The Role of Urban Planning and Urban Design on Safe Cities

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Abstract. Cities are exposed to many security threats in urban areas due to crime and violence, insecurity of tenure and forced eviction, and natural and human-made disasters. Cities have witnessed many challenges and problems, such as: increasing population numbers, housing density, migration to cities, unemployment, poverty, deteriorating infrastructure, unhealthy environment, wars, terrorism and political conflicts. The purpose of this study is to define safe cities and clarify the role of urban planning and design and their elements on safe cities. This paper analyses the role of urban planning and urban design to increase security in safe cities. The research provides an overview of the theories that explain the relationship between urban planning and design and their elements on crime, in addition, it describes the most important planning and design elements that reduce the opportunities for crime like: street planning, land use, building density, and role of management and good governance, in addition to urban design concepts: defensible space, territoriality, access control, surveillance, target hardening, building Image, activity support, and maintenance.

1. Introduction

Security threats increase in large cities, the upsetting of security threats and crime occurring in the urban areas evokes fear among the citizens, it increases government anxiety and alienates investors. To reduce security threats and reduce the crime rate, there are physical and social factors that must be considered. Social factors are represented in poverty, unemployment and the quality of life of individuals. On the other hand, environmental factors include planning and design factors in cities and urban areas. The physical elements that impact crime rate in urban planning are: street planning, land use and building density, and in urban design: public space, building height, street design, hierarchy of spaces, layout and orientation of buildings, location of entrances and balconies.

The city is the set of interaction between physical elements (the physical and urban aspect) and the immaterial or imperceptible elements (social, cultural and political aspects). City planning and design has a role in strengthening social relations between people and their sense of safety and reducing the potential opportunities for crime. It is noticeable that some cities and urban areas are safer than others, while crime is concentrated in some places and not others, because the design of some areas is more easily penetrated by outsiders, and there are negative spaces (spaces that discourage social interaction) that encourage crime, and the weakness of natural control. Urban planners and designers face great challenges when designing a new city or urban area, the most important of which is the security challenge of providing safety for urban areas. There are four important elements that have a role in
creating safe cities, namely: smart governance and management, proper urban planning and design, the presence of a competent police force and the provision of modern technologies. The structure of this study consist of three parts; first, it discusses the literature review. Second, it clarifies the elements of urban planning and design that affect safe cities. Third, it analyses the role of urban planning and urban design and the physical elements of safe cities. The research problem is the lack of scientific knowledge about planning and design factors in cities that provide a feeling of safety. The research assumes that urban planning and urban design have a role in influencing the level of security in safe cities. The aim of the paper is to study and analyse the planning and design factors that are important in creating and strengthening safe cities.

2. Methodology
This paper adopted the analytical method to achieve the aims of the research. In this approach, findings from previous and existing studies were used to study the relationship between urban planning and urban design on safe cities. This paper also studies the most affecting elements of urban planning and urban design on safe cities, and the research reveals the role of each.

3. Literature Review
Many theories have emerged that explain the relationship between the urban environment and security, the most important theories and their results will be mentioned through the historical sequence.

3.1. 1960s period

3.1.1. Elizabeth Wood. In the beginning of the 1960s, American sociologist Elizabeth Wood worked on the microenvironment of the US’ public housing blocks. Her standing argument was the idea that housing developments can’t employ a sufficient number of police officers, service engineers, caretakers, etc., to prevent crime from happening. She was one of the believers in physical design’s importance to achieve social goals. She tried to change the design with the aim of improving the residents’ quality of life and increasing the aesthetic qualities of the residential environment, improving the security conditions for these environments, the visibility of the housing units by the residents, and the creation of residential areas for residents to monitor their neighbours. She clarifies some elements that could be implemented to encourage accidental or causal communication between people: designing for visibility and making the entire area visible from any spot outside the lobby, designing for loitering, and design conducive to the formation of informal adult groups [1].

3.1.2. Jane Jacobs. She concluded that in order to have a safe housing area, it must operate on principles of:

- Demarcation: a clear distinction between private space and public space.
- Proprieter monitoring: The natural proprietors must be able to keep an eye on the street, natural surveillance on the streets and properties.
- Constant users: Sidewalk should be used continuously to add more effective surveillance on the street and walkways, this will result from people inside street-side restaurants and shops keeping watch on them.
- Mixed use: Residential neighbourhoods should be populated by multiple types of people: Should they be old or young, housing for rich and poor, in addition to having both commercial and housing property that is rented or privately owned [2].

3.1.3. Shlomo Angel. In 1968 he wrote “Discouraging Crime through City Planning”, discussing methods in which citizens can help in preventing crime. Angel thought that particular areas suffer higher crime rates than others because of the higher level of opportunity on which a rational offender could capitalize on. Angel proposed that deterrents to crime include high intensity use of a location because this increases the number of effective witnesses and low intensity use of an area because this reduces the number of potential victims. Moderate land use was thought to produce the highest amount
of crime because there were enough victims to choose from but not enough to discourage crime. His ideas were mainly around channelling zoning businesses and pedestrian traffic into areas where parking and mass transit are near [3].

3.2. 1970s period

3.2.1. Ray Jeffery. During the 1970s, research about crime prevention in the urban environment and the methods in which the behaviour could be manipulated through modification of the environment had traversed through various disciplines of urban planning, sociology, architecture and criminology. R. Jeffery coined the phrase “CPTED”, or “Crime prevention through environmental design”, he examined the complex connection between humans and their environment, in addition to its impact on their behaviour. He mentioned three interrelated strategies:

- Access control/ target hardening: limit opportunity
- Natural surveillance: observational monitoring.
- Territorial reinforcement: design lots, streets, and houses to encourage social interaction between neighbours, define property limits by fencing, gates, and planting.
- Maintenance and management: Public areas that are unmaintained encourage criminal behaviour. [4]. Figure 1 shows some forms of natural surveillance.

![Figure 1. Natural surveillance.](image)

3.2.2. Oscar Newman. His leading concept was the theory of ‘Defensible Space’. There are 5 factors that make a space defensible.

- Territoriality: Utilizing physical or symbolic barriers to enhance the feeling of territoriality of residents in their area.
- Natural Surveillance: The physical features that allow the resident to monitor their surroundings.
- Building image: Preventing residents from being stigmatized by choosing proper materials and design ideas.
- Juxtaposition of other facilities: Within residential land. Areas for dwellings should be mixed with commercial zones and other facilities as this helps reduce crime and increase security.
- Safe Adjoining Area: residents obtain ability to survey the adjoining spaces through designing the adjoining area [5].

Figure 2 shows the factors involved in defensible space.
3.2.3. Christopher Alexander. In 1978 he wrote A Pattern Language, which doesn’t focus on crime, but mentioned many elements in design that may offer crime prevention and fear reducing effects. “A Pattern Language” is written on the basis of the existence of a “language” for the design of an environment, one that enables designers to, within a formal system, communicate and articulate an infinite array of ideas. “Patterns” are answers to various design problems (For instance, a good height for a windowsill, or the amount of space dedicated to vegetation). More than 250 patterns are included in the book [6].

3.3. 1980s period

3.3.1. Ronald V. Clarke. In 1980 he published his book Situational Crime Prevention with Patricia Mayhew and developed “Rational Choice theory”, which is based on core doctrines of classical criminology. In 1997 he published his book which contained 16 principle strategies for crime prevention. Figure 3 shows those strategies. [7]:

3.3.2. Brantingham & Brantingham. They found differences between neighbourhoods in the amount of burglaries, in addition to distribution differences within different neighbourhoods. They suggested a theory based on their study’s conclusions. First, they supposed offenders had motives for perpetrating a crime, either emotional, such as assault and vandalism, or instrumental or planned like robbery or burglary. Second, the crime comes at the end of a process in which the offender picks a suitable victim. In impulsive crime cases, the process is more limited [6].

3.3.3. George Kelling & James Q. Wilson. In 1982, they reached the “Broken Window” theory, suggesting that a vacant building or car can stay unharmed indefinitely, but is quickly vandalized once a window is broken. Maintenance of a building and its accessories (paint, lighting, fencing, walkways,
and signage) and repairing of broken elements is vital for signalling to the criminal that it is cared for. Property management is critical to make sure upkeep is kept to standard. [8].

3.3.4. Bill Hillier. He has developed the concept of space syntax in 1984, pioneering new revitalization methods for urban areas. He reached “Space syntax” theory, which has been used for explaining design with a sociological perspective. It asserts that space, as extensions of everyday life, are analysable. Visual characteristics are not the most important element in architecture, but in what way a series of spaces can be used, e.g., how these will affect pedestrian movement, safety and economic vitality. The process uses computer-based technology which produce graphical demonstrations of factors like reported crime patterns, land use, pedestrian movement, etc. through computer modelling of housing zones, Hillier concluded that:

- Quiet, less connected places usually suffer higher rates of crime. Many of those places are very isolated.
- Accessible streets carry more traffic by pedestrians. The degree of spatial accessibility is directly related to adult pedestrian activity.
- Urban space downscaling makes it easier for exploring of less accessible parts by children.
- Lack of outward-facing dwelling is directly correlated with pedestrian fear.

A primary conclusion is that an effective and well-defined pattern of movement is itself an effective way to control crime in housing estates [6].

3.3.5. Alice Coleman. In 1985 she wrote “Utopia on Trial: Vision and Reality in Planned Housing”, it was about the land use and the principles of designing out crime. It demonstrated that social breakdown was more common the more frequent, in any block, is the defective design [6].

3.4. 1990s period

3.4.1. Timothy D. Crowe. He refined Oscar Newman’s ideas. He created a system to categorize CPTED solutions, making use of his experience with the Westinghouse CTPED project. Crowe suggested that CPTED has three classifications for its measures.

- Mechanical measures: Or target hardening, it emphasises physical barriers. It should not be used by itself, but with people and other strategies for design.
- Organizational or human measures: Instructing or teaching individuals and groups self-protection methods. They may include things like block watches and neighbourhood watch.
- Natural measures: Deterring crime through space design, while ensuring it is more functional for the legitimate user [9].

3.4.2. Greg Saville & Gerry Cleveland. Cleveland and Saville, in 1998, created second generation CPTED. It moves beyond the debate concerning design’s effect on crime, onto including societal factors. It employs four main strategies, “the four C’s” [9]:

- Social cohesion
- Connectivity
- Community culture
- Threshold capacity

3.4.3. UNICRI. In 2011, the United Nations Interregional Crime and Justice Research Institute (UNICRI) published “Improving Urban Security through Green Environmental Design.” This document proposes a third-generation CPTED that uses green sustainable design to improve communities and reduce crime (and other social) problems. The key to this is making inhabitants, guests, and anyone else feel safe in the community. This is essentially territoriality. Third-generation CPTED “insists on practical measures, physically or cybernetically enhanced, that foster the perception of urban space as safe”. This is done using technologies that transform public space to interactive communal space, which fosters a sense of belonging, ownership, and surveillability. Third-generation CPTED included four major components: (1) places, (2) people, (3) technology, and (4)
networks. This version of CPTED seeks to reprogram urban space to achieve a safer community [10, 11, 12, 13].

Table 1 shows the historical sequence of the theorists and their proposed theories.

| Theorist                  | Theory                                                                 | Most important conclusion                                                                 |
|---------------------------|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| E. Wood (1961)            | “A Social Theory of Housing Design”                                    | Designing for visibility, loitering and design conductive to the formation of informal adult group. |
| J. Jacobs (1961)          | “Eyes on the streets”                                                  | Residential blocks should face the street to increase surveillance.                         |
| S. Angel (1968)           | “Discouraging Crime through City Planning”                             | Increasing the number of people and street activity.                                       |
| R. Jeffery (1971)         | “CPTED”                                                                | Importance of access control, natural surveillance, territorial reinforcement, maintenance and management. |
| O. Newman (1972)          | “Defensible space”                                                     | Territoriality, natural surveillance, juxtaposition of other facilities, building image, and safe adjoining area are important in increasing urban security. |
| C. Alexander (1978)       | “A Pattern Language”                                                   | Towns and buildings will only be able to become alive if they are made by all the people in society. |
| R.V. Clarke (1980)        | “Situational Crime Prevention”                                         | Target (hardening and removal), access control, identification property, surveillance, controlling, reduce temptation, rules setting. |
| Brantingham & Brantingham (1981) | “Environmental criminology”                  | The offender has many possible motives for committing crime. Crime comes at the end of a decision process. |
| Kelling & Wilson(1982)    | “Broken window”                                                       | Continued maintenance of the building and its accessories and property management keeps buildings in a better state. |
| B. Hillier (1984)         | “Space syntax”                                                        | Ways to analyse a street network are: Integration, choice and depth distance.               |
| A. Coleman (1985)         | Land use                                                               | Size of dwelling per: block, entrance, number of storeys, flat or maisonettes. Circulation, overhead walkways, connecting exits, connecting lifts and stairs, dwelling per corridor, entrance variables, entrance type, entrance position, and doors or apertures, stilts, garage, facilities all effect security. |
| T. Crowe (1991)           | “Target Hardening”                                                    | There are mechanical measures, human or organizational measures and natural measures to urban security. |
| Saville & Cleveland (1998) | “CPTED” 2nd generation                                                 | Inclusion of additional strategies to CPTED: Social cohesion, community culture, connectivity, and threshold capacity. |
| UNICRI (2011)             | “CPTED” 3rd generation                                                 | Insists on practical measures for increasing territoriality.                                |
4. **Elements of urban planning and design on safe cities**

There are many differences between urban planning and urban design, namely scale, orientation, treatment of space, and time frame.

Table 2 shows the most differences between urban planning and urban design.

| Urban planning                  | Urban design                                      |
|--------------------------------|--------------------------------------------------|
| Scale                          | Entire cities, districts or neighbourhoods.       |
| Orientation                    | Places between buildings (e.g., parks or other public spaces) |
| Treatment of space             | Utility                                          |
| Time frame                     | Functional and aesthetic                         |
|                                | Primarily 2 dimensions                           |
|                                | 3 dimensions                                      |
|                                | Long term (5-20 years)                           |
|                                | Short term (>5 years)                            |

### 4.1. Elements of Planning.

The field generally referred to as urban and regional planning consists of several planning elements. Some of these include [14]:

- Transportation planning
- Air quality planning
- Solid waste planning
- Site planning
- Project planning
- Master planning
- Comprehensive planning
- Health services planning
- Water quality planning
- Recreation facilities planning

### 4.2. Elements of Urban Design

- Buildings
- Transport
- Public Space
- Landscape
- Streets

### 4.3. Safe Cities.

The security and safety of the city both have suffered many threats. Some took the form of elaborate dramatic events, and many others have been expressions of the connection between poverty in the urban environment and the institutional, social and economic inequality in slums. Three threats are ever prevalent; urban crime and violence, insecurity of tenure and forced eviction, and natural and human made disasters [15]. Figure 4 shows the threats to the safety and security of cities.

![Figure 4. Safety & security of cities threats.](image-url)
Safety seems to be undervalued in many studies. However, it is observable that safety is a critical element of the quality of life in any city, even going back from Maslow’s hierarchy of needs. A safe, smart city system should offer the following qualities as figure 5 [16].

5. Role of urban planning and urban design on safe cities

5.1. Role of Urban Planning

5.1.1. Land Use. The realization of the optimal solution for sustainable urban planning and design is the revival of old principles and concepts. It has proven successful in traditional urban structure such as Monolithic city, land and mixed use and strengthening pedestrian traffic movement [17].

5.1.2. Street Planning. Some road layouts have proven to be more advantageous when compared to others, particularly in patterns that could irritate searching behaviours of criminals and offenders for routes to escape. The development and its security could be compromised by an excessive amount of penetrability, for example by opening access to rear borders of housing units. It is the job of the designer to make sure that the development is well secured [18].

5.1.3. Density. It is a general standard in the planning for all kinds of housing that densities should be limited to provide for the following:
- Adequate daylight, sunlight, air, and usable open area for all dwellings
- Adequate space for community facilities.
- A general feeling of privacy and openness.
- A reasonable relationship to land and improvement costs.
- A relationship to scale of the site, the neighbourhood, and the geographic area.

High densities are to be avoided because the problems of crowding are self-evident. The density and its importance must be examined on a site-by-site basis. High-density areas could very well be liveable in cases where human activities are placed appropriately to buildings [19].

5.1.4. Management and good governance. Safety governance enhances the well-being of people and their communities through appropriate management and resource allocation. It encapsulates a number of concepts:
- Regulation: City governments have authority and powers related to crime prevention and control to address insecurity and its causes.
- Enforcement: Local communities must work with law enforcement, cooperating on problem-solving techniques to address issues causing loss of public safety. Upholding rule of law and human rights is key for improving safety.
- Engagement: City officials must engage and communicate with the community, including marginalized and vulnerable groups.
• Resilience: Increasing community resilience and reducing vulnerability. Vulnerable or often excluded groups must also be considered, such as women and the youth [20].

5.2. Role of Urban Design
There are various principles that affect security in urban design:

5.2.1. Defensible Space. It is a term coined by Oscar Newman. Newman suggested that the neighbourhood's residents' sense of control over their space can be inhibited or increased by its physical design. In general, it is design that allows residents of a particular space to bar offenders out [21].

5.2.2. Territoriality. Territoriality can be defined as emotional response to space by its residents, which define it as theirs. Examples include residents marking areas with signs or gates. [21].

5.2.3. Access Control. It aims to allow only those who have legitimate affair in an area to enter. This decreases the opportunity for crime by increasing the amount of effort required to enter and exit buildings or areas for the purpose of committing a crime [22].

5.2.4. Surveillance. The ability to observe suspicious behaviour, either by informal (passer-by, etc.) or formal (police officers, etc.) users of the space. It relies on the way an area is designed, and whether it maximizes or inhibits surveillance

5.2.5. Target Hardening. Also known as physical security, it comprises of additions of fences, windows, doors and other physical structures, highly increasing the effort required for breaking into a space or building by an offender.

5.2.6. Image. It refers to a state and the maintenance required to the activities that create that state.

5.2.7. Activity Support. An environment should have legitimate users that make use of the space and, subsequently, provide surveillance [21].

5.2.8. Maintenance. It is an indicator for property ownership. Deterioration signals a low state of control by intended users. The importance of maintenance to deter or discourage crime was described in the "Broken window" theory. [5].

5.3. Physical characteristics.
Urban design’s impact on security
• Public spaces and parks
• Avoiding negative spaces
• Using trees and vegetation in urban space and avoiding dense vegetation and shrubs around pedestrian routes.
• External lighting
• Hierarchy of spaces from public space to semi-public to semi private to private space.
• Building height; taller buildings increase crime
• Street permeability
• Footpaths design
• Layout and orientation of buildings
• Location of entrance
• Car parking design; should be observable by residents
• Access gates
• Fencing
• Windows and balcony design; should overlook open areas
• Fire service access
• Rear entrance design
• Closed circuit television CCTV

6. Discussion
This study focused on the role of urban planning and urban design on safe cities. The safe city is an environment that provides security and a feeling of safety to its residents. It clarifies, through analysing previous studies in both the fields of urban planning and urban design, the impact of various concepts and elements on crime rates. One of the primary limiting factors in advancing safe city progress is the presence of the existing cities, as some planning and design decisions can become very major changes to the inherent structure of the city, and will potentially constitute a great economic and social barrier to construction, in addition, each city has its own culture and society that might be negatively impacted by the design changes suggested by some safe city planning and design doctrines. – moreover, urban planning and design suggestions will have to be submitted to the local government and urban management authority, which will have the ultimate say over greenlighting said suggestions. The study was motivated by the question asked in introduction, to clarify the role of urban planning and design on safe cities. This study aims to assist future research through further analysis of smart city systems and their potential impact on safe cities.

7. Conclusion
Governments strive to achieve stability, security, to improve the living environment, and to decrease the fear of crime through creating safe cities. In the design process, urban planning is done first as it is more important, and urban design follows. By combining both planning and design, the safe city could be built. Many enhancements could be done to cities and urban areas through: street planning, efficient land use, and optimising building density in the field of planning. In addition to designing for territoriality, access control, defensible space, accessibility, activity support, building image, increasing visibility, improving lighting in streets, public spaces and parks, maintenance and upkeep of the environment, designing for natural surveillance and artificial surveillance (CCTV) (through connecting the surveillance systems of different institutions and areas to a city operations centre to attain fast response times for a wide area.) Urban planners and designers face a multitude of challenges in the safe city planning process, namely, the political, social, and economic impact of overhauling built environments, and the requirement of proper organization and cooperation with city authorities to reach suitable planning decisions for building safe cities. To achieve a safe city environment and to provide better security in urban areas, the following policies and tasks should be implemented as follows:
• Successful planning and design that will increase security and safety in safe cities, reduce potential opportunities for crime and increase the city’s resilience in the face of security challenges.
• Good governance, successful management and cooperation of various institutions.
• Training and utilizing competent and professional police personnel.
• Using modern surveillance technologies and linking them with other institutions in order to create a joint operations centre that can monitor potential risks and respond quickly and effectively.

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