

RESEARCH IN BRIEF: TERRORISM RISK ASSESSMENT

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Aim:

This brief provides a general overview of how Risk Terrain Modeling (RTM) has been used to study terrorism. It presents applications of RTM for threat assessment and counterterrorism. It covers: 1) the background of terrorism risk assessments, 2) RTM as it relates to terrorism, and why it is important and useful, 3) how RTM builds on and advances current threat analysis and risk assessments, 4) how RTM can be used in the “real world” by counterterrorism practitioners, and 5) key spatial risk factors to consider.

Citation: Neudecker, C. H. (2021). *Terrorism Risk Assessment*. Newark, NJ: Rutgers Center on Public Security.

Key Terminology

- *Risk Terrain Modeling (RTM)* is a methodological advancement in spatial risk analysis that allows practitioners and researchers alike to explore the potential risk for terrorist incidents occurring in relation to physical and built environments. It does this by combining the influence of both vulnerabilities and exposures on a phenomenon, in this case, terrorism. RTM can be visualized as the stacking of risk factors on top of one another. Given the inputs or risk factors put into the model, a risk score can then be assigned over space and time on a map. To learn more about the processes involved in RTM please refer to Caplan and Kennedy (2016) and visit riskterrainmodeling.com.
- *Terrorism* is a term that is dynamic and, as such, is notorious for having several definitions (See Hoffman, 2006). In fact, it can go by several names such as terrorism, violent extremism, extremism, domestic terrorism, and international terrorism. After conducting a qualitative meta-analysis of several definitions, Hoffman (2006) defines terrorism as “the deliberate creation and exploitation of fear through violence or threat of violence in the pursuit of political change” (p. 40). Terrorism is defined in the *Code of Federal Regulations* as “the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives” (28 C.F.R. Section 0.85). Terrorism is also made up of a variety of types like, separatism, religious, liberalism, anarchism, communism, conservatism, fascism, single-issues, organized crime, right-

wing, left-wing, eco-terror, ethnic nationalist, and terrorism perpetrated by the State (Drake, 1998; Martin, 2013; Byman, 1998). The definition of terrorism used by researchers and practitioners should be well-established and from a reputable source.

Background of Terrorism Risk Assessments

During the early to mid-2000's the threat of terrorist action(s) and the risk thereof grew, particularly as western nations became targets of such attacks. A sampling of such tragic events are: 9/11 in NYC, 7/7 in London, the 2004 train bombing in Madrid, and Istanbul's bombings in 2004, just to name a few. These events solidified the need for more knowledge surrounding terrorism, specifically, the risk associated with geographic space and time. Thus, risk assessments and analyses became the response to such actions and, in some cases, an effort to assign risk before terroristic actions occurred.

There are two main strains of risk assessment for terrorism to consider. The first pertains to the risk of specific terrorist organizations or grouping of people, such as whole countries. The second attempts to assign risk to geographic targets. Both strains aim to halt terrorist activity but the way that risk is assigned to each vastly differs.

Risk studies today tend to use two primary methods for assessment: qualitative and quantitative. There has been, however, a preference towards the former, making qualitative risk assessments popular today. This followed a 2010 recommendation by the National Academy of Sciences to the Department of Homeland Security (DHS) to use these methods over quantitative risk assessments "due to the heterogeneity of risks and complexity of their task" (Lundberg, 2016, p. 1). Alternatively, there are several quantitative risk assessment options that exist, including traditional attribute modeling, regressions, and risk terrain modeling (RTM).

Risk Terrain Modeling and Terrorism

RTM is typically used to determine locations that are most ideal for various crime types to occur; it involves the stacking together of various risk factors to produce a map modeling the risk associated to an area for the given crime type (Caplan & Kennedy, 2011), creating a 'crime lasagna' (Andreychuck, 2018). Here it would be used to determine the most likely place for a terrorist attack. It does this by compounding the exposures, i.e., terrorist incident data, on top of the physical vulnerabilities of the area, i.e., RTM data sources. Terrorist incident data can be further broken down based on terrorist ideology, organization, weapon type, target type,

un/successful attack, etc. It is all dependent on how much data is available for exposures and vulnerabilities – the inputs necessary for RTM.

Data sources for terrorism and RTM are becoming more readily available to both researchers and practitioners alike. Terrorist events are the ‘exposures’ in RTM analyses. For those that have access, there is official data sources from government resources that list terrorist events. However, unofficial terrorism datasets are readily available for those that do not have access to official resources. Some examples of this include the Global Terrorism Database, Canadian Incident Database, and American Terrorism Database. RTM data resources are available from both paid and free resources. Data-Axle (formerly InfoGroup) is a resource that researchers can use to obtain physical ‘vulnerability’ locations – landscape features. Some common examples of these include religious buildings, police stations, convenient stores, package shipping/receiving, schools, government buildings, and tourist spots. Most cities now have excellent Geographic Information System (GIS) data available on open portals. For example, *NYC Open Data* or *Open Data – City of Toronto*. Other free GIS data can be sourced by contacting your local government departments.

Several sources and studies have now endorsed the use of RTM for use in terrorism risk assessment (Hagan, 2016; Gill, Marchment, Zolghadriha, Salman, Rottweiler, Clemmow & Van Der Vegt; Onat, 2019; Onat & Gul, 2018; Santaspirt, 2020; Marchment, Gill & Morrison, 2020; Marchment, 2019; Duru, Onat, Akyuz & Akbas, 2020). Researchers have used RTM to study terrorism as a whole, however, as stated previously, this can be broken down into subcategories of the incident, for example, ideology. RTM also has the added advantage over other risk assessment tools that it provides relative risk scores (RRSs) over geographic surfaces. Further, with the advancements and increasing availability of data sources, RTM is able to be conducted and is relevant in most geographic locations around the world, including both land and sea (Caplan, Moreto, Kennedy, 2011). Two studies are highlighted below demonstrate the utility of RTM: one in Turkey and the other in Northern Ireland.

Onat (2019) utilized risk terrain modeling (RTM) to study terrorism in Istanbul, Turkey. He was attempting to determine whether there were similarities in terrorist attacks across physical spaces. He found that the proximal coexistence of bakeries, religious institutions, and eateries created the highest risk. Onat and Gul (2018) expanded upon this study. They found that target selection varies by group ideology. That is, groups that subscribe to secular (i.e., right/left-wing, single issue, etc.) or religious ideologies will target different locations that suit their specific goals. While studies have only begun in the terrorism field that utilize RTM, the initial results show great promise for policy makers and practitioners alike.

Similar to the above study, Marchment, Gill, and Morrison (2019) used RTM to identify risk factors for bombings and bomb hoaxes in Belfast, Northern Ireland from January 2007 – December 2013. The acts were committed by dissident republicans and included 99 bombings and 89 bomb hoaxes. The data was obtained from the regularly updated ‘Violent Dissident Project’. Most of the risk factors were obtained from ‘Open Data NI’ and included pubs, bars, restaurants, cafes, sports clubs, Catholic and Protestant churches, railway and bus stations, and governmental buildings. Significant risk factors for bombings were previous protests and riots, punishment attacks, and areas dense with pubs and bars. Bomb hoaxes revealed that punishment attacks, police stations, and places dense with shops were significant risk factors. The results of both studies attest to the ‘spatial rationality’ of terrorists and that there is likely some forethought into what locations they chose to attack.

How Risk Terrain Modeling advances upon current risk assessments

Let’s begin by establishing the core issues that exist within current and past assessments. At the forefront of these issues is the debate over which type of assessment is best utilized in this arena: qualitative or quantitative. Qualitative assessments give us a rich, detailed account of potential risk and is highly subjective, whereas quantitative assessments, arguably more objective, assign risk values. Both have their advantages and disadvantages. RTM improves upon this by offering a method wherein you can utilize both assessment types. Like any other quantitative risk assessment, a statistically valid value pertaining to the risk is given at the end of the process. However, the advantage of RTM over these traditional methods is that RTM offers a visualization of a spatial story wherein continuous risk is viewed over the area of interest. For example, in the studies detailed above risk was spread over the whole of Istanbul, Turkey and Belfast, Northern Ireland. This spatial story pinpoints what areas are at highest and lowest risk for terrorism to occur based on their physical vulnerabilities and built environments, but also allows researchers and practitioners to formulate a greater understanding of why that risk occurs in that location and in relation to those specific risk factors. This [risk narrative](#) adds a valuable qualitative element to quantitative assessments.

Another pitfall of previous assessments is that they tend to lump all terrorist activity together. We now know that this logic was faulty based on studies like the ones done in the aforementioned Turkey (Onat, 2019; Onat & Gul, 2018) and Northern Ireland (Marchment et al, 2020) examples. Other recent studies are yielding spatial patterns and the formation of geographic theories of terrorism (Boyd, 2016; Rock, 2006; Braithwaite & Li, 2007). A built-in

advantage of RTM is the ease by which you can separate and run different models by ideology, weapon type, group/ organization, etc., from one file.

Finally, RTM offers a standard and consistent approach to terrorism threat assessments that allows for evaluations of predictive accuracy and risk mitigation success. Given the advantages of RTM – meeting the quantitative and qualitative criterion, and the ease by which data can be managed to study differences in terrorist activity – it would make a prime candidate as the risk assessment tool of choice in analyzing terrorism and planning counterterrorism activities. The technical steps for researchers or practitioners to run RTM analyses are easy compared to traditional quantitative methods that often requires years of schooling and specialized training to master.

How Risk Terrain Modeling can be used in the “real world” by practitioners

Terrorism policies today are formulated using little to no knowledge about the actual risk of terrorist activity occurring at the local levels. Professional practitioners can utilize RTM as a tool to reliably inform these policies. They can use RTM to break through traditional barriers of assigning risk to their areas of interest and to gain actionable insights about threats to people at particular places within these areas. Once risk has been determined there is another factor for practitioners informing policy to consider: effective intervention strategies.

An effective intervention strategy will not only analyze terrorism but seek to counter it by maintaining low risk levels through risk governance. A meta-analytical study by Lum, Kennedy, and Sherley (2006) found that there is much more uncertainty than certainty when it comes to how to effectively combat terrorism. The researchers went on to suggest that “Evidence-based counter-terrorism policy should be lawful, rational, effective, and should cause as little harm as possible” (p. 512). While these suggestions may seem simple, they are often overlooked yet important aspects of maintaining integrity in research and counterterrorism actions by government officials. Practitioners should be mindful of what strategies they choose to suggest to policy makers and push for those strategies that meet these standards.

Summary of key risk factors

Key environmental risk factors of terrorism will vary based on ideology and group type. It is advised that practitioners and researchers conduct a thorough review of ideological and/or group target preferences. Further, an understanding of ideological goals is important in understanding what types of physical vulnerabilities will be of most importance to a group or

organization. Some key risk factors to consider include: government buildings, tourist hot spots, amusement parks, hotels, convention centers, courthouses, crude petro natural gas extraction, shipping and receiving companies/carriers, banks, Fortune 500 companies, historical sites, local law enforcement, medical laboratories, news syndicates and publishers, political organizations, testing laboratories, cafes, areas of high civil unrest/riots, bakeries, and dense shopping areas or areas where people tend to gather.

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