

Perceived socio-physical impact of target hardening elements in the management of neighbourhood security challenges in Otukpo town

Abstract

This study investigates the spatial dimension of socio-physical safety in residential neighbourhoods resulting from the use of CPTED target-hardening elements in the study area. The use of target-hardening elements of the CPTED principles in towns and cities, including Benue State, can improve the socio-physical environment, shaping people's perceptions of liveability and safety. Since the 1960s, various scholars have highlighted both the positive and negative aspects of utilising environmental design elements in the physical development of the built environment. However, the practice effectively prevents, controls, and reduces burglary and theft. Moreover, it increases urban street concealment, street isolation, entrapment, and the prevalence of ghost areas. Therefore, corroborating findings from either of the two positions on the significance of target-hardening elements to the socio-physical environment motivated this study in Otukpo town, Benue State, Nigeria. The methodological processes involve primary data collection through questionnaires and personal observation, and secondary data through a literature review. A purposive sample, along with descriptive and analytical methods, was used to present and analyse the data. First, the results show spatial variation in the application of target hardening elements; second, variation in residents' perceived socio-physical safety in the study area. According to the findings, wall fences with iron gates and street barricades are more prominent and pronounced in the low-density residential neighbourhood, with 79% and 67% of burglary-proof iron bars deployed, respectively. In high-density residential neighbourhoods, the deployment of fences and street barricades is 33% more effective at deterring burglary. The application of burglary-proof iron bars and a target-hardening approach to the socio-physical environment changes the landscape from open, interactive (sociable) to solitary/lonely (unsociable) built environments, as streets are confined and constrained by high walls on both sides. These, therefore, reduce the likelihood of escape routes and encourage territorial control of space, supporting privacy and property boundary delineation and demarcation, which has been the emphasis of Oscar Newman (1971). The study concludes that the construction of wall fences and barricades by homeowners appears to be a continuing phenomenon, as homeowners and residents consider these structures to serve specific purposes, such as security, privacy, and property boundaries. Thus, the negative purpose is that high wall fences are supportive hideout places for stolen goods; for example, the case in Makurdi town, where more than fifty (50) stolen motorcycles, six (6) tricycles and other stolen goods were found in a compound with a tall fence wall along George Akume Way in November, 2025. Hence, the study recommends proper urban design legislation and policy formulation to encourage the development control authority to enforce monitoring of the practice and utilisation of environmental design elements in the built environment during building plan approval, site development, and construction.

Keywords: target hardening, elements, socio-physical, impact, Otukpo town

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Tamen Jonathan Terfa,¹ Brown Ibama²
¹Department of Urban and Regional Planning, Faculty of Environmental Design, Federal University of Lafia, Nasarawa State, Nigeria

²Department of Urban and Regional Planning, Faculty of Environmental Sciences, Rivers State University, Port Harcourt, Nigeria

Correspondence: Tamen Jonathan Terfa, Department of Urban and Regional Planning, Faculty of Environmental Design, Federal University of Lafia, Nasarawa State, Nigeria

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Introduction

In recent times, there has been a global trend indicating that criminality and violence have become synonymous with the urbanisation process in both developing and developed nations alike. The sensitivity of governance in preventing and controlling this emerging surge in criminality and violence ensures safety for residents and potential investors.¹ Crime management is a fundamental element of urban and rural safety, with both short- and long-term approaches. Simultaneous deployment of both approaches makes crimes unappealing and yields no meaningful gains, while also addressing the anomaly associated with behavioural and criminal tendencies.² Environmental target hardening is part of existing crime-prevention strategies aimed at managing crime in crime-prone localities, such as the town of Otukpo in Benue State, Nigeria. In real terms, environmental target hardening involves combining several strategies, ranging from

the deployment of closed-circuit television (CCTV) and security barriers to effective environmental design and development through territoriality, surveillance, street lighting, and body-worn cameras. These strategies reduce the attractiveness of crime and further limit opportunities for crime, while also hardening the environment against criminality. In most scenarios, deploying technology-based security strategies often scales up security provision, especially in addressing the challenges associated with inadequate human resources, leading to localities such as Otukpo town in Benue State becoming under policed. A developmental prevention strategy is an interventionist approach designed to prevent the development of individual criminal tendencies, especially by targeting risk and protective factors.³ These crime management strategies not only indicate that crime is occurring and is experienced at the local level; they also signify the emergence of a micro-crime policing strategy aimed at achieving the desired secure human enclave.

Review of literature

Theory of spatial organisation

In Galster's¹⁵ rendering, the organisation of urban residential neighbourhoods is a holistic package grounded in the spatial application of Crime Prevention through Environmental Design (CPTED) principles. It incorporates territorial reinforcement, natural surveillance, target hardening, and access route control to create an interdictory physical space, like slippery spaces, jittery spaces, stealthy spaces, and prickly spaces, geared towards discouraging undesirable behaviour. These interdictory defensible spaces are deliberately designed and developed to screen them from public view and access, serving as obstacles. They are not to be occupied, as they impede walking, sitting, or standing comfortably within the neighbourhood. This theoretical approach began with "the eyes on the street" in 1961, as described in Jacobs's book "Life and Death of Big Cities of the United States" (1961).¹⁶

Accordingly, the theory of eyes on the street emerged as a form of street surveillance. Given these circumstances, residents are required to look out for odd individual behaviour within the neighbourhoods.¹⁷ The concept of CPTED was first introduced by Jeffrey, a renowned criminologist at Florida State University, in 1971. His work was based on the principles of experimental psychology, with the sole aim of eliminating crime amplifiers to deter crime in neighbourhoods. Similarly, empirical studies by Newman⁶ were conducted, as evident in his book "Defensible Space: People and Design in Cities with High Potential for Crime". In 1997, a group of scholars, after investigating the CPTED approach, considered the mental and social aspects of the environment. These people introduced their approach as the second generation of CPTED and called the previous approach the first. In Savic and Klond's¹⁸ opinion, from Newman's perspective, only the physical design of a place is important. According to Newman, local people can control the environment that belongs to them and be responsible for it. Indeed, the main idea is that the physical structure can influence relationships among people, local culture, and social ecology.¹⁹ According to this model, residents are responsible for creating security in the area, and experts can help.

Components of the CPTED model

In the rendering of Cozens et al.,¹¹ the core components of CPTED entail Territoriality, Surveillance, Access Control, Target Hardening, Image/Maintenance and Activity Support. Similarly, Armitage²⁰ presents the core components of Defensible Space as including Territoriality, Access Control, Surveillance, Target Hardening, and Image and Activity Support. However, Cozens²¹ operationalised the components of Cozens et al.¹¹ to include Geographical Juxtaposition, which "involves assessing the potential influence on crime levels of proximal land-uses that may generate crime". The basic premise of defensible space is to clarify for users of a space who should and should not be in it. CPTED as a concept aims to deter potential offenders from entering an environment and to provide guardians of the space with additional opportunities to manage and monitor it effectively. The concept entails five core principles, namely access and escape routes, surveillance and visibility, territoriality, target hardening, and image and aesthetics, that are often utilised as instruments to discourage insusceptible activities, with attendant physical, economic, and social significance for the urban environment.¹¹ However, this study did not focus on all the principles of CPTED; instead, it focused on the utilisation of target-hardening design elements.

Target hardening of space

Target hardening intensifies the risk and effort of committing crimes and diminishes the rewards associated with committing them, as it serves as an age-old conventional crime-prevention procedure. However, there are pockets of dissent regarding target hardening as a core component of CPTED. Its focus is on limiting access to a crime target through physical barriers such as fences, gates, security doors, and locks. Target hardening is often perceived as access control at a microscale, such as within distinct buildings. Fundamentally, the unnecessary use of target-hardening measures often leads to the development of a 'fortress mentality' and imagery that engenders a sense of relaxation behind home-grown physical fortifications. This perception impairs the community's self-policing capacity and hinders specific CPTED strategies that depend on territoriality, image, surveillance, and the legitimate use of space. Gated communities are arguably an example of the 'fortressification' of space, a trend that appears to be spreading worldwide.²²

Furthermore, target hardening involves using fencing, burglar bars, gates, and walls for protection. It refers to the physical strengthening of spaces to reduce their vulnerability. This, besides the popular use of CCTV, is the first principle used, as it is easily implemented. However, practitioners should be careful not to over-emphasise its role. Target hardening can have negative consequences, for example, by closing roads with gates, burglar bars, or guards.²³ Similarly, people become both socially and physically isolated and segregated. This segregation further creates a collision between private and public space, with fear as the enabler. In addition, using target hardening to 'privatise' space displaces crime.²³ However, implementing these principles in local communities is challenging because even a single flaw can lead to negative consequences rather than the expected positive outcomes. For instance, part of the principle entails the erection of high concrete walls, referred to as burglar bars, which reduce visibility within the neighbourhood and can encourage crime. It serves as a reminder that visibility and the ability to survey the neighbourhood significantly reduce and control crime.

Over-emphasis on target hardening

Global guidelines and strategies encourage regulating its use; however, in countries such as South Africa and across Asia, CPTED is relatively new. Although research on CPTED has been conducted, its implementation has been limited.²³ Most projects rely heavily on target hardening (usually CCTV and burglar guard fencing), thereby limiting capacity by overlooking or neglecting their core planning and design principles. However, the over-reliance on target hardening largely stems from a lack of knowledge and understanding of programme monitoring and evaluation based on environmental design.²³ For Crowe and Zahm,²⁴ professionals with limited knowledge and understanding of CPTED implementation, who tend to apply the principles, often make inappropriate applications, thereby further engendering social inequalities that foster crime. For instance, the uninformed use of target-hardening parameters, such as privatising space and installing high walls, suggests social polarisation and exclusion.

Social and physical control through target hardening

Over the years, it has been argued that the application of CPTED in neighbourhoods has a social and physical impact on human space.²⁵ The socio-physical impact is that the landscape of the residential neighbourhood typically shifts from open, interactive (sociable) to

solitary/lonely (unsociable) environments, as streets are confined by high walls on both sides, making social interaction difficult because few people are seen on the streets. Moreover, safety, security, privacy, and property boundaries may be assured.

Methodology

The methodological procedures of this study are survey research; the data requirements for the study are variables of target hardening elements, with data types and variables focusing on target hardening elements such as fences, access barricades, burglary-proof bars on doors and windows, and street lighting. During the reconnaissance and pilot survey, the data collection instrument was test-run to identify any necessary adjustments. After the reconnaissance and pilot survey, experiences were gathered, lessons learnt, and adjustments were made to the data collection instruments. The study employs a multiple-choice approach, combining quantitative and qualitative methods to collect data on the target-hardening elements used to manage the socio-physical space in the study area. Data required for this study are collected using stratified sampling to distinguish residential density, neighbourhood districts, and income groupings. The quantitative data were drawn from the demographic survey to identify the number and types of target-hardening elements deployed to manage the socio-physical environment. Besides, the qualitative data obtained reflect the socio-physical conditions resulting from the deployment of the target-hardening elements. The study selects two (2) residential density neighbourhoods, one from each density level. The study used the McDonald²⁶ IWSD method to determine the sample size formula, which is expressed as

$$n = \frac{(Z^2 pq)}{d^2} \quad (1)$$

Where n = sample size, Z = standard normal deviate, usually set at 1.96, which corresponds to the confidence level, P = proportion in the target population estimated to have particular characteristics (normally set at 0.1 to 0.5), q = 1.0- P, and d = degree of accuracy desired, usually set at 0.05.

The target study population is 47,686 existing dwelling units of six (6) selected neighbourhoods. The accuracy level set for the study is between 0.01 and 0.05, as this yields the maximum sample size. A sample size of 130 dwelling units was determined, with a degree of accuracy of 0.03, considered reasonable for the study. The selection of dwelling units for questionnaire administration was purposively done. The first street and first dwelling were taken, the 3rd street was skipped, and then one street was sequentially skipped for questionnaire administration in the high-density neighbourhood. In the low-density neighbourhoods. The first street and first dwelling were taken, and the next two streets were skipped, with the 4th street selected for questionnaire administration in the low-density neighbourhood. Then, the first house on the chosen street and, at regular intervals starting from the first house, the 5th dwelling, which includes two dwellings on either side of the street, were chosen. Secondary data were maps of Otukpo town. The data obtained from the field were edited to address questions that were answered only partially or not at all. After editing and coding, the data were entered into the computer using the Microsoft Statistical Package to perform the desired data transformations including frequency distributions and graphs. In contrast, the analytical strategy used was both descriptive and inferential statistical tests. Moreover, Snadocor's F-test was used to test the study's hypotheses. Consider showing the chosen areas, residences, and streets on a map rather than explaining in words. Consider showing the chosen areas, residences, and streets on a map rather than explaining in words (Table 1).

Table 1 Sampling method and procedural approach

Study area	Selected residential density categories for study	Number of housing units	Number of street count	Number of questionnaires administered	Number of questionnaires retrieved
Otukpo town	High Density Residential Neighbourhood	38754	12	114	78
	Low Density Residential Neighbourhood	8932	39	26	22
Total		47686	51	130	100

Source:Authors' Fieldwork (2026)

Findings and discussion

In the study, 130 questionnaires were administered to households to gather exclusive data on the significance of utilising target-hardening elements for crime prevention and their socio-physical impacts. Three checklists were used to gather data on the physical development landscape abnormalities of neighbourhoods. A total of 114 questionnaires were distributed in high-density areas and 26 in low-density areas. Only 100 questionnaires were retrieved out of the 130 administered. This figure represents 77% of the expected responses, which is considered reasonable. Figure 3 presents the demographic survey on the utilisation of Target Hardening Design Elements in the Study Areas.

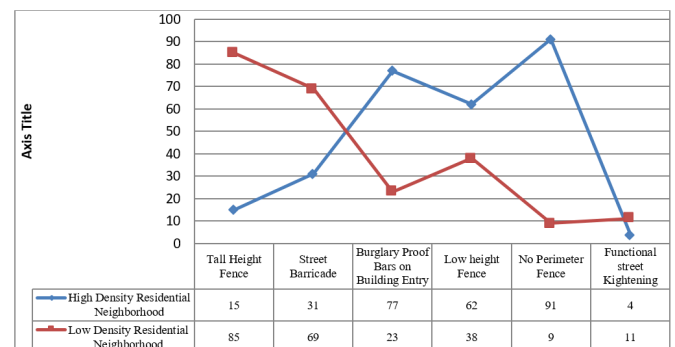


Figure 3 Comparative percentage distribution of Target Hardening Elements utilisation in the study area.

Source:Authors' Field Survey, 2025

Demographic survey of target hardening design elements utilisation in the study areas

Part of this study aimed to gather information on the elements utilised in the study area, with a focus on those that were heavily utilised and those that were rarely utilised. The comparative percentage of target-hardening utilisation by homeowners in Otukpo town is shown in Figure 3.

With reference to Figure 1, there is spatial variation and a fluctuating pattern in the utilisation of target hardening elements in Otukpo town, as shown by the line graph, which indicates increases and decreases. Comparatively, the percentage utilisation of high-fence walls and street barricades as defensible space strategies for target hardening is 85% and 69%, respectively, the highest in the low-density residential

neighbourhood district. The utilisation of high-fence walls and street barricades is lowest in the high-density residential neighbourhood, at 15% and 31%, respectively. Meanwhile, the utilisation of burglary-proof iron bars on house entrances, low-height fences, and no fence is more pronounced and prominent in the high-density residential neighbourhood district with 77%, 62% and 91%, respectively, and least utilised in the low-density residential districts with 23%, 38%, and 9%, respectively. Hence, the spatial variation and fluctuating pattern of utilisation of the target hardening used as a management tool to prevent, control, and reduce insusceptible activities within and between the housing environments obviously has a significant impact on the socio-physical environment of the study area, as expressed in Table 2.

Table 2 Correlation analysis of perceived significant impact of target hardening elements on the social environment in the study areas

Positive impact variables	Resident's views in the high residential built environment (x)	Resident's views in the low residential built environment (y)	(zx)	(zy)	zxzy
Sociable environment	10	3	0.45	0.04	0.018
Safe interaction	9	53	0.41	0.68	0.28
Unsafe Interaction	3	22	0.14	0.28	0.039
Total number of views	22	78	1	1	0.34
Mean value	7.33	26			Calculated Value rxy=0.34

Source: Authors' Field Survey, 2026

Correlational analysis of the perceived score of significance impact of target hardening elements to the social environment

The utilisation informed the correlation value for the sampled number of positive variables of the impact of target-hardening space design elements in the study area. Table 2 presents the correlation coefficient for the positive impact observed in the study area.

Based on the data in Table 2, the significance score indicates that target-hardening elements directly and positively affect the social environment by encouraging safe interactions, with a correlation value of 0.28. At the extreme, it discourages a sociable residential built environment, with a correlation value of 0.018. The two-tailed, non-directional test of a critical value of the t-score table is at $\alpha = 0.34$, with the null hypothesis (H0-hypothesis-meaning negative emotional disposition of impact); there is no social score of significance impact of target hardening being rejected, and the alternative hypothesis (H1-hypothesis-meaning positive emotional disposition of impact) of a social score of significance impact of target hardening being accepted. The $r_{xy}=0.34$ result indicates a perceived significant correlation between the utilisation of target hardening space design elements and the social impact on the built environment in the study area. The significant correlation was confirmed to be valid, and the critical value of α and the calculated value of r_{xy} are both equal to 1.

Correlational analysis of the perceived significance of the impact of target hardening elements on the physical environment

The utilisation informs the correlation value for the sampled number of positive variables of the impact of target-hardening space design elements in the study area. Table 3 presents the correlation coefficient for the positive physical impact observed in the study area.

From Table 3, the significance score of target-hardening elements directly and positively impacts the physical environment by encouraging reduced trespass, with a correlation value of 0.053. At the extreme, it discourages a sociable residential built environment, with a correlation value of 0.05. The two-tailed, non-directional test of a critical value of the t-score table is at $\alpha = 0.2$, with the null hypothesis (H0-hypothesis-meaning negative emotional disposition of impact); there is no physical score of significance impact of target hardening being rejected, and the alternative hypothesis (H1-hypothesis-meaning positive emotional disposition of impact) of a physical score of significance impact of target hardening being accepted. The $r_{xy}=0.2$ result indicates a perceived significant correlation between the utilisation of target-hardening space design elements and their physical impact on the built environment in the study area. The significant correlation was confirmed to be valid, and the critical value of α and the calculated value of r_{xy} are both equal to 1.

Table 3 Correlation analysis of perceived significant impact of target hardening elements to the physical environment in the study areas

Positive impact variables	Resident's views in the high residential built environment (x)	Resident's views in the low residential built environment (y)	(zx)	(zy)	zxzy
Sociable	11	8	0.5	0.1	0.05
Reduce trespass	4	30	0.23	0.39	0.053
Control movement	2	22	0.09	0.28	0.025
Concealment Areas	5	18	0.18	0.23	0.07
Total number of views	22	78	1	1	0.2
Mean value	5.5	19.5			Calculated Value $r_{xy}=0.2$

Source: Authors' Field Survey, 2026

Conclusion

Based on the findings of this study, target hardening is used as a tool, instrument, and agent to respond to hostile environmental conditions by erecting barriers around houses to delay or block such actions. Moreover, the study established that the socio-physical impact of utilising target-hardening elements, such as erecting wall fences and barricading their houses, is significant. In the study, it can be concluded that the fencing and barricading of houses have partly resulted from modifications and fortifications for privacy, but largely from their informed socio-physical impacts that control movement, shape feelings of safe interaction, and prevent, reduce, and control insusceptible activities. Otherwise, homeowners may be doing it and will probably continue doing it because they have become accustomed to building wall fences due to fear of insusceptible activities and for privacy purposes, regardless of whether the urban and architectural fabric of the built environment is hampered, as one is not able to see the urban uniformity, aesthetics and houses unless they are above one storey high. This study affirms that Jacobs' idea of 'eyes on the street' is lost in these responses because streets are isolated from houses; thus, surveillance is not achieved. On the side of urban management, for instance, the collection of urban management charges (such as solid waste collection charges) and utility dues by urban authorities and utility companies (such as water and electricity companies) is difficult because accessing home premises is challenging. Based on the foregoing, the study also established that target hardening, its physical impacts, and its implications for the built environment pose a challenge for architecture, urban planning and design, and/or urban management professionals. The study also highlights to architects, urban planners/designers that the utilisation of target hardening space design elements (tall wall fence, street barricades and others) changes the built environment landscape, influences the plan and design of residential neighbourhoods in the context characterised by concealed and isolated routes, isolated areas, poor surveillance and others.

Recommendations

- 1) Every stakeholder should ensure the implementation of a 1.5 m standard fence height along the street and 2.5 m at the back and the other two sides of the plots.
- 2) The government and city managers should ensure that neighbourhood planning and design consider social interests and implement measures to enhance opportunities for interaction despite walls, fences, and barricades.
- 3) The government and city managers should ensure proper legislation and policy formulation to enable the development control authority to enforce standards,

- 4) The government and the city managers should effectively monitor the application of CPTED principles in the built environment during building plan approval, site development, and construction.

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Conflicts of interest

The authors declare no conflict of interest.

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