of a soft target for an attacker. At the same time, the Framework lists it in the last place among these properties. Neither the relevant methodology for threat assessment issued by the Ministry of Interior of the Czech Republic (Kalvach & Vangeli, 2018) attaches particular importance to the symbolic significance of a soft target. It is, therefore, unlikely that respondents would be influenced in their judgment by strategic or methodological documents issued in the Czech Republic. This is apparently also reflected in the higher variability of individual respondents' answers, as can be seen in Tab. 2.

The importance of symbolic significance in choosing the target of a terrorist attack was also demonstrated by some conducted studies. Most notably, Marchment et al. (2020) have shown that lone actor terrorists are willing to travel from their residence to carry out an attack on a target with symbolic significance significantly further than when attacking other targets.

4 Conclusion

Based on the expert opinion of respondents from regional police directorates of the Police of the Czech Republic, the level of security, the number of persons, and the symbolic significance were identified as the most important criteria for selecting a soft target as a target of a terrorist attack. While the high importance assigned to the number of people and the level of security of the soft target corresponds to strategic and methodological documents relevant to the Czech Republic, the emphasis on the

importance of the symbolic significance of the soft target can be considered a very interesting result. Moreover, this finding is consistent with the results of recent research based on the evaluation of historical data on terrorist attacks. On this basis, the inclusion of symbolic significance in the soft target identification process and the development of techniques and tools for assessing the level of symbolic significance of soft targets for different groups of potential attackers can be recommended.

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