The Efficiency of All Crime Prevention Through Environmental Design Generations in Malaysia Housings

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Abstract— **Crime Prevention Through Environmental Design (CPTED) is an effective approach in reducing the crime rate in residential area which recognized by experts. This approach was introduced in 1960s where the built environment of housing was emphasized initially in first generation CPTED while social dimension was utilized in second generation CPTED. Nowadays, CPTED has improved significantly from the first generation which only emphasize on the physical features of the artificial environment to second generation which consider the social aspects such as mutual trust and sense of belongings among the residents. Since the implementation of CPTED has been long executed, this theory should evolve along with the application of internet technology today as social cohesion has weak physically. People prefer to communicate online during their convenience time. Thus, third generation CPTED which emphasizes the adoption of internet and cloud system should be considered. This study has gone through all generations of CPTED by reviewing relevant literature and intended to develop a third generation CPTED. As a result, the concept of sustainability that consists of environmental, economic, and social dimensions; and connectivity via internet should be added into CPTED on top of the existing tangible and intangible criteria arise from first and second generation CPTED. The outcome of this article can be made as the foundation of the creating of third generation CPTED which can help to reduce crime without huge initial, implementation and maintenance cost to the residents.**

Keywords— **Crime reduction; connectivity; CPTED; Malaysia; third generation.**

I. INTRODUCTION

Urban safety is the main issue emphasized by the citizens, and it is related to the understanding of how to create a secure society to ensure the safety of everyone. Crime issues have become a problematic social issue in urban areas that will directly affect the quality of life [1]. Crime issues are strongly related to urban planning and urban design [2], [3]. Thus, planning land use and urban is effective in mitigating crime [4]. With this, Crime Prevention through Environmental Design (CPTED) has been introduced as an effective crime prevention approach that ensures the development of the residential area is inclusive in the crime and public policy [5].

CPTED is one of the most recent policies introduced to create a secure environment through urban design and planning [6]. There are two objectives of CPTED: to enhance the built criteria and to ensure the safety of residents by reducing the dangerous areas that can promote criminal activities [6]. CPTED can cover the weakness of conventional crime prevention, where an effort to reallocate manpower to monitor crime hotspots can be reduced. Preventing crime through CPTED means activating an interdisciplinary process involving all stakeholders while redesigning the urban, including planning, design, management, and maintenance [5]. Therefore, this research discusses the evolution of CPTED and the creation of third-generation CPTED, where the efficiency for each component's parts of CPTED will be presented thoroughly in each generation of CPTED.

II. MATERIALS AND METHOD

There are always security issues in urban areas where the walls serve as the main symbols in the residential areas [5]. However, it is not only about the absence of danger. It is also about the absence of fear among citizens. Therefore, when the security issue is raised, residents must consider several factors related to the dangerous environment. These factors are related to economic and social dimensions, consisting of the conflicts between residents and outsiders that caused the danger in the urban areas. Although these factors contributed to the crime rate, improper city design and planning, poor

maintenance, and lack of a sense of belonging of the residents, the place will also impact security issues [5]. Thus, CPTED should be implemented where it can manipulate the current environment through design to produce an environment that has a lower crime rate. Crime is an unavoidable global phenomenon as it has become one of the major social problems in urban areas. From the environmental perspective, crime can be considered a behavioral action in a real situation [7]. Thus, each case of crime is different. The incident can happen due to three environmental factors that occur simultaneously: the availability of the target victim, the offender with the motivation to commit the offense, and lastly, the presence of the opportunity to commit a crime.

A. CPTED Definition and Strategies

CPTED has several definitions, but it mainly means "*the proper design and effective use of the built environment that can lead to a reduction in the fear and incidence of crime and an improvement in the quality of life*" [8]. Three basic strategies form the principles of CPTED: surveillance, access control, and sense of belonging. CPTED has contributed to crime prevention and improved residents' quality of life [9]. The purpose of CPTED is to reduce the opportunity for a crime that may be inherent in the design of structures or neighborhoods. Preventive approaches such as CPTED are useful in the early stages of design, where the physical elements are designed to eliminate or reduce the chances of crime happening. However, this is hard to achieve as these crime prevention strategies only rely on suppositions that are hard to predict. CPTED was introduced as a new crime prevention approach that functions differently as it emphasizes the physical environment, like the installation of fences and walls, and manipulates the social dimensions in the residential areas [10]. Initially, CPTED focuses on natural surveillance, access control, and territorial reinforcement, known as natural security approaches. Thus, CPTED focuses on modifying the physical environment elements, which seems to decrease the possibility of crime [6].

Implementing CPTED can improve the quality of life, where the crime rate can be reduced. CPTED can reduce the crime rate by manipulating the built criteria through proper building designs and encouraging the involvement of residents through education [11]. Furthermore, implementing CPTED should be promoted through various approaches like deep investigation by planners and architects on site to identify the causes of crime. Four CPTED strategies comprise the CPTED principles and tools, which strive to manipulate the natural criteria into artificial aspects and social activities [10]. Practicing these key concepts can greatly reduce the crime rate and fear of crime. However, there are limitations of the knowledge on how precise CPTED and its components parts work, where to practice it to obtain the best performance and evaluate its effectiveness [7].

B. Crime Prevention Through Environmental Design

CPTED is a popular crime prevention approach that manipulates the physical environment to ensure residential area security. Furthermore, CPTED also increases the quality of life by diminishing the fear of crime among residents and the crime occurrence rate through proper design and effective usage of surrounding physical environments [6]. By increasing social security, bonding among residents can be created, improving the sense of community and eventually forming social stability [12]. Nowadays, crime reduction means enhancing the residents' social interaction, increasing the opportunity for criminals to be spotted due to increased social activities within the community. From this, a stronger sense of community can be formed.

Moreover, the CPTED policy has merged both artificial factors and social dimensions. CPTED can reduce the cost while having better environmental designs as it minimizes the modification of the original states of the location by utilizing the existing physical spaces. However, CPTED cannot solve crime issues perfectly but only aid the effort [6]. To ensure CPTED can be implemented successfully, comprehensive crime prevention plans must be formed to manipulate the manageable factors in CPTED through strict investigation of causes and factors.

CPTED is causing psychological pressure on potential criminals, which is the fundamental second-generation CPTED [11]. Second-generation CPTED manages to reduce the crime rate significantly, and this achievement is due to the improvement in the physical environment where the residential conditions and crime causes have been identified through the deep investigation. Thus, a safe residential area is created after the crime causes are eliminated and residential conditions are controlled with competent security guards [11]. Next, several early attempts have been carried out to develop third-generation CPTED, which considered the innovation on social dimensions and sustainability among the residents living in the neighborhood.

C. Evolution of CPTED

CPTED was introduced in the 1960s in America by Jane Jacobs; where she promoted the idea of security creation through environmental design. Next, Ray Jeffrey introduced a new concept emphasizing the use of the physical environment and residents emphasizing environmental design as crime prevention strategies [12]. Through this strategy, the opportunity for the crime can be reduced greatly through physical designs and psychological aspects. Crime prevention theories have evolved to be more efficient in solving crime issues since the past half century, changing how residential areas are designed significantly. First-generation CPTED might fail if there is no continuous effort to maintain the physical environment where the unique characteristics of the residential area are not utilized in crime prevention [11].

Moreover, focus on the physical design is limited in crime prevention as first-generation CPTED cannot prevent irrational crimes and crimes arising from social issues, local demographic, and economic matters. To cope with these limitations, second-generation CPTED is proposed to refine the existing strategies to overcome these weak points [13]. Next, third-generation CPTED is developed to fulfill the self-esteem aspects of residents. Before the third-generation CPTED practice can be achieved, basic physiological needs should be fulfilled in the previous CPTED generations to form the fundamental of third-generation CPTED [14].

First-generation CPTED emphasized that the physical built environment reduces crime rates [15]. Thus, first-generation CPTED focused on the designing of the built environment. In other words, by implementing first-generation CPTED,

offenders have a greater risk of being spotted. To reach this, the residential area must be well-maintained [8]. There are six broad characteristics emphasized by first-generation CPTED: territoriality, surveillance, access control, image/maintenance, activity program support, and target hardening. However, several refinements need to be made to first generation CPTED as there are practitioners who demand a more robust strategy which can be known as the next generation of CPTED [8].

CPTED theory emphasizes that proper design and effective use of the physical elements can greatly reduce crime rate and improve the quality of life as physical environment might contribute to crime incidence and prevent crime from happening [6]. However, first-generation CPTED has limited capabilities in preventing crime, where this theory only focuses on the aspects within the territory of the residential area, such as the physical environment, and providing competent security guards for guardianship in this area through the physical designs [6]. Second-generation CPTED fixed the limitations of the previous generation by considering the social dimensions within the neighborhood. Thus, second-generation CPTED has also been considered an extension that intends to form social cohesion through a sense of community in the long term [14].

Next, second-generation CPTED assumes the neighborhood as a unit for management for analysis purposes [14]. From this assumption, second-generation CPTED can increase the feeling of security, improving the quality of life and ensuring the feeling of security. The roles of the local residents need to be emphasized [16]. Furthermore, the architect and planners should review their design criteria to enhance the physical built environment of the residential area. This can promote the realm of ownership and create the boundary between public space and residential areas, forming the next generation of CPTED and encouraging residents' involvement in security issues [12].

Moreover, second-generation CPTED focuses on the residents' involvement, which can be understood as social cohesion, which means residents' participation in local activities where issues and conflicts can be discussed and solved [12]. The second-generation CPTED has five points that should be utilized: communication, justice, local knowledge, community empowerment and trust, and trust and respect. Thus, the implementation of second-generation CPTED will improve the artificial design of first-generation CPTED and, at the same time, utilize the social aspects among residents to prevent crime [11].

The social dimension in second-generation CPTED affects the quality of natural surveillance as residents' reaction to take action on the incidents happening within the residential area when they notice them while having their leisure and recreation time in the area is important [4]. Arabi et al. [13] 's results support that natural surveillance is formed by the combination of social cohesion among residents and willingness to participate in community activities which act as the "eyes on the street" [5]. This can be achieved by optimizing opportunities for natural surveillance, clearly defining boundaries to form territoriality, and maintaining a healthy image that the residential area is well-maintained. A good residential area can be formed by achieving these

conditions, discouraging the offender from committing a crime as they have a higher chance of getting detected [8].

The sense of community and maintenance aspect is the core of the second-generation CPTED [14]. Kim et al. [11] further said that the implementation of CPTED protects selected residential areas and contributes some protection to nearby areas. Residents' active interventions help tackle social problems, contributing to effective responses to crime issues. This can be achieved by motivating residents to actively join the community activities in the community spaces where this action contributes to natural surveillance and prevention of crime [17]. Community activities with participation from residents can contribute to crime prevention as there is bonding among the neighborhoods. To ensure the success of second-generation CPTED's implementation, the importance of crime prevention policies must be comprehended by residents [11]. This is agreed by other researchers where educating residents helps develop second-generation CPTED, where the management can create this by forming a consensus perception among residents through seminars and training [11]. Some indicators can be used to measure the social dimensions, such as residents' satisfaction, recent crime rate, and involvement of residents in local events, which form social interaction [12]. Second-generation CPTED promotes community spirit in the residential area by facilitating resident participation and creating a sense of belonging [11]. Yu et al. [17] also emphasize that cooperation between residents must be considered to develop a safer community.

Second-generation CPTED can solve limitations faced by first-generation CPTED where several new practices like social cohesion, connectivity, and community culture are added [11]. "Social cohesion" means strengthening the relationships among residents, while "connectivity" means maintaining internal cohesion without compromising the relationships with the external environment, such as external facilities. Connectivity can also be understood as convenient in accessibility to external services. Lastly, "community culture" means forming a community spirit among residents by organizing more recreational and leisure activities that can contribute to crime prevention. Thus, second-generation CPTED is a new form of CPTED that overcome the limitations of the previous CPTED by embracing the social dimension, including the neighborhood factor and collective efficacy, into the theory [14]. Cozens and Love [4] said that the refinements done in second-generation CPTED have extended beyond mere physical design where social factors are included; factors like neighborhood planning and collective efficacy are considered in second-generation CPTED. The collaboration between the built environment and social dimensions can form neighborhoods that effectively prevent crime [15]. Furthermore, second generation CPTED uses risk assessments, socio-economic and demographic profiling as well as active community participation.

Next, two early generations of CPTED act as the fundamental for third-generation CPTED, considering aspects such as sustainability, information and communication, and residents' feedback [15]. Then, third-generation CPTED is developed based on the assumption that residents will search for connectedness among residentials within the neighborhood area [18]. Third-generation CPTED focuses on the physical built environment and social

dimension that utilize social factors such as pro-social behaviors, which eventually will improve the feeling of secure and livability [15]. Also, it integrates the aspects that can ensure livability, such as utilizing information and communication technologies to allow residents to know the conditions of their dwellings where they can give feedback and opinion to management. This can improve the sense of belonging, where the involvement of residents can be encouraged greatly [19]. Moreover, concept of sustainability come with three core aspects which are the environmental, economic, and social are crucial to be emphasized in new generation of CPTED as these aspects will eventually influence the quality of life.

Recently, certain components concerning sustainability have received particular attention in third-generation CPTED. Third-generation CPTED is intended to connect the environment with the residents through the network and mobile apps [20]. Modern technologies and residential areas combined with electronic communication will create a platform for residents to know more about their accommodations [15]. Residents' involvement in managing residential areas through information and communication channels can ensure the quality and well-maintenance of residential neighborhoods [15]. A well-maintained residential area will lead to a better sense of belonging among residents.

Furthermore, Mihinjac [14] claims that third-generation CPTED which aims for a higher quality of life is a good crime prevention approach in the long term, which is not emphasized by earlier versions of CPTED. The explanation above shows that collective efficacy theories have been considered in third-generation CPTED where the residents' thoughts are considered with environmental aspects. Thus, third generation CPTED emphasizes on the capacity of crime prevention where these impacts can sustain for long term.

In short, crime problems have been considered wisely by all generations of CPTED. Thus, CPTED is a new framework that was created to strengthen the residential area. Lastly, CPTED theory effectively prevents crime, as Cozens [18] claimed, where there are many place-focused prevention tactics with evidence of effectiveness. However, The effectiveness of each CPTED component is not demonstrated [8].

III. RESULTS AND DISCUSSION

A. Surveillance

The concept of "eyes on the street" is utilized in natural surveillance. Natural surveillance focuses on the thought that residents observe that the more space, passengers, and security guards, the more secure it is [10]. This also means the lack of natural surveillance is going to promote crime. However, natural surveillance highly depends on residents' ability to watch their residential areas while their presence in the area will change criminal behavior. As the effectiveness of natural surveillance cannot be guaranteed, developing second-generation CPTED, which seeks to engender positive social activities and diversity to encourage residents to take ownership of the space and take advantage of natural surveillance, is vital. Furthermore, if criminals think they are being observed even though they are not, they will be less likely to offend as there is a higher potential to be caught [8].

Moreover, properties with low lighting levels at night, high walls or thick landscapes will provide concealment opportunities for offenders, especially when it is close to access points such as windows.

Formal surveillance is another kind of surveillance that emphasizes systematic and mechanical surveillance, such as security guards and CCTV. Services of security guards have been used since a long time ago to reduce crime. Besides that, Cozens et al. [8] emphasize that formal surveillance utilizing mechanical strategies effectively lowers the crime rate and sense of fear among residents. CCTV installation ensures property crimes such as handling stolen goods, burglary, and fraud can be reduced significantly. CCTV can deter criminal offenses as offenders are aware that the risk of being detected is higher than the reward from crime. However, surveillance has its limitations as surveillance highly relies on visibility. After dark, visibility is affected by lighting conditions. Thus, street lighting needs to be improved to improve the effectiveness of surveillance. This is aligned with Cozens et al. [8] that street lighting can reduce the crime rate of all genres. This also means that street lighting should be worked together with surveillance to form stronger security which can increase the sense of belonging and territoriality [21].

B. Access Control

Access control utilizes the entrances and exits of the residential area where these spots must be easily observed [10]. Thus, the residents must be enclosed by walls, where the signages and paths are clear to the users to ensure that access control can be implemented. Access control is one of the CPTED components that emphasize restricting access to strangers or outsiders to reduce crime opportunities [8]. It is proved that areas with unregulated access will have higher crime rates. Access control can be formal (security personnel), informal (spatial definition), and mechanical (locks and bolts). This can be successful by using gates to control access along alleyways and signage to limit pedestrian movement through residential areas.

C. Territoriality

Territoriality reinforces notions of a proprietary concern and improves the sense of ownership in the community to reduce the intention and opportunity for offending [22]. Several actions can create territoriality, such as the usage of symbolic barriers. Signages and physical barriers like walls that can differentiate the residential area and the public can be used to create territoriality. The territorial reinforcement strategy emphasizes the division between the residential area and public space, and this can be achieved through the implementation of various designs for pavement and signages surrounding the residential areas [10]. Eliminating unassigned spaces and ensuring all spaces have a clearly defined and designated purpose is a component of territoriality. This is also emphasized in first-generation CPTED, where it is the primary umbrella concept on which all the other components are based [8].

D. Target Hardening

Target hardening is a conventional crime prevention approach that is intended to cause criminal difficulties while offending. The criminals' access can be denied or limited by

physical barriers such as gates, lock and electronic alarms [22]. However, overdoing target hardening will create an image that this area is having high crime rate, which will increase the fear within the community as the excessive use of target hardening tactics will create imagery whereby residents withdraw behind physical barriers and the self-policing capacity of the built environment is damaged [8]. This is great against the CPTED concept that emphasizes the implementation of natural surveillance and image of the residential area, supported by Olajide and Lizam [3] 's research, where they found that target hardening measures effectively reduce the crime rate.

E. Positive Image and Maintenance

The image of a residential area is important in reducing the crime rate, and this can be done by improving the physical conditions and image of the residential area [8]. Thus, promoting a positive image and routinely maintaining the built environment ensures that this space can continue to function effectively, and it will transmit positive signals to residents. Vacant and unmaintained buildings have been found to represent a magnet that attracts crimes as these spaces have less management that regulates criminal activity, which the "broken window theory has proved". Furthermore, this theory has elaborated on the importance of managing the physical environment of the residential area to indicate the levels of sense of belonging and social cohesion among residents [10]. Therefore, maintenance is also one of the strategies in CPTED.

F. Activity Supports and Sense of Community

The activity supports using landscape designs, facilities, and signages to encourage residents to conduct leisure and recreational activities within the residential spaces. This can be done by carrying out more events to encourage residents' outdoor activity within residential areas, as this is a relatively recent innovation [8]. The activity supports seek places with high-risk activities in safe locations, like letting kids play independently at the playground [21]. These safe activities and locations will serve as magnets for residents to carry out recreational activities, which can prevent crime from happening. The opportunity for a criminal to commit a crime is highly reduced with increased bonding activities among residents within the residential area. Moreover, creating systematic zoning within the residential areas for resident usage can also reduce the crime rate. The research intends to monitor outdoor activities and record the activities carried out by residents, creating a more permeable layout [8].

In short, residential areas and crime prevention approaches should collaborate tight to reduce the crime rate by forming social bonding among residents, creating a sense of community within the residential estate [7]. Social interaction is the capability of the residents to gather and congregate [23]. The interaction will contribute to the sense of community through the local events in the residential areas. This sense of community can significantly reduce property crime rates [24].

G. Sustainability

Sustainability means combining three aspects of environmental, economic and social dimensions [14]. The environmental dimension in third-generation CPTED can be

assessed through greening the environments where the parks and gardens are within the residential area. For example, green walls can be built to help reintroduce nature to otherwise sterile public spaces to integrate the people-environment connection. These places can be made friendlier for residents while reducing pollution in the nearby area and increasing air quality, eventually improving public health and safety. Residents will have more relaxation and be willing to exercise within the parks [25]. The increased levels of exercise in walkable neighborhoods will enrich the local activities where residents will have more social cohesion [26]. The economic dimension means the opportunity of businesses for current and future residents that can sustain in the long term to form the livability and feel of security where these economic activities generate revenue and encourage changes among residents. Montolio [27] showed that an economic dimension could be achieved by encouraging local investment and improving economic performance through neighborhood redevelopment. The effect can also reduce the crime rate when the quality of life among residents increases [14]. Local businesses can provide job opportunities in a neighborhood. Social dimension has long been utilized in second-generation CPTED, where social cohesion, known as collective efficacy, overlaps with the third-generation CPTED's cohesion [19]. Social cohesion in neighborhoods is not new in CPTED, where it further expands beyond social cohesion into local decision-making. The social cohesion that brings more residents together as a united entity will help them feel secure and included [14].

H. Connectivity

The concept of connectivity can be achieved using new information technologies that can contribute to sustainable development in all aspects. Social dimension should be utilized in the usage of Information and Communication Technology (ICT), where participation of residents can be encouraged through e-participation [5]. E-participation can be known as residents' involvement through ICT to enhance the dialogue between residents. Residents' participation is considered to start when residents' concerns are considered in decision-making [14]. Using ICT can significantly enhance the participation of residents and information exchange among users, where users can increase their civic commitment through this channel. This is because ICT is acting as a valuable tool that can enhance the residents' participation and increase openness and transparency [15].

Furthermore, merging ICT into social dimension planning gives a great opportunity to form better bonding between management and residents as a direct connection can be formed through participation and promotions related to security. To understand further, [28] said that ICT means using the internet that the majority can access through platforms like Geographic Information System (GIS) technology and mobile application. This is an online interaction between management and residents with the internet, which help in decision-making. Empty retail spaces, poor lighting, pavement surface condition, and house facades can be known from the data produced from the e-participation, which can increase the efficiency of doing maintenance works to improve the security within the neighborhood [26]. Thus, this makes it a tool for measuring social cohesion, sense of

belonging, and community. This method needs more encouragement from the authority, where government should develop national legislation requiring each residential area to have an integrated system with the center.

I. Third Generation CPTED

Third-generation CPTED shows approaches to gaining quality of life from the community from the developments in earlier versions. These developments represent an attempt to develop third-generation CPTED. The thought of developing third generation starts from rejecting unsupported assumptions like social cohesion in second-generation CPTED that are detached from the physical environment in first-generation CPTED [14]. Moreover, third-generation CPTED also has been attempted to be reframed as an approach that emphasizes the involvement of residents [15]. The adoption of third-generation CPTED can be seen as a green city concerned about crime issues [14]. Thus, this development can be understood as integrating sustainability and green technologies into the CPTED concept.

Third-generation CPTED should embrace beneficial technologies and theories such as communication and information sharing, sustainability, and residents' feedback [14]. The goal for third-generation CPTED needs to be based on the quality of life and livability to achieve this aim. The concept of third-generation CPTED not only works in crime prevention but also acts as an encouragement to reinforce social dimension, ultimately improving the quality of life and livability. This can be done by optimizing the information system that can enable residents to know their residential area better, which can further improve the sense of belonging among residents to their neighborhood. Online social networks can enhance the sense of belongings among residents [14].

J. Limitations of CPTED

Although there is evidence that can substantiate the effectiveness of CPTED theory, limitations will always be with all crime prevention strategies. In the context of first generation CPTED approach, it is less likely to respond to unpredictable actions such as "irrational" offenders intoxicated by alcohol or drugs [8]. Furthermore, in the context of the second-generation CPTED approach, Mihinjac [14] emphasizes that negative social factors will affect the effectiveness of CPTED. Thus, this has become one of the reasons for developing the second-generation CPTED. Moreover, social conditions may nurture fear, reduce the inclination to intervene and result in the individual's withdrawal into the home, which becomes heavily fortified.

Next, displacement is another major criticism leveled at CPTED. Implementing the CPTED approach in one area can displace the existing crime in terms of location, time, tactics, targets, and type of crime [8]. However, Cho and Jung [6] said that displacement does not mean negative consequences as it can be utilized as a positive tool. Displacement of crime can be converted into a positive tool by including a bigger environment during the considering and planning which can be against the limitation of CPTED concept. In addition, crime displacement happened on the CPTED crime prevention approach, and all other crime prevention approaches.

Lastly, there is no national law or standards to enforce the implementation of ICT in a residential area, although it remains potentially effective. The government can decide on security issues, whereas authority has legislative power on urban planning [2]. This further substantiates the difficulties in encouraging ICT's usage through regulations. However, with the increase in internet use and familiarity with ICT, e-participation should bark soon.
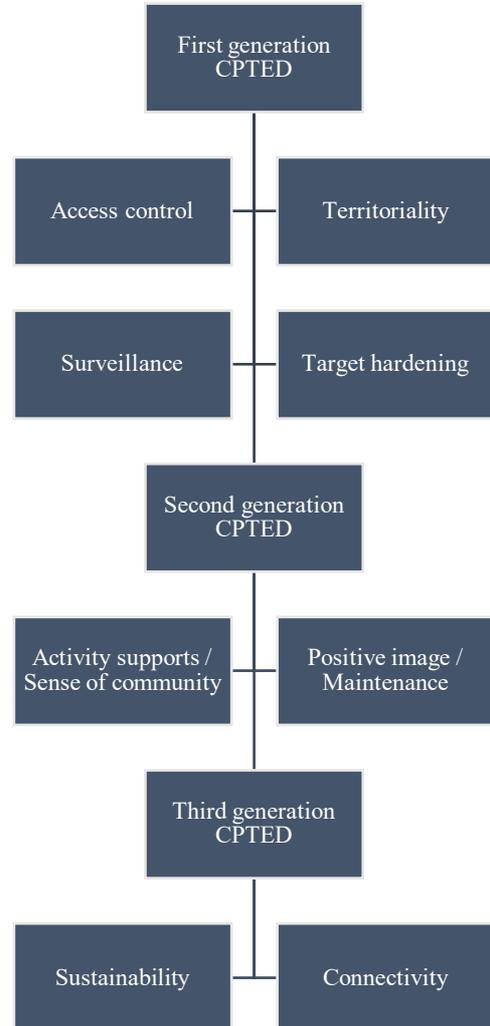

Fig. 1 Evolution of Crime Prevention Through Environmental Design

Initially, first-generation CPTED theory only emphasized one objective: the physical criteria of the residential area [15]. Then other dimensions like surveillance, territoriality, and access control which are related to human behaviors, were considered in second-generation CPTED [14]. The participation of residents is important in CPTED as adopting target hardening strategy solely will create "fortress mentality" among residents who think they are safe behind the fortified residential areas without contributing to the social dimensions [8]. This is highly against CPTED theory which is designed to support social interaction and promote leisure and recreation activities that can create the "eyes on the street". Thus, questions are raised on the crime reduction effectiveness of first and second-generation CPTED theory.

IV. Conclusion

To conclude, CPTED is a crime prevention strategy based on physical building designs and the surrounding environment in crime prevention, which eventually can bring a quality of life to residents [29]. There is quite a lot of research that supports the effectiveness of CPTED, such as Farrington and Welsh [30] on lighting, Welsh and Farrington [31] on surveillance, and Tseloni et al. [32] on target hardening. Although there are critics of the CPTED approach, some studies show confidence in the CPTED theory. The second generation has been proven to be more effective on crime prevention than the first-generation CPTED. Thus, if there is a continuous effort to complement the limitations of second-generation CPTED, the development of third-generation CPTED can proceed [11]. Furthermore, the research that criticizes CPTED implementation is less effective. These researchers may not use good evaluation approaches to obtain the results; thus, these results cannot represent that the CPTED approach is not scientifically effective in crime prevention [33]. The only concern is how precisely the parts of CPTED are utilized to achieve optimum effects and ways to assess these components' effectiveness systematically. Although it is unlikely that implementing CPTED will create "safe heaven" and "sanctuary", the use of CPTED approach will help prevent crime within the residential area.

In first-generation CPTED, lighting is improved in dark areas like car parks and walkways to enhance natural surveillance. Furthermore, improving lighting can increase guardianship where the dark areas can see clearly [5]. Crime rates can also be reduced by operating commercial activities in dangerous areas. These commercial activities may create a pleasant experience for residents while placing natural surveillance, preventing crime. Next, second-generation CPTED focus on activities that are held within the community to provide opportunities for residents where they can know each other and participate in crime prevention activities. Besides working as natural surveillance, this bonding can reinforce the residential area territory, reducing crime. This encourages the owners to care about the condition within the territory. Third-generation CPTED is built from the fundamental of earlier CPTED, which focuses on the social dimension where residents participate in pro-social activities. From these activities, residents cannot only prevent crime but also express themselves to their neighbors. Thus, third-generation CPTED intends to form a community with pro-social activities that allow residents to share their feelings and care about their properties. In short, CPTED strategies can be useful in preventing crimes.

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