

REVIEW ARTICLE

The localization of crime prevention through environmental design in China: Theory, practice, and policy integration

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Abstract

This article reviews and reflects on the localization of crime prevention through environmental design (CPTED) in Chinese cities and architecture. It outlines the evolution of CPTED from early physical prevention strategies to the gradual integration of social-ecological perspectives and, more recently, to a stronger emphasis on environmental resilience and human wellbeing. Drawing on three types of cases—residential communities, public landscapes, and university campuses—the study found that although safety awareness has improved, hardware-based interventions remain the dominant approach in current practice. At the policy level, national initiatives, such as “Safe Cities,” “Urban Renewal,” and the “Resilient Cities Action Plan (2025–2027),” have incorporated CPTED-related principles; however, their integration with local socio-cultural contexts remains limited. This study adopted a semi-systematic literature review, combined with analysis of Chinese policy documents and comparative case synthesis from domestic and international contexts, to identify four major challenges in the localization process: insufficient cultural adaptation, design simplification and technological bias, inadequate post-construction maintenance, and the lack of systematic evaluation tools. Looking ahead, this article proposes four development directions: advancing digital CPTED through geographic information systems, building information models, and artificial intelligence; strengthening attention to perceived safety and environmental stress in the development of “psychological CPTED”; integrating culturally adaptive knowledge into design frameworks; and embedding CPTED into industry standards and professional education systems to reinforce institutional and human-resource support.

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1. Introduction

Crime prevention through environmental design (CPTED) is gradually becoming an important research direction in architecture, landscape architecture, and environmental psychology. The concept believes that the space around us—how buildings are arranged, whether the line of sight is open, how entrances and exits are set, and even the daily

maintenance of the environment—imperceptibly affects people's behavior. Good design can not only effectively reduce the risk of crime but, more importantly, make people feel secure in their daily environment (Cozens & Love, 2015). For designers, planners, and researchers, CPTED provides an important conceptual framework—it guides us in connecting the physical form of space with human behavior and psychological perception, enabling us to more comprehensively understand and create a safe environment (X. Chen & Marzbali, 2024). Recent studies have further revealed that the details often ignored in the environment actually play a vital role. Open vision, appropriate lighting, and boundary treatment that can clearly define the space without appearing stiff and cold can inadvertently reduce people's inner anxiety and enhance our sense of familiarity and control over the environment (Sezavar *et al.*, 2023). In the context of China's rapid urbanization, the dense population and mixed-use development mode have made security issues more complex. At this point, the significance of CPTED is even more prominent. It is no longer just about the planning and design of physical space, but also about the psychological experience of people living in it, the long-term management of the community, and even the overall idea of urban governance (Li *et al.*, 2025).

In recent years, CPTED's concept has shifted from a single crime-prevention tool to a more comprehensive direction of social care and space creation. Early theories mainly focused on reducing potential targets, strengthening environmental monitoring, and enhancing access control to achieve deterrence (Cozens *et al.*, 2005; Jeffery, 1971; Newman, 1972). However, in recent years, research has increasingly focused on the dimensions of community participation, interpersonal interaction, psychological comfort, and spatial justice (Rupp *et al.*, 2025). In particular, the third-generation CPTED concept has expanded its focus beyond simply reducing crime rates to improving urban resilience, promoting social inclusion, and enhancing people's wellbeing (Mihinjac & Saville, 2019). This change echoes the overall trend of architecture and landscape science from "closed defense" to "open experience." Now we realize that a truly safe environment is not only a place with a low crime rate but also a place where people can feel at ease, belong, and experience vitality (Hou *et al.*, 2025). For researchers and practitioners in the field of architecture and landscape, the core challenge now is not only how to prevent crime but also how to jointly create a safe, belonging, and dynamic place experience through spatial form, management mechanism, and interpersonal interaction (Y. Wen *et al.*, 2024).

The rapid urbanization process in China has led to a highly dense built environment, which not only affects

residents' sense of security but also poses challenges to community cohesion (Sun *et al.*, 2022). As urban spaces become increasingly compact and buildings continue to rise, the lines of sight available for people to naturally observe their surroundings have decreased, while visual dead zones have increased, weakening daily interactions between neighbors (Raman, 2010). In high-density residential areas, narrow streets, dense high-rises, and limited green spaces significantly reduce children's outdoor activities and residents' public interactions. In the long run, this weakens the overall sense of security in the community (X. Huang *et al.*, 2024). A study based on structural equation modeling further indicates that, in the process by which the built environment affects safety perception, surrounding social conditions, such as neighborhood relations and community atmosphere, play a key moderating role (Zeng *et al.*, 2023). Hence, the high-density spatial configuration and rapid pace of renewal are gradually eroding the foundations and social bonds that originally provided a sense of security and belonging (Soltani *et al.*, 2022).

Although domestic attention to safety-oriented design has continued to increase in recent years, there are still obvious deficiencies in the systematic integration and localization research of CPTED in architecture and landscape architecture. Internationally, CPTED theory has developed to a third-generation framework that emphasizes the creation of resilience and happiness experience (Mihinjac & Saville, 2019; Rupp & Saville, 2019), while domestic research is still relatively scattered, mostly focusing on technical means such as lighting and monitoring, and the discussion on the social ecological adaptability behind it is still weak (Vogiatzaki *et al.*, 2020). At present, limited studies have verified the practical applicability of the CPTED principle through specific cases, given China's high population density, collectivism, and rapidly changing urban reality. Due to the lack of an effective localization analysis framework, systematic evaluation tools, and sufficient empirical comparison, the applicability of CPTED in the Chinese context has not been fully explained in theory or tested in practice. Therefore, it is necessary to conduct a critical review, systematically evaluate its applicability, identify specific obstacles in the localization process, and explore a development path that truly fits its own context for the practice of Chinese architecture and landscape.

The purpose of this study is to critically examine the application characteristics, reality bias, and adaptation mechanism of CPTED in Chinese architecture and landscape practice. Although the relevant concepts and technologies of CPTED have been increasingly integrated into design in China in recent years, systematic reflection

and real-world localization research remain insufficient (Y. Wen *et al.*, 2025). Based on this, this study mainly focuses on two aspects: on the one hand, identify and sort out the application mode of CPTED in the Chinese environment and its deviation; on the other hand, it proposes forward-looking research and practice directions, including the development of assessment tools adapted to the Chinese context, the introduction of the evaluation dimension of environmental psychology, and the effective connection with the existing planning policy framework (X. Chen & Marzbali, 2024).

To systematically examine the development context, application path, and policy integration mechanism, this study used a three-level analytical framework of “theory, practice, and policy,” integrating a semi-systematic literature review, policy text analysis, and case integration research. At the literature level, relevant literature from Social Sciences Citation Index, Science Citation Index, Scopus, and China National Knowledge Infrastructure since 2010 was selected to outline the theoretical development context and focus in this field. At the policy level, it analyzed the national and local policy documents on urban safety, renewal, and resilience construction. It revealed how CPTED principles are integrated into China’s planning system through keyword analysis. At the practical level, it selected typical scenarios and cases at home and abroad, compared governance modes and design strategies across the board, and summarized experiences and challenges. Through three-level cross-validation, a critical discussion of the localization path of CPTED emerged.

Through this work, we aim to provide operational reference for urban managers, architects, landscape designers, planners, and other relevant practitioners, thereby promoting CPTED to achieve more systematic, landscape-adaptive development in China’s built environment.

2. Evolution of crime prevention through environmental design theory

Over the past five decades, CPTED has undergone three stages of development (Arabi *et al.*, 2020). Its core ideas have shifted from early physical determinism to social and ecological integration, thereby broadening the explanatory and intervention dimensions of how the built environment shapes human behavior and community safety (Ismail, Jing, Yee, & Shafiei, 2023). The developmental trajectory is summarized in Figure 1.

2.1. First generation of crime prevention through environmental design

In the 1970s and 1980s, CPTED development primarily focused on controlling and deterring the physical environment. Jeffery (1971) and Newman (1972) proposed that environmental features, such as lighting, fencing, and spatial boundaries, can increase the perceived risk of potential offenders and reduce their anonymity, thereby reducing the opportunity for crime (Behl & Stevenson, 2021). Among them, the theory of “defensible space” is the representative, especially emphasizing the importance of space visibility and natural monitoring. CPTED at this stage usually covered six core elements: natural surveillance, access control, territorial reinforcement, maintenance and management, and activity support (Lee *et al.*, 2023). Empirical studies have also supported the effect of such interventions, such as improving lighting, eliminating sight barriers, and enhancing spatial permeability, which help to reduce the incidence of theft and attack in public places (Cadena-Urzúa *et al.*, 2025; Kim & Seong, 2022; Liang *et al.*, 2025). A randomized controlled trial in New York City found that strengthening street lighting can significantly reduce violent crime at night (Chalfin *et al.*, 2022). However, CPTED at this stage has also been criticized for over-reliance on “spatial determinism” and ignoring social



Figure 1. Timeline of the evolution of crime prevention through environmental design
Source: Image by the authors

factors such as community trust, social ties, and long-term maintenance (Armitage, 2018; Gooren, 2023). Follow-up studies further indicated that criminal problems stemming from social structure, population flows, and economic pressure could not be fundamentally solved solely by transforming the physical environment (Barton *et al.*, 2021; De Nadai *et al.*, 2020). For this reason, scholars began to call for the inclusion of a social dimension in CPTED, which also promoted the emergence of the second and third-generation CPTED, with more emphasis on inclusive and sustainable prevention strategies (Ruirui *et al.*, 2023), and gradually shifted from simple environmental control to closer integration with social, psychological, and governance mechanisms.

2.2. Second generation of crime prevention through environmental design

From the 1990s to the 2000s, CPTED theory and practice underwent significant transformation. The core idea of this stage is that effective crime prevention not only depends on improving the material environment but also is inseparable from the community's social structure and residents' daily interactions (Saville & Cleveland, 2008). Studies have shown that neighborhood cohesion and collective effectiveness can form a protective network of "social capital" that enhances community self-governance and resilience to risk (Gearhart, 2022). During this period, CPTED, from the perspectives of environmental psychology and sociology, understood safety as a complex outcome of the joint action of people, places, and governance systems (Mihinjac & Saville, 2019). Empirical research has also confirmed that communities with close social ties, residents' active participation in daily maintenance, and neighborhood watch tend to have lower crime rates and stronger residents' sense of security and belonging (Rupp *et al.*, 2020). Therefore, the second-generation CPTED attaches particular importance to community participation, social cohesion, and collective effectiveness, and believes that these factors are the cornerstone of building a sustainable and safe environment (Mihinjac & Saville, 2019). The practice model of safe growth explores a bottom-up governance path by integrating residents' participation and capacity-building into the planning and prevention system (Nilsson *et al.*, 2023; Vongvisitsin *et al.*, 2024). However, in communities with high density or frequent population mobility, this model still faces practical challenges—the complexity of the urban environment and the heterogeneity of the population often make it difficult to form stable social ties and to sustain collective effectiveness (Hipp & Wickes, 2017). In the future, ways to effectively stimulate and sustain community participation and social capital across different social structures to improve the

sense of security and the quality of space remain a key area for exploration (Bradley & Mahmoud, 2024).

2.3. Third generation of crime prevention through environmental design

Emerging since the 2010s, CPTED has entered a new stage of development. At this stage, crime prevention is incorporated into the overall framework of urban resilience, emphasizing the coordinated promotion of sustainability, adaptability, and residents' wellbeing. It no longer views personal safety in isolation but closely combines it with ecological quality, mental health, and subjective wellbeing, so that urban safety and overall quality of life are interrelated (Ismail, Jing, Yee, Shafiei, & Dan, 2023). The third-generation CPTED requires coordinated actions in the environmental, social, and economic fields (Arabi *et al.*, 2020), and encourages the use of green infrastructure and smart city technologies such as big data, Internet of Things, and building information model (BIM) to improve security, inclusiveness, and livability (Z. Chen *et al.*, 2023). In recent years, more research has turned to empirical design methods. By combining digital space assessment methods with psychological indicators such as perceived safety and pressure level, researchers can identify potential risk areas in the environment and optimize space design. The purpose of this is not only to prevent crime but also to enhance people's sense of security and belonging, thereby improving the overall quality of life (Arabi *et al.*, 2020). This concept closely aligns with the United Nations' Sustainable Development Goal 11. It is committed to promoting inclusive, safe, resilient, and sustainable urban construction. It emphasizes that environmental design should be deeply integrated with the sustainable development of society to help cities improve safety, security, and wellbeing in addressing complex challenges (Mara & Cutini, 2024). In practice, attention is directed not only to crime reduction but also to resident engagement, community cohesion, and multi-stakeholder collaboration, with digital and green technologies used to promote spatial equity, adaptability, and long-term sustainability (Bittencourt *et al.*, 2025).

2.4. Global crime prevention through environmental design debates and China's localization challenges

Although existing studies have traced the evolution of CPTED from physical prevention and control to a focus on society and welfare, its development has not been linear and has not yet led to a global, unified understanding. In fact, CPTED is a field of ongoing discussion in the international academic community, and there are ongoing controversies about its potential problems, such as excessive reliance on mechanical security, spatial exclusion, ethical risks,

and insufficient empirical evidence. Some critics pointed out that the CPTED strategy, which overly focuses on monitoring, access control, and defensive space, may improve short-term security but may not be conducive to maintaining social trust and spatial inclusion in the long term.

In the context of such international discussions, China's CPTED practice should be seen as a "selective transformation" under specific institutional and spatial conditions, rather than a simple theoretical transfer. Compared with the common community autonomy and bottom-up governance logic in international theory, China's practice relies more on a top-down policy-promotion system, which partly explains why it emphasizes technical, institutionalized hard measures in its application. At the same time, there is still room for improvement in social participation and in the integration of governance. Especially against the background that the third-generation CPTED emphasizes resilience and wellbeing, the development of China's high-density urban

morphology and digital governance further highlights its challenges in evaluation, ethics, and governance structure. These not only reflect the applicable boundaries of international theory in specific situations but also provide a reflective perspective for us to build an assessment framework and practice path more in line with the local context (Table 1).

3. Applications of crime prevention through environmental design measures in China

This study focused on residential areas, public spaces, landscaped settings, and university campuses, which together encompass the major arenas of living, everyday activity, and learning.

3.1. Residential areas and community renewal

In China's urban renewal efforts over the past few years, the concept of CPTED has been widely used in the reconstruction of old neighborhoods, aiming to improve

Table 1. Global crime prevention through environmental design (CPTED) debates and China's localization challenges

Debate theme	Global practices and debates	China's manifestation	Implications for CPTED localization
Over-securitization and spatial exclusion	International CPTED scholarship increasingly questions whether surveillance-oriented and defensible-space strategies may lead to over-securitized environments, spatial exclusion, and stigmatization of vulnerable groups, despite short-term crime reduction benefits.	CPTED implementation in China often prioritizes rapidly scalable hardware-based measures (e.g., closed-circuit television [CCTV], access control, lighting), facilitated by policy-driven governance, which may reinforce a narrow "security-as-control" paradigm.	Localization requires integrating inclusivity and social equity indicators into CPTED evaluation to avoid equating safety solely with surveillance intensity.
Community participation and governance assumptions	Second-generation CPTED emphasizes community participation, collective efficacy, and co-governance, often assuming relatively high levels of civic autonomy and bottom-up engagement.	In China, community participation is frequently consultative rather than co-governed, embedded within top-down administrative and property-management systems.	CPTED principles must be institutionally translated rather than directly transferred, with participation mechanisms embedded into formal governance and maintenance processes.
Digital CPTED: ethics and privacy	Global debates highlight ethical risks associated with digital CPTED, including data privacy, algorithmic bias, and the normalization of pervasive surveillance.	The rapid expansion of smart-city and digital governance technologies enables large-scale deployment of digital CPTED tools, while ethical oversight and privacy governance remain uneven.	Ethical frameworks—such as data minimization, transparency, accountability, and public engagement—are essential for responsible digital CPTED localization.
Evidence base and evaluation metrics	Third-generation CPTED promotes resilience, wellbeing, and inclusivity, yet faces criticism for limited empirical validation and a lack of standardized evaluation metrics.	High-density urban form and accelerated redevelopment cycles complicate long-term evaluation of CPTED outcomes in China.	Developing localized CPTED evaluation frameworks and performance indicators is critical for moving beyond descriptive adoption toward evidence-informed practice.

Note: This table provides a conceptual synthesis of major global debates in CPTED research and the corresponding localization challenges observed in the Chinese context. The authors summarize the contents based on a review of international literature and an analysis of Chinese policies and practical cases

residents' sense of security and overall living quality. Renewal projects in Wuhan, Shanghai, Chengdu, and other cities generally focus on enhancing street lighting, clarifying spatial boundaries, and optimizing visual permeability. These measures not only improve the natural conditions for space monitoring but also promote nighttime activities, thus enhancing people's perception of environmental safety (J. Wang & Deng, 2022). Empirical research also shows that improvements in lighting uniformity and building facade transparency can significantly improve residents' sense of security and satisfaction in the night environment (Y. Wen *et al.*, 2025). In addition, by redesigning semi-public courtyards and shared green spaces, some projects aim to balance privacy and visibility, thereby promoting neighborhood exchanges and strengthening the attribute of space security (T. Liu *et al.*, 2024).

Nevertheless, it is worth noting that some renewal projects still rely mainly on hardware transformation, such as the addition of fences, camera monitoring, and lighting facilities, as the main means to achieve security (Deng *et al.*, 2025). Although such interventions may improve people's perception of safety in the short term, they often ignore social participation and community empowerment. In the long run, this may not only weaken residents' identity and attachment to the place but also affect the continued maintenance of the space (S. Yang & Koizumi, 2025). Studies have further suggested that projects with low levels of resident participation tend to depress place identity and satisfaction, thereby undermining sustainability. In contrast, community empowerment-oriented CPTED models that emphasize resident engagement and multi-party collaboration can enhance spatial safety while strengthening social cohesion and belonging (Y. Shen *et al.*, 2025).

3.2. Public space and landscape environments

In public spaces such as urban parks, squares, and waterfront areas, the application of the CPTED principle has received increasing attention. Its goal is not only to improve safety perception but also to ensure an inclusive space. Taking Baitashan Park in Lanzhou as an example, research has shown that visual permeability, vegetation visibility, and clear path guidance are closely related to tourists' feelings of safety and their experiences of environmental restoration. Interestingly, socioeconomic status and interpersonal needs moderate it—generally, groups with higher socioeconomic status are more sensitive to the security gains brought by CPTED measures (Hou *et al.*, 2025). At the same time, the quality of the landscape is closely related to the effect of the CPTED principle. The higher the quality, the stronger people's sense of security, and this feeling differs across genders and family backgrounds (X. Chen & Marzbali, 2024).

Further evidence shows that dense vegetation and opaque shrubs can constrain fields of view and heighten fear among women and older adults. In contrast, defensive openness achieved through layered, moderately permeable planting can enhance informal surveillance and social comfort (Min *et al.*, 2022). Landscape attributes such as visual and physical accessibility, spatial enclosure, and complexity exert important effects on perceived safety. Moderate spatial permeability and calibrated visual complexity contribute to safer experiential appraisals (H. Wang *et al.*, 2022).

3.3. Campus environments

In recent years, quantitative research on campus environments has shown that lighting conditions, crowding levels, and spatial structure significantly affect students' sense of security, avoidance behavior, and mental health. Adequate lighting and open spaces can often improve the sense of security and reduce students' deliberate avoidance of certain areas. On the contrary, corridors with insufficient light, closed staircases, and visual blind areas formed by vegetation are likely to become places where fear breeds and even bullying events frequently occur (Maier & DePrince, 2020; H. Wen *et al.*, 2025). High building density and cramped space design may also cause avoidance behavior and psychological pressure (Asim *et al.*, 2023).

However, spaces with broad views and active use, such as open squares and paths convenient for natural monitoring, can often promote positive interaction among students and reduce defensive avoidance and fear of crime. Demographic factors, such as gender and school type, also moderate perceived environmental security. For example, female students and students from certain universities are often more sensitive to the configuration of lighting and monitoring facilities (Li *et al.*, 2024). The landscape characteristics of campus public space, including green space landscape index, water form, and openness, are also directly related to users' psychological recovery experience and sense of security. Optimizing the spatial layout and facility configuration can significantly improve the sense of safety for teachers and students during the day and night (Gao *et al.*, 2025). These findings show that the campus environment integrates the physical and psychological dimensions of CPTED and thus serves as an ideal micro-scale setting to observe the relationships among design, behavior, and safety.

Scholars are increasingly recognizing that security comes not only from monitoring or defense facilities but also from spatial psychological experiences created by environmental readability, social vitality, and sensory comfort (Li *et al.*, 2024). In the practice of public landscape, CPTED has

gone beyond the early, simple monitoring logic and begun to integrate aesthetic quality and mental health care, which is also consistent with the third-generation CPTED's emphasis on resilience and inclusiveness (D. Lamoreaux & Sulkowski, 2020).

Beyond physical hardware such as lighting and surveillance facilities, spatial management systems also play a critical role in CPTED implementation on university campuses. Spatial strategies that support social management—such as activating ground-floor common spaces, enhancing wayfinding clarity to reduce spatial ambiguity, aligning space use with class schedules, and coordinating spatial design with student affairs management—can strengthen informal supervision and social interaction. These approaches help translate CPTED from a predominantly defensive strategy into a socially embedded mechanism that supports everyday campus order, perceived safety, and student wellbeing.

3.4. Case studies of crime prevention through environmental design practice in China and international contexts

Experiences from China and other countries suggest that for CPTED to be truly effective, the key is to closely integrate spatial design, community engagement, and governance methods with specific local conditions (Cozens & Love, 2015). Taking Shanghai's community renewal as an example, enhanced visual transparency, the transformation of semi-public spaces, and active resident participation have significantly improved the sense of security in high-density communities (Cao & Tang, 2022).

In Singapore, CPTED has become institutionalized. Public housing areas naturally integrate crime prevention into daily life by maintaining clear sightlines, revitalizing

ground-floor spaces, and coordinating community management (Cao, Heng, & Fung, 2022). The Dutch "Design for Safety" framework emphasizes spatial identifiability, access control, and compatibility with social functions, thereby reducing crime rates while ensuring an open, aesthetically pleasing environment. Similarly, research on Australian university campuses showed that adopting CPTED-based strategies, such as improving lighting, enhancing path visibility, and activating public spaces, can effectively reduce students' and faculty's fear and avoidance of crime while maintaining an open campus atmosphere (Cozens *et al.*, 2019).

These cases collectively reveal that the success of CPTED lies not only in a single technological approach but also in the ability of environmental design to truly integrate with social behavior, institutional support, and local culture.

4. Key issues and localization challenges

Although the CPTED principle has been gradually popularized and applied in Chinese urban practice, it still faces a series of structural and situational challenges. The main problems can be attributed to a lack of cultural adaptability, overly simplified design, insufficient governance and maintenance mechanisms, and imperfect evaluation methods. Overall, these factors restrict the sustainable localization of CPTED within China's architectural and landscape systems (Figure 2).

4.1. Cultural and behavioral misalignment

In the process of introducing CPTED to Chinese cities, it has clearly encountered cultural and practice dislocation. This concept originates from Western society and emphasizes a high degree of autonomy and citizen participation. At



Figure 2. Key issues and localization challenges of CPTED in China
Source: Image by the authors

the same time, the governance of Chinese communities is often based on collective property rights and a hierarchical management system. Residents' participation is generally low, making it difficult to fully implement the core concept advocated by CPTED (J. Shen *et al.*, 2023). CPTED focuses on domain and collective monitoring. In European and American communities, residents often spontaneously organize and manage public spaces, thereby fostering a strong sense of belonging and security (Rupp *et al.*, 2020). However, in China, community management mostly relies on top-down systems such as property companies or neighborhood offices. Residents' participation in decision-making and daily management is limited, which affects the development of autonomy and proactive prevention mechanisms emphasized by CPTED (Lang *et al.*, 2025).

Studies have further indicated that residents' participation in Chinese communities is often a mere formality. Most residents passively cooperate in the implementation process, lacking substantive decision-making power, and the demands of the community are sometimes marginalized by the government or by market-oriented economic goals (Xu & Lin, 2019). This phenomenon of "symbolic participation" weakens the actual effectiveness of CPTED in enhancing community cohesion and security.

The principles of CPTED in the West are often based on residents' autonomous regional awareness and informal supervision generated through daily interactions. However, in many enclosed communities in China, the management of public and semi-public spaces is usually undertaken by property management companies or neighborhood committees rather than residents themselves. Therefore, designs aimed at encouraging resident participation, such as shared courtyards or semi-private boundaries, may be ineffective in stimulating informal social supervision mechanisms in practice. Therefore, when China applies CPTED, it often combines institutionalized governance mechanisms to adjust, such as clarifying the attribution of maintenance responsibilities and establishing semi-official participation mechanisms. This reflects a localized adaptation from spontaneous community autonomy to organized safety management.

4.2. Design simplification and technological bias

In practice, security design is often reduced to hardware upgrades, such as adding cameras, strengthening lighting, and installing fences, but it fails to fully integrate social and psychological considerations (Vogiatzaki *et al.*, 2020). Research from Nanjing, Guangzhou, and other places shows that designers tend to equate safety with "seeing," overly rely on physical monitoring means, and ignore

comfort and social inclusiveness (Z. Wu *et al.*, 2020). This practice may create a bright environment full of surveillance, making people feel uncomfortable being monitored, but it weakens people's inner sense of security (Deng *et al.*, 2025).

Recent studies have shown that the actual effectiveness of CPTED depends not only on physical facilities but also on psychological perceptions of the environment and the quality of social interaction (Y. Wen *et al.*, 2025). Relying solely on hardware transformation can make it easy to ignore users' real needs and psychological experiences, resulting in a separation between safety and comfort (D. Lamoreaux & Sulkowski, 2020). Excessive lighting and monitoring may even cause tension and pressure among some people, reducing the sense of belonging and spatial inclusiveness (Seymour *et al.*, 2024). If socioeconomic differences and interpersonal needs are not taken into account, efforts to enhance safety may increase spatial exclusion and social stratification (Hou *et al.*, 2025). Localization should therefore move beyond a hardware upgrade mentality. Priority should be given to environmental psychology, social interaction, and inclusive design so that physical and social measures can be integrated to improve overall safety and livability.

4.3. Gaps in governance and maintenance

Whether CPTED can continue to play its role depends on whether the environment can be sustained over the long term and whether residents are willing to participate. Studies have found that once the community management is relaxed, the improvement in people's perception of security tends to weaken within two to three years, especially in old communities (T. Liu *et al.*, 2024). After the completion of many reconstruction projects, there is no clear maintenance responsibility, leading to the aging or damage of lighting, monitoring equipment, public courtyards, and other facilities, and a gradual loss of sense of security in daily life (You & Yang, 2025). The actual cases in Nanjing and Guangzhou also show that without proper maintenance, people will soon lose confidence in the environment's safety and may even face new hidden dangers (Lang *et al.*, 2025). Without continuous monitoring and participatory governance, physical redesign alone cannot secure long-term improvements in perceived safety (Gu *et al.*, 2022). Empirical works have indicated that joint community management, routine evaluation, and feedback mechanisms can stimulate participation, increase spatial vitality, and strengthen perceived safety (Zeng *et al.*, 2023). Moreover, higher socioeconomic groups are more likely to consistently benefit from CPTED, whereas lower socioeconomic groups depend more on ongoing community support and public investment (Lee *et al.*, 2023).

4.4. Methodological and evaluation limitations

Currently, CPTED assessment tools tailored to the Chinese socio-spatial context remain limited. Most existing international audit instruments are practice-oriented and lack cross-cultural validation, constraining their applicability in high-density environments. This gap underscores the necessity of developing context-sensitive and empirically grounded CPTED assessment frameworks (Li *et al.*, 2025). Although some scholars have attempted to develop localized CPTED evaluation indices, such as the environmental psychological safety model for urban villages, most of these systems rely on subjective questionnaires and expert scores. Because they are sensitive to perceived bias and a lack of a systematic empirical basis and objective quantitative support, they find it challenging to reveal the complex interactions among environmental variables (N. Zhang *et al.*, 2023). There are also obvious limitations in data collection and the indicator system. Existing statistical data are mostly limited to small-scale towns and urban communities. Traditional data collection methods are difficult to meet the needs of multi-dimensional and dynamic assessment, which affects the integrity and timeliness of the assessment (M. Chen *et al.*, 2024). At the same time, due to the lack of uniform standards, evaluation methods vary across environments, making it difficult to compare results and limiting the provision of evidence-based decision support.

5. Aligning crime prevention through environmental design with Chinese planning and design policies

At present, China's urban planning policy is shifting from technology-driven "safe city" construction in the past to a more people-oriented urban renewal and resilience-oriented governance model. This transformation provides an objective institutional interface for integrating CPTED's first-, second-, and third-generation concepts. The early "safe city" project focused on urban-scale monitoring, emergency linkage, and digital security. Its logic is the same as that of the first generation of CPTED—both focus on lighting, access control, video monitoring, and other physical control methods (Arabi *et al.*, 2020). Today's "urban renewal" and "resilient city" policies emphasize social participation, community resilience, and human wellbeing, which align with the socio-ecological integration and resilience orientation advocated by the second and third generations of CPTED. The transfer of policy focus provides a rare window for CPTED to shift from hardware-based prevention and control to comprehensive management (Feng *et al.*, 2024).

In 2025, the Chinese government (General Office of

the CPC Central Committee & General Office of the State Council of the People's Republic of China, 2025) issued the *Opinions on Continuing to Advance the Urban Regeneration Initiative*, which adopts a people-centered orientation and calls for complete communities, risk governance, long-term maintenance, and public participation. These priorities are highly consistent with the socio-ecological orientation of second-generation CPTED. The document calls for improvements in safety in older neighborhoods, greater transparency in management accountability, and stronger resident participation. These provisions correspond directly to CPTED social mechanisms, including semi-public boundaries, co-managed maintenance, and lighting system governance (Zhou *et al.*, 2021). It is recommended that CPTED-reviewed procedures be mandated for project submissions and post-occupancy evaluations in urban regeneration programs.

At the same time, the General Office of the State Council of the People's Republic of China issued the *2024 Action Plan for Implementing the Opinions on Advancing New Urban Infrastructure Construction to Build Resilient Cities*, covering 2025 to 2027, which emphasizes city information modeling and digital twins, lifeline safety engineering, and multi-departmental coordination. These priorities provide policy support for third-generation CPTED that integrates spatial safety, urban resilience, and resident wellbeing (L. Wu & Leng, 2025). Evidence indicates that resilience governance performs better when environmental design indicators are combined with psychological safety metrics and operational monitoring data (Lv & Sarker, 2024). It is therefore advisable to establish a CPTED and resilience scoring system within city information modeling platforms to enable dynamic evaluation of urban safety.

Policy alignment recommendations with CPTED are as follows:

- (i) Design codes: Add clauses on natural surveillance, circulation, access control, and landscape sightlines.
- (ii) Regulatory plans and approvals: Require site plans and urban design submissions to include a CPTED statement that addresses day and night visibility, entrance hierarchy, and spatial boundaries, and include these items in safety retrofit checklists for urban regeneration.
- (iii) Resilience and operations: Connect third-generation CPTED indicators, including fear, perceived safety, and social vitality, to city information modeling and integrated urban management platforms.
- (iv) Procurement and evaluation: Incorporate CPTED scores into scheme review criteria and conduct post-occupancy evaluations 12 to 24 months after commissioning to ensure life cycle safety management (Almulhim, 2025).

Through three complementary linkages, namely safe or smart city with first-generation CPTED, urban regeneration with second-generation CPTED, and resilient city with city information modeling for third-generation CPTED, CPTED can shift from a set of design strategies to institutionalized elements within China's planning system that are measurable, reviewable, and sustainable.

6. Future directions and research agenda

With the continued development of the CPTED concept, its local practice in China should move beyond traditional spatial and physical design categories and pursue systematic innovation across the four interrelated dimensions of digital intelligence, psychological perception, cultural integration, and education policy. These directions, together, constitute the key path for future research and practice.

6.1. Digital crime prevention through environmental design

The integration of geographic information systems, BIM, and artificial intelligence enables more feasible risk prediction and dynamic monitoring. Image recognition and big data analysis powered by artificial intelligence can identify potential hazardous areas, simulate pedestrian flow patterns, and predict “hot spots” prone to high crime or anxiety. A relevant research in Nanjing found that spatial visibility, calculated using spatial syntax and machine learning, is significantly associated with people's perceived sense of security (Pan *et al.*, 2022). In the future, efforts should be made to develop a CPTED digital twin system integrated with the urban information model platform to enable two-way mapping and dynamic feedback between physical space and behavior data (Chong *et al.*, 2025).

6.2. Psychological crime prevention through environmental design

In recent years, studies have increasingly emphasized that crime prevention and security depend not only on visibility and access control but also on the adjustment of emotional comfort and psychological pressure (Schwerdtfeger *et al.*, 2025). Psychological CPTED advocates the use of physiological and psychological measurement methods, such as the Perceived Safety Scale, heart rate variability, and eye tracking, to assess the psychological impact of the environment on people (Peng *et al.*, 2024). In high-density urban environments, integrating behavioral psychology into design evaluation helps clarify how people interpret safety signals and promote a sense of belonging through design (D. Lamoreaux & Sulkowski, 2020; Peng *et al.*, 2024).

6.3. Cultural crime prevention through environmental design

The localization practice should also reflect China's unique space ethics and cultural symbols. Integrating the geomantic omen concept, community rituals, and neighborhood customs into the design enhances residents' sense of identity with the place and awareness of independent environmental maintenance (P. Liu *et al.*, 2023). Empirical studies in Fujian and Guangdong showed that designs that conform to the traditional concept of orientation and landscape image can enhance the sense of psychological security and environmental harmony (D. Zhang *et al.*, 2025). Therefore, the culture-oriented CPTED model can integrate the aesthetic value with the collective security goal to form a culturally rooted path to create a safe environment (Hung & Chang, 2024).

6.4. Education and policy integration

To promote the institutionalization of CPTED, its system needs to be incorporated into the curricula of architecture, urban and rural planning, and other specialties, as well as into the framework for vocational qualification certification (Kohale *et al.*, 2024). Special training for architects, planners, and local managers can enhance their spatial behavior awareness and their ability to implement policies in design and management. Government departments should also incorporate the CPTED principle into relevant technical standards and professional certification systems, making safety design a core professional quality in China's urban governance framework (Chen & Zhao, 2025).

6.5. A localized crime prevention through environmental design evaluation framework

Given the lack of systematic assessment tools in existing CPTED research, this study developed a localization assessment framework suitable for China's urban environment. It should be noted that the framework is not a finalized standardized measurement system but is primarily used as a conceptual basis and analytical reference to provide direction for subsequent empirical research, policy evaluation, and institutional development. The framework revolves around four interrelated dimensions: first, the physical space dimension, which focuses on design quality, spatial clarity, and natural monitoring beyond traditional security; second, the dimension of social behavior, focusing on the role of space use mode, inclusiveness, and community participation in informal social control; third, the dimension of psychological perception, which examines the sense of security, fear of crime, behavior avoidance, and sense of belonging, and notes that there may be differences between subjective experience and objective intervention;

and fourth, the governance system dimension emphasizes the importance of integrating CPTED principles into the regulatory system, cross-sectoral collaboration, long-term maintenance, and ethical supervision, especially in digital applications and data privacy. This framework offers some flexibility and situational adaptability and can be used for case comparison and problem diagnosis, laying the foundation for the establishment of CPTED evaluation practice in line with local realities and based on empirical research in the future.

7. Localization of crime prevention through environmental design: Limitations, challenges, and future directions

7.1. Limitations of research methods and evidence level

This study used a combination of semi-systematic literature review, policy text analysis, and case synthesis. Although it is inclusive and comprehensive in overall understanding, it also has some limitations. Due to significant differences in design, scale, and evaluation indices across current research on CPTED in the Chinese context, this study did not use quantitative review or causal inference methods but instead focused on qualitative and comprehensive analysis, which imposes some limitations on the strict verification of the actual effects of CPTED measures.

Secondly, although we have referred to both international and Chinese literature, domestic long-term follow-up research and quasi-experimental research remain relatively limited, which creates difficulties for cross-regional and cross-time system comparisons. Therefore, the view of this article should be regarded as an analytical and guiding discussion rather than an empirical test of the specific implementation effect. These limitations, to some extent, reflect the current exploration stage of CPTED research in China as a whole.

7.2. Practical challenges in implementation and governance

In Chinese practice, one of the prominent problems CPTED faces is the fragmentation of the implementation path and governance structure. Although the relevant concepts have gradually entered the urban renewal and public security policy system, their practice remains at the project design stage, lacking an institutionalized, systematic promotion mechanism. CPTED involves planning, design, public security, community, property, and other multi-party participants, but has not yet formed a coordinated and orderly division of responsibility and a normalized cooperation mechanism.

In addition, security-oriented space intervention is often regarded as a “one-time project,” and the follow-up maintenance, evaluation, and dynamic adjustment mechanisms are insufficient, making it difficult to sustain the initial results. This shows that CPTED needs to gradually shift from “project-oriented” to “governance-oriented” in China and build institutional support for the whole process.

7.3. Dual influence in the application of digital technology

With the development of smart cities and digital technology, CPTED has gained new tools for risk identification and environmental optimization, but its application also faces technical barriers and ethical concerns. From a technical perspective, digital CPTED relies on data quality, departmental collaboration, and model adaptation, but in practice, data islands and uneven technical capabilities pose challenges that limit its widespread application.

More noteworthy is that digital CPTED may pose ethical risks, including breaches of data privacy, algorithmic bias, and excessive monitoring. Excessive reliance on monitoring technology may weaken public trust and even cause uneasiness about being monitored. However, it also weakens people’s subjective sense of security. Therefore, digital means must be promoted within a clear ethical framework and cannot be regarded only as a technology-neutral solution.

7.4. Future outlook and suggestions

Despite the above challenges, this study also provides a direction for future exploration. First of all, we should gradually build a CPTED evaluation system aligned with China’s national conditions and coordinate the physical, social, psychological, and governance dimensions to form a measurable and comparable index system. Secondly, the CPTED principle should be systematically integrated into the urban and rural planning and construction process through design standards, vocational training, approval mechanisms, and related measures.

At the same time, future research can strengthen comparisons with other high-density, non-Western cities and further position the uniqueness and reference value of the Chinese experience in the international context. Finally, when promoting digital CPTED, we must simultaneously build governance and ethical constraint mechanisms to ensure that technology truly serves human security and public welfare. Only in the three levels of system, technology, and society can CPTED realize the profound transformation from “security intervention tool” to “social spatial governance mechanism” in China.

8. Conclusion

Over the past two decades, the introduction and dissemination of CPTED theory in China have significantly improved the understanding and practice of safety-oriented design across architecture, landscape, and urban planning. In a variety of environments, such as residential areas, public spaces, landscapes, and campuses, CPTED provides a systematic framework that organically combines spatial visibility, behavior guidance, and environmental maintenance (X. Chen & Marzbali, 2024). However, the current practice still stays at the level of physical environment intervention.

The actual localization of CPTED should be based on the overall understanding of the integration of spatial, psychological, and social dimensions. From a spatial perspective, CPTED should evolve from local design interventions to a city-level framework integrated into the planning, control, and maintenance system (L. Huang *et al.*, 2020). At the psychological level, security perception and emotional comfort should be used as important supplementary indicators, alongside crime statistics, to form a more comprehensive security evaluation system (D. J. Lamoreaux & Sulkowski, 2021). In terms of social dimension, community participation, common governance, and neighborhood watch are important foundations for achieving continuous safety improvement (Y. Yang & Lee, 2024).

The future development of CPTED in China should achieve a balance among aesthetics, toughness, and safety. This means we should shift from a defensive, technology-driven design thinking to a people-oriented, resilient design orientation, and create a space that can promote a sense of belonging, inclusiveness, and happiness. At the policy level, it is also necessary to institutionalize the CPTED principle into the design specification, professional education, and evaluation system, so that “eliminating fear through design” becomes one of the core principles of urban planning in China. With the continuous integration of artificial intelligence, big data, and social and cultural research, China has the opportunity to play a leading role in the next stage of CPTED’s development—by integrating architectural aesthetics, environmental psychology, and urban resilience system—thereby promoting the formation of a safer and more people-oriented new paradigm for urban development (L. Wu & Leng, 2025).

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