Observing the correlation of crime and urban physical environment: an input to urban renewal and revitalization

Donna R. Tabangin[1], Jacqueline C. Flores[2] & Nelson F. Emperador[2+]
[1] Engineering and Urban Planning Research Laboratory
[2] Deparment of Electronics and Communications Engineering
Saint Louis University, Baguio City
Contact information: don_rillera@yahoo.com.ph; jcflores@slu.edu.ph
+ Deceased

Abstract:

Pursuing the ecological theory that design influences how people think and feel in a place, and ultimately how they behave, the researchers used crime data for the years 2004 to 2007 from the Baguio City Police Office to determine crime patterns within the Central Business District (CBD). Crime mapping was performed using Geographic Information Systems (GIS), satellite Global Positioning Systems (GPS) and satellite imageries. The study demonstrated that crime prevention may not only be about catching offenders and putting them through the criminal justice process but can also be about environmental design. Knowing the physical features of crime-prevalent areas and understanding why they are conducive to crime may help architects, planners, developers and policymakers make appropriate and purposive decisions for urban renewal and rejuvenation initiatives.

Keywords: *Crime mapping, architecture, urban design, Geographic Information Systems*

The integration of ecological ideas into architecture, planning and design is a paradigm whose time has come. Architectural design by itself can not fully understand all the intricacies that happen in a particular place. The use of new tools and technologies as well as the acquisition of new paradigms is a sign of maturity in the development of any professional community (Khun 1962). Ecology is relevant to "place-making" since "place" is the interface between the physical environment

and human activities (Steiner 1991). This symbiotic relationship can be utilized and integrated to an otherwise invisible and complex urban phenomenon – the preponderance of crime as correlated to the design of the built environment, the mix of land uses, and the physical characteristics of the place.

The past two decades has seen the advancement of the concept that places may act as precursors to anti-social behaviour. Environmental sociologists and criminologists have posited that there is a link between criminal behaviour to physical or social space. They argue that crime must be viewed in the context of the place where it occurs because such places present bigger or lesser opportunities for criminal behaviour (Park and Burgess 1921; Shaw and McKay 1969; Newman 1972; Brantingham and Brantingham 1991; Wikstrom 1995). Empirical studies have shown that crime is concentrated in a few "hotspots" (Sherman et al. 1995, 1989). Hotspot places are very small micro units of analysis, such as buildings or addresses, block faces or street segments; or clusters of addresses, block faces or street segments (Eck and Weisburd 1995). Such observations have led to the recommendation of reorienting crime prevention efforts from the traditional socio-demographic characteristics of offenders to the manipulation of the built environment in order to reduce crime opportunities (Jeffery 1971; Newman 1972).

Studies that delved into the concept of "designing out" crime have examined the relative merits of trying to prevent crime through alleviating the social problems which are thought to encourage crime, versus treating the symptoms – that is, reducing the opportunities for criminals to commit crimes. This "opportunity theory" was put forward by two particularly influential works: C. Ray Jeffery's Crime Prevention through Environmental Design (1971), and Oscar Newman's Defensible Space (1972). Jeffery, a criminologist, suggested that urban design could be used to prevent crime by reducing the opportunities. Newman, an architect, conducted a study which further established the relationship between urban design and crime rates. In his analysis, he came up with three crucial factors: territoriality, natural surveillance, image and milieu. Jeffery and Newman both built on two previous works: Jane Jacob's "The Death and Life of Great American Cities" (1961) which argued that urban design broke down many of the traditional controls on criminal behaviour; and Schlomo Angel's "Discouraging Crime Through City Planning" (1968) which noted that crime was inversely related to the level of activity on the street.

The "opportunity theory" was further expounded by Mayhew, Clarke, Sturman and Hough (1976) and Clarke and Mayhew (1980) in their work for the UK Home Office Research Unit, the Canadian criminologists Paul and Patricia Brantingham (1981), Greenberg and Rohe (1984), and Shaw and McKay (1929). Their researches have shown that certain physical attributes such as specific land uses, street layouts that provide access and escape routes, environmental disrepair and deterioration, and physical features that block visibility and natural surveillance can encourage higher incidence of crime. It was found out that commercial and transitional areas tended to be more attractive targets for criminals, followed by industrial areas, with residential areas considered as the least attractive. Block and Block (1995) went further by noting that specific commercial uses are more likely to generate crime than others, especially if there is a high concentration of them in a limited area. Liquor stores, bars and taverns are crime generators whereas pawnshops, ATMs, vacant lots or buildings, and public parks are crime attractors (Perkins et al. 1992). Wilson and Kelling (1982) put forward their "broken windows" theory stating that physical incivilities (trash, graffiti, abandoned buildings, disrepair, unkempt lots) and social incivilities (rowdy behaviour, drug dealing, public drunkenness, prostitution, panhandling and loitering) result in higher crime and fear of crime.

In 1990, Brantingham and Brantingham introduced their "rational choice" theory arguing that criminals make rational choices before committing a crime thus the possibility of surveillance by the users and owners of the place plus the presence of physical features that increase the visibility of a site (such as open storefronts, unobstructed windows, and well-lit areas) and the absence of features that block views (blank walls, thick vegetation) can influence the final decisions of potential offenders. Donald Perglut (1981, 1982) concurred with this expanded scope of defensible space by pointing out that "soft" architecture should be complemented with "soft" management practices. Soft architecture responds to people, and the design welcomes and reflects the presence of human beings. Soft management, on the other hand, assumes that the place users or owners can seek out responsibility and exercise high degrees of imagination and creativity in participating in their environment.

This study tests the theory of the ecology of crime and design in the urban setting of Baguio City. It intends to utilize data mining and geographic visualization to identify locations of crime hotspots and their physical

environmental attributes which encourage crime. The findings provide helpful input to architects, planners and policy makers in their effort towards improving urban design.

Research design and methods

In order to investigate the relationship of environmental design and crime, data consisting of a total of 2,632 crime incidents over a period of four (4) years (2004-2007) were collected from the Baguio City Police Office (BCPO). Since each crime was uniquely identified by an address, systematic ground surveys were conducted and each of the addresses was visited and "geocoded" with handheld GPS units. The recorded x and y coordinate locations were uploaded in a GIS software (Geomatica Ver. 9.1.7) for visualization. Data verification was done by using a satellite image as well as road, land use and police jurisdiction basemaps of the City as background features.

To geographically visualize the spatial locations and distributions of the top three crimes in the city, centrographic statistics using the standard distance circle, mean centre, and standard deviation ellipse algorithms of GIS were employed. Hotspots were identified through kernel density estimation using CrimeStat III, a freeware crime statistic and analysis software package which can be used in conjunction with most GIS softwares.

Findings and discussion

The computed hotspot maps and derived addresses consistently show that the crimes of theft, robbery, and physical injuries have occurred within a number of select places in the CBD over the four-year period. Other crimes (e.g. murder, rape, etc.) were comparatively few and too dispersed to provide usable and address-specific hotspot computations. From actual site visits and direct observation, the researchers studied the physical attributes and environmental milieu of the hotspot addresses. Six (6) addresses were visited and analyzed for theft, eight (8) for physical injuries, and four (4) for robberies. The physical attributes which were observed are grouped into four (4) classifications as shown in Table 1.

Table 1. Environmental inventory physical attributes and their characteristics

Physical Attribute	Attribute Characteristics
1. Building Design	Features that offer natural surveillance, delineation between public and private space, proximity of sites to well-used locations (Newman 1972; Jacobs 1961).
2. Land Use and Circulation Pattern	Boundary characteristics, land uses, vehicular and pedestrian patterns that may encourage or discourage different types of crime (Greenberg and Rohe 1986; Greenberg, Williams and Rohe 1982).
3. Territorial Signage	Signs of caring and proprietorship that signals to users that the owners care and are vigilant to what happens there (Brower 1988; Greenbaum and Greenbaum 1981).
4. Physical Deterioration and Disorder	Signs of incivility and physical deterioration which are contagious, stimulating and attractive to potential offenders (Wilson and Kelling 1982).

Theft occurs at places where closed front and open-air commercial activities abound as shown in Annex A. Theft hotspot places are usually on narrow sidewalks and overpasses which experience crowding due to heavy pedestrian traffic. Theft also happens in rundown buildings with on-street parking for private vehicles and terminals for public utility vehicles (called "jeepneys") which obstruct the view from the surrounding areas. Scattered litter, vagrants and vendors likewise abound. The mall, which is a new development, is another theft hotspot. It offers contradictory attributes though, since it has large glass open frontages and good aesthetic design. Theft in the mall happens at crowded hallways where escalators and elevators are situated. Crowding in constricted spaces seems to be a major factor for this type of crime which negates

the theory of Jane Jacobs (1961) that "more eyes on the street" would mean lower levels of crime. In this case, planning which permits for the convergence of people (and vehicles to a certain extent) plus the obvious lack of guardianship all, add up to an environmental mix where opportunities for theft are made possible.

In the case of physical injury crimes, they were observed to happen in places with the preponderance of bars, discos, and inns, as seen in Annex B. Elevated night time occurrences were noted and usually at addresses where there is poor lighting, absence of public phones, and on narrow sidewalks and overpasses. Moderate pedestrian and vehicular traffic were observed especially at night time but the hotspots are near jeepney and bus terminals as well as vehicular drop off points. Dark alleys and the presence of parked vehicles afford poor visibility from the surroundings. Majority of the hotspots are located in older and run-down buildings where guardianship and maintenance are lacking. In the case of the newly refurbished buildings, large columns on the sidewalk provide good hiding places and the provision of railings entrap possible victims. In this case, there are only two possible entry and exit points which are situated at the far ends of the property. The market, which is the only place that experiences heavy pedestrian traffic compared to the other addresses, was observed to house the bars on the upper storeys of the old buildings which usually operate during and after market hours.

Annex C presents the hotspot places for robberies. This crime type is observed to happen in closed front commercial areas and places with design features that afford hiding and entrapment (columns, railings, trees and bushes, seating, alleys) were observed. The absence of public phones, good lighting and guardians were likewise detected. Offenders seem to prefer places with wide sidewalks but with poor visibility from the opposite side of the street since the view is obstructed by the presence of tall bushes and trees in the park as well as parked vehicles. Jeepney terminals and vehicular drop off points are situated nearby. The streets serve two-way traffic but experience moderate pedestrian and vehicular traffic. Liquor stores, bars, and inns are located nearby. Most of the buildings are old and run-down. Vendors and beggars are also observed to abound in the hotspot places.

It can be noted that the "heart" of these crime activities is the market. Since the area exhibits a very mixed land use, deteriorating building stock, abundance of jeepney terminals and drop-off points, high pedestrian and vehicular traffic volume, and thus an almost 24-hour operation, this place is a persistent crime hotspot. The apparent loss of control and management due to the sheer volume of activities may have contributed to the physical breakdown and worsening of the area. Offenders seem to favor areas of this type where guardianship and physical care have clearly been neglected. The "broken windows" thesis of Wilson and Kelling (1982) is thus supported. The presence of dilapidated buildings, scattered litter, graffiti, illegal vendors and beggars evidently demonstrate the relationship of physical and social incivilities to crime. Land use, as earlier stated, can be a determinant of crime type. It was shown that bars, liquor stores, and inns may act as crime generators especially in the case of physical injury crimes. Theft and robberies are strongly observed in commercial and retail areas where people converge.

Street characteristics such as on-street parking, vehicular and pedestrian traffic also seemed to affect crime. Theft favors crowded areas whereas the crimes of physical injuries and robberies stay in moderately used areas. The presence of parked vehicles contributes to obstruction and poor visibility. The location of the jeepney terminals and vehicular drop off points strongly suggest a strong influence on all three crimes. Since the Baguio CBD is where most of inter- and intra-city public transportation terminals are situated, they may, aside from bringing a large amount of people into the CBD, act as offender "importers". The adjacency of undesirable establishments (bars, liquor stores, inns) and the apparent laxity in maintenance and security at the terminals themselves may further alleviate criminal opportunities. Marcus Felson (1987) had argued that criminals and victims find the shortest route, spend the least time, and seek the easiest means to accomplish something. The terminals, thus, may help ease the traveling and escaping of offenders.

Conclusion and recommendations

The ecology of crime is true in Baguio City CBD. Crime is not only about offenders and victims but is also about situations and places. The study has shown that there are places which experience high criminal activities, while there are other places in the City which offer similar land uses but experience lesser crime. The researchers explained why

there are hotspots as well as cool spots: physical design attributes and milieu affect crime. The presence or absence of certain environmental attributes present greater or lesser opportunities for crime. Crime is place-specific and environmental design must be used to reduce criminal activity while still maintaining the aesthetic standards sought by architects and designers.

Although architects and physical planners may not be able to deal with the social variables affecting crime directly, physical design that is conscious of its eventual effects on criminal behaviour fall right within their scope of work and responsibility. Physical features that offer better natural surveillance and lines of sight (e.g. large glass store or building fronts), clear delineation between public and private spaces, elimination of possible offender concealment spaces and escape routes (e.g. shrubs, trees, alcoves and blind corners), multiple well-defined and controlled exit and entry points (e.g. guards, locks, appropriate spatial definition), as well as the provision of adequate lighting and public pay phones (which can be used to ask for help) are deemed important in order to overcome the sense of spatial isolation.

Traffic patterns and land use mixes may encourage or discourage different types of crime. By implication, changes in land use and traffic patterns may result to higher or lower crimes because they may alter the exposure of potential offenders. The researchers are looking into the possible "importing" potential of jeepney terminals. Since terminals are movement generators, a physical change in circulation pattern like separating them from crime generators and undesirable establishments (such as bars, liquor stores, inns) and crowded areas (market, commercial and retail places) may help reduce crime. Likewise, on-street parking for both private and public vehicles may be restricted at certain places to enable visibility from the surrounding establishments thus reducing the risk. Incorporating features that may increase pedestrian volume (sidewalk cafes, convenience stores) or defuse their presence (wider hallways and lobbies) may further aid in lessening vulnerabilities.

Signs of caring and proprietorship signal to users and outsiders that the owners are concerned with their space and are vigilant about what happens within their properties. Improving and redeveloping areas that are physically deteriorated, unsafe, or poorly planned will lead to much safer places as well as overall neighbourhood viability. Incorporating

patrolling guards or policemen or the installation of CCTV cameras may add to the sense of control in the area.

Probably the most influential element that makes people afraid and concerned with their welfare and general well-being in urban areas are the physical and social signs that indicate a breakdown in society: physical deterioration, large-scale accumulation of graffiti and trash, prevalence of beggars, drunks and itinerant vendors. These "incivilities" make establishment owners and personnel more concerned with their own safety and participate less in the maintenance and order in public places. Sensing fewer "eyes on the street", offenders become emboldened. Physical changes may precede crime changes. Policy makers especially from the City Planning and Development Office (CPDO) and the City Environment and Parks Management Office (CEPMO) play a large role in this part and they should rid the city of these signs of incivility and send a message that someone is in control.

This study hopes to put forward a message to architects, planners, developers and policymakers – the major actors in urban renewal and rejuvenation efforts. Crime prevention through environmental design (CPTED) seeks to prevent crime by influencing people's behaviour in places while at the same time improving our physical environment. While rejuvenating the built environment might not be the cure-all for improving our deteriorating quality of urban life, it may provide a partial solution, and one that is within the concern of the physical design professions.

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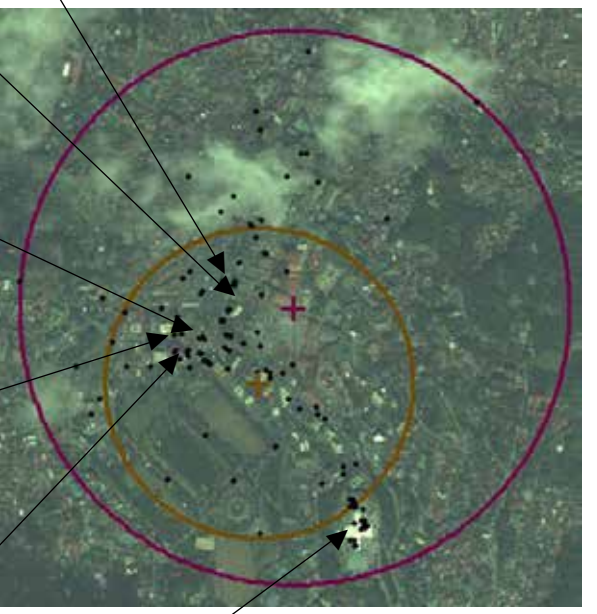
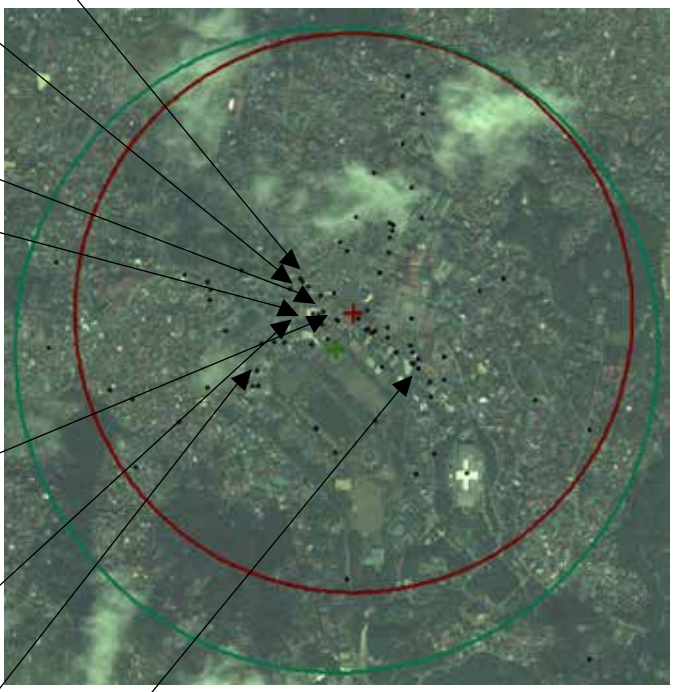
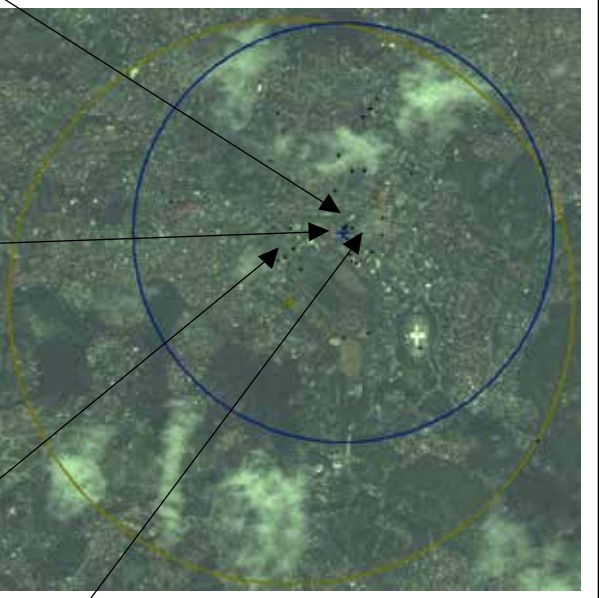
Annex A. Theft hotspot places

Address	Location Map
 Y Overpass	
 General Luna Road	
 City Market	
 Zandueta Street	
 C Overpass	
 SM City	The mean circles indicate the concentration of theft in the CBD. At night, theft is more concentrated (as shown by the smaller circle) as compared to day time.

Annex B. Physical injury hotspot places

Address	Location Map
 Tabora Park	
 P. Burgos Street	
 City Market	
 Maharlika	
 Malcolm Square	
 C Overpass	
 Otek Street	
 Assumption Road	The mean circles indicate the concentration of physical injury crimes in the CBD. At day time, it is observed to be more concentrated (as shown by the smaller circle) as compared to night time.

Annex C. Robbery hotspot places

Address	Location Map
 Hilltop Road	 The mean circles indicate the concentration of robbery crimes in the CBD. At day time, it is observed to be more dispersed (as shown by the larger circle) as compared to night time.
 Maharlika	
 Otek Street	
 Malcolm Square	