Chapter 23

Prevention of Bomb Attacks by Terrorists in Urban Settings: Improvised Explosive Devices

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In recent times, a significant amount of policy development has been directed towards assessing, countering, and mitigating the threat from improvised explosive devices (IED) in urban environments. Much of this has been in direct response to the impact of specific terrorist attacks that have occurred in recent times in many cities. Less attention has been positioned towards understanding how policy- and practice-based approaches in disciplines that are not considered mainstream in the counterterrorism discourse could be used to enhance the resilience of new developments linked to the protection of crowded places. This chapter seeks to overcome this by critically analyzing the fundamental questions of "what measures have been undertaken" and, to a lesser extent, "who should be responsible for counterterrorism-related protective security measures?"

Although, terrorism has been called "the philosophy of the bomb," in recent years only about half of all terrorist attacks involve high-explosives or homemade bombs. As access to powerful explosives has been made more difficult by governments, there has been a shift to self-fabricated bombs. The use of such improvised explosive devices (IEDs) by terrorists including vehicle borne IEDs (VBIEDs) is a frequent tactic in terrorist campaigns. Such attacks not only result in fatalities and injuries to those caught up in the explosion, but they also damage physical structures and have the potential to bring down buildings. Additionally, as Meyer notes, the resulting "media coverage of bombings is considerably more graphic than coverage of, say, a shooting."[1] Of the twenty most fatal terrorist attacks recorded in the Global Terrorism Index for 2018, nine involved the use of explosives, with eight of these undertaken by suicide bombers including three VBIEDs. The remaining attacks saw explosives detonated during the Taliban's assault on the major city of Ghazni, Afghanistan.[2] The focus of this chapter is on the prevention of bombing attacks by terrorists. Drawing upon a diverse body of literature, it discusses the various measures which can be undertaken to prevent such attacks and considers who is responsible for preventive measures. To assist in our understanding of protective security measures, we first consider some of the theoretical considerations behind them.

Rational Choice Theory and Situational Crime Prevention

Much of the literature is informed by rational choice theory, which aims to explain human behavior and "assumes that people, whenever faced with several possible options, choose the one they expect to have the best overall outcome."[3] Rational choice theory has been further used by criminologists with respect to decision-making by criminals. It considers criminal behavior "as the outcome of decisions and choices made by the offender."[4] Consequently, if the benefits outweigh the costs, the potential offender will commit the crime. Crucially, rational choice theory has informed situational crime prevention (SCP), which attempts to reduce specific crimes by affecting the situational determinants (e.g., the immediate environment and opportunity reduction) of that crime and thereby making it less likely to occur.[5] Thus, SCP is concerned not with *why* a crime occurs but with *how* a crime is committed. As such, it belongs to what Clarke terms a "family" of similar preventative approaches found within environmental criminology including Crime Prevention Through Environmental Design (CPTED) and by creating a "defensible space."[6] CPTED involves crime control through the design of the physical environment and the implantation of social policies that reduce the rewards of criminal behavior while also increasing the risk involved in committing a crime.[7]

The concept of "defensible space," put forward by Newman, focuses on the manipulation of the built environment to reduce opportunities for crime. It emphasizes four key areas: territoriality (i.e. increasing residents sense of ownership of space), surveillance (i.e. increasing opportunities for natural surveillance), image (i.e. overall look and characteristic of a place that will give either a positive or negative impression), and milieu (i.e. making the most of a development's location to places that will help to prevent crime).[8] For scholars like Clarke, crime is always a choice and therefore "creating unfavorable circumstances is the objective of situational crime prevention."[9] Subsequently, SCP involves five main mechanisms by which to affect the potential offender's decision-making process, namely:

1. increasing the effort (e.g., target harden, control access to facilities, screen exits, deflect offenders, and control tools/weapons);
2. increasing the risk (e.g., extend guardianship, assist natural surveillance, reduce anonymity, utilize place managers, and strengthen formal surveillance);
3. reducing the rewards (e.g., conceal targets, remove targets, identify property, disrupt markets, and deny benefits);

4. reducing the provocations (e.g., reduce frustrations and stress, avoid disputes, reduce emotional arousal, neutralize peer pressure, and discourage imitation); and

5. removing excuses (e.g., set rules, post instructions, alert conscience, assist compliance, and control drugs and alcohol).[10]

Before looking at the use of SCP measures to counter terrorism and, more specifically, preventing bombing attacks by terrorists, it would be remiss of us not to acknowledge that SCP is not without its critics. A major criticism of SCP is that it does not solve the problem of crime, but merely displaces it from one place to another.[11] A number of different types of displacement have been identified, namely:

• temporal (i.e., committing the intended crime at a different time);
• spatial (i.e., committing the intended crime at a different location);
• target (i.e., changing the target of the crime to another object);
• tactical (i.e., committing the intended crime using a different method); and
• functional (i.e., committing a different type of crime from the originally intended crime).[12]

Research has shown that displacement had occurred as a result of SCP measures, for example following the introduction of steering column locks in new cars in the UK in the 1960s, vehicle theft was displaced to older models. In New York City, a police crackdown on subway crime displaced robberies to the street.[13] Other research has found that SCP measures did not result in displacement, for example, the use of passenger screening and boarding gate security searches in the US dramatically reduced criminally motivated hijackings.[14] Reppetto, in his study of robbers and burglars, concluded that "some crimes are so opportunistic that their prevention in one circumstance will not lead to their occurrence in another. Even in instances where offenders blocked in one sphere would wish to operate in another, limits and costs will lessen the frequency of operation."[15] Interestingly, researchers have found that the introduction of SCP measures may result not in displacement, but in positive benefits in terms of general crime reduction beyond the immediate focus of the measures introduced, known as the "diffusion of benefits."[16] For example, the installation of live CCTV cameras (two real cameras and three dummy ones) to combat vandalism and graffiti on a fleet of 80 double-deck buses in the North of England saw a sharp reduction in vandalism and graffiti across the entire fleet while the introduction of electronic tagging of library books at the University of Wisconsin to combat book thefts saw a decline in thefts of other material such as videocassettes.[17] Other criticisms of SCP relate to the theoretical and conceptual adequacy of the approach (e.g. it ignores the root causes of crime and is a-theoretical), and the social and ethical issues that situational interventions raise (e.g. it promotes a "fortress society" and encourages Big Brother surveillance).[18]

Despite these criticisms, proponents of SCP argue that mechanisms should be focused on specific crimes such as burglary rather than on a broad category of crime such as theft as "the situational determinants of any specific category of crime are quite different from those of another one, even one that seems similar."[19] To this end, Clarke and Newman identified four key pillars of situational opportunities that terrorists exploit in order to engage in terrorism, namely targets, weapons, tools, and facilitating conditions.[20] Targets concerns the physical structures where terrorist attacks take place - these can be either static (e.g. monuments and transportation hubs) or moving (e.g. vehicles and planes). Weapons refers to the means utilized by terrorists in their attack on the target (e.g., explosives, guns, and knives). Tools involve the everyday objects used to carry out their attacks (e.g., money, identification cards, and vehicles). Facilitating conditions include those factors that permit the terrorist attack to occur (e.g., access to buildings and lack of identification requirements). Using established SCP techniques, they developed a terrorism risk assessment template for evaluating the desirability of targets to terrorists, based on eight criteria, known by the acronym EVIL DONE (exposed, vital, iconic,

legitimate, destructible, occupied, near, and easy).[21] Exposed targets are those that stand out and attract attention (e.g., a high-rise building). Vital targets are necessary to the survival of people in their daily life (e.g., water supplies and power plants). Iconic targets are symbolically significant to society (e.g., the White House and the Statue of Liberty in the US). Legitimate targets are deemed deserving of an attack (e.g., military personnel or government buildings). Destructible targets are those that are easily destroyed in comparison to other targets. Occupied targets are those with more potential victims. Near targets are those that are relatively close in proximity to where the terrorists are based. And, finally, easy targets are those easily accessed or with little or no security measures in place. Clarke and Newman argued that we "must identify vulnerable targets, prioritize them for protection, analyze their specific weaknesses, and provide them with protection appropriate to their risks."[22]

Using Clarke and Newman's EVIL DONE terrorism risk assessment template, Boba produced sets of items for each of the eight EVIL DONE criteria.[23] In doing so, she created a methodology involving ordinal-level indexes (where five is the highest score and signifies the value showing the most vulnerability and zero is the lowest score for each of the criteria) that could be used by practitioners to score consistently across potential targets. To illustrate, within the exposed criteria, large high-rise structures in an urban area (e.g., the Washington Monument) would rank as a five in Boba's index, while a cluster of buildings in an urban area (e.g., a university campus) would rank as a one, namely a low exposed status. While Boba's work provided a system for individual target assessment of terrorism risk, it did not apply the methodology to assess the attractiveness and vulnerability of actual targets selected by terrorists.

In contrast, Ekici et al. employed the EVIL DONE approach to terrorist targets (actual and potential) in Istanbul, Turkey in the period 1990 to 2006, by looking at the three major terrorist groups operating in the country.[24] These were the Kurdistan Workers' Party (PKK/KONGRA-GEL), the Revolutionary People's Liberation Party-Front (DHKP/C), and Turkish Hezbollah. Their study involved tasking Istanbul-based intelligence service officers from the Turkish National Police with rating identified targets from the perspective of each of the three respective terrorist groups. They found that the attractiveness of targets was similar across the three terrorist groups.[25] Adding to this small but growing body of literature concerning SCP and terrorism, Gruenewald et al. used data from the American Terrorism Study to assess the attractiveness and vulnerability of targets selected by environmental and animal rights extremists or eco-terrorists between 1987 and 2012.[26] Their study operationalized the eight criteria of the EVIL DONE framework into applicable measures of eco-terrorism targets with eight corresponding hypotheses. They found that eco-terrorists had a preference to attack targets where access was not restricted and where the general public rarely frequented either during the day or at night. Additionally, eco-terrorists selected "easy" targets that were not protected by security measures. They also suggest "that eco-terrorists most commonly attacked or planned to attack legitimate targets, or those targets most directly responsible for engaging in behaviors viewed as harmful to animals and the environment."[27]

Other research has examined particular SCP measures and concluded that increasing the effort and risk through target hardening can lead to unintended consequences, not only in terms of displacement but also with regard to transference.[28] Enders and Sandler found that following the introduction of measures to increase the security at American embassies (e.g. perimeter defenses, physical security, and the screening of visitors) in the 1980s, attacks shifted from embassy grounds to diplomatic officials outside of their secure compounds.[29] They also discovered an increase in kidnappings and assassinations following the installation of metal detectors at airports.[30] As Morris noted, such a finding "does not necessarily suggest that we should abandon target-hardening efforts."[31]

Indeed, more recent research has suggested that displacement is not inevitable. Perry et al. have evaluated the effectiveness of the Israeli West Bank Barrier to prevent suicide bombing

attacks, finding that the Barrier "together with associated security activities was effective in preventing suicide bombing and other attacks and fatalities with little, if any, apparent displacement."[32] Hsu and McDowall's study considered whether target hardening of the aviation sector and American embassies and diplomats resulted in more lethal terrorist attacks against those targets between 1970 and 2001 using time-series data from the Global Terrorism Database.[33] They concluded that the protective security measures undertaken, did not systematically increase casualty incidents for the protected targets. Moreover they "suggest that perhaps attacks against hardened targets are more prominently based on symbolism rather than violence."[34] A similar finding was discovered by Hasting and Chan in their examination of the relationship between target hardening and the value that a terrorist group derives from the attack, using a case study of aviation security.[35] Thus, even though a target has been hardened, it now has more symbolic value to the terrorist group concerned and "regardless of whether there are any casualties, attacks on fortified targets signal strength and determination that underscore the credentials of the terrorists."[36]

With the theoretical considerations behind SCP discussed, we can now turn our attention to the practical steps that can be taken to prevent bombing attacks by terrorists.

Target Hardening and Strengthening

Target hardening measures are "meant to either make it impossible to attack the target or to have an attack on a target judged not worthwhile by terrorists, given the elevated risk, effort, or difficulty associated with a successful strike."[37] In contrast, strengthening measures are those undertaken to increase the overall stability and strength of a structure.[38] With respect to bomb attacks, Meyer identifies four main strategies for reducing the expected harm from bomb explosions, specifically: "*reducing the probability* of the attack being successful; *reducing the damage* from an explosive attack; *reducing the* offender's *benefit* from a successful attack; and *increasing the* offender's *cost* of attacking."[39] Such strategies are in keeping with the core tenets of SCP, namely increasing the effort and risk while reducing the rewards. Much of the protective security literature emphasizes the importance of a layered approach to security and "describes the practice of securing a site by applying multiple layers of complementary protective security measures."[40] A layered approach involves four independent security layers, namely deter, prevent, protect, and contain - with each layer representing an integrated system of measures or controls designed to either stop a terrorist attack from occurring or to mitigate it consequences if it does.[41] Deter and prevent are aimed at reducing the likelihood of a terrorist attack while protect and contain are intended to reduce the attack's impact. Thus "if implemented correctly, layered security ensures that the failure of any single layer – which may consist of different security measures – will not significantly compromise the overall security of the place being protected."[42]

In order to reduce the probability of a bomb attack being successful, a number of measures can be taken both to deter and prevent bombings. Two main types of bombs can be identified, namely mailed bombs and placed bombs. Placed bombs comprise person-borne IEDs and VBIEDs and include suicide bombers.[43] As Atlas and DiGregorio noted: "the majority of bombs are placed so that controlling access is the most important thing that facility managers can do to protect their facilities."[44] Establishing a secure perimeter with access control procedures can guard against terrorists gaining access to a site while allowing authorized personnel entrance. Utilizing comprehensive screening procedures can prevent devices from entering a potential target's space. For example, for a person-borne IED (placed bomb), either a hand-carried device or suicide bombers vest, screening stations at entrances, the requirement that visitors show identification to reception personnel for admittance to a building, the keeping of detailed logs recording visitor and service staff arrival and departures times, and the use of easily distinguishable identification badges for staff and visitors, can prevent such devices from

reaching their intended blast location. Bomb sniffer dogs and portable explosive detection units can also be employed. For example, K-9 (police dog) teams and explosive trace detection devices that scan the air for traces of bomb materials are already deployed at Pennsylvania Station in New York.[45] For air travelers, a host of measures have been introduced post-9/11, including the use of behavioral detection officers, air marshals, x-rays and hand checks for baggage (both checked in and carry on), explosive trace detection, pat-downs, the use of full body scanners, and limitations on the amount of liquids carried in hand baggage.[46] In terms of a device sent through the post (mail bomb) screening in mail rooms is required and the location of the mail room should be placed on the exterior of a building with consideration given to blow out walls in the event of a letter bomb detonating.[47]

For devices involving vehicles, vehicle access control is important. This includes separation of access points by vehicle type (e.g., employee, service, or visitors' vehicles), underground parking and public parking close to the site must be secured or should be non-existent while street parking adjacent to the potential target should not be permitted.[48] Additional measures can include controlling the flow of traffic around targets located in urban areas. This can be done through road closures, speed limits, traffic redirection and the use of high curbs, median strips, and bollards.[49] As Young noted: "the principal reason why this attack vector is popular as a weapon of terrorism is the ability to deliver relatively large, concealed payloads in proximity to the target."[50] VBIEDs can involve moving cars or trucks (e.g., in suicide attacks) as well as stationary vehicles (e.g., bomb detonates in car on timed delay or by remote signal). For both types, increasing the separation distance between the vehicle and the target, the stand-off distance, is crucial. By increasing this distance, the terrorist is required to increase the payload to achieve the desired objective. For example, an increase in stand-off distance from 10 to 20 feet would need a corresponding increase in payload from 100 to 1,000 lb of TNT-equivalent explosive to achieve a total building destruction and would mean moving from the use of a car to a truck.[51] Thus, increasing the stand-off distance is viewed by many as the most effective defense against a VBIED.[52] Therefore, physical barriers are required to counter the threat of VBIEDs. For a stationary vehicle bomb, the barrier need only to make it difficult to cross the boundary without being noticed, whereas for a moving VBIED the barrier must be capable of stopping the vehicle, thereby providing a hard stop to the terrorist attack.[53] Such vehicle security barriers can include passive mechanisms like static bollards, strengthened planters and street furniture (e.g. seating, bike racks, and lighting), walls, fences, and topographical features like water, berms, bunds, and ditches. They can also involve active measures including retractable blockers, bollards, and gates.[54]

Measures designed to increase both natural and mechanical surveillance opportunities can also reduce the probability of a bomb attack being successful in that a placed bomb may become more visible.[55] Natural opportunities can take "informal" and "low tech" forms such as good lines of sight, the absence or removal of blind spots and hiding places, consideration of the placement of windows and the replacing of litter bins with clear plastic bags.[56] Examples of mechanical surveillance opportunities include the installation of CCTV, including "second generation CCTV," where "cameras actively identify and inform operators of phenomena worthy of attention rather than passively receive events," automatic number plate recognition (ANPR), intelligent pedestrian surveillance, and facial recognition technology.[57]

In terms of mitigating the damage or impact from a bomb attack and thereby reducing the terrorist's expected benefit, a range of options are available and involve the protect and contain layers. For suicide bomb attacks involving VBIEDs, preventing vehicle approach to the target is required. Here measures can include increasing stand-off by installing physical obstacles such as barriers and bollards, and traffic calming measures such as chicanes and bends, which force vehicles to slow their speed or risk flipping over.[58]

Blast resistant construction - once the domain of military facilities and critical infrastructure assets - is increasingly being considered for commercial developments and

buildings.[59] As already noted, stand-off distance is considered the most effective measure against a terrorist bomb, especially a VBIED. However, if distancing is not present or cannot be imposed, then other measures exist to protect or reduce a bomb's damage. Many blast resistance measures are aimed at preventing progressive structural collapse by increasing the structure's ductility and involve incorporating more columns or load carrying walls and the strengthening of upper floor systems.[60] Progressive structural collapse is defined as "the spread of local damage, from an initiating event, from element to element resulting, eventually, in the collapse of an entire structure or a disproportionately large part of it."[61] One example where progressive structural collapse was evident following a terrorist attack is the Oklahoma City Bombing in 1995, which saw a stationary VBIED (box truck) containing the equivalent of 4,000lb of TNT detonate just 16 feet from the north side of the Alfred P. Murrah Federal Building. Another example is the 1983 attack on US marines at their headquarters at Beirut International Airport in Lebanon. This attack involved a moving VBIED (stakebed truck) loaded with the equivalent of over 12,000lb, which breached the perimeter of the compound and was driven into the building where it exploded.[62] As Eytan noted: "much has been done recently to devise and implement protective hardening measures in new structures.… much less has been done to strengthen existing structures, as this is considerably more difficult and more expensive, if at all feasible."[63] In existing structures and buildings, retrofit measures can be undertaken to prevent progressive structural collapse, e.g. by strengthening columns on lower floors. Measures include adding concrete around the columns, the reinforcement of existing columns with steel plates or the strengthening of column connections to the adjacent structural elements. The dislocation of slabs by the blast can be countered by the strengthening of existing slabs for uplift loads with extra steel (plates or meshes), concrete layers or sheets, connections between the slabs and supporting walls. Beams can also be reinforced by additional steel shielding slabs.[64]

Façade protection can help to prevent or mitigate blast injuries and would include laminated glass, blast resistant curtain wall protection, "stand-alone" or punched windows incorporated into the façade of a building and bomb blast net curtains designed to catch and contain projectiles and shrapnel from the blast.[65] Injuries or deaths arising from shards of broken glass are common following an explosion. Retrofit measures to prevent injuries from glass range from adding blast curtains, the application of anti-shatter films to existing glazing, the introduction of inner "catching" systems utilizing energy absorbing strong plastic or steel cables, bars or strips and the replacement of existing glazing with blast resistant glazing.[66] For new buildings, there is the option of using blast and fire resistant materials such as laminated glass, which crumbles rather than shatters and reinforced concrete.[67] Retrofit measures to mitigate injuries from masonry wall debris include the addition of layers of plastic or sheets to the inner side of walls, the addition of extra shielding blast walls (e.g. reinforced concrete and the use of layered configurations like steel-concrete-steel), and the replacement of extant masonry walls with blast resistant walls.[68]

Providing good evacuation routes including good signage, safe refuge areas, and emergency lighting has the potential to reduce the impact of a bomb and in doing so reduce both the terrorist's benefit and rewards from undertaking the attack.[69] For example, following the 1993 bombing of the World Trade Center, a number of improvements were made to facilitate the safe evacuation of the buildings' occupants, including the improvement of the voice communication system on each floor. In addition, evacuation drills were held bi-annually with staff training and personal evacuation chairs provided for disabled employees. Furthermore, in the stairwells of each tower, photoluminescent paint was used to mark the steps and handrail, and also to illuminate travel paths. Additional, photoluminescent signs were posted on the stairwell's doors specifying the stairwell name, floor level and the closest re-entry floors. A backup power supply was added for emergency systems while battery packs were added to the emergency lights in the stairwells.[70] As Proulx and Fahy noted: "the

improvements made to the buildings, the training received, the behavior of the occupants, all contributed to allow nearly all of the occupants present below the impact points to escape on September 11th." [71]

For terrorists not engaging in suicide attacks, a number of measures aimed at increasing the offender's cost of undertaking a bomb attack center around the risk of being apprehended by security personnel and law enforcement. Such measures include foot and vehicle patrols by security personnel, intrusion detection systems, blast resistant CCTV, with surveillance footage located on external servers, and extensive CCTV coverage in potential target areas so that if some cameras are destroyed in the blast, others may have captured images of the assailant.[72] However, as Shaftoe et al. noted regarding suicide bombers: "the potential deterrence of arrest and punishment becomes meaningless and the traditional need to have a means of escape after the act becomes unnecessary."[73]

The use of a variety of SCP measures has at times resulted in the creation of security zones around whole city sections - most notably in Baghdad, Belfast, London, New York, and Washington. Baghdad's Green Zone (also known as the International Zone) encompassed a heavily fortified seven square mile district housing the American, British and other coalition embassies, and the Iraqi National Assembly Building, which saw roads and neighborhoods sealed off, a limited number of entrances guarded by military checkpoints, and some 12,000 blast resistant reinforced concrete T-walls, measuring 12 feet high, and weighing 14,000lb used to line streets and block off intersections.[74] In response to the threat posed by Irish Republican terrorism over the course of some 30 years, both Belfast and London have witnessed the militarization of its urban space and parts of both cities were characterized by "fortress architecture."[75] Between 1970 and 1975, Belfast experienced a deteriorating security situation with some 1800 explosions, Bloody Friday (21st July 1972), alone saw 19 bombs (15 VBIEDs and 4 person-borne IEDs) detonated in less than an hour across the city.[76] In an effort to combat the Provisional IRA's use of stationary VBIEDs, unattended parking was banned in the city center from March 1972. In July 1972, temporary barbed wire and concrete barriers were placed at entrances to the small shopping streets of the city center while pedestrians and delivery vehicles were stopped and searched by security forces.[77] By 1974, the barbed wire and concrete had been replaced by more permanent iron and steel barriers, and with the merging of four of the seven existing security areas, a single extensive security zone was created, which encircled the city's main shopping streets. Entrances were either sealed off or staffed by security personnel - Belfast's "ring of steel" was complete. As Brown noted: "since the creation of the security zone there has been a marked decline in the number of terrorist attacks on central Belfast and a concomitant increase in levels of trade and private sector investment."[78]

In 1992, London enacted its own "Ring of Steel" in the City of London and a "mini ring of steel" known as an "iron collar" in London Docklands in 1996 following bomb attacks by the Provisional IRA.[79] A territorial approach involving security cordons covered both areas with the number of entrances reduced and then secured. Use was made of roving and static police checkpoints, no parking areas and sophisticated technology including CCTV and ANPR.[80] As Coaffee pointed out: "since the ring of steel's implementation there have, to date, been no further bombs in the City, and a number of other benefits have emerged, such as a reduction in recorded crime, pollution and traffic accidents."[81] In New York and Washington, especially in the aftermath of both the Oklahoma Bombing and 9/11, Jersey barriers made out of three feet high and ten feet long concrete blocks sprung up around monuments. There were new visitors screening stations (e.g., at the Washington Monument) and chain link fences. In addition, roads were closed off (e.g., closure of Pennsylvania Avenue between 15th and 17th Street immediately north of the White House) and bollards and bunkers were dotted around both Washington DC and New York.[82]

Within the literature on damage limitation, a number of scholars contend that protective security measures designed to counter terrorism including bomb attacks have negative impacts on the urban environment. Matijosaitiene and Petriashvili noted that "antiterrorism design often creates a hostile environment for daily users by scarring downtowns with desolate security zones, repetitive rows of bollards, and threatening architecture."[83] While scholars like Benton-Short, Jasiński, and Graham have suggested that such measures result in the militarization of cities, the securitizing of everyday spaces, a "hardening" of urban landscape, restricted access to public space and facilities by residents, and constant control and 24/7 surveillance through state-of-the-art technologies.[84] Others suggest that visible counter terrorism measures in urban spaces are fear-inducing and result in undue anxiety among the public. They claim that counter-terrorist measures act as a continual reminder to the user or visitor that the area is considered a potential terrorist target.[85] However, Dalgaard-Nielsen et al.'s research - conducted in Denmark - suggests otherwise.[86] They found that far from having negative effects upon residents, "visible security measures apparently made people feel safer."[87] Thus, the empirical evidence to date has been somewhat limited in this area and the results rather contradictory

Whilst overt protective security measures are still evident, there has been a shift towards more "toned down" security with invisible and sensitive measures.[88] This shift emphasizes that security interventions should be acceptable to the public, aesthetically pleasing, and less obtrusive.[89] Thus, as Coaffee et al. noted: "security features are being increasingly 'camouflaged' – or covertly embedded within the urban landscape. These counter-terrorism features may be 'invisible' to the unaccustomed eye and do not obviously serve a counter terrorism purpose. They include aesthetically landscaped barriers or street furniture and collapsible pavements."[90] The American embassy in London is emblematic of this shift. In the aftermath of 9/11, the embassy based in Grosvenor Square had become increasingly fortified with a perimeter of high fences, concrete blocks, and bollards, while armed guards were stationed outside the site and one side of the square had been closed to vehicle access. In 2009, the American government announced a design competition for a new embassy to be built on the south bank of the River Thames in Nine Elms. The new embassy opened to the public in December 2017, and was inspired by European castle architecture, involving a highly protected structure surrounded by moats and ditches. The embassy is a 200-foot (11-storey blast proof) glass cube, which sits on a hill, thereby maximizing visibility. It has a "seclusion zone" of 100 feet from the nearest street, is surrounded by a reflecting pool and is built within a self-contained site of 4.5 acres mainly planted with trees and grasses.[91] The multi-level site acts as a defensive buffer zone in which the architects have minimized the use of fences and walls by utilizing "tactical topography of 'hostile vehicle mitigation' techniques woven into an undulating idyll of prairie grasses and weeping willows."[92]

With some practical ways that exist to prevent bombing attacks by terrorists discussed, we can now turn our attention to the issue of who ought to be responsible for protective security.

Responsibility for Protective Security

Protective security standards with respect to American government and military facilities at home and abroad were developed and introduced in the wake of deadly terrorist attacks, primarily those involving VBIEDs. The April 1983 terrorist attack on the American embassy in Beirut, Lebanon, saw a suicide bomber crash a truck into the front of the building and detonate approximately 2,000 lbs. of explosives. It resulted in a review of security at American overseas facilities and led to the development of the so-called Inman standards for embassy planning.[93] These included standards requiring minimum setbacks of 100 feet in the event of an IED or VBIED, rules regarding window size, namely a window-to-wall ratio of 15 percent, and walled compounds.[94] These standards were incorporated into legislation with the Secure

Embassy Construction and Counterterrorism Act of 1999. This act outlines five crucial security criteria with respect to embassies, which address blast resistant design and construction:

1. 100-foot setbacks from streets and uncontrolled areas to mitigate the impacts of a VBIED or IED.
2. High-perimeter walls and fences that are tough to climb, deterring would-be attackers on foot from entering the compound.
3. Anti-ram barriers to stop vehicles from penetrating the facility perimeter, getting close to the building, and detonating a VBIED.
4. Blast-resistant construction techniques and materials, e.g., reinforced concrete and steel construction and blast-resistant windows.
5. Access control of pedestrians and vehicles at the perimeter of a compound.[95]

Domestically, there were no standards for protective security measures of non-military federal buildings in America prior to the 1995 Oklahoma City Bombing.[96] Following the attack, President Clinton tasked the Department of Justice (DOJ) with undertaking an assessment of the vulnerability of non-military federal facilities to acts of terrorism and other forms of violence, and to develop recommendations for minimum standards. Two months after the bombing, the DOJ published its report "Vulnerability Assessment of Federal Facilities."[97]It proposed 52 minimum security standards, based on a building's assessed security level (ranked from minimum security I through to V maximum security). It also recommended the establishment of an Interagency Security Committee (ISC).[98] This concerted focus on the protection of buildings and general efforts to design out terrorism culminated with the passing of Executive Order 12977 in October 1995, and the creation of the ISC, which was given three key responsibilities, namely the establishment of policies for security in, and protection of, federal facilities, the development and evaluation of security standards and a strategy for ensuring compliance, and to take such actions as may be required to increase the quality and effectiveness of security and protection of federal facilities.[99] Over the years, the ISC has modified and updated the General Services Administration's (GSA's) *Draft Security Criteria* and working with other key federal agencies has developed ISC Standards such as perimeter buffer zones, security of entrances and exits, and introducing innovative design features such as shatterproof glazing and reinforced plates, the latter predominantly used in the ceilings of underground and multi-story parking garages.[100] Both the GSA and ISC documents are considered important in that they represent "the first attempt to truly integrate security into every facet of the design and construction of a facility…. Prior to these documents, security was generally an afterthought: the last item added and the first item cut from any typical project."[101] Similarly, prior to 1999, there were no common standards for force protection (anti-terrorism/protective security measures) in fixed Department of Defense facilities.[102] The military and Department of Defense facilities adhere to Unified Facilities Criteria 4-010-01 2018, which provides minimum antiterrorism standards for buildings, ranging from planning to design to construction, and also includes modernization criteria.[103]

While these measures sought to counter and mitigate the impact of future terrorist attacks, they were mainly deployed at sites of federal interest, with little attention paid toward other critical infrastructure or locations where mass gatherings took place (i.e., crowded places).[104] Indeed, "with very few exceptions, the government does not compel private owners to make security changes or upgrades to their properties. Private buildings must only respond to building codes."[105] In the aftermath of 9/11, the New York City Department of Buildings convened a task force to analyze the building code as it related to the terrorist threat. The task force made 21 specific recommendations for code, code administration, and code enforcement changes. It stipulated that all high-rise commercial buildings taller than 100 feet must install sprinkler systems within 15 years. It also requested that egress routes, including doors and

stairs, must be marked with photoluminescent materials, and buildings must maintain plans to evacuate occupants in all kinds of emergencies.[106]

In the UK, following an observable shift in terrorist attack methods from disruptive attacks on critical infrastructure assets, to attacks on crowded places, a number of guidance documents have emerged from government task forces, designed to help organizations mitigate risks associated with a terrorist attack.[107] Examples include the Home Office's *Protecting Crowded Places: Design and Technical Issues* and the Centre for the Protection of National Infrastructure's design guide for hostile vehicle attack mitigation.[108] The UK government, through its National Counter Terrorism Security Office (NaCTSO), has placed considerable emphasis on protecting crowded places, using the vehicle of the Protect strand of the UK's counter-terrorism (CONTEST) strategy.[109] NaCTSO has delivered a number of projects since its inception in 2002, including Project Argus, a testing and exercising initiative that aimed to enhance resilience in the face of terrorism in crowded places. Project Argus was launched in 2007 and designed to engage mostly private sector organizations through mechanisms such as the Counter Terrorism Security Advisor network. Project Griffin sought to increase awareness of terrorist threats and provide information to businesses on what to do in the event of a terrorist threat or an actual attack.[110] It has produced a number of guidance documents for a range of sectors within the UK, including the night-time economy, cinemas and theatres, stadia and arenas, retail, education, places of worship, hotels and restaurants, major events, visitor attractions, commercial centers, and transport.[111] Topics covered consist of managing the threat (e.g. suspicious items and good housekeeping), attack methodology (e.g. IEDs, VBIEDs, bomb threats, chemical, biological and radiological [CBR] attacks, unmanned aircraft systems (i.e. drones), and the use of a vehicle as a weapon). Also covered are aspects of physical security, such as security awareness, access control, perimeter, control rooms, building construction, evacuation, and procedures following lockdown and in protected spaces.[112]

While these programs and guidance documents were mostly designed to inform the business communities of already existing crowded places, emphasis was also placed on the need to inform those developing new crowded places in the future. In 2010, the Royal Institute of British Architects (RIBA) released guidance for architects, planners, and engineers on designing for counterterrorism. It contends that "in considering counter-terror risk response, the concepts of proportionality, relevance and effectiveness are fundamental. There is no need to build fortresses to protect property and interests against the terror threat, nor necessarily even a requirement to install extensive (and expensive) physical barriers or bollards."[113] The RIBA guidance highlighted the most common considerations for reducing vulnerability to the threat when designing for counterterrorism in the built environment, namely these: access control (e.g. electronic swipe cards readers, ANPR, and vehicle security barriers), hostile vehicle mitigation measures (e.g. active and passive barrier systems), surveillance CCTV, reception, communications, stand-off (e.g. recommended distance of 100 feet between an IED or VBIED and the building), measures relating to air conditioning/air handling systems, and service areas (e.g. loading docks).[114] The guidance also considers containing damage in the event of a VBIED with specific reference to glazed façades and noted that "while we emphasise efforts to prevent or deter any successful terrorist attack, one should acknowledge that should a charge be detonated, glass often causes more injuries than the explosion itself."[115] Two possible design solutions were offered in the RIBA guidelines: firstly, design the glazing not to break. However, RIBA noted that this would result in very thick glazing, which necessitates very strong structural supports back to the building frame, leading also to costly facades, which is not a realistic option for most buildings. Secondly, design glazing that retains the glass fragments after the glass cracks, for example PVB laminated glass for new constructions or the application of anti-shatter film to existing glazing.[116]

Collaboration between the Home Office and the Department for Communities and Local Government resulted in the publication of *Crowded Places: The Planning System and Counter*

Terrorism in 2012, which provides guidance to those involved in the planning, design, and development of crowded places.[117] The guidance emphasizes four key counter-terrorism design principles aimed at deterring, detecting, and delaying a terrorist attack. First, designing better blast resistance (e.g., external barriers or a reinforced perimeter to prevent a penetrative or close proximity VBIED and the use of building materials that reduce fragmentation including blast resistant glass and a structural design which reduces the risk of building collapse). Second, designing better building management facilities (e.g., entrance arrangements which resist hostile entry and the separation of delivery areas and mailrooms from the main building). Third, designing better traffic management and hostile vehicle mitigation measures (e.g., structural measures that prevent unscreened vehicles gaining access to or coming into close proximity to the building and measures that reduce the speed of vehicles approaching the site like bends or chicanes). Finally, designing better oversight (e.g., clear lines of sight around the building, well maintained and litter-free environments that reduce the opportunity for placing and hiding suspicious items). It also recommended CCTV and the use of security guards, to provide formal oversight so that suspect activity could not go unnoticed.[118]

Conclusion

From the discussion above, it is evident that there is a considerable body of knowledge with respect to protective security measures, including those aimed at preventing terrorist bomb attacks. Many of the measures utilize situational crime prevention techniques, and, as such, they are concerned with *how* a terrorist attack is committed, rather than *why* terrorism occurs. Thus, the measures aim to increase the effort, increase the risk, and reduce the rewards of the terrorist through target hardening and strengthening and utilizing a layered approach to security, based on deterring, preventing, protecting, and containing the threat. Historically, this has led to a degree of militarization and fortification of urban spaces and the creation of security zones in cities targeted by terrorists, such as Baghdad, Belfast, London, New York, and Washington, DC characterized by "rings of steel," concrete barriers, and bollards. This has given rise to calls to consider a "balance between security aspects and other aspects of landscape design.… to achieve effective risk reduction without losing the identity of a building's surrounding spaces."[119] The new American embassy in London is an example of this shift towards protective security measures that are acceptable to the public, aesthetically pleasing, and less obtrusive.

In her study on soft target hardening, Hesterman observed that in the US only "a very small portion of our national security budget and effort is spent protecting civilian venues." Hesterman continues by saying that "Responsibility for security is often passed on to owners and operators, who have no training and few resources. In military terms, we are leaving our flank exposed."[120] Likewise in the UK, Lord Harris, in his review of how best to protect crowded places from a terrorist attack in 2007, acknowledged "that whilst a substantial amount of work had been undertaken to increase levels of protective security, more was needed to turn available advice into action on the ground." According to Lord Haris, "A key finding was to highlight the importance of engaging with a wide range of local partners, in particular, local authorities and local businesses, to implement counter-terrorist protective security advice."[121] Despite the abundance of advice and guidance on offer, much of it is advisory not mandatory.

In the UK, in the aftermath of the Manchester Arena suicide bomb attack of May 2017, there has been a growing demand for greater protective security at public spaces and venues, culminating in the call for Martyn's Law, named after Martyn Hett, one of the persons who lost his life in the attack.[122] In February 2020, the Security Minister James Brokenshire announced plans to introduce a Protect Duty Law, that would make it mandatory that owners and operators of public spaces and venues consider the risk of a terrorist attack, and take

proportionate and reasonable measures to prepare for and protect the public from such an attack.[123] The government's consultation scheduled for the spring of 2020 has been delayed due to the COVID pandemic.[124] Thus, as Meyer notes "the existing literature on protective security measures focuses mainly on suggesting measures for protecting targets against terrorism rather than on prioritizing such measures."[125]

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Endnotes

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[2] Institute for Economics & Peace, *Global Terrorism Index 2019: Measuring the Impact of Terrorism*, Sydney, 2019. Available at: http://visionofhumanity.org/reports .

[3] Meyer 2012, p. 310.

[4] Cornish, Derek B. and Ronald V. Clarke, 'Understanding crime displacement: an application of rational choice theory', *Criminology*, Vol. 25, No. 4,1987, p. 933.

[5] Clarke, Ronald V., 'Situational crime prevention'; in: Richard Wortley and Michael Townsley (eds.), *Environmental Criminology and Crime Analysis* (2nd Edition). London: Routledge, 2017, pp. 286-303.

[6] Ibid; and Wortley, Richard and Townsley, Michael, 'Environmental Criminology and Crime Analysis: Situating the theory, analytic approach and application'; in: Richard Wortley and Michael Townsley (eds.), *Environmental Criminology and Crime Analysis* (2nd Edition). London: Routledge, 2017, pp. 1-25.

[7] Wortley and Townsley, 'Environmental Criminology and Crime', op. cit.; and Jeffery, C. Ray, *Crime Prevention through Environmental Design*. Beverly Hills, CA: Sage, 1971. Jeffery argued that criminal behavior could not occur without opportunity.

[8] Newman, Oscar, *Defensible Space: Crime Prevention through Urban Design*. New York: Macmillan, 1972.

[9] Clarke, 2017, p. 287.

[10] For more details, see Arizona State University Center for Problem-Oriented Policing, *25 Techniques of Situational Crime Prevention.* Available at: https://popcenter.asu.edu/content/learning-center

[11] Cornish and Clarke, 2017; and Guerette, Rob T. and Katie J. Bowers, 'Assessing the Extent of Crime Displacement and Diffusion of Benefits: A Review of Situational Crime Prevention Evaluations', *Criminology*, Vol. 47, No. 4 2009.

[12] Reppetto, Thomas A., 'Crime Prevention and the Displacement Phenomenon', *Crime & Delinquency*, Vol. 22, No. 2, 1976.

[13] Cornish and Clarke, 1987; Geason, Susan and Wilson, Paul R., *Crime Prevention, Theory and Practice*. Canberra: Australian Institute of Criminology, 1988.

[14] Wilkinson, Paul, *Terrorism and the Liberal State*. London: MacMillan, 1977. Wilkinson notes that for flights originating in North America there were 29 hijackings in 1971 and in 1972 but only 2 in 1973, the year after the security measures were introduced.

[15] Reppetto, 1976, p. 166.

[16] Clarke, Ronald V. and David Weisburd, 'Diffusion of Crime Control Benefits: Observations on the Reverse of Displacement', *Crime Prevention Studies*, Vol. 2, 1994.

[17] Ibid, p. 171. Clarke and Weisburd argued that two processes were at work in relation to diffusion, namely deterrence and discouragement. They suggested that as a crime prevention program in an area becomes known, would-be offenders' uncertainty about the extent of the increased risk (deterrence) together with an exaggerated perception that the rewards of particular crimes are no longer proportionate with the effort (discouragement) leads to less crime.

[18] See Wortley, Richard, 'Critiques of situational crime prevention'; in: Bonnie S. Fisher and Steven Lab (eds.), *Encyclopedia of Victimology and Crime Prevention*. Thousand Oaks, CA: Sage, 2010, pp. 884-887; and Clarke 2017, p. 299. Clarke outlines 14 ethical criticisms of SCP and their rebuttals.

[19] Clarke, 2017, p. 290.

[20] Clarke, Ronald V. and Greame R. Newman, *Outsmarting the Terrorists*. Westport and London: Praeger Security International, 2006.

[21] Ibid. See also Boba, Rachel, 'EVIL DONE'; in: Joshua D. Freilich and Graeme R. Newman (eds.), *Reducing Terrorism through Situational Crime Prevention*. Boulder, CO: Lynne Riener Publishers, 2010, pp. 71-92; and Freilich, Joshua D. et al, 'Situational Crime Prevention and Terrorism: An Assessment of 10 Years of Research', *Criminal Justice Policy Review*, Vol. 30, No. 9, 2019.

[22] Clarke and Newman 2006, p. 4. The application of SCP to terrorism is not without its critics; see Fussey, Peter, 'Deterring Terrorism? Target–hardening, Surveillance and the Prevention of Terrorism'; in: Andrew Silke (ed.), *The Psychology of Counter-Terrorism*. London: Routledge 2011, pp.164-185. Fussey noted that such analyses "….largely assume a fairly straightforward application of crime prevention strategies to counter-terrorism and arguably overstate the similarities of these activities" (p. 164).

[23] Boba 2009.

[24] Ekici, Niyazi et al., 'Outsmarting Terrorists in Turkey', *Crime Prevention and Community Safety,* Vol. 10, No. 2, 2008.

[25] Ibid., p.136.

[26] Gruenewald, Jeff et al., 'Assessing the Attractiveness and Vulnerability of Eco-Terrorism Targets: A Situational Crime Prevention Approach', *Studies in Conflict & Terrorism*, Vol. 38, No. 6, 2015. The American Terrorism Study housed at the University of Arkansas is an empirical database created from data provided by the FBI relating specifically to acts of American terrorism between 1980 and 2002.

[27] Ibid., p. 448.

[28] Brandt, Patrick T. and Todd Sandler, 'What Do Transnational Terrorists Target? Has It Changed? Are We Safer?', *The Journal of Conflict Resolution*, Vol. 54, No. 2, 2010.

[29] Enders, Walter and Todd Sandler, 'The effectiveness of anti-terrorism policies: A vector autoregression-intervention analysis', *American Political Science Review*, Vol. 87, No. 4 1993.

[30] Ibid.

[31] Morris, Nancy A. 'Target Suitability and Terrorism Events at Places', *Criminology & Public Policy*, Vol. 14, No. 2, 2011. Morris further notes "that the existing evidence examining displacement and transference in terrorism was done so indirectly, and it has not examined whether target-hardening tactics have led to more attacks directed at similar targets in the surrounding geographic areas" (p. 421).

[32] Perry, Simon et al., 'The Situational Prevention of Terrorism: An Evaluation of the Israeli West Bank Barrier', *Journal of Quantitative Criminology*, Vol. 33, 2017, p. 727.

[33] Hsu, Henda Y. and David McDowall, 'Does Target-hardening Result in Deadlier Terrorist Attacks against Protected Targets? An Examination of Unintended Harmful Consequences', *Journal of Research in Crime and Delinquency*, Vol. 54, No. 6, 2017. The Global Terrorism Database (GTD) is an open-source database including information on terrorist events around the world since 1970. It is housed at the National Consortium for the Study of Terrorism and Responses to Terrorism (START), University of Maryland.

[34] Ibid., p. 945.

[35] Hastings, Justin V. and Ryan J. Chan, 'Target Hardening and Terrorist Signaling: The Case of Aviation Security,' *Terrorism and Political Violence*, Vol. 25, No. 5, 2013.

[36] Hsu and McDowall 2017, p. 946.

[37] Ibid., p. 931.

[38] Bennett, Brian T., *Understanding, Assessing, and Responding to Terrorism: Protecting Critical Infrastructure and Personnel*. Hoboken, NJ: John Wiley & Sons, 2018. An example of strengthening would be the replacement of standard reinforced concrete with ultra-high performance fiber reinforced concrete.

[39] Meyer 2012, p. 313.

[40] Australia-New Zealand Counter-Terrorism Committee, *Australia's Strategy for Protecting Crowded Places from Terrorism*. Canberra, Commonwealth of Australia, 2017, p. 14. See also Kang, Kyung-Yeon et al, 'Development of the vulnerability assessment model of explosive terrorism in multi-use buildings', *Journal of Asian Architecture and Building Engineering*, Vol. 18, No. 3, 2019, pp. 170-179; and Remennikov, Alexander and David Carolan, 'Building vulnerability design against terrorist attacks'; in: Mark G. Stewart and Brad Dockrill (eds.), *Proceedings of the Australian Structural Engineering Conference 2005*. Australia: Tour Hosts Pty. Ltd, 2005, pp. 1-10.

[41] Nunez-Vaz, Rick and Steven Lord, 'Designing physical security for complex infrastructures', *International Journal of Critical Infrastructure Protection,* Vol. 7, 2014. See also Argenti, Francesca et al, 'A study on the performance assessment of anti-terrorism physical protection systems in chemical plants', *Safety Science*, Vol. 94, 2017, pp. 181-196. Slight variations on the four layers can be found in the literature, for example the Australian and New Zealand governments use: deter, detect, delay and respond (see Australia-New Zealand Counter-Terrorism Committee 2017); and the Federal Emergency Management Agency in the US employs: deter, detect, deny and devalue (see FEMA*, A Reference Manual to Mitigate Potential Terrorist Attacks against Buildings* (FEMA 426). Washington DC: FEMA, 2003).

[42] Australia-New Zealand Counter-Terrorism Committee, 2017, p. 14.

[43] Atlas, Randy I. and Tony DiGregorio, 'Designing for Explosive Resistance'; in: Randy I. Atlas (ed.), *21st Century Security and CPTED: Designing for Critical Infrastructure Protection and Crime Prevention* (2nd Edition). Boca Raton, FL: CRC Press, 2013, pp. 253-274.

[44] Ibid., p. 272.

[45] Marcuse, Peter, 'The "War on Terrorism" and Life in Cities after September 11, 2001'; in: Stephen Graham (ed.), *Cities, War, and Terrorism*. Oxford: Blackwell Publishing, 2004, pp. 263-275.

[46] For more details on the evolution of aviation security and Al-Qaeda plots against the aviation targets, see Hastings and Chan 2013, pp. 785-789.

[47] Atlas and DiGregorio 2013. Blow out walls are designed to give during an explosion and let escape the positive pressure resulting from the blast.

[48] Zineddin, M. and L. Sherwood, 'Anti-terrorism Protection and Protective Design Measures for Hotels', *WIT Transactions on the Built Environment*, Vol. 134, 2014.

[49] Longinow, Anatol and Kim R. Mniszewski, 'Protecting Buildings against Vehicle Bomb Attacks', *Practice Periodical on Structural Design and Construction*, Vol. 1, No. 1, 1996, pp. 51-54.

[50] Young, Carl S., *The Science and Technology of Counterterrorism*. Oxford: Butterworth-Heinemann, 2015, p. 133. For Davis, the car bomb "was comparable to airpower in its ability to knock out critical urban nodes and headquarters as well as terrorize populations of entire cities" (p. 5) – see Davis, Mike, *Buda's Wagon: A Brief History of the Car Bomb*. London: Verso, 2007.

[51] Young 2015, p. 135.

[52] Little, Richard A., 'Holistic Strategy for Urban Security', *Journal of Infrastructure Systems*, Vol. 10, No. 2,2004; Bennett 2018; Remennikov and Carolan 2005: Remennikov and Carolan suggest that maximizing stand-off distance "is the easiest and least costly method for achieving the appropriate level of protection to a critical structure" (p. 8).

[53] For more details, see Forman, Paul et al, 'Vehicle Borne Threats and the Principles of Hostile Vehicle Mitigation'; in: David Cormie et al (eds.), *Blast Effects on Buildings* (2nd Edition). London: Ice Publishing, 2009, pp. 250-273.

[54] Centre for the Protection of National Infrastructure, *Integrated Security: A Public Realm Design Guide for Hostile Vehicle Mitigation* (2nd Edition). London: CPNI, 2014. See also

Department of Transport and CPNI, *Vehicle Security Barriers within the Streetscape*. Traffic Advisory Leaflet 01/11 (as amended October 2017).

[55] Ball, Joey B., *Anti-Terrorism Site Design Guidelines for US Military Installations: An Evaluation of the Implementation Process at US Army Forts in Texas and Louisiana*. Master's Thesis, Graduate School, University of Texas at Arlington, 2010. Ball contends "that aggressors will not attempt to place explosive devices in areas near buildings where these explosive devices could be visually detected by building occupants observing the area around the building" (p. 19).

[56] Atlas, Randy I., 'Protecting Buildings and Infrastructure with CPTED'; in: Randy I. Atlas (ed.), *21st Century Security and CPTED: Designing for Critical Infrastructure Protection and Crime Prevention* (2nd Edition). Boca Raton, FL: CRC Press, 2013, pp. 275-288; Despard, Erin, 'Cultivating Security: Plants in the Urban Landscape', *Space and Culture*, Vol. 15, No. 2,2012; Fussey, 2011; and Schneider, Richard H., 'American Anti-Terrorism Planning and Design Strategies: Applications for Florida Growth Management, Comprehensive Planning and Urban Design', *University of Florida Journal of Law & Public Policy*, Vol. 15, No. 1, 2003.

[57] Fussey 2011, p. 171. Intelligent pedestrian surveillance involves software designed to automatically spot 'suspicious' behavior or packages and bring it to the attention of CCTV operators.

[58] Young, 2015.

[59] Little, 2004.

[60] Little, 2004. See also Ellingwood, Bruce R. et al., *Best Practices for Reducing the Potential for Progressive Collapse in Buildings,* NISTIR 7396. US Department of Commerce, 2007.

[61] Little, 2004, p. 1.

[62] Atlas and DiGregorio, 2013. See also Ellingwood, 2007; and the Department of Defense, *Report of the DOD Commission on Beirut International Airport Terrorist Act, October 23, 1983*. Washington DC: DOD, 1983.

[63] Eytan, R., 'Cost Effective Retrofit of Structures against the Effects of Terrorist Attacks – the Israeli Experience', *Structures Congress*, April 20-24, 2005, New York, p.1.

[64] Ibid.

[65] Zineddin and Sherwood 2014. See also Centre for the Protection of National Infrastructure, *Windows*, Crown Copyright, 2019. Available at: https://www.cpni.gov.uk/windows; and Longinow and Mniszewski, 1996.

[66] Eytan, 2005.

[67] Atlas and DiGregorio 2013; Hinman, Eve, *Blast Safety of the Building Envelope.* Whole Building Design Guide, Washington DC, 2017. Available at: https://www.wbdg.org/resources/blast-safety-building-envelope .

[68] Eytan, 2005.

[69] Meyer, 2012; Atlas and DiGregorio, 2013.

[70] Proulx, G. and R.F. Fahy, 'Evacuation of the World Trade Center: what went right?'; in: *Proceedings of the CIB-CTBUH International Conference on Tall Buildings*, Oct. 20-23, 2003, Malaysia, pp. 27-34

[71] Ibid., p. 32.

[72] Meyer, 2012.

[73] Shaftoe, Henry et al, 'Dealing with Terrorist Threats through a Crime Prevention and Community Safety Approach', *Crime Prevention and Community Safety,* Vol. 9, No. 4, 2007, p. 296.

[74] The Green Zone was installed in central Baghdad by the American military in 2003 and only re-opened to the public in 2019 - For more details see Daughtry, J. Martin, *Listening to War: Sound, Music, Trauma, and Survival in Wartime Iraq*. Oxford: Oxford University

Press, 2015; and Murrani, Sana, 'Baghdad's thirdspace: Between liminality, anti-structures and territorial mappings', *Cultural Dynamics*, Vol. 28, No. 2, 2016.

[75] Briggs, Rachel, *Joining Forces: From National Security to Networked Security*. London: Demos, 2005; Coaffee, Jon, 'Rings of Steel, Rings of Concrete and Rings of Confidence: Designing out Terrorism in Central London pre and post 9/11', *International Journal of Urban and Regional Research*, Vol. 28, No. 1, 2004; and Gearson, John, 'Deterring Conventional Terrorism: From Punishment to Denial and Resilience', *Contemporary Security Policy*, Vol 33, No. 1, 2012, pp. 171-198.

[76] Brown, Stephen, 'Central Belfast's Security Segment: An Urban Phenomenon', *Area*, Vol. 17, No 1, 1985. For more details on Bloody Friday, see CAIN, *Bloody Friday (21 July 1972) Northern Ireland Office News-sheet*, 2019. Available at: https://cain.ulster.ac.uk/events/bfriday/nio/nio72.htm .

[77] Ibid.

[78] Ibid.

[79] Coaffee 2004; and Coaffee, Jon, 'Recasting the "Ring of Steel": Designing Out Terrorism in the City of London'; in: Stephen Graham (ed.), *Cities, War, and Terrorism*. Oxford: Blackwell Publishing, 2004, pp. 266-296. The Provisional IRA detonated two large VBIEDs in the City of London's financial district in 1992 (Baltic Exchange bombing) and in 1993 (Bishopsgate bombing). The group also targeted London's Docklands, the city's second financial district in November 1992 but the VBIED was spotted by security guards. The area was targeted again in 1996 when a large VBIED detonated at the South Quay Station of Canary Wharf.

[80] Ibid., pp. 278-279.

[81] Coaffee, Jon, 'Rings of Steel, op.cit., p. 204. Fussey contends that not a single person has been caught involved in terrorist activities by CCTV operators monitoring the City of London – For more details, see Fussey 2011, p.180.

[82] Benton-Short, Lisa, 'Bollards, Bunkers, and Barriers: Securing the National Mall in Washington, DC', *Environment and Planning D: Society and Space*, Vol. 25, No. 3, 2007.

[83] Matijosaitiene, Irina and Petriashvili, Ana, 'Urban Planning and Design for Terrorism Resilient Cities', *Journal of Sustainable Architecture and Civil Engineering*, Vol. 1, No. 18, 2017, p. 29.

[84] Benton-Short 2007; Jasiński, Artur, 'Protecting Public Spaces against Vehicular Terrorist Attacks', *Technical Transactions*, Vol. 2, 2018; and Graham, Stephen, 'Cities and the 'War on Terror,' *International Journal of Urban and Regional Research*, Vol. 30, No. 2, 2006.

[85] Coaffee, Jon et al., 'The Visibility of (In)Security: The Aesthetics of Planning Urban Defences Against Terrorism', *Security Dialogue*, Vol. 40, No. 4-5, 2009; and Grosskopf, Kevin R., 'Evaluating the Societal Response to Antiterrorism Measures', *Journal of Homeland Security and Emergency Management*, Vol. 3, No. 2, 2006.

[86] Dalgaard-Nielsen, Anja et al., 'Visible Counterterrorism Measures in Urban Spaces - Fear-Inducing or Not?', *Terrorism and Political Violence*, Vol. 28, No. 4, 2016, pp.692-712.

[87] Ibid., p. 693.

[88] Briggs, 2005, p. 77. Following 9/11, concrete barriers were placed outside the Houses of Parliament in London and have since been painted black to make them appear less unwelcoming.

[89] Home Office, Centre for the Protection of National Infrastructure, and National Counter Terrorism Security Office. *Protecting Crowded Places: Design and Technical Issues*. London: Home Office, 2014; Federal Emergency Management Agency, *Site and Urban Design for Security: Guidance against Potential Terrorist Attacks* (FEMA 430). Washington DC: FEMA, 2007; and National Capital Planning Commission, *The National Capital Urban Design and Security Plan*. Washington DC: NCPC, 2002.

[90] Coaffee et al., 2009, pp. 498-499. Collapsible pedestrian pavements also known as 'Tiger Traps' are designed to allow pedestrians to walk over them but give way under the weight of a vehicle thereby trapping the vehicle some way from the intended target. There is a 'tiger trap' outside the New York Mercantile Exchange. Other examples of covertly embedded features within London's urban landscape include security balustrades at Whitehall and the use of reinforced letters spelling out Arsenal, benches and large canons dotted around Arsenal Football Club's stadium.

[91] Despard, 2012; and Wainwright, Oliver, 'Fortress London: The New US Embassy and the Rise of Counter-Terror Urbanism', *Harvard Design Magazine*, No. 42, 2016.

[92] Ibid, p. 111. Hidden measures include steel and concrete bollards within hedges, ditches deep enough to stop a truck, a wall of seating and benches atop of truck-impeding concrete.

[93] US Department of State, *Report of the Secretary of State's Advisory Panel on Overseas Security*. Washington DC: Department of State, 1985.

[94] Ibid.; and: Buildings, *Global Diplomacy and Design: Security at U.S. Embassies*, 2008. Available at: https://www.buildings.com/article-details/articleid/5784/title/global-diplomacy-and-design-security-at-u-s-embassies.

[95] Ibid.

[96] Paizs, Franziska, *Urban Planning after Terrorism*. Berlin: Technical University, 2013; and Atlas, 2013.

[97] US Department of Justice. Vulnerability of Federal Facilities. Washington, DC: 28 June 1995.

[98] Atlas 2013.

[99] Atlas and DiGregorio 2013.

[100] McIlhatton, David et al., 'Protecting Crowded Places from Terrorism: An Analysis of the Current Considerations and Barriers Inhibiting the Adoption of Counterterrorism Protective Security Measures', *Studies in Conflict & Terrorism*, (2018); and Rothrock, Sara E., *Antiterrorism Design and Public Safety: Reconciling CPTED with the post-9/11 City*. Master's thesis, Department of Urban Studies and Planning, Massachusetts Institute of Technology, 2010, p.12. The General Services Administration constructs, manages, and preserves government buildings and also leases and manages commercial real estate for government use in America.

[101] Federal Emergency Management Agency, (FEMA 430) 2007, pp. 1-6.

[102] This was a finding of the 1996 Downing Commission report on the Khobar Towers bombing in Dhahran, Saudi Arabia in 1996, which saw a VBIED bomb estimated to contain the equivalent of 3,000 - 8,000 lbs of TNT explode outside the northern perimeter of a facility housing American and allied forces supporting the coalition air operation over Iraq. The explosion resulted in 19 fatalities and some 500 injured persons. For more details, see Downing Assessment Task Force, *Report of the Assessment of the Khobar Towers Bombing*, 1996. Available at: https://fas.org/irp/threat/downing/annx_a.html .

[103] Ball, 2010; and Department of Defense, *Minimum Antiterrorism Standards for Buildings UFC 4-020-01*, 2018. Available at: www.wbdg.org.

[104] McIlhatton, David et al., 'Protecting Commercial Real Estate and Crowded Places from Terrorism', *Journal of Real Estate Literature*, Vol. 27, No. 1, 2019.

[105] Rothrock, 2010, p.12.

[106] Chan, Sewell, '9/11 Has Spurred Only Modest Changes in New York City and National Building Codes', *New York Times*, September 9, 2006. Available at: https://www.nytimes.com/2006/09/09/nyregion/09codes.html ; and New York City Department of Buildings, *Local Law 26 of 2004 – Summary of Provisions*, New York, updated 2006. Available at: www.nyc.gov/dob .

[107] Harris, Lord Toby, 'London and Anti-terrorism in Europe', *European View*, Vol. 16, 2017; Aradau, Claudia, "Crowded Places are Everywhere we go': Crowds, Emergency,

Politics', *Theory, Culture & Society*, Vol. 32, No. 2, 2015; and McIlhatton, David et al. 2019, pp. 44-45. Aradau notes "crowded places have recently been problematized as objects of terrorist attacks" (p. 155).

[108] Home Office, Centre for the Protection of National Infrastructure, and National Counter Terrorism Security Office 2014; and Centre for the Protection of National Infrastructure, *Integrated Security*.

[109] CONTEST involves the 4Ps, namely Pursue (i.e., to stop terror attacks from happening), Prevent (i.e., to stop individuals from either supporting or becoming terrorists), Protect (i.e., to increase protection from a terrorist attack), and Prepare (i.e., to mitigate the impact of a terrorist attack). For more details, see HM Government, *CONTEST: The UK's Strategy for Countering Terrorism*, July 2011. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data /file/97994/contest-summary.pdf . The Protect strand of CONTEST focuses on keeping people safe by strengthening protection against terrorist attacks in the UK and its interests overseas, thus reducing vulnerability. It includes work undertaken to secure the Critical National Infrastructure, assessing and reducing risks to crowded places through improved protective security and strengthening UK border security.

[110] For more information, see Price, Stuart, *Worst-Case Scenario: Governance, Mediation and the Security Regime*. London: Zed Books Ltd, 2011; National Counter Terrorism Security Office, *Guidance: Project Argus*. 2016. Available at: https://www.gov.uk/government/publications/project-argus/projectargus; Malcolm, James A., 'Project Argus and the Resilient Citizen', *Politics*, Vol. 33, No. 4, 2013; National Counter Terrorism Security Office, *Guidance: Project Griffin*. 2016. Available at: https://www.gov.uk/government/publications/project-griffin/projectgriffin . NaCTSO is a law enforcement unit that supports the Protect and Prepare strands of the UK government's counter terrorism strategy. The unit supports a network of some 200 counter terrorism security advisors (CTSAs) who work within local law enforcement and provide help, advice and guidance on all aspects of counter terrorism protective security to specified industry sectors.

[111] These individual guidance documents have been collated into just one – see National Counter Terrorism Security Office, *Crowded Places Guidance*, Crown Copyright, 2017.

[112] National Counter Terrorism Security Office 2016.

[113] Royal Institute of British Architects. *RIBA Guidance on Designing for Counterterrorism*. London: RIBA, 2010, p. 6.

[114] Ibid, p. 11.

[115] Ibid, p. 13.

[116] Ibid.

[117] HM Government, *Crowded Places: The Planning System and Counter-Terrorism*, op.cit.

[118] Ibid., pp. 6-7.

[119] Felix, Mary and Mostafa Elhefnawi, 'Landscape Design Elements as a Defensive Tool for Building Security'; in: Hocine Bougdah et al. (eds.), *Urban and Transit Planning*. Basel: Springer Nature, 2020, p. 227.

[120] Hesterman, Jennifer, *Soft Target Hardening: Protecting People from Attack*. Boca Raton, FL: CRC Press, 2015, p. 2.

[121] Home Office, *Safer Places: A Counter Terrorism Supplement*. London: Home Office, 2009, p. iii.

[122] Survivors against Terrorism, *Martyn's Law*, 2019.

[123] Gov. UK, *Government proposes duty to protect public spaces from terror*, February 24, 2020. Available at: https://www.gov.uk/government/news/government-proposes-duty-to-protect-public-spaces-from-terror .
[124] Hooper, Ryan, ''Martyn's Law' plan to protect public at venues is delayed by coronavirus', *Belfast Telegraph*, May 21, 2020. Available at: https://www.belfasttelegraph.co.uk/news/uk/martyns-law-plan-to-protect-public-at-venues-is-delayed-by-coronavirus-39223204.html .
[125] Meyer, 2012, p. 309.

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