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Master Thesis

Terror Resilient Planning of Urban Open Spaces with a Focus on Vehicle Ramming Attack Prevention.

An empirical study on the attacks of Breitscheidplatz, Berlin and Dorttninggatan, Stockholm

in partial fulfillment of the requirements of a Double-Degree-Programm

for the degree of Diplom-Ingenieurin / Master of Science

submitted by

Veera Sofia Jääskeläinen, Bsc. (01126934)

Supervisors:

Univ.Prof. Dipl.-Ing. Dr.-Ing. Martin Berger | TU Wien, Faculty for Architecture and Spatial Planning

Prof. Tang Yuqing | Tongji University Shanghai, College for Architecture and Urban Planning

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Abstract

Since the 9/11 attack in New York terrorism has taken a new turn and more European urban open spaces have become targets of terror attacks. However the inclusion of the factor security against terrorism is not yet part of urban and transportation planning.

Therefore this thesis examines how transportation planners can contribute in making urban open spaces more terror resilient. Firstly it explores how terrorism has impacted cities in the past and how terrorism and its impacts have changed over time in literature. Secondly a literature review is given on what the connection of security and planning is and existing security planning strategies as well as preventive measures are introduced. Furthermore the characteristics of terror attacks since 9/11 in urban open spaces are being analysed. Concluding from the literature review and the analysis it is clear that vehicle ramming attacks are the new method of choice. Therefore in a last chapter the two vehicle ramming attacks on Breitscheidplatz, Berlin and Drottninggatan, Stockholm are being examined closer.

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摘要

自纽约“9· 11”恐怖事件发生后，恐怖主义发生了新的变化，欧洲更多的公共空间成为了恐怖袭击的主要目标。然而，很少或几乎没有地区将反恐防灾与安全规划作为城市和交通规划的一部分。

因此，本文探讨了交通规划者如何使城市开放空间具有更强的韧性。首先，本文研究了恐怖主义在过去如何影响城市，以及文献记载中恐怖主义及其影响如何随时间发生变化。其次，对安全与规划之间的联系进行了文献综述，并介绍了现有的安全规划策略与预防措施。此外，还分析了自“9· 11”恐怖事件以来在城市公共场所发生的恐怖袭击的特征。文献研究和分析表明，车辆撞击是一种新的方法与选择，因此在全文最后一章中，以柏林的布莱特施德广场与斯德哥尔摩的多廷加坦的两次车辆撞击事件为例进行了更详尽的研究。

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Zusammenfassung

Seit dem 9/11 Anschlag in New York hat der Terrorismus eine neue Wendung genommen und mehr öffentliche Plätze in Europa sind zu Zielen terroristischer Anschläge geworden. Jedoch ist Sicherheitsplanung und Terrorbekämpfung sehr selten bis kaum ein Thema in der Raum- und Verkehrsplanung.

In dieser Arbeit wird daher untersucht, wie VerkehrsplanerInnen dazu beitragen können, öffentliche Plätze widerstandsfähiger gegen Terrorismus zu machen. Als erstes wird untersucht, wie sich Terrorismus in der Vergangenheit auf Städte ausgewirkt hat und wie es sich im Laufe der Zeit verändert hat. Zweitens wird eine Literaturübersicht über den Zusammenhang von Sicherheit und Planung gegeben und bestehende Sicherheitsplanungsstrategien sowie vorbeugende Maßnahmen diskutiert. Darüber hinaus werden die Merkmale von Terroranschlägen seit dem 9/11 Anschlag in öffentlichen Plätzen analysiert. Aus der Literaturrecherche und der Analyse geht hervor, dass Fahrzeug-Rammangriffe die neue Methode der Terroristen ist. Zum Schluss werden daher zwei Fahrzeug-Rammangriffe, Breitscheidplatz in Berlin und Drottninggatan in Stockholm näher untersucht.

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List of Abbreviations

9/11 attack	Terror attack on the World Trade Centres on 11th September 2001 in New York
CCTV	Close Circuit Television
CPTED	Crime Prevention Through Environmental Design
FEMA	Federal Emergency Management Agency
GTD	Global Terrorism Database
ROG	Raumordnungsgesetz Deutschland - spatial planning act of Germany
SPSS	IBM SPSS Statistics: Statistical Product and Service Solutions

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1. CHAPTER – Introduction

"Terrorists (and terrorism) seek to exploit the everyday-things that people do, places that they visit, the routines of daily living, and the functioning of institutions. Terrorism is an adaptive threat which changes its target, timing, and mode of delivery as circumstances are altered. The seeming randomness of terrorist attacks (either the work of organized groups or renegade individuals) in both time and space increases public anxiety concerning terrorism." (Cutter, Richardson, & Wilbanks, 2013, p. 2)

Since the attacks on the World Trade Centre on 11th September 2001 (9/11 attack) terrorism has been a frequently discussed topic everywhere, but in the last few years more and more developed cities have been targets of terror attacks and not only government buildings or political people are being targeted but also civilians and urban open spaces. This has given terrorism a new dimension in the western world: "fear" (Koskela, 2009). Many politicians, academics as well as planners and architects started to worry that in consequence this new dimension of fear would start a militarisation of cities in the Western world (Briggs, 2005).

Terrorism is not a new phenomenon and throughout history cities have been targets of attacks because of their concentration of buildings and people (Glaeser & Sharpio, 2001). This has shaped the development of cities in the past. In the last years terrorist attacks have undergone a shift and more cities in Europe and other developed countries have become targets of disastrous attacks conducted by terrorists. Especially public spaces have become targets of these attacks and vehicles have become their weapon.

In the future safety in cities will be an even more important aspect. Because already 4.2 billion people live in urban areas, which is 55% of the population. It is estimated that the number will grow by 2.5 billion until the year of 2050. This means in 30 years 6.7 billion people will live in cities worldwide. (United Nations, 2018) This is why cities will be more attractive targets for terror attacks as cities get bigger and denser. It will be more important for the future to understand vulnerabilities of urban open

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spaces towards terrorism and how we as planners can make them safer and more resilient without impacting everyday lives.

The European Union has developed a counter terrorism strategy, which is divided into four parts: Prevent, Protect, Pursue and Respond. In the part "protect" is where planners fit in. As the strategy states, a central element of fighting terrorism is to protect critical infrastructures and public places. (Council of the European Union, 2005)

1.1. Aim and Scope of Research

The topic of security in the field of urban planning and transportation planning is still not yet very widespread, although with concrete physical measures planners can have impact and be an asset when fighting against terrorism. Some cities are already very advanced in this topic but still many have to learn, that security planning is not only a task for the police but as many different fields of urban planning, this as well is a topic which should be integrated into urban and transportation planning.

The aim of this thesis is first of all to understand how terrorism and cities were impacted in the past as well as are impacted in the 21st century and secondly to understand how urban planning can contribute towards safer cities.

For this the following research question and sub questions were formulated:

How can an urban open space be made terror resilient with measures from urban and transportation planning?

Sub questions:

How does terrorism impact cities?

What measures against terror attacks in cities do exist? (on planning level)

What are the characteristics of terror attacks that occur in urban open spaces?

What were the vulnerable elements of sites where an attack has occurred?

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How have these sites changed after the attack?

As terrorism is a very wide topic and differs in many aspects in time and space, clear demarcations were made. Time wise the 9/11 attack is seen by many scholars as a significant point in counter terrorism and therefore this thesis concentrates on the time after this attack on September 11th 2001.

Spatially it was important to narrow down the scale as terrorism and its counter measures differ very much and therefore this thesis is concentrating on European countries, however still including literature from outside Europe for example the United States.

For types of attacks this thesis focuses on vehicle ramming attacks on urban open spaces, to further narrow down the topic of research. Vehicle ramming attacks are attacks where a large vehicle such as a truck or van is driven into a crowd of people.-Usually these take place in urban open spaces. Meaning spaces in urban areas which are accessible to public. When an attack occurs these spaces are often crowded, either because of an event, a Christmas market for example, or are crowded all year long, popular tourist attractions or shopping streets for example.

time dimension	**since 11.9.2001**
spatial dimension	**Europe**
type of attack	**Vehicle ramming attacks on urban open spaces**

Table 1: Demarcation

As urban planning is a very wide topic where sub disciplines such as transportation planning, city planning or sociology are very much interconnected and not always possible to separate, this thesis will not solely concentrate on the discipline of transportation planning but the connections between different aspects of urban planning as well.

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1.2. Structure of the thesis

This thesis is divided into four main chapters as well as an introduction in the beginning and a conclusion at the end. An overview of the structure can be seen on the next page (Figure 1).

Chapter 2 “Terrorism and Cities” explores the facts how terrorism and cities are connected in existing literature. This starts with a historical view on terrorism and explains the definition of the word as well as introduces the definition used in this thesis. As Glaeser and Sharpio (2001) argue in their paper “*Cities and Warfare: The Impact of Terrorism on Urban Form“* that terrorism is seen as a kind of warfare, this topic is explored. Later impacts of terrorism on urban areas are covered and lastly the shift of targets of terrorists are discussed.

Chapter 3 “Security Planning and Terror Resilience” is the second literature review chapter of this thesis. In this chapter it is discussed what planners can do to help prevent terrorism, what strategies exist and impacts such strategies have. Lastly clear physical measures are being introduced. Many European cities have already started to invest in counter terrorist measures, however it is important to know the current situation on terrorism in order to being able to make decisions on countermeasures.

This is where the fourth chapter “Terrorism today and its Characteristics” is important. According to the Institute for Economics and Peace (2018) it is important to understand the various characteristics of terrorism, for example what and who are terrorists targeting and how. This is why in this chapter the characteristics of terrorism in European open spaces since the 9/11 attack are being analysed.

Chapter 5 “Breitscheitplatz & Drottninggatan” looks at two cases and tries to understand why these sites were attacked and what the reactions were after the attack in a qualitative approach. As the American Association of State Highway and Transportation Officials state it is natural for operators of crowded places to examine sites where a terror attack has occurred in a similar setting, what it means to them and how they can learn from these. (AASHTO, 2017) This is what this thesis is seeking to do as well. To learn from previous attacks and how these sites changed in the aftermath.

The thesis ends with an overall conclusion, answering the research question and reflecting on the topic.

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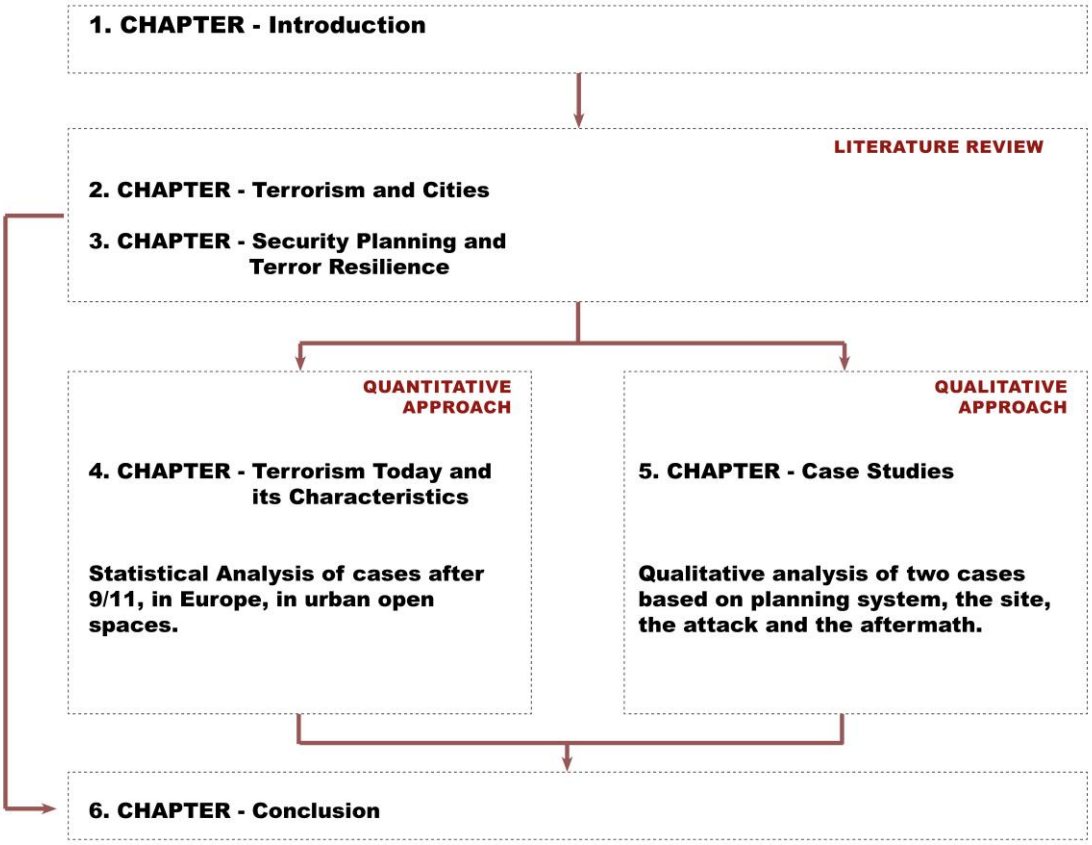

Figure 1: Structure of the Thesis.

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2. CHAPTER – Terrorism and Cities

This Chapter is a literature review on the topic of terrorism in general and how it is linked to cities. Firstly the origins of terrorism is discussed. Terrorism is a topic which has been around throughout history. It has many different definitions which according to several authors have changed over time and still have different interpretations. Therefore as a first step it is important to understand where terrorism has its origins, how it has changed and evolved over time, so it is possible to understand the definition of it. Due to this, the definition of terrorism has changed and in fact there is not one correct definition for the term. The definition used in this thesis is introduced.

As scholars argue that terrorism is a way of warfare, the thesis will continue to discuss the impacts of warfare on cities and how this has shaped cities in the past: To understand how urban open spaces should be adapted today it is important to understand how cities in the sense of urban development have been affected by war and terror. Referring to the four effects of warfare shaping cities, the Safe Harbour Effect, the Target Effect, the Transportation Effect and the Physical Destruction of Buildings mentioned in the discussion paper "*Cities and Warfare: The Impact of Terrorism on Urban Form"* by Glaeser & Sharpio (2001).

As terrorism and cities have evolved over time, so have the impacts that terrorism has on cities as well. Therefore the impacts of terrorism in the 21st century are discussed and how these have changed over time. These impacts are substantiated with incidents that have occurred all over the world.

The last topic of this chapter is about how there has been a shift in the target selection from hard to soft targets, especially focusing on public spaces. Not only have the targets changed over time but also the weapons used. Scholars write about how especially since 2009 more and more European cities have been targets of vehicle ramming attacks.

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2.1. Terrorism

2.1.1. History

Historically the act of terrorism has been practiced since the ancient Greek, where measures as banishment, property dispossession or executions were used to scare enemy populations. Another example of early terrorism is when the Sicarii, Jewish Zealots, attacked other Hebrews because they were suspected of working together with the Roman authorities. (Jenkins J. P., 2004)

The word itself and the modern way of terrorism started during the French Revolutions Reign of Terror in 1793-1794 where the group of rebels called the Jacobins and their leader Maximilen Robespierre used violence, torture and executions against people with different religious views. A few years later in 1798 the very first definition was released in the dictionary of the Academie Fançaise as "système, regime de la terreur" which can be translated as "government of terror". (Matusitz, 2013)

Later, in the 19th century terrorism came to Europe, Russia and the United States, where Anarchists saw the easiest way to bring to public their political and social standpoints was to kill the people in powerful positions. (Zalman, 2018)

In the 20th century political, religious and social activists wanted changes so terror attacks became more popular all over the world. For example Palestinian terrorists started to hijack airplanes in the 1970s in order to state their opinion. In the 1980s and 1990s other groups committed acts of terrorism in order to stand up against animal rights or the environment (Zalman, 2018). Most of these attacks were targeted at specific people or organisations and are called old terrorism (Laqueur, 1977).

Scholars argue that at the end of the 1990 there was paradigm shift from the old terrorism, which was characterized by attacks only on selected targets, to new terrorism, where the main goal is to cause as many casualties as possible. Two known terror attacks that are seen as part of this paradigm shift are firstly the bombing of the World Trade Centre in New York in 1993 (Matusitz, 2013). In this attack a small cell of terrorists with a radical Islamic background detonated a bomb in the parking garage of the World Trade Centre killing six people, injuring more than 1000 people and damaging the buildings

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underground floors (National September 11 Memorial & Museum, n.d.). Secondly, the 1995 sarin gas attack in Tokyo (Matusitz, 2013), where members of the religious movement AUM Shinrikyo released the highly toxic nerve gas sarin in the subway system of Tokyo. 13 people were killed and around 5500 injured (Pletcher, 2012).

2.1.2. Definition

Terrorism in today's understanding has many different definitions but they all have a few general aspects in common. Jenkins (2004) describes terrorism as a way to use violence to create fear in the general population, not only in the people involved but also in a bigger scale. This is done by generating a wide range media coverage. In order for the attacks to get a wide media attention terrorists conduct very violent and dramatic actions. The background of terrorism is mostly religious, ideological or political. In the new terrorism, as mentioned before, terrorism are acts that target random victims and that the intention is to create an overwhelming sense of fear (Jenkins J. P., 2004; Zalman, 2018). According to the Section I of the United Kingdom Terrorism Act 2000 all actions where *"the use of threat is designed to influence the government or to intimidate the public or a section of the public"* and as already mentioned, actions of religious, political and ideological cause are defined as terrorism. This is not only in regards to violence on people but also on damage of property, risks on the health or safety of the public as well as interference on the electronic system (The Terrorism Act 2000, c. 11).

The definition used in this thesis to separate terrorism from other crimes is defined by the National Consortium for the Study of Terrorism and Responses to Terrorism (START) in context with the Global Terrorism Database (GTD), which is explained more thoroughly in Chapter 4 of this thesis. The definition is as follows:

Terrorism is *"the threatened or actual use of illegal force and violence by a non-state actor to attain a political, economic, religious, or social goal through fear, coercion, or intimidation*." (START, 2018, p. 10)

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2.2. Warfare shaping cities

Glaser and Sharpio (2001) discuss how cities have historically been impacted by warfare. These impacts are divided into three effects:

- Safe Harbour Effect
- Target Effect
- Transportation Effect

In the past cities grew firstly because of the safety it brought. First it is believed people had to defend themselves from natural disasters, this changed over time to defend cities from other people. It was much easier to defend a small area with a high concentration of people, than far out scattered farmers. Therefore the primary purpose of cities was to give shelter and safety to the people. (Koskela, 2009). Glaeser and Sharpio (2001) name this the Safe Harbour Effect. It is described that one reason for people to move into cities was that it was safer to live close to other people than in the countryside, which made cities grow and develop over time. According to Pirenne (1936) in Western Europe during the 10th century castles of feudal princes were used to serve shelter to the surrounding people. Over time these castles grew and evolved into self-sustaining cities. The reason why cities were seen as safe harbours is mainly because of the advantage an accumulation of people brings. In the past the size of the army played a huge role in whether they would be able to defend themselves or not. Another important role in regards to cities being safe harbours, were city walls. (Glaeser & Sharpio, 2001) These were an especially important part of the defence strategy in times of warfare on the ground, where the enemy was kept outside the city boarders with walls surrounding the city or town and other physical obstacles (Little, 2004). Glaeser and Sharpio (2001) write that because of the accumulation of people and the physical protection, many cities have existed and still exist today. They name Constantinople as an example, which existed for centuries and kept its residents safe due to its renowned city wall.

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The Safe Harbour Effect may not be accurate in the world today, as the effect describes that the main reason for people to move into cities was that it was safer to live close to other people than in the countryside, but against modern warfare cities are not safe harbours anymore. On the contrary, due to the high concentration of people in space, cities are more vulnerable to attacks than the rural area. In the modern world walls or other physical obstacles cannot protect cities the way they used to anymore. Glaeser and Sharpio (2001) call this the Target Effect. It contradicts the Safe Harbour Effect by saying that cities are more likely to be targets of war and terrorism because of its density. The higher the density the more attractive the site, because of the higher number of casualties or the more severe the damage of buildings, infrastructure with a smaller effort. During World War I for example, German cities' population shrunk drastically, because the enemies attacked cities to destroy as much as possible with a small effort (Glaeser & Sharpio, 2001). The same happened during World War II, where German city centres were specifically targeted. In about 30 cities more than 70% of the buildings were destroyed and several big cities were destroyed completely (Bode, 2013).

Another factor to consider is that warfare has often targeted the transportation infrastructure, which has had an indirect impact on cities in the past especially on its economy. While, as already mentioned, cities were seen as safe harbours, the journey to and from the city was often dangerous. In the past travelling was unsafe, as travellers and transportation infrastructure were more vulnerable, because of the concentration of people and goods without the safety of city walls and other urban defence measures. When for example the rail network connecting cities with rural areas or other cities was destroyed, this had serious impacts on the economic situation of cities, as rebuilding transportation infrastructure was expensive and time consuming and there was, of course the loss of a mode of transportation of goods and people (Glaeser & Sharpio, 2001).

Lastly, a point to consider, when talking about warfare shaping cities, is the physical destruction of buildings. Here the important aspect to consider is that when during warfare buildings were destroyed, if they were rebuilt or not. If the demand for the destroyed space was large enough and therefore was rebuilt, the physical destruction had no significant impact on the city. However if the demand for

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rebuilding was low, this changed the space permanently and therefore had an impact on the area. (Glaeser & Sharpio, 2001)

All in all it can be said that cities have been demolished and rebuilt, the population has grown and then again shrunk over time. In this regard warfare has to some extent shaped cities and made them what they are today.

2.3. Impact of Terrorism on Urban Areas

Now that the connection of warfare and cities throughout history has been discussed, it is important to look at the impact of terrorism on urban areas in the 21st century.

Terrorism has the goal to make as big of an impact as possible with their attack. This can be compared with the intentions from the past where, as already mentioned, warfare targeted cities because of the high concentration of people (Glaeser & Sharpio, 2001). Now a days though, the tools, strategies and targets of terrorism in urban areas have changed and therefore the impact is different as well.

When thinking of the impacts of terror attacks in urban areas, Beall argues as follows. The physical space of cities is planned by planners to *"keep people in their place"* (Beall, 2007, p. 4) but more importantly the residents and their interactions within this space change its originally intended use. Therefore when a terror attack occurs, it affects on two levels. Firstly on the physical level, when the built environment gets destroyed or damaged. Either the space is built up again or as in case of the 9/11 attack the space becomes a memorial. An attack does not only affect the physical space but also secondly the social factor and as Beall writes, *"terrorist acts not only attack the built environment and the urban political economy but cities as social institutions and the very fact of urbanism itself."* (Beall, 2007, p. 4).

In contrast to the past where cities were targeted specifically, terrorism in the 21st century does not have to have the specific site or city of attack as the target. It can be an attack on the government or have an international motive. This is often the case when a terror attack occurs in a developing country

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(Beall, 2007). At this point it has to be mentioned that the attacks that are shown in the western media have international individuals or renowned names as casualties. Beall (2007) uses as examples the bombing of tourist centres in Bali and Sharm el Sheikh and writes that the towns nor even the countries were the targets. It is more likely that these targets were chosen because they either had due to a high density of people promised a high impact or due to the targets being tourists which lead to high visibility internationally. Nowadays, as Coaffee (2009) writes the fear, that similar attacks will also happen more often in the Western World, has become reality. Now it is not a question if a city is targeted, but where, when and how (Coaffee, 2009).

Therefore terrorism has steered away from attacking targets of interest, as it was in the past, to maximising the destruction and impacting as many layers as possible. Even "just" city life can be enough to catch terrorists' interest to attack a site. For example, when the Israelis attack Palestinian towns, the political goal is to destroy the urban structures (Beall, 2007).

2.4. Urban Open Spaces as Targets of Terrorism

Terrorists of the 21st century choose to attack soft targets, which are in this context usually crowded places with none to low security standards. It is no longer only hard targets for example government buildings or political centres which were easier to firstly recognize as targets and secondly to protect with advanced technological measures. As the spaces that are being targeted by terrorists have not only changed but multiplied, it is not possible to identify targets and secure them in that extent as in the past. Now a days many terror attacks have occurred in urban open spaces, which are easily accessible by the public (Coaffee, Moore, Fletcher, & Bosher, 2008). Especially crowded places have become targets of terror attacks. These include open spaces which are crowded most of the time, such as shopping streets or large intersections as well as open spaces which are crowded only at certain times of the year, for example Christmas markets (Australia New Zeeland Counter Terrorism Commitee, 2017).

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As a remembered act of terrorism was the attack in Mumbai 2008 which is seen as the turning point of targets of attacks from hard targets to soft targets. Although the attacks occurred at a railway station, a cafe, two hospitals and a theatre and not in urban open spaces, this event is important to mention in regards of the shift in terror targets. The Mumbai attacks occurred on 26th to 28th of November 2008 where ten Pakistani gunmen attacked civilians in several different sites (D'Souza, 2019). In this case the terrorists did not use highly complicated tactics like two years before, in the 2006 Mumbai bombing. The attack was executed with easily accessible firearms and simple bombs (Jenkins B. M., 2009).

Jenkins (2009) believes that terrorists will continue to focus on attacking soft targets as these are easily accessible and offer a high number of casualties. By targeting a big crowd of civilians, terrorists also ensure to get international attention through the media. Large crowds have lots of witnesses, which leads to a high number of social media updates as well (Australia New Zeeland Counter Terrorism Commitee, 2017). This was the case after the Mumbai attack where the media was almost solely reporting on the attack for three days. Lastly by attacking everyday spaces, terrorism creates fear, especially for people who often visit similar places to those that where attacks have occurred (Australia New Zeeland Counter Terrorism Commitee, 2017). This believed to encourage similar attacks in the future (Jenkins B. M., 2009).

Since 2009 there has been a change in regards to the weapons terrorists use in attacking urban open spaces. Ladan-Baki and Enwere (2017) write about vehicle ramming attacks, which have become a popular method for terrorists, where a vehicle is driven into a crowded open space with the intent to kill as many innocent people as possible. In the EU these kind of attacks have been reported in cities such as Paris, Nice, Barcelona, London, Stockholm, Berlin and many more. Several factors to why vehicle ramming have become a more popular choice of attack for terrorists especially in the EU are being discussed (Takacs, 2017).

First of all, vehicle ramming attacks are deadly and have almost always grave consequences (Veilleux-Lepage, 2017). For example in the 2016 Nice attack 86 people were killed and 434 injured, when a truck drove through a crowd of people, who were celebrating bastille day (START, 2017).

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Secondly, the person carrying out the attack does not have to have any special know-how. The only required skill is to know how to drive a car and the knowledge on how to get a vehicle. (Takacs, 2017)

Another factor is, that the attack itself can be carried out by one single person and there is no need for a network or team behind the attack, although often a terrorist group claims responsibility. This makes it almost impossible for authorities to be alerted, thus these attacks are very hard to prevent, because of the simplicity and spontaneity. (Takacs, 2017)

As the weapon is the vehicle itself, it is affordable and accessible and anyone can rent, borrow or even steal a vehicle easily. Although a vehicle is often the main weapon, this attack type allows for follow-up attacks with for example explosives, knives or guns (Takacs, 2017). In the vehicle ramming attack on the London Bridge in 2017 for example, after the vehicle had crashed, the attackers started stabbing innocent people who tried to help, killing 8 people and injuring 48 (Jackson, 2019).

In Israel vehicles are the third most popular type of attack after stabbing and shooting (Israel Ministry of Foreign Affairs, 2017). Due to this, Takacs (2017) from the Slovak Security Policy Institute writes that the EU should take advice from Israel's experience on this topic. However Coaffee and O'Hare (2008) argue that the high frequency of terror attacks in Israel have led to highly visible and brutal terrorism counter measures, which significantly impacted the everyday use of places. In 2002 for instance, the Israeli Defence Force began to build a wall to protect Israeli areas from Palestinian attacks, which was eight meters high and consisted of *"concrete slabs, electronic fences, barbed wire, radar, cameras, deep trenches, observation posts and patrol roads."* (Weizman, 2007)

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3. CHAPTER – Security Planning and Terror Resilience

This thesis will continue to understand what can be done to prevent terror attacks in urban open spaces concentrating on design elements that can be integrated in transportation planning.

First of all the connection of security and planning in general is discussed. Which leads to explaining the CPTED principle, which has its origins in 1971, when the idea of using design elements in open spaces as crime prevention measures was firstly introduced. The next paragraph is about the impacts of counter terrorism measures and the visibility and invisibility of these. Many scholars argue that visible counter measures have negative effects on people and their everyday lives and that these measures promote the vulnerability of the site and create fear amongst people.

Furthermore terror resilience of specific sites is being discussed. A general definition of resilience is given before setting the focus on preventive planning. Preventive planning against terrorism can reduce the damage of an attack as well as act as a mitigating factor (Office for Security and Counter-Terrorism, 2009) and is therefore an important aspect of resilience. The three layers of defence strategy by the Federal Management Agency is explored and lastly the different physical measures used as traffic management and calming are listed.

3.1. Connection of Security and Planning

As already stated in the previous chapter that soft targets and spaces of everyday use are being more common as terror attack sites, these should be taken into account when thinking of security which should be integrated in traditional urban and transportation planning processes (Burke, 2012). The UK has a long lasting history of terrorism due to the threat from the Irish Republican Army and because of this they have recognized that new urban defence strategies are necessary as new terrorist tactics have surfaced (Coaffee & O'Hare, 2008).

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Although many scholars see the 9/11 attack as the beginning for counter terrorism measures, planners already had a role to play before the terrorist attack on the World Trade Centres in 2001. The US was targeted by terrorists in 1993, when a bomb exploded in the parking garage of the World Trade Centre, killing six and injuring over 1000 people. 1995 a federal building in Oklahoma City was destroyed, 168 people were killed and over 800 injured by a truck bomb. These and other attacks on US civilians abroad resulted in the attempt to bomb-proof federal buildings and commercial districts. At the same time the UK, especially London was also targeted by terrorists and the reaction was to prevent further attacks by installing rough defensive barricades (Coaffee & O'Hare, 2008).

After 9/11 the safety of buildings was prioritized over considerations of social, economic, aesthetic or transportation topics. In Washington DC jersey barriers and chain link fences were installed without any coordination between stakeholders. These adjustments were not seen in a positive manner by the locals nor the visitors (Coaffee & O'Hare, 2008). Such public places with jersey barriers and fences, were seen less welcoming and do not match the idea of a successfully planned public space (Németh, 2010).

Nowadays security planning has become a part of the traditional planning process in some cities. In contrast to the past tactics of using visible and robust measures, today planners work together with other stakeholders such as architects, urban designers, landscape architects, structural engineers, as well as the police, emergency planners, public space managers and insurers to create public spaces which are safe but also aesthetically pleasing (Coaffee & O'Hare, 2008). With a well-designed planning process public spaces can be improved socially and physically and prevent from terrorism and other crimes to destroy the space (Hollander & Whitfield, 2005). The U.S. Homeland for example has been reinforcing surveillance systems for several years. In Washington DC one of the most important objectives of urban planning is the prevention of possible terrorist attacks but still considering the urban and landscape design strategies and thus securitizing every day spaces (Graham, 2006). For example the surrounding greenery around the Washington Monument is created in a way that it is impossible for vehicles to get close due to the changes of heights and invisible barriers called a ha-ha wall but without looking like a counter terrorism measure (FEMA 430, 2007).

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The difficulty for planners is to integrate strategies from security planning and creating safe open spaces but not interfering with the everyday lives of users or creating fear amongst them (Bartolo, 2012).

In addition to security planning preventing future terror attacks, which arguably is only a small fraction of criminal activities in a city, it can have the effect of reducing crime in general. (Coaffee, Moore, Fletcher, & Bosher, 2008)

3.1.1. Crime Prevention through Environmental Design

The integration of the security aspect into urban planning is not new. The oldest classic of designing/ planning safe surroundings is seen by academics as the work *The Death and Life of Great American Cities (1961)* by Jane Jacobs. Her idea was that by creating more public spaces even in residential districts, this would get people to spend more time in the streets, which would create an "unofficial social control" and increase safety. When life is brought to the streets a sense of community is created. This led to the fact that people living in these neighbourhoods would get to know each other and therefore recognize security threats more easily. Jacobs argues that through physical design of space the feeling of cohesion between the users of the space can be created and this makes areas safer. In her book she criticised the at that time modern planning practices and architecture, because the old neighbourhoods, where the life was still happening on the streets were being destroyed and new high rise buildings and anonymous neighbourhoods were being built. (Jacobs, 1961)

This led to other urban planners to research the topic on how the physical environment could be planned so that it leads to decreased criminal actions. (Anderson, 2013)

In 1971 the criminologist C. Ray Jeffery developed "Crime Prevention through Environmental Design" (CPTED). His theory was, that with designing space in a certain way, criminal activity could be discouraged and social activities maintained. This was inspired by Jacobs work and is the base for today's strategy of CPTED. (FEMA 430, 2007)

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Another known work is *Defensible Space (1972)* by Oscar Newman. Newman, an urban planner and architect focused on residential areas in New York and St. Louis. He believed that residential neighbourhoods could prevent crimes by being in control of their environment. Newman created four features in this context:

Territoriality is based on zoning space into private, semi-private and public space, where the private and semi-private space is clearly separated from the public space. This clear hierarchy of space increases the willingness to defend the resident's space.

Natural surveillance is created through physical design of the space in a way which maximizes visibility of the activities in residential areas.

Image maintenance is important as a neat area is less likely to have less opportunities for criminals.

Milieu, physical features so that the neighbourhood is merged with an area that is considered safe. Such as commercial neighbourhoods. (Newman, 1972)

Koskela (2009) compares Jacobs and Newmans approach and comes to a conclusion that both Jacobs and Newman have a similar idea on the fact that natural surveillance plays an important role. However for Newman the architectural, physical aspect of crime prevention is more important where Jacobs emphasises on the social aspect. Both had the idea of making spaces more individual and this strategy has been taken into account in latter works as well. Newmans as well as Jacobs strategies also had its negative sides. Koskela sees the territorial approach negatively. The strong feeling of belonging to a community also enforces the feeling of exclusion or "not belonging". (Koskela, 2009) Many other scholars criticised these methods as well and came to conclusions of the strategy only working on short term, if at all. (Anderson, 2013)

However many scholars took Newmans strategy and adapted this. For example another strategy on crime prevention is situational crime prevention. The most significant advocate of this strategy was Ronald Clarke. He argued that by reducing the amount of opportunities for criminal activities through environmental design this would decrease the number of crimes in an area. (Clarke, 1997)

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Since these different strategies on crime prevention by Jacobs, Jeffrey, Newman and Clarke, the concept has developed, new measures and technologies, such as Closed Circuit Television (CCTV) have been included. Today's CPTED is a design principle which is defined as follows:

"Crime Prevention Through Environmental Design (CPTED) is defined as a multi-disciplinary approach for reducing crime through urban and environmental design and the management and use of built environments. CPTED strategies aim to reduce victimization, deter offender decisions that precede criminal acts, and build a sense of community among inhabitants so they can gain territorial control of areas and reduce opportunities for crime and fear of crime." (International CPTED Assosiation, n.d.)

The base for the CPTED principle consists of three strategies: natural access controls, natural surveillance and territorial reinforcement.

Natural access controls include physical design elements of streets, sidewalks and building entrances to minimize opportunities for criminals to commit crimes by creating a perception of a high risk in selecting the target or victim.

The natural surveillance strategy focuses on the perception that people are under observation. This is achieved with a thought out placement and design of windows, lighting and landscaping elements, which encourage social interactions in a way that maximizes visibility so intruders are easily observed by others.

Lastly, territorial reinforcement means, that with the help of environmental design the public and private spaces are recognizable. Such elements can be low walls, or even as simple as pavement patterns, which create a sense of ownership and therefore urge criminals to stay away (FEMA 430, 2007).

These strategies can be realized with natural, mechanical or organizational solutions. Natural solutions are physical and spatial elements and design features, which can delay or stop intruders through different kinds of barriers. Natural solutions can also enhance observation by other users of the space as well as reduce blind spots. Lastly these can create borders between public and private spaces.

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Mechanical solutions are technological systems, such as CCTV, locks, security screens, key control systems, etc., that can be used for example to detect intruders, as an addition to the observation of users or at access controls. Organizational solutions are individuals or groups of people that are used in surveillance or access controls. These include professionals such as hotel concierges, security guards or police officers as well as private citizens for example neighbourhood watch groups and other individuals (FEMA 430, 2007).

3.1.2. Impacts of Security Planning

The topic on the impacts of security planning has been discussed in literature on different occasions. Especially the fact that visibility and invisibility of security planning is a crucial factor in the context of impacts. Coaffee & Rogers (2008) argue and Burke (2012) confirms this in his research that visible security planning, especially prevention measures against terrorism can result in more fear and dissatisfaction in the society. It can be argued that fear is created because of measures taken to make cities safer. Ellin (1997) calls the planning of such defensive measures without considering the psychological aspect "Architecture of Fear". This is because the impact of counter-terrorism not only has a physical effect on the built environment, but also a psychological impact on people (Briggs, 2005). So instead of stating that form follows function, Briggs (2005) argues that in the case of counter terrorism measures, form follows fear.

Briggs (2005) speaks about three ways how counter terrorism measures can impact the built environment:

- *Militarization of urban space*
- *The end of urban iconography*
- *Decentralisation.* (Briggs, 2005, p. 3)

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For militarization of urban space a good example is the ring of steel in the city of Belfast, in Northern Ireland, where the access to the city centre was cut down first with concrete blockers and barbed wire, which were later exchanged with high metal gates. This had an enormous impact on how people used the space and on how the city looked like. (Briggs, 2005)

Another ring of steel was made in London. This was an urban planning project, which started in 1993 after the Irish Republican Army had announced the capitalist financial centre in London would be a perfect target for bombing (Briggs, 2005). The ring of steel was made in the inner city of London, where the entrances to the city were reduced, CCTV cameras were put up, the road network was optimized for police use and planned in a way it discouraged people from lingering or doing everyday activities in the streets. Scholars have often used the term "fortress urbanism" in this context (Williams, 2014). Grosskopf (2006) argues, that the post 9/11 militarization has had a negative effect on the public, as it reinforces the perception of vulnerability and gives the feeling of an acute threat.

Briggs (2005) argues that the end urban iconography is another impact on the built environment. Marcuse (2002) stated shortly after the 9/11 attacks that planners and architects will concentrate on more uniformity than on iconographic, "signature fashion" high rises. But actually already in 2005, when Briggs wrote her paper, there were almost no evidence on this happening, since then there were a number of buildings being planned or built that prove the opposite. One of those examples being the Shanghai World Financial Centre (Briggs, 2005). Woudhuysen and Abley (2004) even argue that creative architecture and a well-designed urban landscape can be a tool on how to face terrorism, by winning the psychological battle and facing the fears of society. It is possible to create well-designed urban landscapes, which are at the same time less vulnerable to terrorism.

Decentralisation or urban sprawl was a policy which many planners started to advocate for after the bombings in Dresden and Tokyo, when many realized what devastating consequences a single explosion can have. The movement was developed by Tracey B. Augur, a planner from the United States with the goal to mitigate or minimize the impact of such an attack (Rhodes, 1986). Augur's idea was to create satellite towns with certain parameters, so that a single attack would not destroy a whole city and would therefore make a city more resilient towards terrorism (Bartolo, 2012).

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3.2. Site Specific Terror Resilience

Resilience of cities or an urban area in general is seen as the result of how the space reacts on challenges and changes (Coaffee, 2013). The term resilience is defined by many scholars and institutions in a similar manner. The Federal Highway Administration defines resilience as *"...the ability of systems to anticipate, prepare for and adapt to changing conditions and withstand, respond to and recover rapidly from disruptions."* (FHWA, 2014) Resilience therefore asks the question on how fast the environment can firstly prepare, secondly resist and thirdly recover from a crisis. These can be a natural hazard for example an earthquake/flooding or a large terror attack (Coaffee & Bosher, 2008). It is also important to see resilience as a multi-layered topic which is the outcome of different instruments and strategies of different disciplines where many different stakeholders, such as governmental agencies, planners, architects, designers, as well as clients work together. (Bosher, Carillo, Dainty, Glass, & Price, 2007; Coaffee, 2013)

Preventive planning against terrorism can act as a mitigating factor (Office for Security and Counter-Terrorism, 2009) and can reduce the likelihood of an attack, because if a site is terror resilient it will be irrelevant as a target for terrorists as it will be too much of an effort to plan an attack there. As in the previous chapter discussed, terrorists are shifting to targets, which have a low planning effort while doing as much damage as possible. This is at the same time a challenge for counter terrorism experts, as it is harder to recognize possible targets and then to make these terror resilient. However it is still important to know what makes a site vulnerable, so these can be factored into the planning.

If an attack occurs on a site with our without prevention measures in an urban open space, resilient planning can reduce casualties and damage as well as help the site to recover in the aftermath After an attack resilience can be divided into short-, mid- or long-term resilience. Short-term resilience refers to the immediate response to a terror attack, such as evacuation of the site, or first aid treatment on site. Mid-term resilience is seen as the first stage of recovery by finding provisional solutions to restoring the functions destroyed in the attack. Long-term resilience is the redevelopment of the attack site as

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well as the installation of memorials, like was done after the 9/11 attack (Vale & Campanella, 2005). Thus, in the aftermath a resilient design should achieve a faster and easier recovery from the damage of the terror attack.

3.2.1. Preventive Planning

The first step in preventive planning should be to recognize which sites are likely to be targeted, by looking on what terrorists want to achieve and through this recognizing vulnerabilities. For when the sites with need for more security are recognized, there are different stakeholders, where strategies on how to make a space more terror resilient have been made (FEMA 430, 2007; Office for Security and Counter-Terrorism, 2009; Home Office, 2012). For example the Federal Emergency Management Agency (FEMA) has come up with a strategy on how specific urban open spaces can be made resilient against terror attacks. The guide was made to help planners to integrate terror resilient planning into their designs in North America.

3.2.1.1. Site Vulnerabilities

Petriashvili (2017) has done research on this topic by looking at different case studies to recognize factors that influence how terrorists choose their site of attack. This is divided into three topics: target selection, site organization and street network organization. These factors are summarized in the following:

Target selection

Sites that are according to the research most likely to be targeted by terrorists and are therefore seen as vulnerable spaces are governmental buildings, religious objects, tourist attraction spots, entertainment and shopping venues as well as transportation hubs.

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Site organization

Site organisation is about the factors that makes a site itself vulnerable. Multiple entrances for vehicles and pedestrians increases the vulnerability, especially when talking about accessibility of vehicles to important buildings. Another factor, which has been mentioned in previous chapters is, whether the site is well visited. Crowds of people make a site vulnerable because of higher chance of more casualties. Governmental districts or cultural districts, where same function buildings are situated close together, is seen as a vulnerability of the site.

Street network organization

A terror attack is more likely to happen at a site with direct access or even closeness to the main road. The distance to the city centre plays a role as the closer the site is to the city centre and the easier the accessibility to the city centre is, the more it is considered important and therefore more vulnerable towards attacks. (Petriashvili, 2017)

3.2.1.2. Three Layers of Defence Strategy

Originally the three layers of defence strategy was used in security engineering since ancient times to protect important buildings for example castles. FEMA 430 (2007) adapted the strategy to defend buildings from vehicular attacks but it can as well be transferred to protecting open spaces. This strategy is meant as a guide for planners to develop site specific security requirements in the United States.

The Three Layers of Defence strategy examines the area on three different layers. The first layer of defence is the surrounding area, neighbourhood of the asset or building. The second layer is the space between perimeter defence, for example property line and/ or fence and the asset. The third layer of defence is the building itself (Figure 2). It can be said that for urban planners the first two layers are more relevant and this is where planners can contribute.

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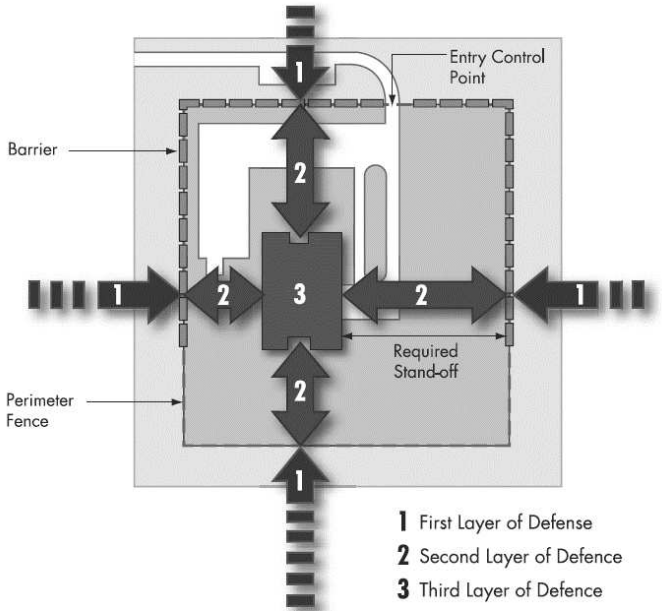

Figure 2: Three Layers of Defence Strategy. Source: (FEMA 430, 2007)

First Layer of Defence

The first layer of defence is the surrounding area and its community of the asset in a big scale. A thorough analysis of the neighbourhood is essential for the planning of the defence measures between the first and second layer. It is suggested that with careful studying of the surrounding, possible threats can be identified. This should include overlooking buildings and tall structures as well as underground tunnels and utilities. Topics such as building stock, essential facilities, hazardous materials, transportation systems and demographics should be taken into account as well (FEMA 430, 2007).

Second Layer of Defence

The second layer of defence is the space between the defended perimeter and the asset, where the most important task is to keep terrorists away from the building, where they could do the most amount of damage. While the first layer is more about assessing threats and analysing the surrounding, the second layer is about installing defence systems, such as fences or walls as well as allowing a certain standoff distance to the building. Standoff distance is the distance between the defence perimeter and the building (FEMA 430, 2007). Several factors make this the most important aspect when developing secure sites. Firstly, the bigger the standoff distance, the less damage for example a detonating bomb

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in the first layer of distance can cause to the building. Secondly, by increasing the standoff distance, planners can achieve, that intruders are detected more easily, as it takes longer to cross a bigger distance and thus would be more likely to catch an intruder trying to breach the asset. Thirdly, by providing lots of space around the asset, this gives planners and security professionals a chance to improve target hardening (FEMA 430, 2007). This is of course more challenging when talking about assets in the city. Usually there is not enough space to reach a sufficient standoff distance, which is a challenge planners have to deal with.

Third Layer of Defence

The final layer of the strategy is seen as the protection of the asset itself. This is done by reinforcing the building and its structure. The third layer of defence is in cases that are in urban areas very important, especially when there is not enough space for the second layer of defence.

3.2.1.3. Physical Measures for Traffic Management and Calming

FEMA (2007) advises in *"Site and Urban Design for Security - Guidance Against Potential Terrorists Attacks"* planners on different physical elements which can act as counter terrorism by preventing from unwanted vehicles from entering a site with for example barriers. These include passive barriers, active barriers and new innovative barrier systems, both temporary and fixed measures. Additionally measures that reduce the speed of approaching vehicles can play a role in decreasing damage (Home Office, 2012). In the following are some of the basic elements described that are sutiable as prevention measures in open spaces, described by FEMA (2007), GCDN (2018) and NACTO (2013).

Fistly, temporary measures, which can either used temporarily until fixed measures are planned and executed or for events where barriers are only needed for a certain time.

Jersey Barriers

Jersey barriers were originally invented to prevent from vehicles crossing over to oncoming traffic, especially on highways. After 9/11 these started to be used as vehicle barriers against terror attacks.

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They are, although due to their size and weight quiet inflexible, relatively easy to place and are usually used in a provisional manner. (FEMA 430, 2007)

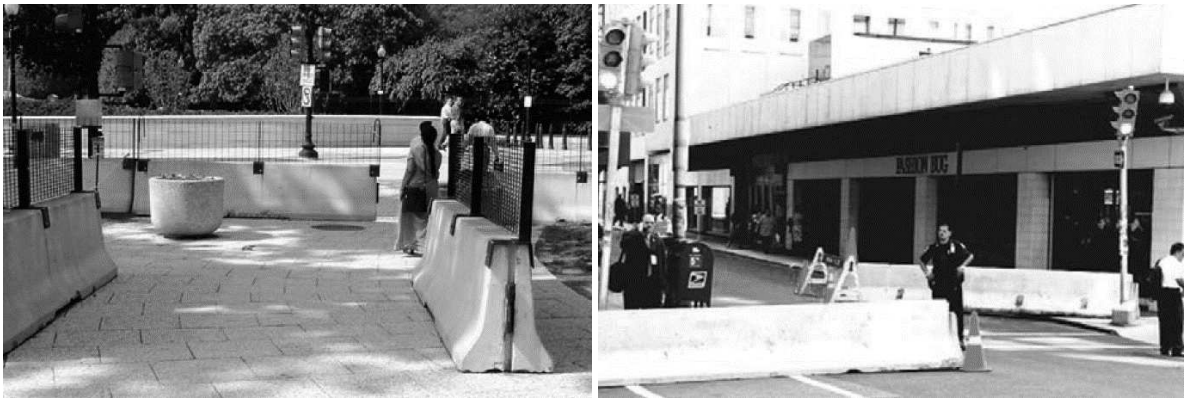

Figure 3: Jersey Barriers at the White House and on a Street in Washington D.C. Source: (FEMA 430, 2007)

Modular Vehicle Barrier (MVB) and Talon Steel- Spiked Dragnets

The MVB is a lightweight and easily movable vehicle barrier that can be used as a temporary road block designed by Mifram Security. The Talon Steel –Spiked Dragnets are road mats that have the same objective, which is to stop vehicles from entering a site or space. (GCDN, 2018). However both are very visible measures and should be used only temporary, for example at events or demonstrations in open spaces.

Figure 4: MVB and Steel-Spiked Dragnet. Source: left (Mifram Security, n.d.), right (Christodoulou, 2017)

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Bollards

Fixed as well as retractable bollards are used as vehicle barriers to prevent vehicles from driving in areas where they do not belong, but still letting pedestrians and cyclists through without major obstruction. However especially fixed bollards are a very visible counter mesure and it is suggested that the design of these, is done for every project individually so the bollards can be adjusted designwise to the streetscape to achieve a minimal visual impact. Figure 5 shows three different designs of bollards, however there are many more. FEMA also suggests not using only bollards, but combining these with more invisible anti-ramming barriers. (FEMA 430, 2007) Bollards are the most common physical measure and can bee seen in many cities all over the world

Figure 5: Bollards in different styles. Source (from left to right): (Reliance Foundry, n.d.), (URBACO, 2013), (DELTA Scientific Corp., 2018)

Planters and other heavy objects

As an alternative to regular bollards, well designed planters (Figure 5) as well as other heavy objects, such as art sculptures, decorative rocks, fountanins or trees can be used as vehicle barriers. Visually they are not seen as intrusive as bollards, because they are not associated with counter terrorism measures, more over they can add aesthetic value to the space. However the bigger the elements are, the more they can affect the pedestrian movement. Another aspect to consider, is that planters as well as trees have to maitnanced. (FEMA 430, 2007) Good example for an artwork, which for one serves as a vehicle barrier but also attrackts visitors are the big letters reading ARSENAL in front of the

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football stadium (Figure 7). Additionally, in different cities can be observed how concrete barriers have been made into pieces of art, such as big lego blocks, or made into “boll-art” (Figure 6).

Figure 6: Giove Protective Planter. Source: (Marshalls, n.d.A),
Figure 7: “Boll-Art” in Melbourne. Source (BBC News, 2017)
Figure 8: ARSENAL letters as vehicle barrier in front of the Arsenal Emirates Stadium. Source: (Havis, 2019),

Water Obstacles

Water is one of the oldest forms of security design. Not suitable for all cases that are in an urban area, however if the space is given, artificial lakes, ponds, rivers or fountains can be designed to keep people and vehicles at a distance. So this can be an effective and aestheatically pleasing choise as a defence barrier. (FEMA 430, 2007)

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Reinforced Street Furniture

Common street furniture, when reinforced, can serve as anti-ramming barriers as well. These include outdoor seating, lamp standards, bus shelters, etc.. Changing regular bollads with reinforced street furniture can enhance the streetscape visually and be used by the public as well. (FEMA 430, 2007; GCDN, 2018)

Figure 9: Protective Seats as reinforced street furniture. Source: (Marshalls, n.d.B)

Tiger Trap

Tiger traps are collapsible sidewalks, which can withstand pedestrians and bicycles but will collapse from the weight of a vehicle. This will result in the vehicle getting "stuck". This is a measure, which can stop a vehicle from entering an imortant area, while not beeing visible to the public. (FEMA 430, 2007)

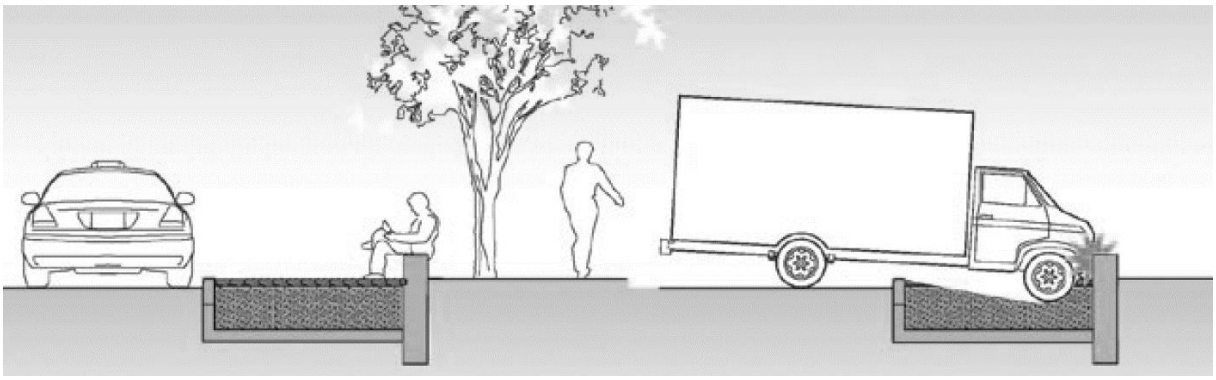

Figure 10: Tiger Trap. Source: (FEMA 430, 2007)

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Turntable Vehicle Barrier

The turntable vehicle barrier has the same function as retractable bollards, without deep foundation. It consists of a turntable on which there are fixed bollards. If a vehicle needs to pass, the turntable simply turns into a different position, allowing for the vehicle to drive over it. (FEMA 430, 2007)

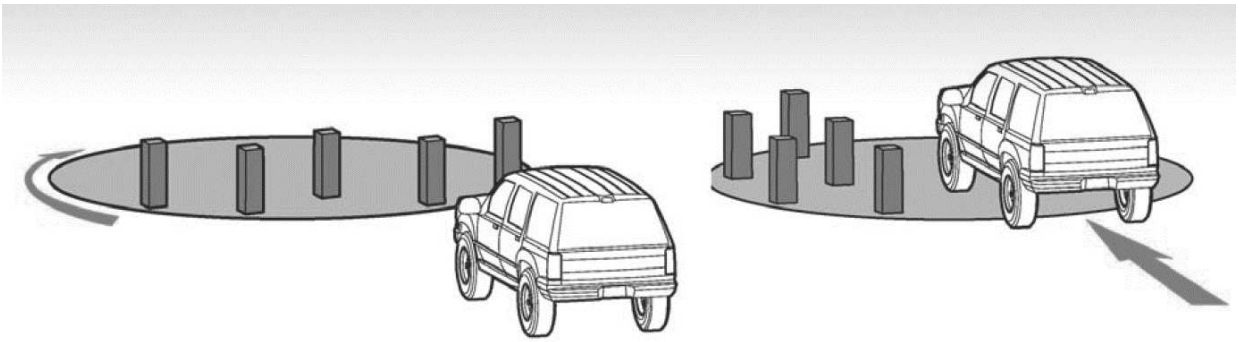

Figure 11: Turntable Vehicle Barrier. Source: (FEMA 430, 2007)

NOGO Barrier

The NOGO Barrier is a special project combining art, street furniture and vehicle barrier. It was designed for the Stock Exchange District in New York City. It is shown as a good example of security design, which while keeping vehicles at distance, is still being usable by the public (for sitting down) and being visually an eyecatcher. Although keeping vehicles at distance, it has a rotating mechanism which allows vehicles to pass when needed (Rogers Architects, n.d.), a previously mentioned Turntable Vehicle Barrier.

Figure 12: NOGO Barriers in New Yorkt. Source: (Rogers Architects, n.d.)

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Chicanes, Speed Humps, Speed Tables

These measures serve as traffic calmers by slowing down the vehicle with either sharp turns (chicanes) or with vertical humps (speed hump, speed table) (NACTO, 2013). These are not traditional measures against terrorism but can be a non-intrusive measure to slow down vehicles and therefore increase safety.

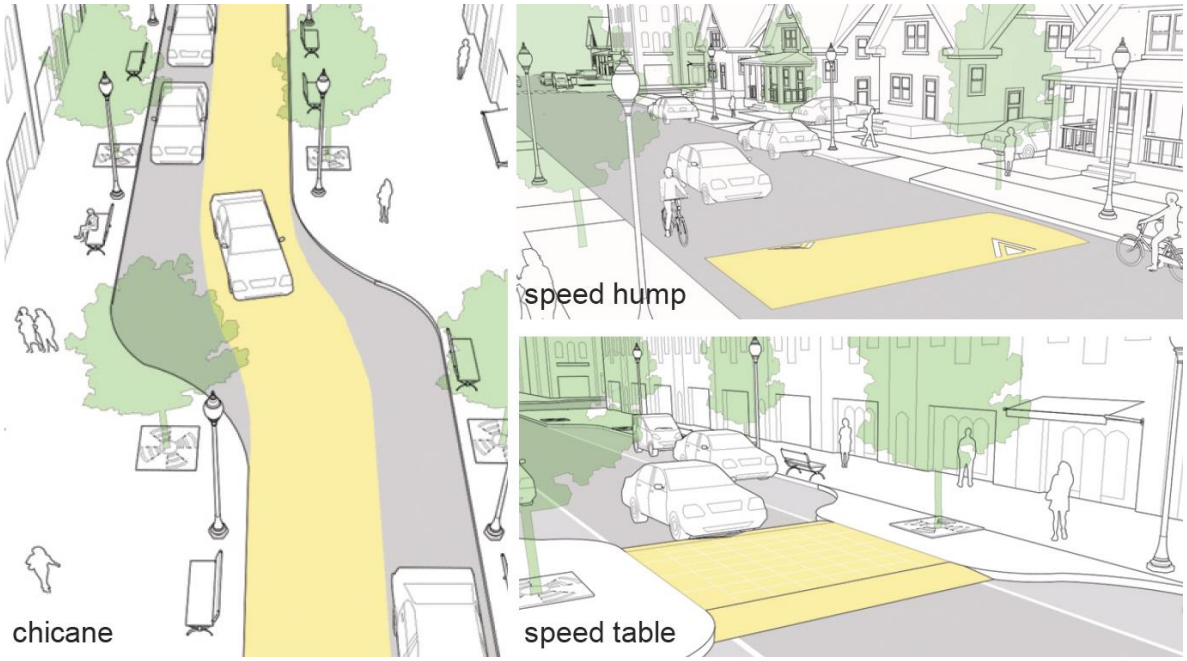

Figure 13: Chicane, speed hump, speed table for traffic calming. Source: (NACTO, 2013)

In table 2 the measures are being rated on the factors of long or short term, purpose, security and obtrusiveness. For the factor short-/mid-/long-term solution the measure can be one of those three. Short and midterm solutions are suitable as temporary measures, either because they are needed for an event which takes place for a limited time, or because they are put in place before a more fixed solution is found. The long-term solutions are measures that are put up for an unlimited time and are not that easy to remove. For the factor purpose it can either be single purpose or multipurpose. Single purpose means these are measures that only have the purpose of being a barrier or calming traffic. The factors security and obtrusiveness are rated with a point system, going from high (●●●) to low (○○○). This was done based on the given descriptions above and an evaluation of the author. The factor how much the measures cost was not considered in this comparison.

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measure	short-/mid-/long-term solution	purpose	security	obtrusiveness
Jersey barrier	short-/mid-term temp. solution	single purpose	●●●	●●●
Modular Vehicle Barrier	short-term temp. solution	single purpose	●●●	●●●
Talon Steel- Spiked Dragnets	short-term temp. solution	single purpose	●●○	●●●
Bollards	long-term solution	single purpose	●●○	●●○
Planters	long-term solution	multi purpose	●●○	●○○
Artwork	long-term solution	multi purpose	●●○	●○○
Water Obstacles	long-term solution	multi purpose	●●○	●○○
Reinforced Street Furniture	long-term solution	multi purpose	●●○	○○○
Tiger Trap	long-term solution	single purpose	●●●	○○○
Turntable Vehicle Barrier	long-term solution	single purpose	●●○	●●○
NOGO Barrier	long-term solution	multi purpose	●●○	●○○
Chicane	long-term solution	single purpose	●○○	○○○
Speed Hump/ Speed Table	long-term solution	single purpose	●○○	○○○

Table 2: Comparison physical terror prevention measures

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It can be observed that the first three measures, which are temporary solutions have only a single purpose and a high security marking, however these are at the same time very obtrusive. Bollards as well as the turntable vehicle barrier are rated as long term single purpose solutions with 2 out of three points for security as well as obtrusiveness. Planters, artwork, water obstacles and reinforced street furniture are all marked as long term solutions with multi-purpose. Planters, artwork as well as water obstacles, while being a barrier can be a design element in the streetscape and therefore have another purpose than just as a preventive security measure. As these can be seen as design-elements they can be very little obtrusive. Reinforced street furniture have a at the same time high security rating (2 out of 3) while being non obtrusive as the barrier is integrated into regular street furniture such as benches, bus stops, lanterns for example. The tiger trap is categorized with a high security level as well as completely non obtrusive, as it cannot be seen from the outside. The NOGO-Barrier is a combination of Bollards, turntable vehicle barrier as well as street furniture and art, which makes it a special measure that is a long term multi-purpose solution with relatively high security and low obtrusiveness. Chicanes, speed humps/tables can be categorized as long term single purpose that are non-obtrusive, however as these are traffic calming measures, they have a low security rating.

3.2.1.4. Other Measures

In addition to the physical measures there are other alternative measures that can be used in counter terrorism, such as CCTV, police presence and building structure.

CCTV

CCTV and Surveillance can be an addition to counter terrorism in a way that detecting potential terrorist activity can be achieved. In the aftermath CCTV can help to identify what happened and help in creating a detailed timeline and in some cases even identify the perpetrator. In order for CCTV to be effective, the quality of the image has to be good enough and lighting must be sufficient as well as there is a need for monitoring and the cameras have to be maintenanced. (Office for Security and Counter-Terrorism, 2009) CCTV has very controversial opinions and raises concerns on privacy issues

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especially in public space and can therefore not be included as a measure in some cities and is only suitable as an addition to other measures.

Personnel Security

Personnel security is recommended as an additional aspect in crowded places, as these can observe and recognize suspicious behaviour, of course this is meant in private spaces. In public spaces during special events for example, increased police presence is recommended. (Office for Security and Counter-Terrorism, 2009)

Site Structure

It is recommended that places are designed and planned in a way that firstly routes are well defined in a way that it encourages convenient movement, that there are no conflicts caused by different uses and that the level of activity is appropriate to the site and therefore reduces for example hiding places. (Office of the Deputy Prime Minister, 2004)

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4. CHAPTER – Terrorism Today and its Characteristics

This chapter contains an analysis on terror attacks today. According to the Institute for Economics and Peace it is important to understand the characteristics of terror attacks, because more and more countries invest in counter terrorism (Institute for Economics & Peace, 2018). For this reason, it was an important part of this thesis to look at the current situation and find out the characteristics of terror attacks.

Firstly, the methodology for this chapter is described by introducing the Global Terrorism Database. It is described with what criteria an attack is counted as terrorism. This database is used for the following analysis which was done by using the programme SPSS as well as Microsoft Excel. As terrorism and counter terrorism varies especially in conflict and non-conflict countries and this thesis is narrowed down to European cities after 11.9.2001, the sample size used in this chapter had to be narrowed down. The main part of this chapter consists of the results of this analysis by looking at the cases chronologically as well as spatially to get a sense of the characteristics of the incidents. Additionally the 10 attacks with the most casualties of the sample size are looked at. In the conclusion main findings are listed.

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4.1. Methodology

The analysis was conducted with data from the Global Terrorism Database using SPSS and Microsoft Excel. The results are presented with graphs and maps.

4.1.1. Global Terrorism Database

The Global Terrorism Database (GTD) is a database consisting of terror attacks from 1970 to 2017. It is important to explain the origins of this, the methodology used for obtaining the data and what the criteria were, by which it was decided whether an incident can be classified as a terror attack or not.

The database is maintained by the National Consortium for the Study of Terrorism and Responses to Terrorism (START). As terror attacks from as early as 1970 are listed, there have been different methods and tools on how the data was collected but still trying to keep the methodology as consistent as possible. Since 2012 the methodology has not been changed and has included automated and manual data collection strategies. The automated strategy consists of a filtration of keywords searching over a million media articles published daily worldwide recognizing all articles that describe terror attacks. After this the GTD team manually reviews the articles and verifies the validity of the data and decides if the data meets the inclusion criteria (START, 2018). This means, that an attack is accepted into the GTD if firstly all three of the following attributes are included:

1. *The incident must be intentional – the result of a conscious calculation on the part of a perpetrator.*
2. *The incident must entail some level of violence or immediate threat of violence -including property violence, as well as violence against people.*
3. *The perpetrators of the incidents must be sub-national actors. The database does not include acts of state terrorism.* (START, 2018, p. 10)

As the second step two of the following three inclusion criteria have to be met for the incident to be counted as a terror attack in the GTD:

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***"Criterion 1: The act must be aimed at attaining a political, economic, religious, or social goal**. In terms of economic goals, the exclusive pursuit of profit does not satisfy this criterion. It must involve the pursuit of more profound, systemic economic change.*

***Criterion 2: There must be evidence of an intention to coerce, intimidate, or convey some other message to a larger audience (or audiences) than the immediate victims**. It is the act taken as a totality that is considered, irrespective if every individual involved in carrying out the act was aware of this intention. As long as any of the planners or decision-makers behind the attack intended to coerce, intimidate or publicize, the intentionality criterion is met.*

***Criterion 3: The action must be outside the context of legitimate warfare activities**. That is, the act must be outside the parameters permitted by international humanitarian law (particularly the prohibition against deliberately targeting civilians or non-combatants)."* (START, 2018, p. 10)

Other filtering criteria is the variable "doubt terrorism proper" this is included in the database and coded as

1= "Yes" *There is doubt as to whether the incident is an act of terrorism.*

0="No" *There is essentially no doubt as to whether the incident is an act of terrorism*

(START, 2018, p. 16)

"Yes" is given when the incident fulfils at least two of the three criteria, but it is not clear if the attack is in fact an act of terrorism or if it is another type of crime.

The variables listed in the GTD are categorised in 9 different main categories: GTD ID and date, incident information, incident location, attack information, weapon information, target/victim information, perpetrator information, casualties and consequences, additional information and sources.

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4.1.2. Case Reduction

For the classification of terrorism attacks that have occurred in urban open spaces, the global terrorism database was used. As the whole database consists of 181.692 cases the sample size had to be narrowed down to be able to then reduce it to the relevant cases, meaning cases that took place in urban open spaces between the 9/11 attack in 2001 and 2017. The difficulty hereby was to be certain, when excluding data to only exclude cases that for certain are not relevant. To reduce the data from all terror attacks to only the relevant ones, the following steps had to be taken.

Step	Reduction	Number of cases
1	Time: since 11.9.2001	
2	Regions Western Europe, Eastern Europe	2748
3	Excluding attack types	1920
4	Excluding target/victim type	1625
5	Excluding target/victim subtypes	831
6	Excluding cases not in public open spaces	487

Table 3: Overview of case reduction steps

First of all, only cases after the 9/11 attack in 2001 were taken in account, as this marks the transformation point of terrorism according to research. Although the plan was to analyse data from 2001 to present, there is only data until 2017 available and therefore the years 2018 and 2019 are not considered.

Secondly, the cases were narrowed down spatially. Only cases that occurred in Europe are considered, as most this thesis is concentrated on Europe as explained in the introduction.

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As not all of these countries have witnessed terror attacks since 2001, not all of them are represented in the analysis. After the time reduction and spatial reduction the sample size included 2.748 cases.

As a next step in this case reduction the attack types were looked at. In the GTD the attack type consists of nine categories. Only the category 7. Facility/infrastructure attack was excluded as the goal is to damage a non-human object. These are described as attacks that can include arson or other ways of sabotage on buildings, monuments, or a pipeline (START, 2017). These attacks can cause injuries or fatalities but that is not the main objective. The sample size was reduced to 1.920 cases.

After this, the target/victim type was reduced. Out of 22 categories 6 were excluded. The category "business" was excluded as it does not include attacks carried out in public or quasi-public areas (START, 2017). The other categories that were excluded are abortion related, airports and aircrafts, food and water supply, maritime as well as telecommunications. The sample size was reduced to 1.625.

The next step was to exclude non-relevant target/victim subtypes, which were not automatically excluded with the previous step. The categories that were excluded were either buildings (such as Government buildings/facility/office, police buildings, prison/jail, house/apartment/residence, etc.) or transportation that does not move in urban open space (trains and subways were excluded but buses, taxis were included). These exclusions left a sample size of 831 cases.

The last step of this case reduction was the most important one. As with all the previous steps, it still did not leave the cases that occurred in urban open spaces, the cases that were left had to be sorted through manually. For this the summary of each case was read and decided whether or not the attack happened in urban open space. For this a new variable was made called "urban open space" and the categories were 1=yes, 0=no and 2=unclear. 487 cases were categorized as "1", 312 as "0" and 32 as "2". This left the sample size to 487 cases.

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4.2. Results Terrorism in Urban Open Spaces 2001-2017 in Europe

The incidents considered in this chapter are seen in the figure below. These are the cases chosen by the case reduction described in the previous subsection. In summary it can be said that the cases considered are since 11.9.2001 until the end of 2017 that occurred in urban open spaces in Europe. These attacks have occurred in 17 different countries and in 190 different cities. Of these 487 incidents 75,4 % were successful. This means that 24,6 % of these attacks were stopped before they took place. These attacks resulted in a total of 299 deaths and 1412 injuries.

Figure 14: Overview on analysed incidents. Source: Data based on START, 2017, prepared by author

When looking at the time line (Figure 15) it is clear that the number of cases has been rising. However in 2011 there were much less attacks in urban open spaces in Europe. If compared to worldwide data analysed in the Global Terrorism Index report, it can be seen that there was an overall drop in terror attacks during this time as well (Institute for Economics & Peace, 2018).

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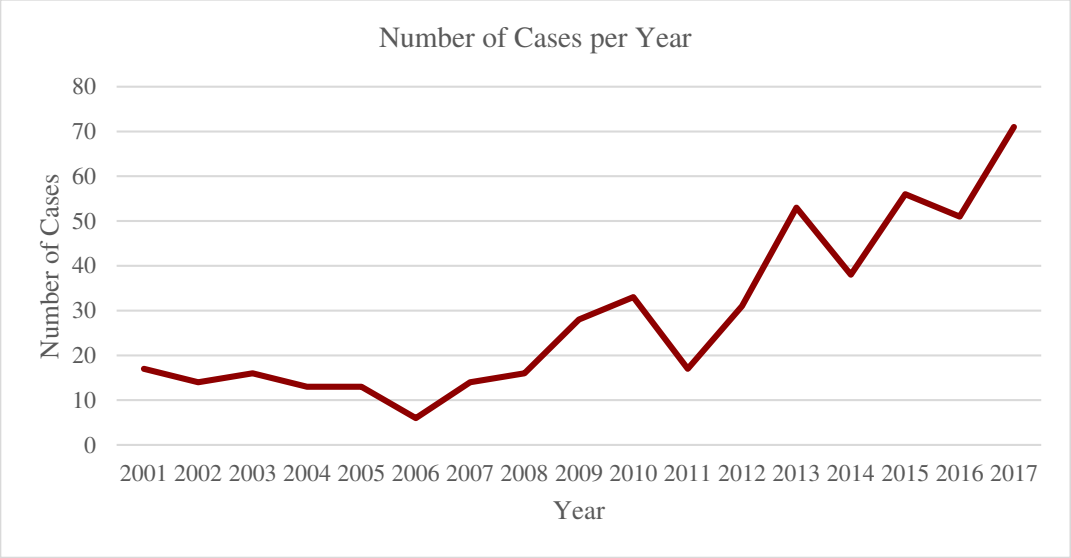

Figure 15: Number of cases each year. Source: Data based on START, 2017, prepared by author

In comparison, looking at the number of casualties per year (Figure 16) – excluding the peak in 2016, which was the year of the attack on Bastille Day in Nice, France - shows the attacks with the most casualties and the peak of deaths in 2011, which was caused by the attack in Oslo, Norway. Otherwise, according to the analysis, the numbers of casualties have not risen the same way as the number of incidents in total have.

So, although the number of incidents has been growing, the number of casualties has not. This same observation has been made by the Institute for Economics and Peace. They argue that a reason for this can be the increased spending of non-conflict counties on counter terrorism and security measures (Institute for Economics & Peace, 2018).

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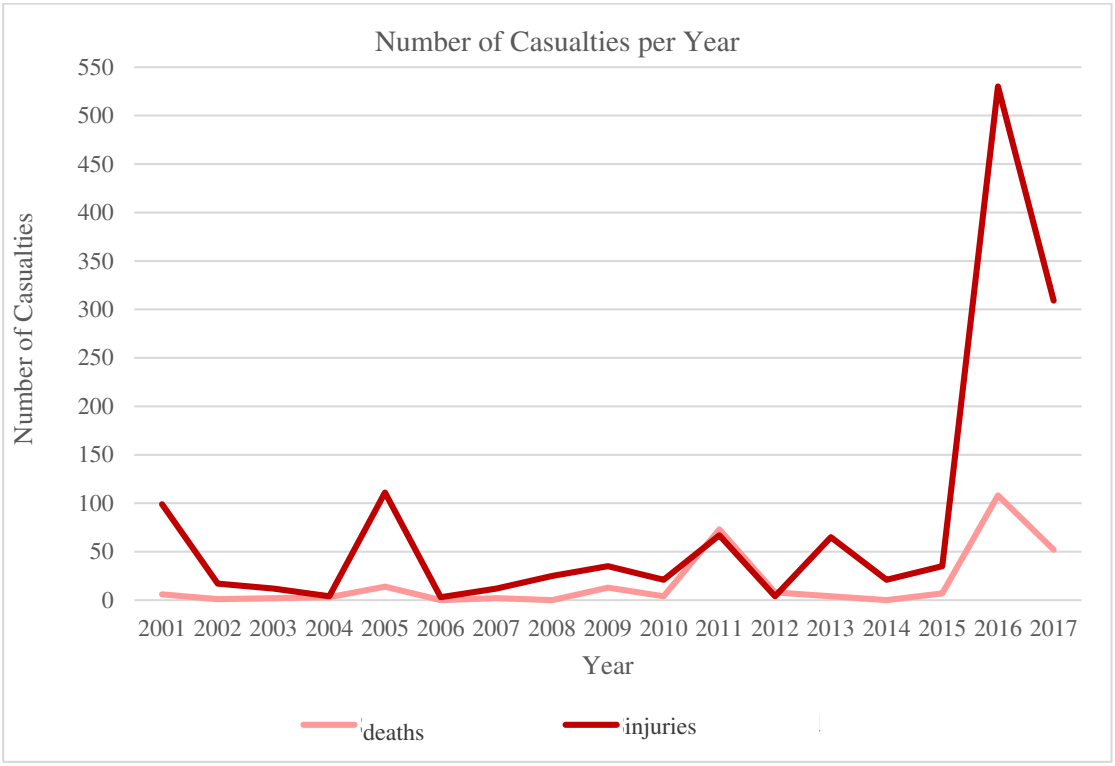

Figure 16: Number of casualties each year. Source: Data based on START, 2017, prepared by author

Next if and how the targets of the cases has changed over the years was analysed. The most targeted group in this analysis are private citizens and tourists. Of course, since the analysis concentrates on urban open spaces, this is foreseeable. During the years this has not changed a lot. The other two heavily targeted groups are the police and the government. Interestingly, as the number of cases has gone up during the years, so has the number of attacks where private citizens and tourists were targeted. However the number of attacks where the government was targeted has gone down. In this case a slight change in targets can be observed, which confirms the research of subchapter *2.4 Urban Open Spaces as Targets of Terrorism*.

When looking at the different weapons used in these attacks it is clear that explosives and firearms are the most used in these attacks. This can be observed in the world wide context as well (Institute for Economics & Peace, 2018). 52% of the cases had explosives marked as the weapon type. This category includes all explosive weapons. As a subtype category is mentioned “vehicle”. Out of all the 251 cases that had the weapon “explosive”, for 45 cases the weapon subtype is marked as “vehicle”. These are

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all the attacks where the vehicle is not used as the primary means of attack but as a way to get an explosive closer to the target. Around 20% of the attacks were executed with Firearms, 13% with melees (weapons used to target people rather than property, such as knifes, blunt objects, hands/feet (START, 2018)), and 5% or 26 cases were attacks in which a vehicle was used. This does not include the use of explosives such as truck/car bombs (START, 2018). The figure below shows the use of weapons over the years. It can be observed that the number of cases where explosives were used, had the most cases in the year of 2013 and ever since the number has gone down. In contrary to the cases where firearms, melees and vehicles were used, these numbers have increased in the last years.

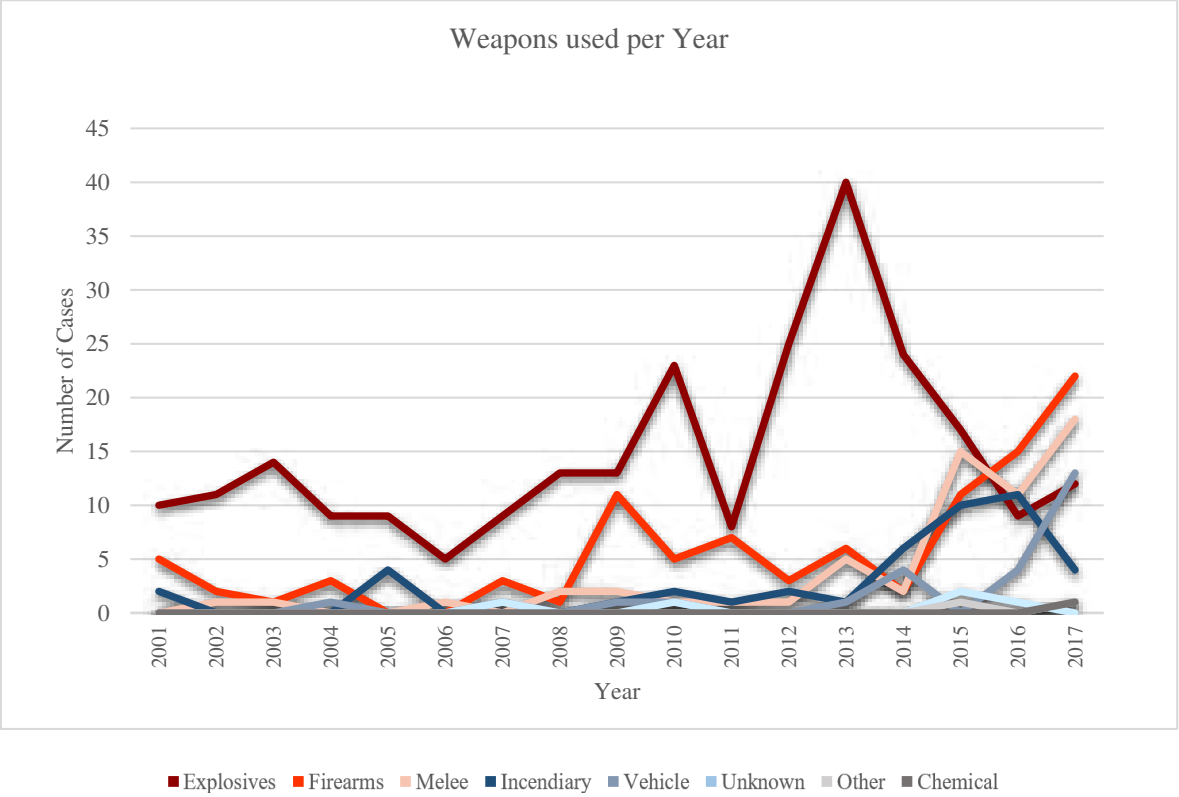

Figure 17: Weapons used per year 2001-2017. Source: Data based on START, 2017, prepared by author

Although the weapon most often used in these attacks are explosives and firearms, the more the vehicle attacks have killed and injured people. Comparing the numbers of casualties per weapon, over 50% of the casualties have been caused by an attack with a vehicle. Vehicle ramming attacks have caused in

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sum 755 injuries and 151 deaths, whereas explosives have caused 287 injuries and 25 deaths and firearms 143 injuries and 108 deaths. The categories “Unknown”, “Other” and “Chemical” were all under one percent and are therefore not visible in the figure below (Figure 17).

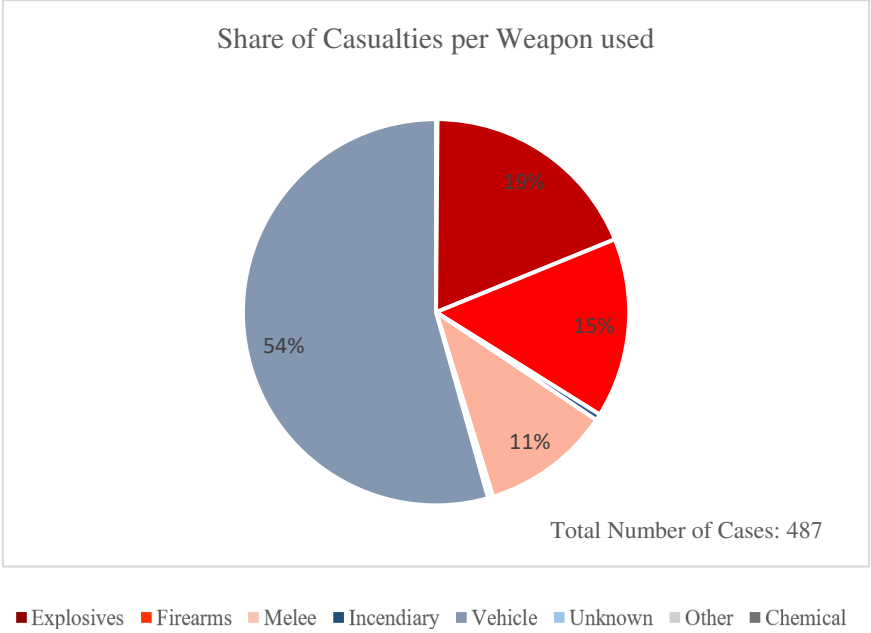

Figure 18: Share of Casualties (sum of deaths and injuries) per Weapon used. Source: Data based on START, 2017, prepared by author

Taking a closer look at the attacks where a vehicle was used as the primary weapon (26 cases). In 42% of the cases a secondary weapon was used, these were gasoline, handguns, knives, bombs or even fake weapons. This finding is in accordance with the literature in subchapter 2.4. Urban Open Spaces as Targets of Terrorism.

The spatial distribution of the cases is seen in the following figure. This shows in which countries the most attacks have happened and which countries have not had any terror attacks during the time of the analysis. The darker the colouring the more incidents have occurred in this country. Definitely most cases have occurred in the United Kingdom with a total of 223 incidents. This can be explained by the fact that United Kingdom has a long history of terrorism by the dissident republicans. These are Irish republicans, who do not support the political agreement between Northern Ireland and the United

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Kingdom and are seen as a terrorist group active in Belfast, the capital of North Ireland and Londonderry (BBC, 2010). After the United Kingdom most attacks have occurred in Greece, Spain and France. Interestingly there have been no cases in Eastern Europe, nor in Portugal or Iceland.

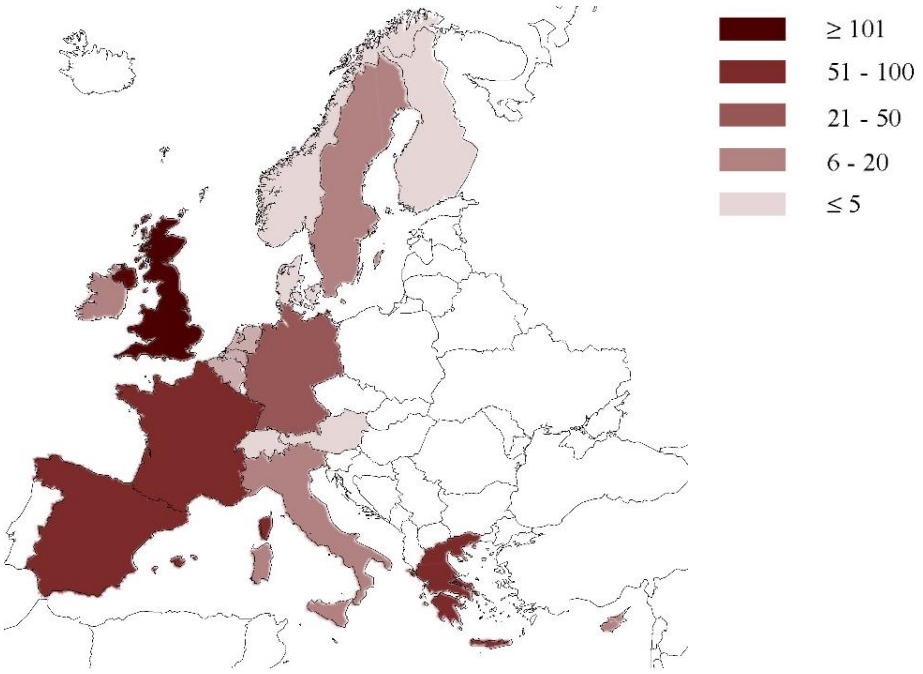

Figure 19: Spatial distribution of the cases by country. Source: Data based on START, 2017, map based on cadsample.com, prepared by author

How the distribution of cases is on city level can be seen in Figure 20. The city with the most terrorist attacks in this analysis was Belfast (76 cases), which are is the reason for the most cases in the United Kingdom. Many other smaller cities surrounding Belfast have been targets of attacks as well. This can be recognised by the depth of colour in the same figure. The second most attacks have occurred in Athens, the capital of Greece. Other clusters can be observed in Paris and its surrounding cities as well as the northern coastline of Spain, especially Bilbao and its surroundings.

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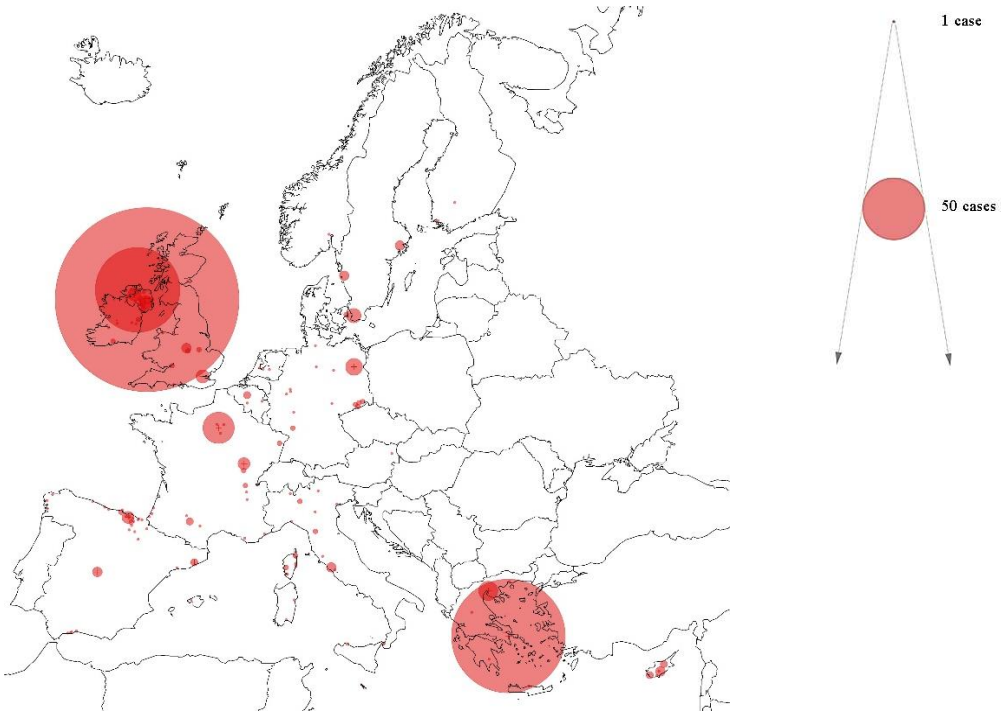

Figure 20: Spatial distribution of cases occurred in each city. Source: Data based on START, 2017, map based on cadsample.com, prepared by author

However comparing the results from figure 20 with the results from figure 21, the cities with the most attacks have not had the most casualties.

Figure 21 shows the number of deaths for each city due to terrorism (excluded are the number of injuries). Nice, France has had the most deaths and injuries in the period in question, although having only had two incidents. From these incidents only the vehicle ramming attack on Bastille Day in 2016 had casualties (87 deaths and 433 injured). This can be categorised as the terrorist attack with the most casualties in European cities, which, as already mentioned, made the number of casualties in the year of 2016 peak in Figure 15. The city with the second most casualties and injuries is Utoya, Oslo in Norway. This was caused as well by a single attack in 2011 where the perpetrator dressed as a police officer attacked people on an island with a firearm.

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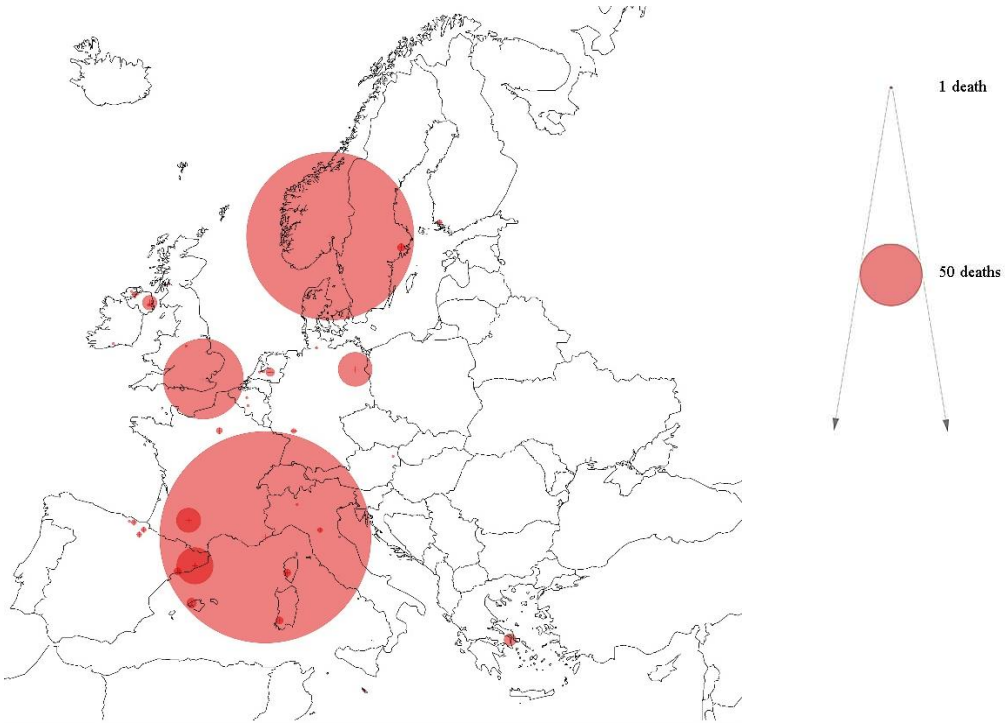

Figure 21: Spatial distribution of deaths in cities due to terrorism. Source: Data based on START, 2017, map based on cadsample.com, prepared by author

Now looking at the ten most devastating incidents of the data analysis, the attacks with the highest number of casualties (sum of deaths and injured). The table 4 shows the list of these ten attacks in chronological order.

Date	Place	Casualties	Summary
06.11.2001	**Madrid, Spain**	**deaths: 0 injuries: 95**	A car bomb exploded on a busy road during rush hour. The attack was targeting Juan Junquera, the Secretary General of the Scientific Policy Department who was driving by at the time of the explosion.
07.07.2005	**London, United Kingdom**	**deaths: 14 injuries: 110**	One of four suicide bombers detonated himself on the No. 30 Dennis Trident 2 double-decker bus operating in London's Tavistock Square.
01.05.2009	**Apeldoorn, Netherlands**	**deaths: 7 injuries: 12**	A man aimed his car into a crowd of civilians attending a festival for the royal family. The target of the attack was a bus carrying the Queen and her family, but the car was stopped 15 yards from the bus.

Table 4 part 1: The 10 attacks with the most casualties in urban open spaces in Europe since 9/11

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Date	Place	Casualties	Summary
22.07.2011	**Oslo, Norway**	**deaths: 69 injuries: 60**	A man dressed as a police officer opened fire on civilians on the island of Utoya.
09.08.2013	**Belfast, United Kingdom**	**deaths: 0 injuries: 56**	Assailants attacked the police as they were providing security for a pro-Irish republican parade.
14.07.2016	**Nice, France**	**deaths: 87 injuries: 433**	An assailant rammed a truck into a crowd celebrating Bastille Day. The assailant opened fire on police officers.
19.12.2016	**Berlin, Germany**	**deaths: 12 injuries: 48**	An assailant drove a truck into a Christmas market in Breitscheidplatz. Earlier the assailant had hijacked the vehicle and killed the driver.
22.03.2017	**London, United Kingdom**	**deaths: 6 injuries: 50**	An assailant drove a vehicle into pedestrians along the Westminster Bridge. The assailant then fled the vehicle outside the Palace of Westminster, stabbing a police officer before being shot and killed by police forces.
03.06.2017	**London, United Kingdom**	**deaths: 11 injuries: 48**	Three assailants driving a van ran over pedestrians along the London Bridge. The assailants, wearing fake suicide vests, then crashed the van on Borough High Street. After exiting the vehicle, the assailants ran towards the nearby Borough Market, stabbing civilians in pubs and restaurants along the way.
17.08.2017	**Barcelona, Spain**	**deaths: 14 injuries: 101**	An assailant rammed a van into a crowd of pedestrians along Las Ramblas.

Table 4 part 2: The 10 attacks with the most casualties in urban open spaces in Europe since 9/11

The following factors and characteristics can be observed:

All of these incidents got worldwide attention by the media. Half of these incidents targeted civilians, two of the incidents had police officers as targets, one a government official, one the royal family of the Netherlands and one targeted a public transportation bus, but still all cases had civilians as casualties. All, except one (Alpedoorn, Netherlands) are popular cities for tourists. Although the attack in Oslo did not result in tourists as casualties. Four of the ten attacks occurred in the United Kingdom, three of these in London. Six out of ten incidents were vehicle ramming attacks where a truck or car was driven into a crowd of people, killing and injuring as many people as possible. Many of these attackers continued the attack with another weapon, such as a firearm or melee. Half of the attacks occurred in the years of 2016 and 2017.

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4.3. Preliminary Conclusions

In summary, the following conclusions on the characteristics of terror attacks in urban open spaces in Europe after the 9/11 attack can be made:

- The number of incidents has risen, but the number of casualties from these incidents has not risen as much. This is believed to be an impact of the increased counter terrorism measures in public spaces. (Institute for Economics & Peace, 2018)
- In accordance with the theoretical research, the most targeted group are private citizens and tourists. The other two heavily targeted groups are the police and the government. A slight shift from government targets to private citizens as targets can be observed.
- The most used weapons in these incidents are explosives and firearms. However the number of vehicle ramming attacks has gone up during the time in question, especially in the years 2016 and 2017.
- Vehicle ramming attacks often continue with another weapon after the vehicle has come to a halt.
- Vehicle ramming attacks have had more casualties compared to other attack weapons.
- Almost half of the incidents occurred in the United Kingdom, mostly in the capital of North Ireland, Belfast. Although the number of cases in the United Kingdom is high, the number of casualties is lower than in other cities.

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5. CHAPTER – Case Studies

This chapter is a case study analysis of the attacks on Breitscheidplatz, Berlin and Drottninggatan, Stockholm. Firstly, the methodology for this chapter is introduced and after both cases are examined on the topics of planning system, the site, the attack and the aftermath of the attack. Concluding, these two cases are compared to find similarities and differences as well as to find out whether the literature findings from the previous chapters are in accordance with these cases. The reason for this chapter is as the American Association of State Highway and Transportation Officials state it is natural for operators of crowded places to examine sites where a terror attack has occurred in a similar setting, what it means to them and how they can learn from these. (AASHTO, 2017)

5.1. Methodology

The methodology used in this chapter is a Multiple Case Study Design, where two cases will be reviewed to help answer the research question. The incidents chosen are Drottninggattan, Stockholm and Breitscheidplatz, Berlin.

The case study method was chosen, because of the fact that this can be seen as a sensitive subject, which varies strongly and should be looked at case by case. According to Yin (2009) the case study approach is an empirical study that explores a current phenomenon within the real life.

Two main cases were selected according to the criteria already mentioned, but also different back up cases were considered, if the data collection would turn out difficult in the two cases chosen.

The data collection for both cases was done by collecting both primary and secondary data. As secondary data different written documents such as newspaper articles, city-websites, strategies, mapping tools as well as legal documents were used.

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The primary data collection consisted of semi structured expert interviews. As on the question who should be interviewed, the author was researching newspaper articles to find people, who had been interviewed by newspapers on the specific incidents, to get a sense who could be involved in this topic. The conclusion was made that experts from different fields of work would give an overall view on the topic from different points of view.

The plan was to interview three different experts in each case to get an overall view and expert knowledge from different branches on the topic of security planning, how it was dealt with before the attack and what the reactions were after the attacks occurred. For this, it was intended to interview the police, city/transportation planners and researchers from both cities.

Unfortunately this thesis was written in spring 2020 during the COVID19 outbreak and due to this, many expert interviews were cancelled, because of priority issues.

The following people were interviewed:

Dr. Holger Floeting, DIFU is a researcher at the German institute for Urban Studies working on the topic of urban security focusing on municipal actors and institutions, security technologies and security perception.

Georg von Strünck, Berlin Police is the head of the subject group of prevention 3 of the crime prevention department, where they are for one in charge of technical prevention measures especially against burglaries and secondly they advise on terrorism and amok.

Robert Kindroth, CVE is a senior advisor at the Swedish Centre for Preventing Violent Extremism and before he worked for the Swedish police in Stockholm.

For the interviews the semi structured approach was chosen. A list of interview questions was sent beforehand to the interviewee, for Mr von Strünck and Dr Floeting in German and Mr Kindroth in English. These were divided into two topics. First, questions about security planning and terrorism in general and second, questions about the attack itself. The interviews were conducted via telephone and

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in either German or English, all three were recorded with consent of the interviewee and transcribed for further analysis. Questions for the second case study can be found in the appendix as a sample.

The interviews on case study 1 were conducted in German, the mother tongue of both interviewees and the interview on case study 2 was conducted in English. Therefore the interviews on case study 1 can be characterized more in depth as of course talking in your mother tongue mitigates the problem of a language barrier, which was in the interview of case study 2 not the case, and therefore more general answers were received.

As mentioned, many interview requests were left unanswered or cancelled due to the COVID-19 outbreak. One of these cancelled interviews was with a person working at the city planning office of Charlottenburg - Wilmersdorf in Berlin. A contact was established but after a first successful contact, the request of setting up a time were not answered, even after several follow ups. Unanswered interview requests were from the Stockholm International Peace Research Institute (SIPRI), the city planning office of the City of Stockholm and the transportation planning office of the City of Stockholm. The transportation planning office would have been especially interesting as they are in charge of all matters concerning streets and roads and were the ones who decided on the measures taken on Drottninggatan. From the security department of the City of Stockholm one contact declined the request due to lack of time because of the ongoing COVID-19 pandemic and a second one promised to answer the questions via email, unfortunately this was not done after several reminding emails.

An on-site visit of the two case studies was not possible because the boarders were closed due to the COVID-19 pandemic and therefore travelling to the cities was not done.

In conclusion there is a comparison between the two cases to see what was done in a similar manner and what the differences are and if there is anything we can learn from these cases in accordance to the research question.

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5.2. Case Introduction

The cases were chosen based on different criteria conducted from the literature review. Firstly, the cases are in Europe, which are geographically close. As Yin (2009) states it is important to choose cases where it is possible to access data. So by choosing cases that are located in approximate distance, this gives the opportunity to visit the sites and makes data collection easier, although as already mentioned this was not possible during the time when the thesis was written. Secondly, as terrorism seeks to get a wide range media attention, both of the cases have had a wide range of media attention. Thirdly, cases were chosen according to their similarity. Both cases were vehicle ramming attacks in crowded spaces, which has been argued in literature as a new trend in terrorism as well as determined as the attack method with the most casualties in urban open space in chapter 4 of this thesis. The places these attacks occurred on, were both public places where lots of people go during everyday life activities or for sightseeing. Lastly, the cases were chosen by the date of the attack. It was important that they had occurred in the recent time but not after 2017 as it is important for the research that the city has had time to recover since the incident. Short descriptions on the attacks are seen in tables 4 and 5.

Breitscheidplatz, Berlin

Location	**Christmas market**
Date, Time	**17.8.2017, 16:56**
Target	**Private citizens. tourists**
Attack Type	**Vehicle Ramming attack**
Deaths	**12**
Injuries	**48**
Perpetrator	**Anis Amri**

Table 5: Facts about case study 1 Breitscheidplatz, Berlin

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Drottninggatan, Stockholm.

Location	**Pedestrian shopping street**
Date, Time	**7.4.2017, 14:53**
Target	**Private citizens. tourists**
Attack Type	**Vehicle Ramming attack**
Deaths	**5**
Injuries	**14**
Perpetrator	**Rakhmat Akilov**

Table 6: Facts about case study 2 Drottninggatan, Stockholm

5.3. Case Study 1 – Breitscheidplatz

5.3.1. Planning System Berlin/Germany

The German planning system can be characterized by a decentralized division of tasks and responsibilities. It is divided into four different levels: city, region, state and government. Each planning level differs in terms of content, in particular through the degree of specification of the respective plans and programs. The planning principles, goals and measures formulated there in become more realistic, precise and binding the closer to city level it gets. The overall goal of all levels is described in Article 72, paragraph 2, clause 3 of the German constitution (Grundgesetz), which is the uniformity of living conditions and the uniform development in the Federal Republic of Germany. The German constitution writes that the government has the right to spatial planning of the states under certain conditions.

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This is manifested in the spatial planning act (Raumordnungsgesetz, short ROG), where the tasks and goals of spatial planning in the Federal Republic of Germany and the regulations of spatial planning in the states are formulated. The principles of the spatial planning act refer to the topics of settlement structure, the city regions and centres, rural areas and structurally weak areas, infrastructure, open space structure, nature conservation, economy as well as housing and transportation. (Bezirksamt Spandau von Berlin , n.d. A) The responsibilities on national level are described in article 3 of the ROG.

The states are in charge of a state wide spatial plan, regional plans and regional land use plans which both have to be in accordance with the state wide spatial plan (section 13, sentence 1 of the ROG 2008[1]). In section 14, sentence 1 of the ROG 2008[2] it is stated that during the realisation of these above mentioned plans, cooperations with relevant governmental and non-governmental bodies are to be pursued and inter-municipal cooperations are to be supported.

The spatial planning act (ROG) does not have any specific guidelines on local/city level. However the city planning level has to follow the above mentioned plans made by the states as well as other specialist plans that the government is responsible for. These include plans of for example federal highways, air traffic or defence systems as well as specifications of the nature conservation act (Bundesnaturschutzgesetz). If goals of the state or government have been formulated as binding statements, they must be taken into account by the local planning authority. For the establishment of land-use plans, the Building Code (Baugesetzbuch) in section 1 sentence 4 even directly requires that the land-use plans of the municipalities and cities have to be adapted to the objectives of the state planning. (Bezirksamt Spandau von Berlin , n.d. A)

The states Berlin and Brandenburg have a joint state development plan as they have a large number of spatial, infrastructural, landscape and economic interconnections. This task is performed by a common authority called “Gemeinsame Landesplanungsabteilung” with its headquarters in Potsdam. (Bezirksamt Spandau von Berlin, n.d. B) The legal basis for this cooperation is a state planning contract

[1] §13, Abs.1, ROG 2008
[2] §14, Abs. 1, ROG 2008

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(Landesplanungsvertrag), which functions as a state planning law between Berlin and Brandenburg. This contract holds the common goals for the joint planning authority which are: Establishment of conditions for a balanced distribution of development opportunities in the area, supporting of the joint state development, protection and preservation of natural resources, strengthening the economic area and to insert the aspired structures of both states into the together growing Europe. (Gemeinsame Landesplanungsabteilung Berlin-Brandenburg, 2020)

The Senate Department for urban development has composed an urban development plan (SteP), which is a basis for all short term and long term planning in Berlin. It focuses in particular on the planning uses: residential, industrial and commercial, retail, climate as well as transportation. The latest urban development plan for transportation was made in 2011 and has defined a mission statement for 2040 as well as goals for 2025. This mission statement is based on eight components that are closely related to each other and are as follows. (1) Sustainable mobility for all: Berlin sees its future as a city with less cars and more bicycles and pedestrians. (2) A big city with a high quality of life: The city will have grown and developed new neighbourhoods which are compact and pedestrian friendly. (3) An attractive city centre: The city centre of Berlin will be full of attractive street spaces and high quality of stay from which retail and tourism benefits. (4) Commercial traffic - efficient and effective, environmentally conscious: New city-friendly logistics concepts are developed and tested within the city as well as in connection with the surrounding area. (5) Clean. Quiet. Post fossil.: The future mobility offer ranges from public transportation to car sharing with low emission cars to rental bikes and a newly discovered desire to walk. (6) Traffic innovations strengthen mobility and economy: Innovations and new technologies are a crucial factor in the year 2040. (7) Networked metropolitan area: Together with Brandenburg, they form a by public transportation well connected metropolitan region with a focus on rail transport. (8) Internationally accessible: Berlin and Brandenburg is internationally easily accessible and well connected through the airport as well as by rail transport. (Senatsverwaltung für Stadtentwicklung, 2011)

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Additionally the Senate Department of environment, transport, climate protection is working on a mobility change, where they see mobility in the future as safe, climate-friendly and comfortable (Senatsverwaltung für Umwelt, Verkehr, Klimaschutz, n.d.).

For security planning there is not much to be found in the topics of the planning departments, however the German police force has a department which concentrates on crime prevention and as one topic urban crime prevention. In this department the aim is to reduce crime, achieve a higher sense of security for the residents and users, avoid of opportunity structures as well as to intensify the influence on the structural, spatial, infrastructural and social design elements of residential quarters. Since the increased vehicle ramming attacks on public spaces, the topic of protecting vulnerable places has become a focus. The idea is to include as many involved actors in the process as early as possible. (Polizeiliche Kriminalprävention der Länder und des Bundes, 2020)

5.3.2. The Site

Breitscheidplatz is a public square located in the centre of Berlin, the capital of Germany. Germany has 82,5 million inhabitants from which Berlin is the biggest city with a population of 3,65 million people and is 892 km² in size. This equals a population density of 4.088 people per km². (Amt für Statistik Berlin-Brandenburg, 2020) In addition to the citizens of Berlin, the city is a very popular for tourists. In 2019 34 million overnights were registered in the city and this number has been growing yearly. (Amt für Statistik Berlin-Brandenburg, 2019) Breitscheidplatz and the Kaiser Wilhelm Memorial Church, which is located on Breitscheidplatz square, are one of the many popular attractions in Berlin and is not only visited by tourists but also locals. During the Christmas season the place is turned into one of the Christmas markets in Berlin.

Breitscheidplatz is situated in the district of Charlottenburg just south west of the known Tiergarten Park, this can still be counted as a part of the city centre of Berlin. It is close to some other known attractions, such as the shopping mall Kaufhaus des Westens also known as KaDeWe and the popular

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shopping street Kurfürstendamm. The Brandenburger Gate and the Reichstags Building are located east of Tiergarten and 4 km away from Breitscheidplatz.

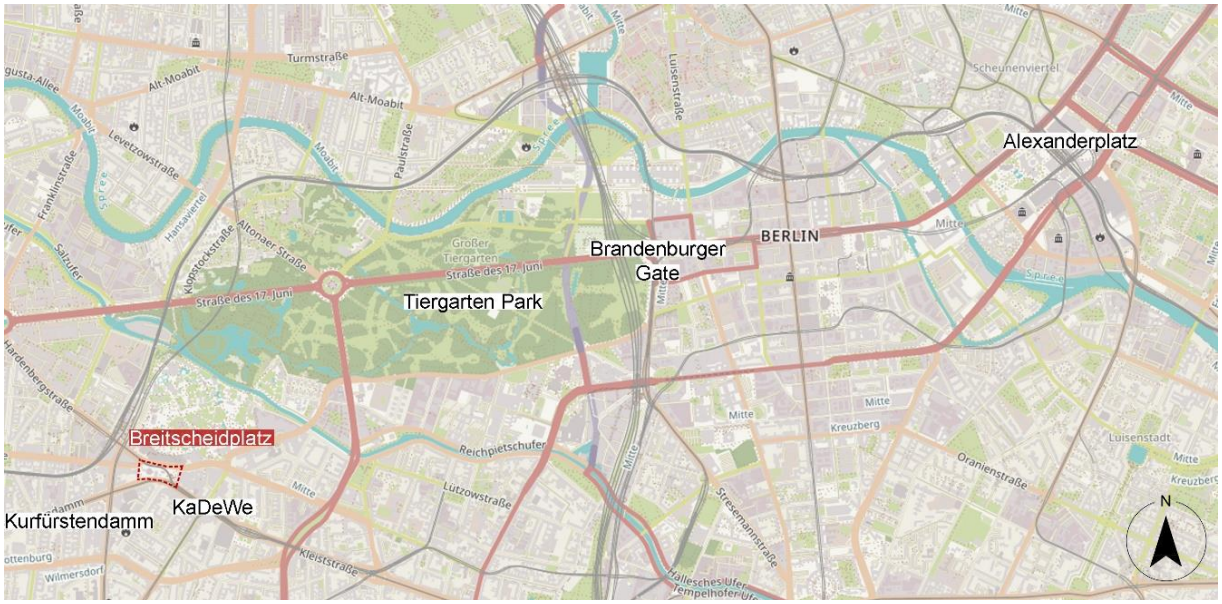

Figure 22: Location of Breitscheidplatz. Source: Based on OpenStreetMap contributors, prepared by author

The square lies between two main roads: Budapester Straße in the north and Kurfürstendamm in the south. The Budapester Straße is categorized as *"Stufe II – übergeordnete Straßenverbindung"*. This is defined as a connection between main centres of the districts as well as connections to the roads of higher categories and other important transportation hubs such as airports, long distance train stations or ports. Kurfürstendamm is classified as *"Stufe III – örtliche Straßenverbindung"* which is defined as connections of "mid centres" or connections between semi-important transportation hubs such as park & ride systems or regional train stations. (Senatsverwaltung für Umwelt, Verkehr und Klimaschutz, 2017) At the same time, as already mentioned, Kurfürstendamm is as well a popular shopping street. This means it is a road with a high traffic volume and many pedestrians.

Public transportation wise, the railway station "Zoologischer Garten" for subway (U-Bahn), railway (S-Bahn) and trains as well as the stop "Kurfürstendamm" for subway are walking distance from Breitscheitplatz. On Budapester Straße there are two bus lines (100, 200) that operate and stop at the bus stop Breitscheidplatz. On the south side of Breitscheidplatz on Kurfürstendamm and

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Tauezienstraße the buses M19, M29 and M46 operate and stop at the bus stop Europa-Center. (Berliner Verkehrsbetriebe, 2020)

When looking at the buildings and their use, the following observations can be made. On the square itself is the Kaiser Wilhelm Memorial Church, which, as already mentioned, is one of the tourist attractions in Berlin. The surrounding buildings are used for retail stores, restaurants, banks and hotels as an extension of the Shopping street Kurfürstendamm. On Budapester Straße is a building under preservation order which has been transformed into a shopping mall called “Bikini Berlin” in 2013 (BHG Berlin Immobilien GmbH & Co. KG). These observations are presented in the following map of the site (Figure 22).

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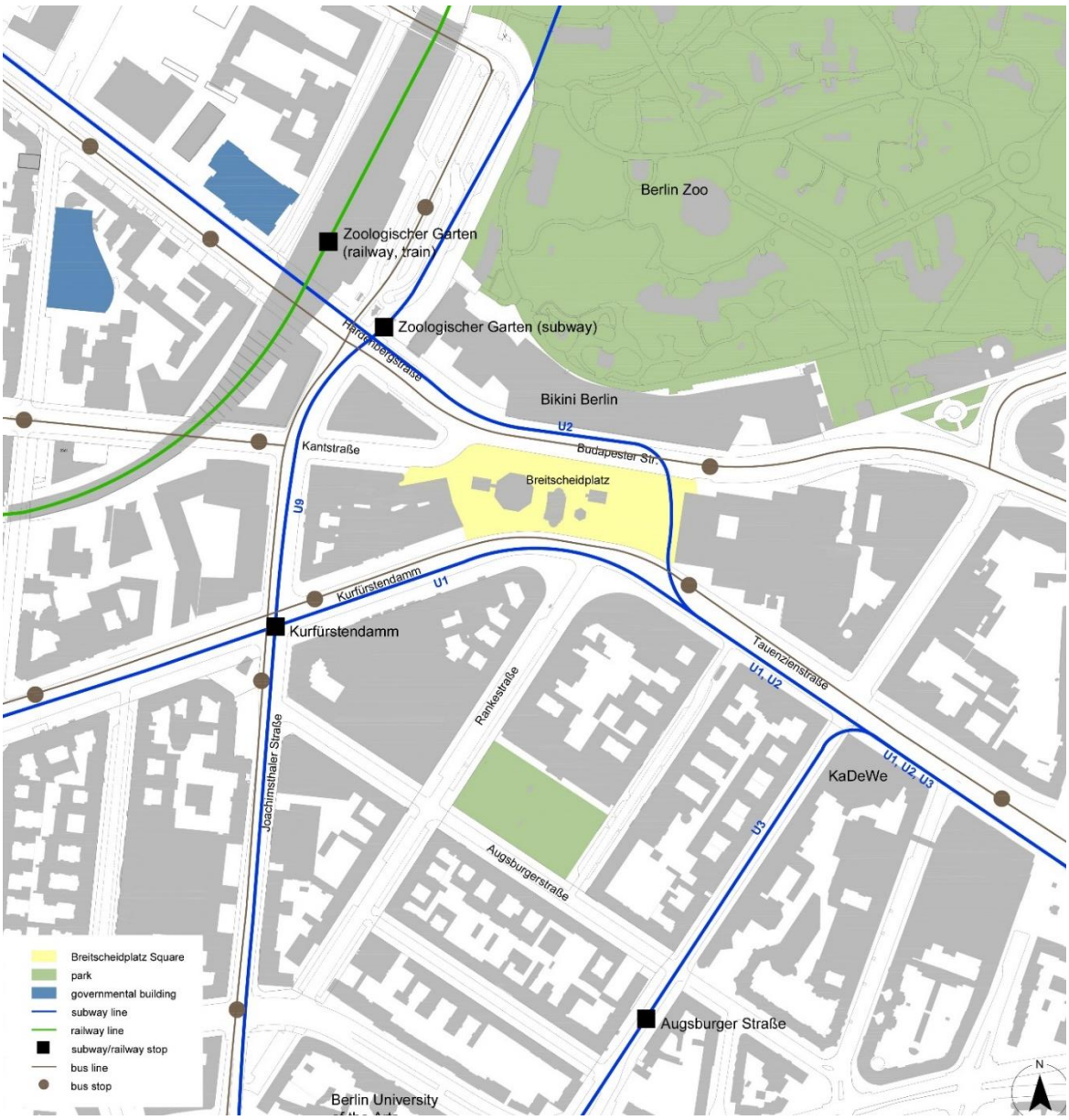

Figure 23: Breitscheidplatz and its surroundings. Source: Based on Senatsverwaltung für Stadtentwicklung und Wohnen Berlin, Abt. II / 2D Innenstadtplan MW2, prepared by author.

5.3.3. The Attack

On the day of the 19th December 2016 the perpetrator Anis Amir stole a truck from a polish freight company. While stealing the truck, the driver was shot dead by the perpetrator and put on the passenger's seat. At 20:00 local time the truck drove from the direction of Hardenbergstraße into the Christmas market. For 60 to 80 m the truck was driven through the pedestrian area before returning onto the road on Budapester Straße and coming to a halt next to the Kaiser Wilhelm Memorial Church.

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(Figure 23) After this witnesses saw the perpetrator flee on foot towards the Tiergarten. On the 20th the Islamic State claimed responsibility and on the 23rd Anis Amir as well claimed responsibility for the attack on a video. (Biermann, et al., 2016)

This attack killed 12 and injured 48 people. (START, 2017)

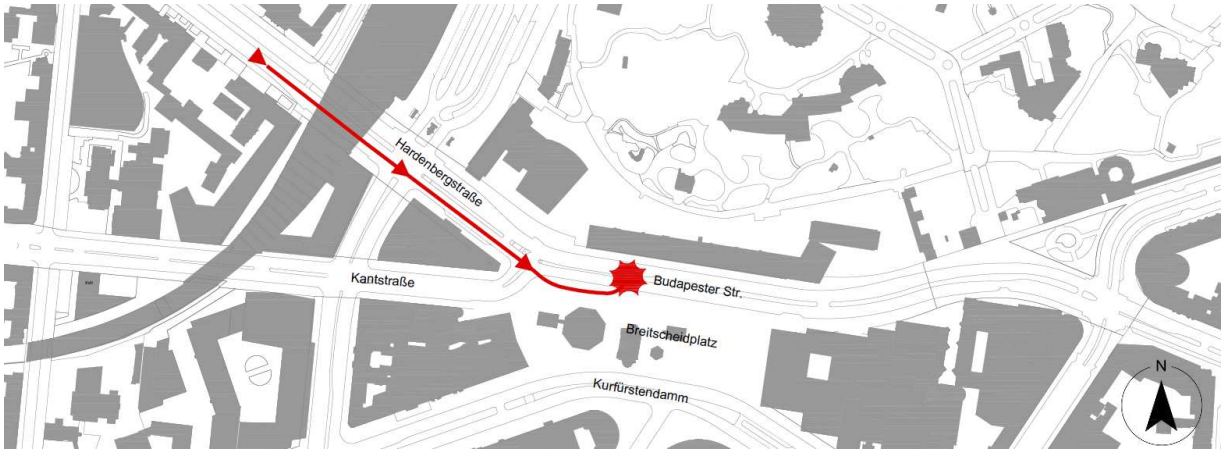

Figure 24: Route of the truck at the attack on Breitscheidplatz Source:Based on Senatsverwaltung für Stadtentwicklung und Wohnen Berlin, Abt. II / 2D Innenstadtplan MW2, prepared by author.

5.3.4. After the Attack

5.3.4.1. Impacts on the Site

First reactions

The attack on Breitscheidplatz was the first islamist vehicle ramming attack in Germany and the first reaction was of curse shock (Floeting, 2020; Strünck, 2020). The security concept of the site in 2016 was based on a threat scenario of attacks with explosives or knives, however a vehicle ramming attack was not anticipated (Floeting, 2020).

After the attack the first reaction was to increase heavily armed police presence, especially on Christmas markets in order to keep them open but still give a sense of security, as well as to prevent any other attacks from happening (Strünck, 2020). Von Strünck describes the attack as a big topic which it still is today as it has changed a lot. The topic of terrorism was already discussed before by

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the public safety authorities and organisations but after the attack it became more public and was an important factor in every security concept for events held in open spaces (Floeting, 2020).

Prevention measures on Breitscheidplatz

As already mentioned, the first measures taken were increased police presence with heavily armed weapons. Shortly after the attack a working group was created by the senate consisting of police officers, fire fighters and the districts. This was divided into two subgroups: mobile barriers and fixed barriers. The mobile barriers were important as it was clear that planning, ordering and setting up fixed barriers could and would take years. A concept on access to the site was made and based on this the locations and types of mobile barriers were decided. (Strünck, 2020) These mobile barriers included truck blocks and a type of chained and gritted sand sack constructions (Floeting, 2020) which were seen as intrusive and too martial by many. As Breitscheidplatz is surrounded by main roads, the police wanted to prevent a 40t truck from being able to drive with high speed onto the square which led to the road closures of the surrounding streets. These are put up every year at the time of the Christmas market. This led to the fact that every year public transportation has to change its bus routes, as the buses are not able to drive their usual roads. Additionally, these roads are highly frequented, thus there have to be alternative detours for vehicles. (Strünck, 2020) Figure 24 shows the road closures to the site.

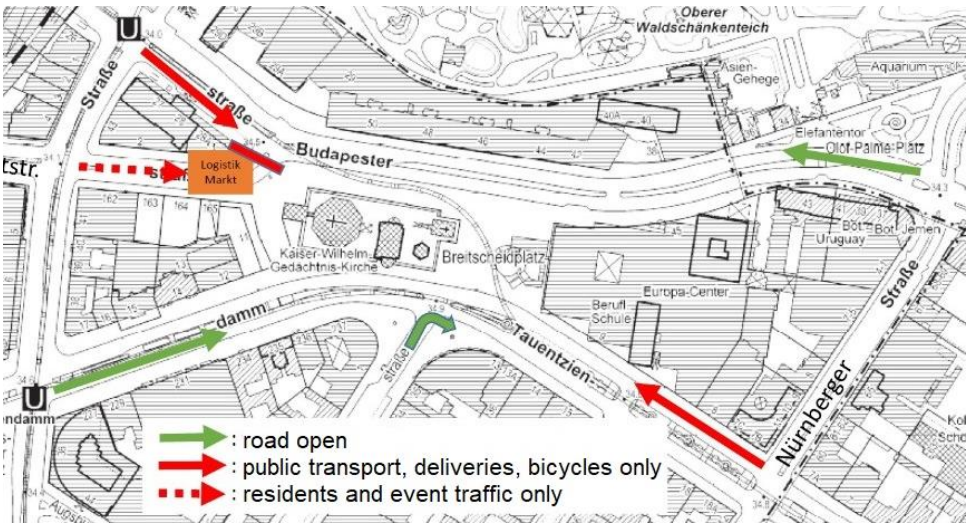

Figure 25: Road closures around Breitscheidplatz 2018. Source: Polizei Berlin found in Der Tagesspiegel, 2018.

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When asked about long term measures, the answer was that Breitscheidplatz is a complicated case according to Floeting (2020) and not suitable for installation of regular bollards that are mounted steep underground because of the subway, which runs under the square as well supply shafts located on site. Therefore different concepts from Israel and London were looked at to try to find suitable solutions for the site. By now there is a concept on how Breitscheidplatz will be made terror resilient and this will be done at the same time when the site is being renovated in general. (Floeting, 2020) On long-term in addition to the barriers, it is in planning that as the traffic concept around the site will be changed as well. It is planned that the lanes will be moved (Floeting, 2020) as well as changes to slow down traffic by moving traffic lights and strengthening traffic islands. However, these changes are still in the planning phase (Strünck, 2020).

Memorial

As a memorial for the attack on Breitscheidplatz, a golden crack in the ground goes through most of the square until the steps of the Kaiser Wilhelm Memorial Church in which is engraved:

"Zur Erinnerung an die Opfer des Terroranschlags am 19. Dezember 2016. Für ein friedliches Miteinander aller Menschen. In dieser Nacht starben: (Es folgen die Namen und Herkunftsländer der Todesopfer)." (Berlin.de, 2018)

Figure 26: The Memorial for the victims of the attack. Source: (Berlin.de, 2018)

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5.3.4.2. General Impacts

Relevance of the topic today

After the attack a difference on how the topic of security planning was dealt with was observable. Before the attack security planning in public places was mostly on petty crimes such as pick pocketing or robberies. The attack had the effect that the politicians and police realized that terrorism is not only a topic in England or Afghanistan but in Germany as well. (Strünck, 2020) When asked about how relevant the expert sees the topic today, after several years since the attack, the answer is that it still is relevant. Although there have not been many attacks in Europe in the recent years, this does not mean there is no terrorism and attacks will happen in the future and that is why it is important to deal with this topic (Strünck, 2020). It is not only relevant to big cities such as Berlin but also smaller cities with symbolic character who have started to invest in security measures. However of course bigger, more prominent cities have more of a pressure to act (Floeting, 2020). Strünck (2020) believes that many European cities are working on identifying and securing public spaces but planning processes take time and thus this is not public knowledge yet. Of course the fact which has to be kept in mind is that there are so many public spaces in Berlin that the probability of being a victim of a terror attack is very slim, however this is the reason why it is so important to recognize the sites where something should be done (Strünck, 2020). Floeting (2020) has the same opinion on this and explained in his interview that the terrain of open spaces is so large that it would involve a major effort and would take a lot of time to secure all open spaces in Berlin. As a police officer, Strünck thinks crowded places where events take place such as Christmas markets, fairs should be protected from vehicle ramming attacks. Another fact he mentions is that when a public space with lots of visitors is newly planned or re-planned, security should be considered a factor from the start, as it was done at the Mauerpark in Berlin. On this Floeting, (2020) agrees and says that Berlin has identified several open spaces that are vulnerable to terrorist attacks in a similar manner as Breitscheidplatz and when these sites are redesigned the factor of security towards terrorism should be included in the planning process.

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When thinking of the perception of safety in cities, Floeting (2020) argues that the need for security is more on the topic of "everyday security" (Alltagssicherheit) and not on security against terrorism, but in both topics Floeting and Strünck assess open spaces in Berlin as safe.

Prevention measures

On the topic of prevention measures in general – meaning not only limited to the Breitscheidplatz Floeting (2020) talks about the fact that since the attack especially temporary measures have been taken in securitizing events in open spaces. But also spaces that have been recognized as possible targets of terrorism have been secured.

Strünck (2020) argues that an important factor when installing prevention measures, the bollards used should be certified and have undergone crash tests. It would be contra productive to install products that are not "ramming proof". These could be more harmful than helpful.

Conflicts of Goals

When asked about the conflict of keeping trucks out of the space but still having to let delivery trucks to the site, Strünck (2020) said that this is not a problem when the site and bollards are designed properly. Another important point to consider is that it is required by law that an ambulance or a fire truck is able to access the site, but this is as well manageable. Both interview partners mentioned to keep in mind that the barriers and bollards have to be designed in a way that people with disabilities can manage and are not excluded. Another conflict of goal Strünck (2020) mentions is that if an accident happens on the site and it has to be evacuated, it is important that people get out without getting hurt or stuck. This Floeting (2020) calls a conflict between security and safety. Lastly a conflict, that has not yet been figured out is that the city cleaning of Berlin has some small cleaning vehicles that would have to get between bollards but are not slim enough. So all in all there are many factors to consider, but with the right planning these are all manageable. (Strünck, 2020)

On the topic of a conflict of goals regarding CCTV and data protection, both Floeting and Strünck say this is not an issue, as Berlin has very few CCTV cameras installed in public spaces especially in

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comparison to other European cities. However, surveillance in today's world includes all the privately taken videos and photos as well, which has been an effective way to solve cases, for example the Boston marathon bombing or the attack on Breitscheidplatz. In this context privacy in regards to data protection is not controlled and therefore can be seen as a conflict of goals. (Floeting, 2020)

Guidelines for planners

The German police crime prevention department has put up a working group that is currently working on information brochures for the municipalities on how to approach the topic of terror resilience. (Strünck, 2020) Additionally, there are several guidelines that focus on the security on big events in open spaces, for example Christmas markets. (Floeting, 2020)

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5.4. Case Study 2 – Drottninggatan

5.4.1. The Planning System Stockholm/Sweden

As Germany, so does Sweden have a decentralized division of the planning system. It is divided into national, regional and municipal level. Similar to the German system, the level of detail and bindingness of the plans gets more significant the closer to the municipal level it gets. (Boverket, 2018)

All this is written in the Legislation Planning and Building Act (Plan- och bygglag) by the Swedish National Board of Housing, Building and Planning. The main goals described in Chapter 2 Section 3[3] are as follows:

"In accordance with this Act, planning with regard to natural and cultural values, environmental and climate aspects, and intermunicipal and regional conditions must promote: 1. a purposeful structure and an aesthetically pleasing design of the built environment, green spaces, and transportation routes; 2. a from a social perspective viable living environment that is accessible and usable for all social groups; 3. long-lasting and effective management of land and water areas, energy recourses and raw materials, as well as good environmental conditions in other respects; 4. good economic growth and efficient competition; and 5. construction of dwellings and the development of the housing stock." (Swedish National Board of Housing, Building and Planning, 2018, p. 15)

On national level there are frameworks on national interests and objectives for the regional and municipal level. The planning and Building Act states that the county administrative boards coordinate the national interests in planning processes and they can intervene in issues that affect interests of the state, environmental standards, inter-municipal issues as well as issues regarding health and safety, risk of accidents, flooding or erosion. (Boverket, 2018)

Regional planning in Sweden is only handling cross-municipality issues concerning infrastructure, climate or regional housing supply. This means the regional planning level is limited on where at least two municipalities work on either issues concerning land or marine areas. There are two different

[3] 2 kap 3§, SFS2010:900

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legislation on the regional level. One legislation for Stockholm County and one for all other municipalities. Only for Stockholm County regional planning is mandatory, for the other municipalities regional planning is voluntarily and it is provided that the municipalities will themselves take initiatives in this context and bring the issue up on national level, where the decision whether regional planning should be done or not is made.

The municipalities are in charge of a comprehensive plan, area regulations as well as a detailed development plan. The comprehensive plan has to cover the whole area on land and water within their geographical boundaries and entails basic information on the characteristics of land use and how national objectives as well as environmental standards are considered in the development of the municipality. These interests and characteristics are regulated in the area regulations. The detailed development plan is where the municipality can regulate the use of land and water for a specific site. Usually these plans are made when new construction is planned. This plan entails definitions on where public space, development districts and water areas are to be built and how they are to be designed. (Boverket, 2018)

For urban planning in Stockholm the City Building Office (Stadsbyggnadskontoret) is in charge. They are responsible for the city plan of Stockholm, detailed planning of a site, strategic planning, building permits, city surveying property development and housing adaptations. (Stockholms Stad, n.d. A)

As for transportation planning the responsibilities lie in the Traffic office (Trafikkontoret). The responsibilities for the Traffic Office is to ensure safe and attractive public spaces and good accessibility in the city. Moreover the office is in charge of the management of the urban environment including some parks of Stockholm, investments in streets and roads as well as the parks, coordination and development of urban environment activities, maintenance of all the trees located on roads/streets, development of the town square, development of road safety as well as monitoring traffic and parking. (Stockholms Stad, n.d. B)

The Traffic Office has formulated an Urban Mobility Strategy which will help achieve Stockholms goals regarding mobility by the year 2030. The mobility strategy is based on the city's overall strategy,

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which most challenging task is to accommodate the growing population of Stockholm. The Urban Mobility Strategy addresses this challenge as well and describes how Stockholms streets, squares and other public spaces should be designed in a way that the rising number of urban mobility and commercial freight deliveries are met. The four main planning goals are (1) As the number of mobility users will be higher by 2030, the use of high capacity transportation such as public transportation, bicycles and walking as well as goods transportation with a high load factor must be encouraged. (2) The street and highway network has to be improved in order to shorten travel times for all users and to make sure these travel times are reliable. (3) The role of streets and roads as attractive spaces must be strengthened in order to create a pedestrian friendly city. (4) The usage of cars should be minimized to journeys where cars create the most public benefit, viz. minimizing negative effects of road and street traffic. (Firth, 2012) As an addition to the Urban Mobility Strategy, a Strategy for Public Space has been written, which compliments the goals and principles of the Mobility Strategy, while concentrating on urban life in public spaces such as streets and squares. (City of Stockholm, 2012)

Neither in the overall City Strategy nor the Urban Mobility Strategy including the Strategy for public space have any security planning goals.

5.4.2. The Site

Drottninggatan, the queen's street, is the central shopping street of Stockholm, the capital of Sweden. Sweden has a population of 10.3 million people and Stockholm, the largest city in Sweden population wise, has a population of 962.000 people and is 188 km² in size. This equals a density of 5.106 people per km² (Stockholm Stad, 2019). When looking at tourism in numbers. Stockholm had 14,6 million overnight stays in 2018 (Stockholm Business Region, 2018). The shopping street not only attracts tourists but residents as well.

Drottninggatan is situated in the district Norrmalm, just north of the famous Old Town "Gamla Stan". It starts at Strömgatan and the Riksbron Bridge in the south which connects the northern part of Stockholm with the old town and goes for 1,6km until the Observtorielunden in the north, however the

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pedestrian street ends at the crossing to Tegnergatan, which makes the shopping street 1,3km long. Especially during the warmer season as well as around Christmas Drottninggatan is very well visited by tourists and locals.

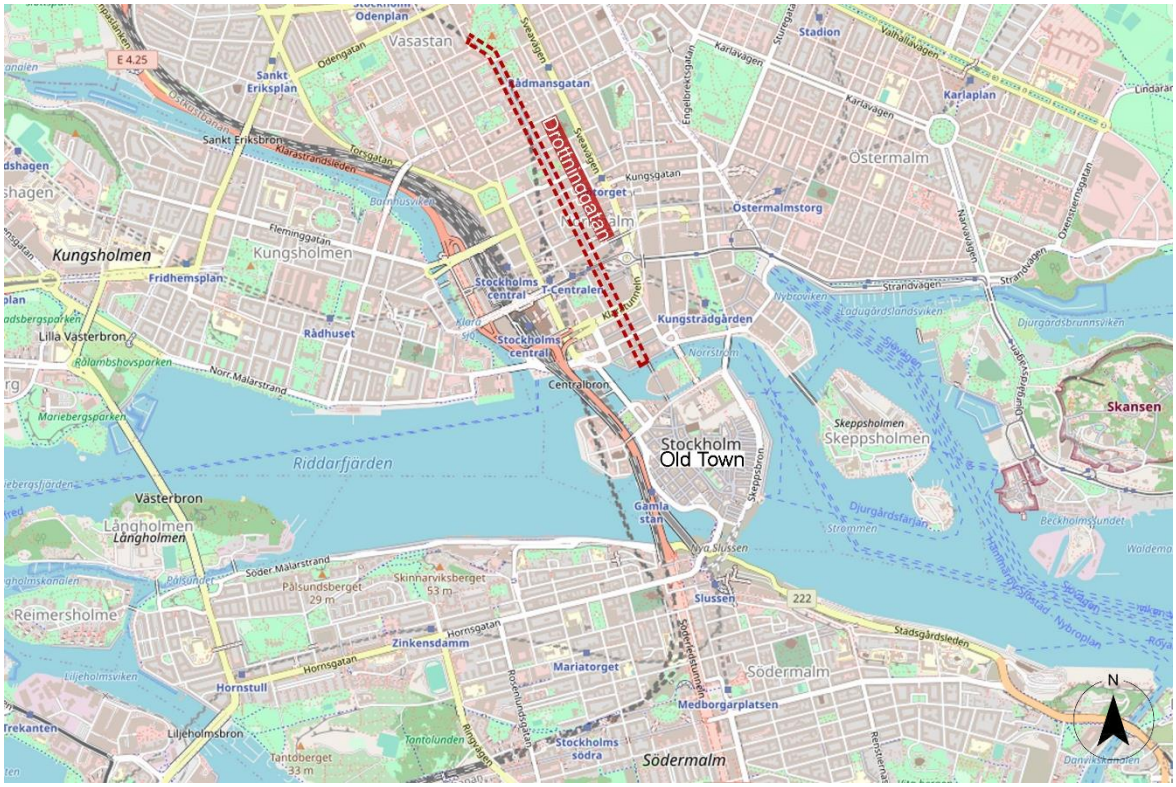

Figure 27: Location of Drottninggatan. Source: Based on OpenStreetMap contributors, prepared by author

The street itself is mostly pedestrian with some access points in the crossing streets for delivery purposes and other vehicles with authorization. However Drottninggatan is surrounded by four main roads connecting the districts to one another as well as linking to the Swedish primary road network. (Firth, 2012) Sveavägen, which goes parallel to Drottninggatan on the east side, Vasagatan west of Drottninggatan, which more north turns into Torsgatan and in the north Odengatan.

When looking at the public transportation network there are numerous public transportation stops in close proximity to the site. As already mentioned, the Central Railway Station is close to the southern beginning of Drottninggatan. In addition the site is reachable per subway through the stations T-

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Centralen, Hörtorget and Rådmansgatan. Several buslines operate on the surrounding roads: Vasagatan (line 50), Sveavägen (lines 57, 516, 526, 565) as well as Kungsgatan (lines 1, 75, 91, 291) and Klarabergsgatan (lines 54, 65).The two latter streets are crossing streets with Drottninggatan. More bus lines operate in the surrounding area. (SL, 2020) As Drottninggatan is a pedestrian street there is no stops directly on this street, however it is still very well connected to the public transportation network.

The buildings on this street are retail shops, restaurants and hotels mostly. The most known store is the department store Åhlens City in the corner of Drottninggatan and Mäster Samuelsgatan. In addition, there are several governmental buildings located at the beginning of Drottninggatan. These are mostly Ministries, the town hall, the parlament and Rosenbad, the seat of the Swedish government. These observations are presented in the following map of the site (Figure 27).

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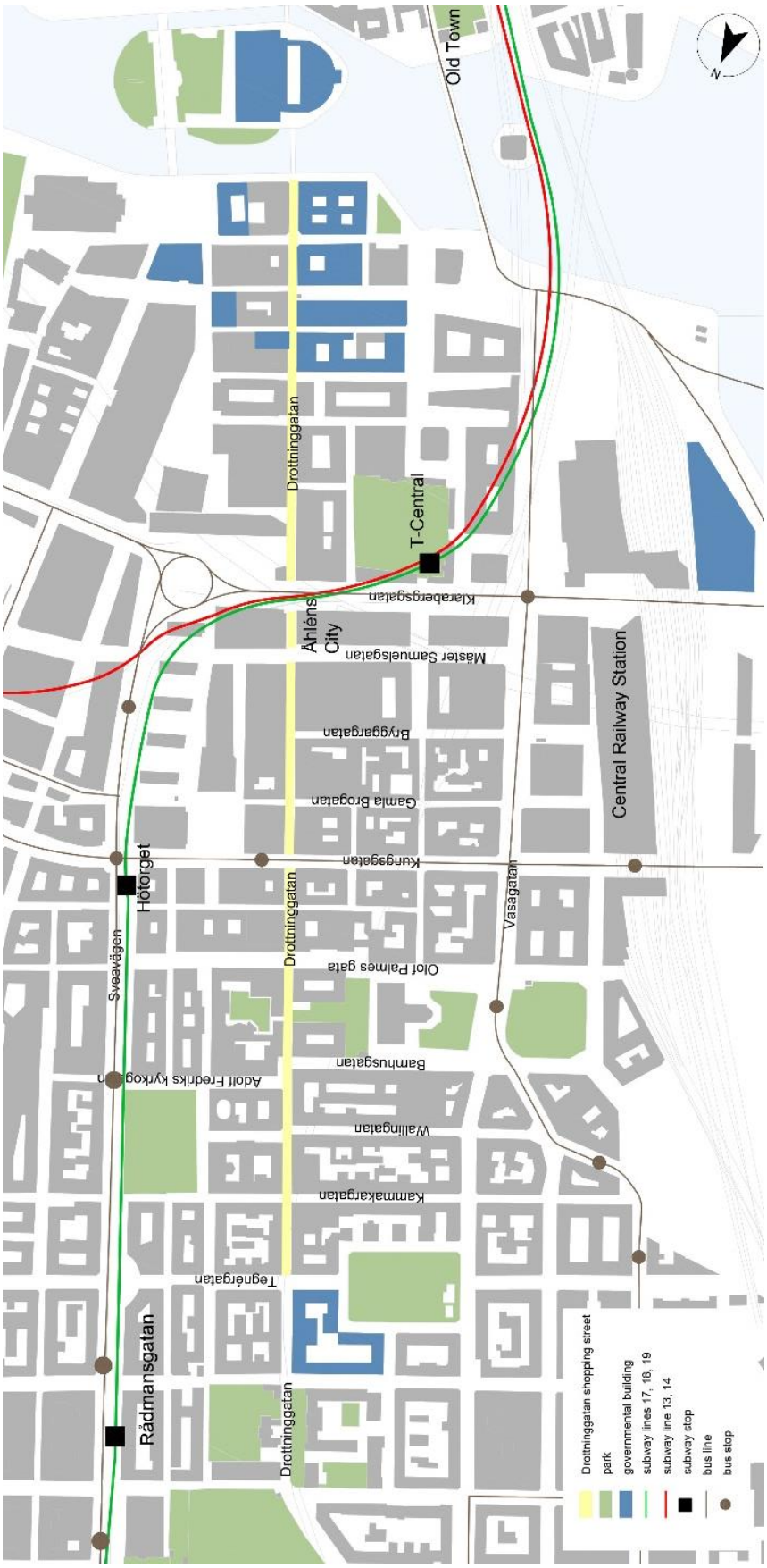

Figure 28: Drottninggatan and its surroundings. Source: Based on OpenStreetMap contributors, prepared by author.

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5.4.3. The Attack

The attack on Drottninggatan, Stockholm, Sweden took place on the 7th of April 2017. This was a vehicle ramming attack where the perpetrator drove a vehicle on the pedestrian shopping street. Similar to the case in Berlin, the truck used in the attack, was stolen while it was being unloaded on a cross street to Drottninggatan. From there the perpetrator drove at around 3 pm onto the pedestrian street continuing along Drottninggatan for 500m until coming to a halt when hitting the Ahlens department store on the corner to Mäster Samuelsgatan (Figure 28). According to witnesses the truck was driven in a zick-zack motion, trying to hit as many people as possible. As a result from the hit the truck caught fire, but the perpetrator was able to flee towards the metro. According to the police an undetonated bomb was found in the truck as well. As a reaction the metro and parliament were closed down and all trains in and out of the Stockholm railway station were stopped. The perpetrator, Rakhmat Akilov, a 37 year old man from Uzbekistan was caught the same evening. Before the attack the perpetrator had made several videos on which he swore allegiance to the IS and expressed his willingness to kill non-believers. (Masters, Said-Moorhouse, & Sanchez, 2017)

The attack killed 5 and injured 14 people. (START, 2017)

This attack was not the first act of terrorism in this area. In December 2010 two bombs exploded on the shopping street. The first car bomb detonated at around 5 pm at the corner of Olof Palmes Gatan and Drottninggatan. Two people sustained minor injuries. The second bomb exploded 10 minutes later at the corner of Bryggargatan and Drottniggatan. According to the police the blast killed only one person and this is believed to be the perpetrator, who had six pipe bombs on him. Only one exploded and it is argued, that if all the bombs would have detonated successfully, the consequences could have been devastating, as the street was filled with Christmas shoppers. (Hanson & Hakansson, 2010)

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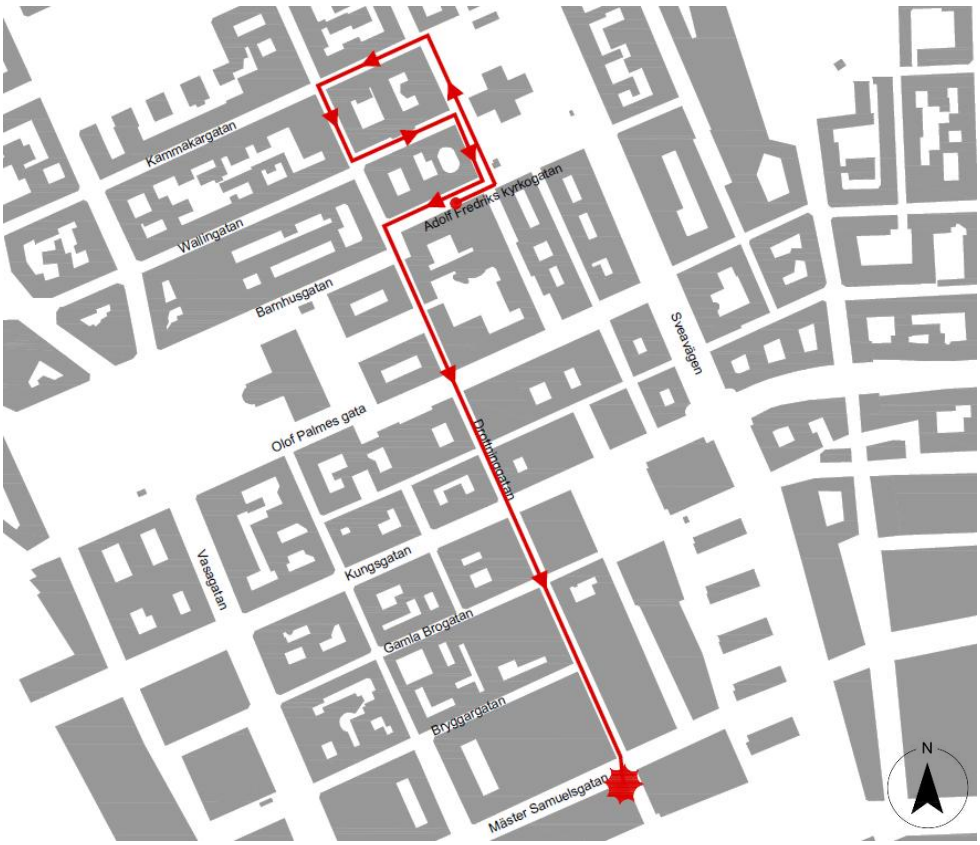

Figure 29: Route of the truck of the attack on Drottninggatan Source: Based on OpenStreetMap contributors, prepared by author.

5.4.4. After the Attack

5.4.4.1. Impacts on the Site

First reactions

Kindroth describes the attack on Drottninggatan in 2017 as an eye-opener. Before the attack there had not been any discussion about hard measures such as bollards or other obstacles. Of course terrorism and counter terrorism had been a topic in Sweden before the attack but more on the level of prevention, meaning looking at terror organizations in Sweden and trying to prevent from attacks happening already in the planning phase. Although the 2017 attack was already the second attack, this is significant, as the police recognized that vehicle ramming attacks can be carried out without much

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planning and by one single perpetrator. This meant recognizing perpetrators before an attack is carried out is much harder. (Kindroth, 2020)

Prevention measures

According to google maps streetview footage smaller concrete lions were at the crossings of roads with traffic (for example at the crossing of Drottninggatan and Vattugatan) before the attack in 2017, however these were placed in a way that vehicles can easily pass between them. (Google, 2012) And these were after research not put up as measures against vehicle ramming attacks.

After the attack Stockholm put up 10 more of such lions within days after the attack had occurred. The Traffic Office ordered 40 more lions, however the delivery took longer than expected and as a temporary solution over three months after the attack, granite blocks were put along the road. The question arose, why it had taken so long, it was explained by the traffic office that this had to be discussed with the police. (Sveriges Radio, 2017)

Today hard measures consists of small and big lions as well as granite blocks (Figures 29-31). The larger lions are placed in a way that vehicles can still enter the pedestrian street for delivery purposes or emergencies, however it is impossible to drive through high speed as you have to drive “slalom” around the barriers. (Kindroth 2020). The smaller lions are as well placed in a way that they are not hindering vehicles and in order for them to not be move, they are attached to the ground – which was not the case with the lions before the attack (The Local, 2017).

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Figure 30: Granite blocks put in a way that vehicles have to drive slowly. Source: Sari Jääskeläinen
Figure 31: Concrete Lion with Flowers as memorial for the victims. Source: (Jönsson, 2018)
Figure 32: Concrete Lions at an intersection. Source: Sari Jääskeläinen.

Memorial

Until today there is no memorial to commemorate the attack in 2017, however Stockholm city has published that a memorial will be placed on Sergels square, which was the spot where many Stockholmers gathered after the attack and laid flowers on the stairs. It will be an artistic design which remembers the event but at the same time reflects the open, free city of Stockholm. (Stockholm Stad, 2020)

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5.4.4.2. General Impacts

Relevance of the topic today

Kindroth (2020) says that the topic of terrorism is important and should not be ignored. Terrorism will continue to happen in Europe, however it is not the "only problem" in Stockholm and regarding this, smart and thought through decisions have to be made. It is important to find a balance of making public spaces safe and letting them be open. Otherwise if there are too many measures and too obstrusive barriers, it will do more harm than good.

Prevention measures taken in other municipalities in Sweden

In reaction to the attack on Drottninggatan other municipalities have put measures in place to prevent terror attacks as well. Out of 20 municipalities four, including Stockholm, have installed or plan to install physical barriers. Some installed temporary barriers at events and some have planned fixed barriers in city centres. Others have invested in more surveillance either through CCTV or patrol guards. (Jönsson, 2018)

Stockholm's strategy of prioritizing vulnerable spaces

Based on the Swedish strategy against terrorism which is divided into three parts: prevent, advert and obstruct, a working group was formed to prioritize spaces in Stockholm that have to be kept safe. This working group was a cooperation of the police force, city of Stockholm and city planners. Certain places in Stockholm were divided into three categories based on the measures needed: (1) Places with public gatherings. These need solutions where barriers can be activated on specific occasions, otherwise not in use. (2) Spaces that are used by many people daily. Barriers that limit the speed and prevents vehicles from entering the site. (3) Event locations, such as summer pedestrian zones, where flexible and temporary solutions are needed that are decided in cooperation with the organizers and the police. (Kindroth, 2020)

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5.5. Comparison & Preliminary Conclusions

When comparing the two case studies the following observations can be made:

Planning System

Both countries have a decentralized planning system. The responsibilities of each planning level are written in a planning act. The level of bindigness gets more significant the closer it gets to the municipal level. Both cities, Berlin and Stockholm have an urban development plan which describes short and long term planning goals for the city. Stockholm additionally has a Mobility strategy as well as a strategy for public spaces. None of these strategies mention security planning goals. However the German police force has a department which concentrates on crime prevention and as one topic urban crime prevention.

The Sites

Comparing both Breitscheidplatz and Drottninggatan with the chapter *3.2.1.1 Site Vulnerabilities,* both cases can be classified as vulnerable, as they have many of the characteristics described as factors that makes a site vulnerable.

The sites where the attacks occurred on have many similarities. Both Berlin and Stockholm are capitals and are popular destinations for international visitors. The sites are both well visited places by tourists and locals, however Drottninggatan is crowded all year long, as it is a shopping street and Breitscheidplatz is more crowded during Christmastime when the Christmas market is put up, but still has visitors all year round as on the square lies one of Berlins sightseeing destinations: The Kaiser Wilhelm Memorial Church. Both sites have multiple entrances, which also indicates vulnerability (Petriashvili, 2017). For Breitscheidplatz the entrances are along the two main roads on the north and south side of the square. As for Drottninggatan there are several crossing streets either for just pedestrians or for vehicles. Additionally both cases are located in the city centre with good accessibility by public transportation as well as by vehice. Especially Breitscheidplatz is located between two main roads, giving the site a direct connection to the city centre. Drottninggatan is a pedestrian zone but is

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still in close proximity to Stockholms main road network as well. Both sites are mostly surrounded by retail stores, restaurants and hotels. In the south end of Drottninggatan, there are additionally several governmental buildings.

After the attack

Comparing the proceedings after the attacks it can be observed while both cities took measures immediately as a reaction to the attack, there are some differences. The city of Berlin took very intrusive temporary measures by increasing heavily armed police presence and closing the two main roads on both sides of Breitscheidplatz with very martial barriers. These barriers are put up every year during the time of the Christmas markets while a working group put up by the senate is working on a long term solution. This results to the fact discussed in chapter *3.1.2. Impacts of Security Planning,* where Briggs (2005) argues that counter terrorism measures can lead to the militarization of urban space, however in the case of Breitscheidplatz it is only a temporary solution until a more permanent is made.

In contrary, the city of Stockholm put up permanent barriers within months of the attack. However it has to be said that the sites are quite different in form and use and therefore different solutions are necessary. While increasing the number of barriers (in form on concrete lions) works in the case of Drottninggatan, it would not be a solution for Breitscheidplatz.

Both solutions, I would argue are the opposite of Briggs *"End of urban iconography"(*Chapter 3.1.2. Impacts of Security Planning). Although she writes about the uniformity of high rise buildings it can still be compared to the case studies. Briggs argues that one of the impacts of counterterrorism is that less creative urban landscapes will be planned in order not to attract terrorism. However in Stockholm the counterterrorism measures have designed to be an eye catcher, rather than something uniform. In

The overall reactions were very similar. The experts in both cities are seeing the relevance of the topic, however beeing critical not to give it too much weight. Finding a balance of security and letting a space be a space is crucial. All experts are in uniformity about the opininon that not everything can or should

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be made terror resilient and it is important to identify the vulnerable spaces. Both cities have identified vulnerable spaces towards terrorism and will concentrate on making these terror resilient.

All in all it can be said that the way the cities reacted on the attacks were quite different. Of course every case is different and therefore there is not one right way to approach this topic, however planners can learn from different projects and use them as reference. Additionally some kind of guideline for planners could be a helpful tool to firstly recognize vulnerable sites as well as on how to make a site terror resilient.

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6. Conclusion

The topic of this thesis was to examine the terror resilient planning of urban open spaces focusing on vehicle ramming attack prevention with the aim to understand how planners can contribute towards terror resilience and therefore safer cities. The goal was to find an answer to the question on how urban open spaces can be made terror resilient in regards to urban and transportation planning. This concluding chapter therefore consists of firstly answering the sub research questions before secondly trying to answer the main research question. Then further research topics are discussed before coming to a concluding statement.

In the following the sub research questions are answered.

How does terrorism impact cities?

This question was answered in Chapter *2 Terrorism and Cities*. It was important to firstly understand the origins of terrorism as well as how it is defined today and which definition was used for this thesis. Secondly the impacts of terrorism in a historical sense were discussed to underline the fact that terrorism has impacted cities in the past and will do so in the future. It is important to point out that the impacts have evolved and changed over time, as have the methods terrorists have used. Terrorism in today's sense has an impact on cities when due to an attack the built environment gets destroyed or damaged and the site is built up again or made into a memorial, for example after the 9/11. However terrorism has another impact on cities, which is the psychological impact, as when an attack occurs it creates fear and disrupts our everyday lives. (Beall, 2007) This fear can lead to a militarisation of cities as well as obtrusive measures that should be seen critically.

What measures against terror attacks in cities do exist? (on planning level)

This was examined in Chapter 3 *Security Planning and Terror Resilience* in which the main objective was to understand what can be done to prevent terror attacks in urban open spaces with design elements/measures that can be integrated into transportation planning. For answering this question the

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CPTED strategy and its origins was explored, which gives indications that crime prevention is not a new topic in urban and transportation planning, however CPTED has mostly been researched based on cities in North America. This is the case with the described Three Layer Strategy by FEMA as well, which was developed for North American cities to prevent terrorism. The transferability on European cities of CPTED as well as the Three Layer Strategy would need further research. Finally the physical measures are described in the subchapters *3.2.1.3 Physical Measures for Traffic Management and Calming* as well as *3.2.1.4 Other Measures.*

What are the characteristics of terror attacks that occur in urban open spaces?

The characteristics of terror attacks that occur in urban open spaces are analysed in Chapter 4 *Terrorism Today and its Characteristics*. The characteristics refer solely to attacks that have occurred in urban open spaces in European cities between 2001 and 2017. The main findings summarized are that the most dangerous weapon used in attacks that occurred in urban open spaces in the years between 2001 and 2017 in Europe was a vehicle. Although this was not the most often used weapon, the most casualties were caused by vehicle ramming into crowds of people. Another observation made is that usually one single attack spiked the amount of casualties in one year (Oslo, Norway 2011 and Nice, France in 2016). The ten most devastating terror attacks have mostly been vehicle ramming attacks in capitals of Europe which confirms the results stated earlier in the literature review as well.

What were the vulnerable elements of sites where an attack has occurred?

This sub question was answered for one in the literature review of Chapter 3 *Security Planning and Terror Resilience* and confirmed in Chapter 5 *Case Studies*. The site analysis of both case studies confirmed the main points on vulnerabilities of a site and can therefore be rated as vulnerable towards terrorism. Most crucially the amount of people on the site matters. Both, a site with crowds all year long like Drottninggatan and sites that are crowded due to an (regular) event, are seen as vulnerable. As vulnerable targets governmental buildings, religious objects, tourist attraction spots, entertainment and shopping venues as well as transportation hubs are mentioned (Petriashvili, 2017). However these

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spaces should be examined individually and with consideration to the other vulnerability factors mentioned before.

How have these sites changed after the attack?

On the question of how these sites have changed after the attack can only be answered for the two case studies. A general answer I believe is not possible because every case is different and every country/city deals with this their own way, regarding reconstruction, memorials etc. Also the former use and location plays a role in the rebuilding and redeveloping of an attack site. For Drottninggatan the changes were decided and executed very quickly. The changes were very small and discrete, while still being visible, however not obtrusive. A memorial for the site is still in planning. As for Breitscheidplatz the fixed changes are still under process, however a memorial has been designed and put up.

Continuing with the main research question on "H*ow urban open spaces can be made terror resilient in regards to urban and transportation planning*."

As the world is constantly changing, cities are getting bigger and denser (United Nations, 2018) and the planning culture is changing, so should the way we plan things change as well. This includes giving security planning a more prominent role in transportation planning. However not in a way that everything has to be made more secure but taking security planning into consideration when new areas are being developed or big events are being planned. Of course the question of whether or not a space needs to be protected is an important part to consider (Strünck 2020). Not all spaces need to or can be protected, this would for one be financially not possible and could lead to the militarisation of the area (Briggs, 2005). Finding a balance between securing a site and letting it be an open space is crucial. It is also important to involve security measures to vulnerable sites when other planning and designing measures are done (Floeting, 2020). When implementing security in an early stage of a planning process it can be decided if security should be part of the project or not. With involving all stakeholders, including police, planners, government, residents and many more, optimal solutions can be achieved (Kindroth, 2020).

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However it is to be emphasised to see security measures such as bollards and video surveillance in a critical light. The liveability should still be the central aim, but the expertise of making an urban open space safe and liveable should lie in the competence of planners.

When thinking of the initial scope of this thesis and how it is narrowed down, further research topics can be found.

This thesis concentrated on attacks in European cities and as this topic has been mostly explored in North American cities further research should be done on the possibility of transferring these results on European cities. North American cities have different planning systems compared to European cities. Additionally cities in North America are different in scale, which results in the fact that the strategies mentioned might not work the same way in European cities. It would be an interesting topic to further research how CPTED or the Three Layer Defence Strategy could be transferred on to the different European planning systems and how the strategies would work in European urban open spaces. As the United Kingdom has a long lasting history with terrorism, there is already a lot of research on this topic, however other European cities have just started to explore this topic in the recent years.

Another interesting topic of research would be how to implement these measures into urban and transportation planning processes in the different European countries. The question rises where these measures could be embedded. Could a solution be to embed security planning measures into the already existing planner's handbook/manual. Further research could dive into the topic of who should be involved in security planning and in what projects and to what extent should security planning experts be involved.

This thesis mentions on some occasions the vulnerabilities sites can have towards vehicle ramming attacks and examines these for the two case studies Breitscheidpaltz and Drottninggatan. However a more in depth research on different sites on what makes the space vulnerable should be more researched.

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In the future further research could be done on the measures as well. Especially a topic that was just brought up a few times in this thesis is the difference of temporary and fixed measures. It would be important to recognize in what occasions which solution is the best. This was not a focus of this thesis.

This thesis examines the backgrounds of terrorism and cities, gives ideas what planners can do for safer urban open spaces, describes the main characteristics of attacks in the said spaces and examines two cases on what was done in reaction, but still every case, every site is different and therefore there cannot be an overall/general guide on how to make urban open spaces terror resilient.

Of course planners cannot end terrorism by making spaces terror resilient and it is not our responsibility, however it is the responsibility of planners to plan and design cities that are safe. As said, vehicle ramming attacks are the most dangerous and unpredictable method when it comes to terror attacks in urban open spaces, but at the same time one of the few attack methods that can be prevented or at least minimize the damage of with measures in transportation planning. This is how planners can contribute to making urban open spaces safe while not adding more fear with too obtrusive measures.

As a concluding reflection to this work, maybe the real aim of this thesis was not to find out how to make public spaces terror resilient but to recognize and emphasize the fact that counter terrorism and security planning are not just a topic for public safety authorities and organisations but also for planners. That it is important for transportation planners to keep in mind the security factor, and by this I do not mean road or traffic safety, which in no way is less important but safety of open spaces against terrorism and crime in general.

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Appendix

I Sample Interview Questions Drottninggatan

Introduction of Interviewee

1. Please introduce yourself shortly. Where do you work, what is your field of expertise?
2. Since when have you been working in your field?

Overall view on the topic of security planning in cities

3. Terrorism is a very current topic especially in the media. How do you assess the relevance of the topic in European cities ?
4. Do you feel there is a need for more security in open/public spaces in Stockholm or other European cities and why?
5. Due to the increased terror threats many cities have invested in more security measures in public spaces. (CCTV, bollards, police presence, etc.) What is your opinion on these security measures in public spaces against terrorism?
6. How do you assess the importance of these measures? Are they really useful or do they have more of a symbolic character?
7. How do you assess the conflicts of goals in this matter? CCTV video surveillance– data protection, barriers/bollards – accessibility of trucks (for delivery for example). Do you have any other possible conflicts of goals in mind?
8. In what way do you think these measures impact the everyday lives?

Attack on Drottninggatan April 2017

9. This was after 2010 already the second attack on Drottninggatan, this time a successful one. What were the first reactions/discussions after the attack?
10. To what extent was security considered a topic (in the context of urban planning) in this area or the whole city before the attack in 2017 and was there a change to be observed?
11. What kind of short term measures were taken in the aftermath?
12. In reaction to the attack were there long-term measures?
13. What kind of impacts did these short- and long-term measures have? (for example on traffic flow, visitor numbers)
14. How do you assess the relevance of security measures in today's urban and transportation planning?
15. Have there been changes in planning processes or have new guidelines for planners on how to plan terror resilient spaces been made?
16. Who are in your opinion the experts in this field? Are there cooperations that should be reinforced?
17. Do you have anything to add?

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II Excerpt of Interview with Georg von Strünck (6.4.2020)

“Vor dem Anschlag, war das Thema Sicherheit im öffentlichen Raum auf andere Themen bezogen, also nicht Terroranschlag im öffentlichen Raum, sondern es gab natürlich Sicherheit im öffentlichen Raum. Sei’s jetzt Hütchenspieler, Taschendiebstahl, Raubtaten also die normale Kriminalität würde ich sagen. Das war schon ein Thema. Wir haben ja im Bereich bei uns der heißt Städtebauliche Kriminalprävention und der beschäftigt sich explizit mit Architekten und Stadtplanern mit der Sicherheit im öffentlichen Raum. Definitiv. Aber eben nicht zu dem Thema Terroranschläge. Die Änderung, da waren danach, dass man natürlich auf politischer Ebene sowie Polizeilich gesagt hat ok mit dem Thema müssen wir uns auch mehr auseinander setzen und es ist nicht nur ein Thema mit dem sich die Engländer auseinandersetzten in London, oder Afghanistan, wo solche Dinge öfter vorkommen. Sondern, dass das auch ein Thema für Berlin oder Deutschland ist, war klar.”

III Excerpt of Interview with Robert Kindroth (29.4.2020)

“Yes I think it is relevant and of course important but on the other hand it is the only thing we can discuss, we have other problems in our society and in our country. So, if you talk too much about this and you do too much things in cities, it becomes a risk that it starts to worry people too much and it will be the only topic. (…) So I think it still is important and more terrorist attacks will happen in Europe, so we must be prepared and do smart decisions in right places and in Swedish we have a word for it: Lagom. [balance] You will not do too much and you not do too little. It’s a way in-between. “

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IV Excerpt of Interview with Holger Floeting (2.6.2020)

„Ja, also es wurden tatsächlich eine Vielzahl an Maßnahmen umgesetzt zum Teil temporär vor allem was die Sicherung von Veranstaltungen im öffentlichen Raum angeht. Zum Teil auch dauerhaft, wenn es sich um öffentliche Plätze handelt, die besondere Gefahr haben Anschlagsziel zu werde, symbolische Orte. Ich denke da hat sich in den letzten Jahren gerade das was Sie anfangs schon angesprochen haben als Reaktion auf den Anschlag am Breitscheidplatz in Berlin relativ viel getan, aber man muss auch sagen die öffentlichen Plätze sind ein sehr großes Terrain und wenn man tatsächlich alle diese Bereiche absichern müsste, wäre das mit einem sehr hohen Aufwand verbunden und auch nicht von heute auf morgen zu erreichen. So dass man sich ankucken muss, wie haben sich öffentliche Plätze dann wenn sie ohne hin im Rahmen von Stadtumbau Maßnahmen verändert haben auch hinsichtlich Sicherheitsmaßnahmen geändert und da kann man schon feststellen, dass also was die Möblierung angeht, auch was die Sicherung des verkehrlichen angeht, sich ein paar Dinge verändert haben.“

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