URBAN DESIGN INTERVENTION FOR PREVENTION OF CRIME & CREATION OF A SAFE NEIGHBOURHOOD THROUGH SPACE SYNTAX ANALYSIS: AMHERST STREET, KOLKATA

An Urban Design Thesis Report

Submitted in partial fulfilment of the requirement for the

Postgraduate Degree of

Master of Architecture (Urban Design)

Under the Faculty of Engineering and Technology

of Jadavpur University, Kolkata

Under the guidance of

Prof Dr. Debashis Das and Prof Taapas Kumar Bhattacharya

Submitted by:

Payel Chakraborty

Roll No. 001710202005

Examination Roll No. : M4CIV19005

M. Arch (Urban Design)

Department of Architecture

Jadavpur University

Kolkata 700032

May, 2019

CONTENTS

CONTENTS

ACKNOWLEDGEMENT

The thesis work would not have been possible without contributions from a number of individuals. I therefore take this opportunity to acknowledge all of them who have contributed to the completion of this endeavour. I would like to express my gratitude to the Department of Architecture, Jadavpur university, all of my respected faculties, the staff members and my friends.

I would like to express my gratitude towards my Thesis Guide Professor Dr. Debashis Das and Dr. Taapas Kumar Bhattacharya for their constant support throughout the curriculum. I express my deep gratitude towards Head of the Department and our thesis coordinator, Professor Dr. Sanjib Nag & Asst. Professor Sanghamitra Sarkar for their continuous support and guidance.

An important role has been played by several seniors and Professionals in other fields who have supported me inspite of their busy schedule. I would like to express my deep gratitude to the OC-Crime Record Section of Lalbazar Police Station, Mr.Jayanta Mukherjee, who has helped me in collecting the data. My special thanks to Mr.Ranjay Ghosh who has helped me in spite of his busy schedule. My heartful thanks also goes to Mr.Abhishek Pal ,without whom my thesis would not have completed.

Mostly, no thesis work is possible without the support of family and friends. I would also like to thank my beloved friends who helped me a lot in making of this review.

I would also express my deep gratitude towards my family who have supported me in this whole journey. I thank my husband Mr.Suman Pal, my in-laws Mr.Sushil Kumar Pal & Mrs.Shikha Pal who have been very tolerant with me in the whole process. A special thanks to my son Master Soumil Pal who has contributed his time in helping me. Last but not the least ,I would thank my parents Mr.Sankar Chakraborty and Mrs. Anjali Chakraborty ,who have constantly supported me morally in completing my thesis work.

ABSTRACT

Violence against people in public spaces has become an important issue effecting the development and has been an important point of discussion across the globe, as men , women and children of almost all countries, irrespective of nationality, class, caste, religion, culture, age, and ethnicity, experience it. These crimes can be prevented by various urban design interventions.

The objectives of the research is to examine the effect of the physical layout of the street network ,lighting, vegetation, amenities and activities on the distribution of outdoor crime and intervene into a neighbourhood area for prevention of outdoor violence. The occurrence of criminal events and spatial configuration has been measured by space syntax methodology.

This research tends to confirm Jacobs' view that the circulation of people and appreciation of public spaces are the essence of the urban liveliness and that natural surveillance is a good deterrent to criminal activity.

The distribution of incidents of outdoor pickpocketing , snatching , bicycle theft , taxi theft & motor-cycle theft that occurred in one of the wards of Kolkata(Amherst Street) was analysed and the space syntax methodology was used to estimate the to- and through movement potential of individual street segments.

Space syntax, originated and developed in the 1970s at the Bartlett Unit for Architectural studies, University College, London (Hillier & Hanson), is a robust technique that can be used to describe and analyse patterns of architectural space both at the building and urban level. As predicted, the configuration of the street network was associated with the spatial distribution of outdoor serious violence. Urban design intervention should be targeted for crime reduction in a residential neighbourhood area.

LIST OF FIGURES

CHAPTER 1 - INTRODUCTION

1.1 BACKGROUND

Environment has affected the living creatures and has caused different reactions in different conditions. There has always been a relation between human behaviour and their environment. People have been blending themselves together with the changing social and cultural fluctuations. With social and cultural changes, there has been a change in attitude towards environment. Hence one needs to pay attention to the exterior (city) needs along with the interior atmosphere, to feel secured & satisfied. **S**ocial standards are not the only causes of crimes, but the physical structure also has an effect on preventing or spreading crimes and other social raucousness. In order to prevent crimes and socio-cultural problems along with providing visual comfort, the role of an urban-designer is undeniable. Hence, as the environment is very effective, proper urban designing technique would not only make it possible to deliver some ideas for preventing crimes but also could make it possible to control the behaviours & even guide them.

Environmental security is an urban design process which integrates crime prevent ion with neighbourhood design and urban development. It is a comprehensive design approach that combines traditional techniques of crime prevention with newly developed theories and techniques. It is concerned not only with reduction of crime but also the fear of crime, since the fear is equally serious and is a major contributor to the urban decay process.

Basic theory of Environmental Security:
Urban environments can be designed or redesigned to reduce the opportunities for crime to occur and at the same time the fear of crime without resorting to the building of fortresses and the resulting deterioration in the quality of urban life.

Major Environmental Security theories:

- There are logical reasons why certain patterns of opportunity crimes occur in particular areas
- The cause and effect relationships involve the organization of the physical environment
- By understanding the growth and decay process and what causes and aggravates it, environmental strategies can be developed

Crimes are categorized into:

- Violent crimes

- Crimes against persons
  - Murder
  - Forcible rape
  - Aggravated
  - Assault
  - Robbery

- Property crimes or crimes against property
  - Burglary
  - Larceny
  - Auto theft

The types of crimes being discussed are street crimes/crimes of fear known as predatory crimes which include:

- Pickpocketing
- Snatching
- Bicycle theft
- Private car/taxi/motorcycle theft
- Assault

The recent problems hovering on us include energy and environmental conservation and renewed interest in preserving our urban neighbourhoods. Numerous government programs and private projects are being formulated to restore the city

Certain steps undertaken to restore certain cities are:

- Chennai takes baby steps to restore water bodies
- To Restore the TajMahal — or Demolish It
- Kolkata Meat Scam: Restaurateurs Take Measures to Restore Customers
- Restoring Forests: The Green Manifesto
- Majherhat Bridge collapse: Kolkata Police taking steps to restore normal traffic

Few of these programs also include measures to deal with the prevention of crime.

Community Policing Initiatives by Delhi Police:

- Neighbourhood Watch Scheme
- Eyes & Ears Scheme
- Prahari Scheme
- Police Mitra
- Nigehban
- Sashakti: Self-defence Training
- Nirbheek
- Shishtachar

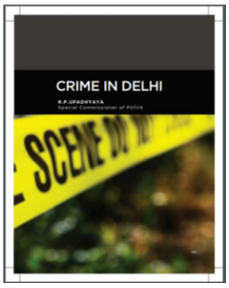


Fig 1.1 CRIME IN DELHI

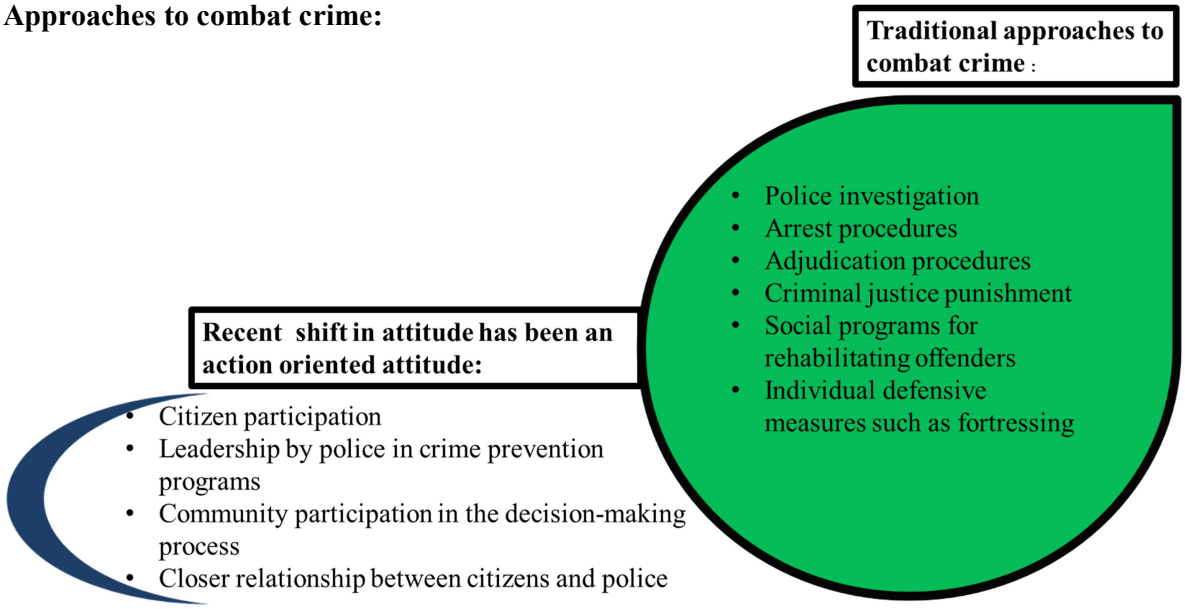
Initiatives taken by Kolkata Police:
All women patrol team to start ops-Kolkata police is launching "The Winners' – a special all-women patrol team to combat & prevent crimes against women and to make public places safe for them. The team had undergone months of rigorous training & started its journey from Lalbazar on 11 July'2018.


Fig 1.2 KOLKATA POLICE

An underlying assumption is that by investing more and more money, the problems of crime and fear will somehow be eradicated.

Crime is a devastating problem, which if left unattended, will undermine private and governmental urban development efforts.

Approaches to combat crime:



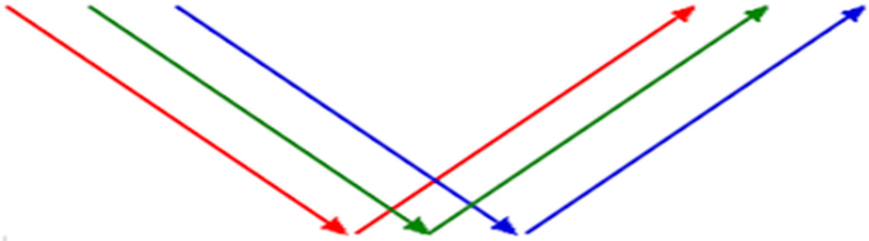


Fig 1.3 APPROACHES TO COMBAT CRIME

Reflects a growing sense of the need to do something about preventing crime instead of waiting for it to occur which is termed as **Preventive Orientation to Crime**

Now the question arises as to…….

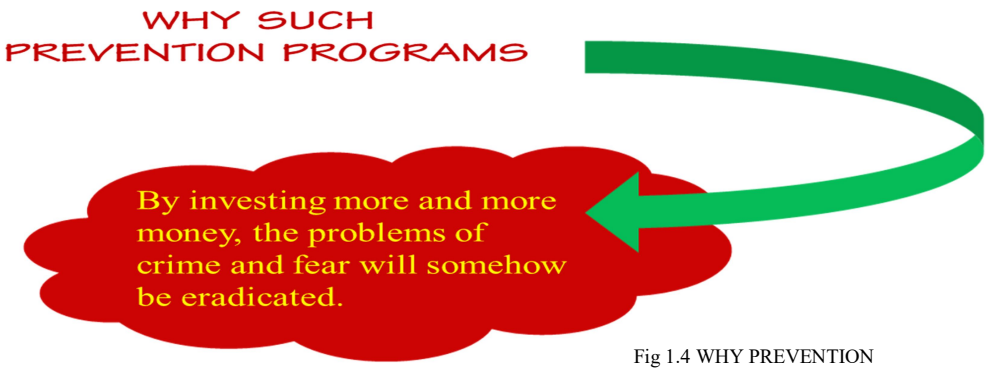


Fig 1.4 WHY PREVENTION PROGRAMS

The main thesis of Environmental Security states that design and organization of the physical environment play a key role in providing the opportunities for criminal acts

For solutions:

- Understand the basic environmental organization of neighbourhoods
- Understand the complex series of causes and effects that allow the occurrence of opportunity crimes.

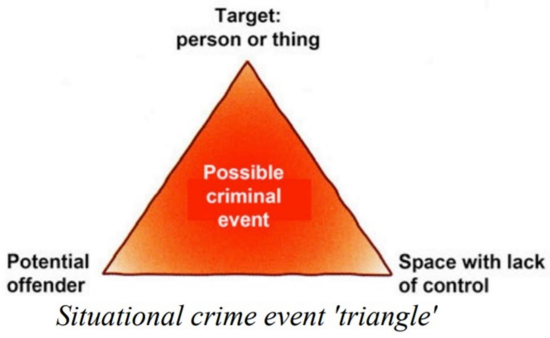
Specific objective of Environmental Security:

Provide a physical structure where the individual will be given opportunity, encouragement and the means to extend his use and sphere of responsibility for his neighborhood beyond his front door…..

One of the major Environmental Security theories is that there are logical reasons why certain patterns of opportunity crimes occur in particular areas. The cause and effect relationships involve the organization of the physical environment and extend over entire neighbourhoods and districts. By understanding the growth and decay process and what causes and aggravates it, environmental strategies can be developed which will help interdict the patterns of deterioration.

Situational Crime Vs Practice Crime:

In situational crime prevention there is a conceptual triangle, but in practice crime prevention usually has an overwhelming focus on the criminal (the offender or the potential offender), while the two other corners of the prevention triangle often have a low priority or are neglected.



Situational crime event 'triangle'

Fig 1.5

Prevention of Crime:

- In preventing crime first of all we need to stimulate natural surveillance.

- Co-presence of people and their social control of space is a basic starting point and have to be thought about together with differences in spatial structures and designs, cultures, concrete locations, times of day and week, etc.

These low prioritized urban spaces become susceptible to crime. The causes of these crimes could be:

- Overpopulation
- Poverty
- Depression
- Politics
- Racism
- Regionalism

Impacts of over population are:

- Unemployment
- Manpower utilisation
- Decreased production & increased cost
- Inequitable income distribution

This leads to increase in competitiveness for resources which leads to elevated crime rates in order to survive.

India's 2019 population is estimated at 1.37 billion based on the most recent UN data (Source:http://worldpopulationreview.com/countries/india-population/).1 of every 6 people on the planet lives in India. The country has doubled in size in just 40 years.

However, in most Indian cities, public spaces are not citizen-centric and remain inadequate. As a result of financial constraint & lack of political will, creation of safe accessible sidewalks, plazas, parks and other accessible public spaces remain a low priority. Per capita open space in Indian metros such as Mumbai and Hyderabad is 1 and 0.5 square meters respectively. This, in comparison to global megacities such as Singapore, New York City, and Tokyo, which stands at 7.5, 6, and 4.5 respectively are very less.

Overpopulation in India has resulted in:

- Burden on natural resources
- Rise in poverty
- Widening the rich-poor gap
- Migration of Population

These have resulted in creating a huge economic inequality among people. It is the urge of poor people to be at par with the economically upgraded people, which has caused an increase in crime. Eventually the rate of crimes is increasing & with this safety in India is decreasing.

Classification of Offences in Urban Spaces:

- Crimes Against Persons
- Murder,
- Aggravated assault,
- Rape,
- Robbery
- Crimes Against Property
- Burglary
- Larceny
- Auto theft
- Arson
- Hate Crimes based on
- Race
- Gender
- Religion
- Disability
- Sexual orientation

- Ethnicity
- **Crimes Against Morality**
- Prostitution
- Illegal gambling
- Illegal drug use
- **White-Collar Crime**
- Stealing money from one's employer
- Insider trading
- Tax evasion
- Violations of income tax laws

What is Petty Offense on roads/public spaces??
Petty offence is a minor crime for which the punishment is usually just a small fine or short term of imprisonment. Examples of petty offense includes

- Pickpocketing
- Purse snatching

The **urban spaces** are those outdoor spaces that are among the buildings that allow communication, movement and social interaction of the inhabitants within the city .These spaces could be public, semi-public and private. It is in these urban spaces where the inhabitants follow various daily activities.

In fact, a safe urban space is the outcome of interaction between

- The people
- The built-forms
- The infrastructure
- The vegetation

The result of this interaction is a situation which is unlikely to cause danger, risk or injury.The interaction of people with each of these elements differs with differing circumstances.

Environmental inducements refer to the physical environment which affects the causes of actions. The idea of using the physical environment as protection against attack dates back to the cavemen.

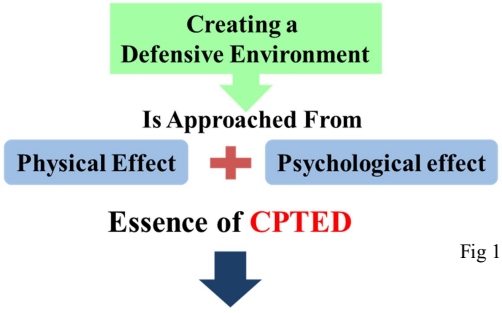


Fig 1.6 ESSENCE OF CPTED

(Source:Crime Prevention Through Environmental Design, By Robert A. Gardner, CPP-http://www.crimewise.com/library/cpted.html)

It introduces ways to deter crime by changing the design of buildings and public spaces. This reduction is achieved by employing physical design features that discourage crime, while at the same time encouraging legitimate use of the environment.

People commit acts of crime because they perceive and choose a particular kind of act of crime as an action alternative in response to a specific motivation. People are the source of their actions but the causes of their actions are situational. Particular combinations of kinds of people and kinds of settings (environmental inducements) promote the perception of particular kinds of action alternatives and choices in response to particular motivations (temptations or provocations).

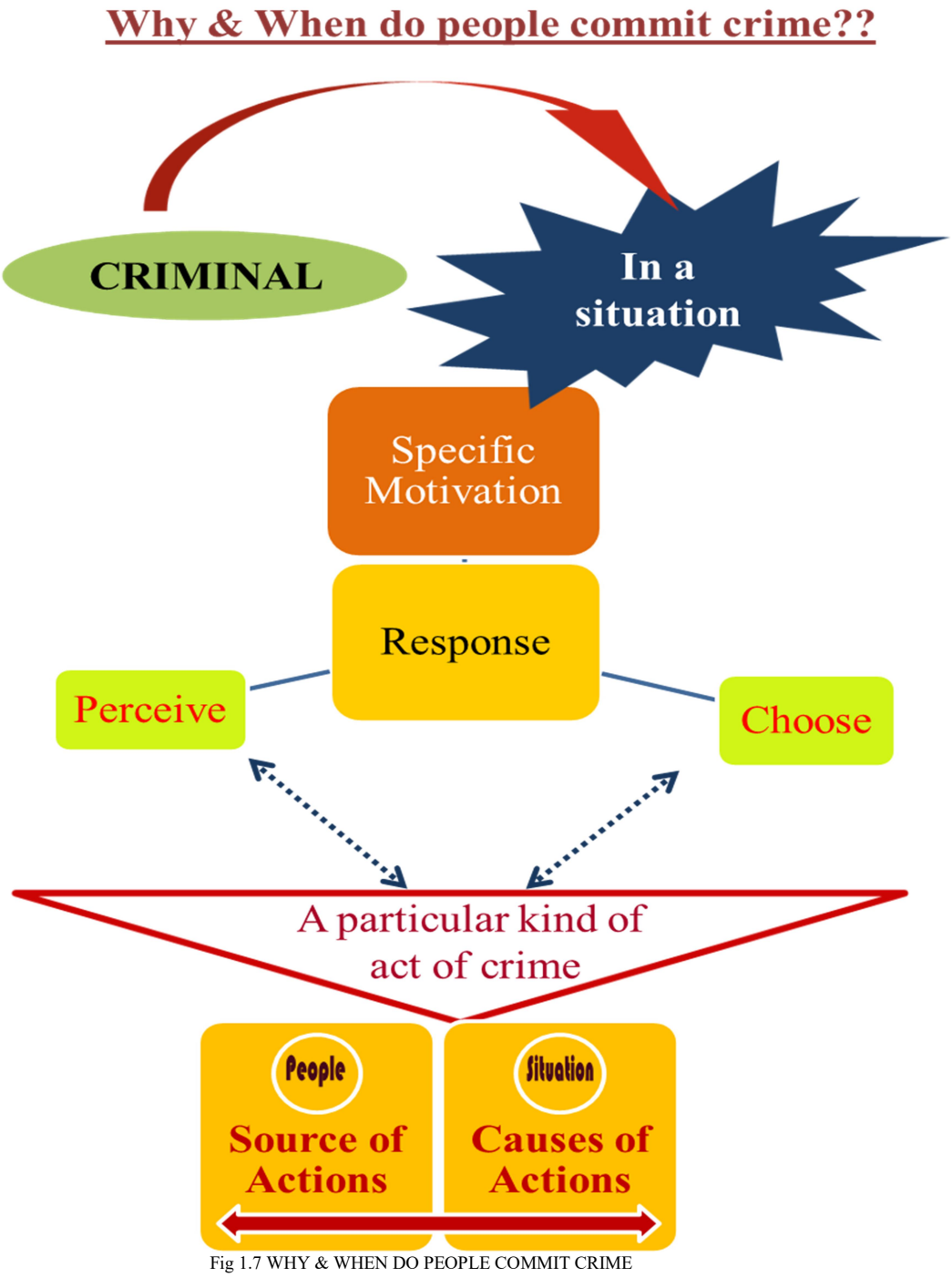


Fig 1.7 WHY & WHEN DO PEOPLE COMMIT CRIME

(Source: Why crime happens: A situational action theory byPer-Olof H. Wikström-Institute of Criminology, University of Cambridge, UK)

Physical environment features can influence the chances of a crime occurring. They affect potential offenders' perceptions about a possible crime site, their evaluations of the circumstances surrounding a potential crime site, and the availability and visibility of one or more natural guardians at or near a site.

What are the parameters to be considered for designing a Safe Urban Space??

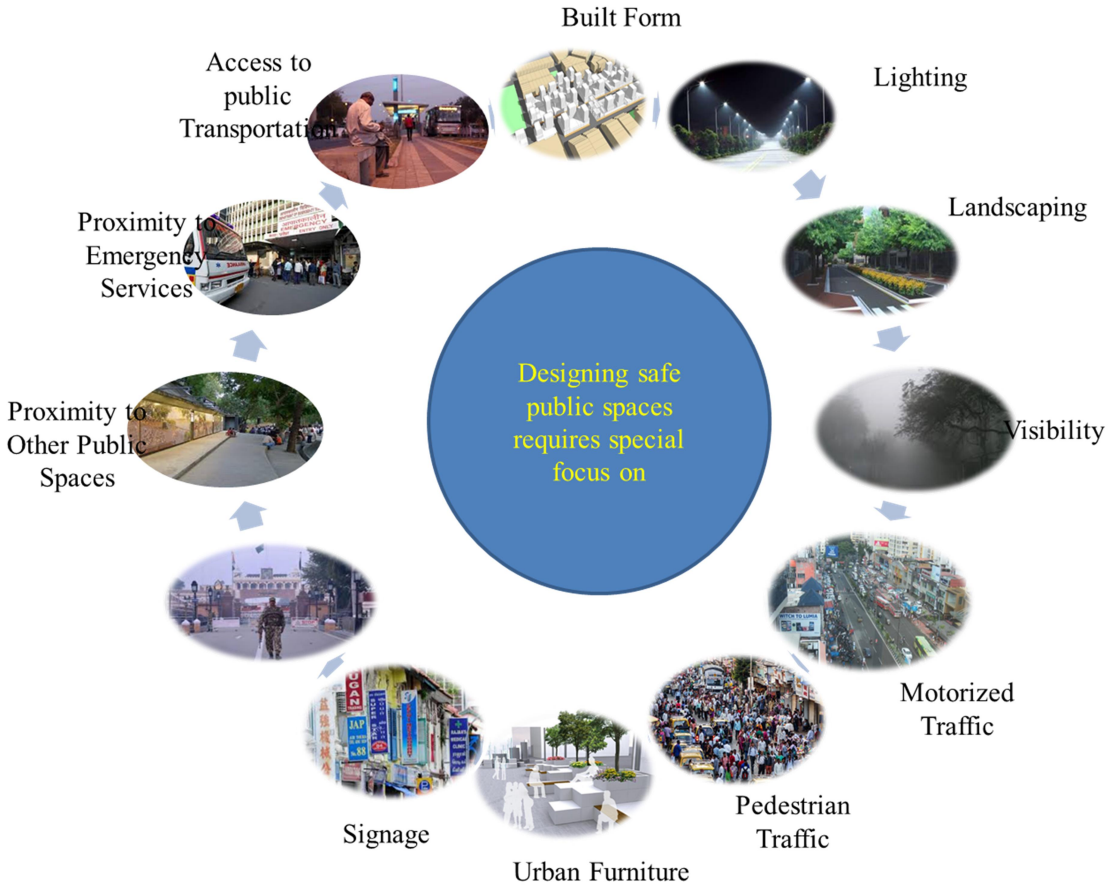


Fig 1.8 PARAMETERS FOR SAFE DESIGN

Offenders may decide whether or not to commit a crime in a location after they determine the following:

- How easy will it be to enter the area?
- How visible, attractive, or vulnerable do targets appear?
- What are the chances of being seen?
- If seen, will the people in the area do something about it?
- Is there a quick, direct route for leaving the location after the crime is committed?

(Source: Research Report by National by National Institute on Physical Environment & science)

1.1.1Rationalization of the topic

Kolkata is no longer the safe city it was once perceived to be. Be it the streets of our friendly neighbourhoods, Metro stations or the fringes of Kolkata, people feel insecure to venture out after dark. In fact, an overwhelming majority feel that they don't feel safe after sundown; some of the city's women feel Park Street is unsafe. The threat perception rise as the hours tick by.The city turns even more unsafe after 10pm, the survey reveals. Women do not feel comfortable on EM Bypass or at the IT hub of Salt Lake Sector-V either. While some feel that the Bypass is unsafe, some rate the posh Salt Lake township and Sector-V as very unsafe. The airport area is deemed unsafe, whilesome label the Alipore area unsafe.*(Source: TOI | Updated: Mar 18, 2013)*
Most prefer stepping out in company, a confirmation that the city is indeed not safe for women.

Public spaces:
Even though women feel comfortable in open spaces like parks during the daytime, the comfort factor dips with the sun. While some say parks are safe only till sundown, some feel uncomfortable after dark. Malls and multiplexes are safer, feel the city's women. The quality of basic services in market places is found to be satisfactory. The malls fare better.
There have been increasing instances of on-street crimes like chain snatching, pickpocketing motorcycle theft. Some of these cases, even if reported to the nearby police stations, remain unresolved as either the culprit flees away or no one recognises him.

Safety from crime has become one of the primary concerns of the present day Kolkata. Hence measures to decrease these types of crimes needs special mention. Every day, newspapers and television remind us of the problems of uncontrolled street crimes where no individual is safe, and where it has now become a custom for individuals to escape the city.

Fig 1.9 CRIME DETAIS (IN DAILY NEWSPAPERS)

1.1.2Fear of Crime

Definition:
'Fear of crime is an emotional response of dread or anxiety to crime or symbols that a person associates with crime' –(Ferraro's -1995, p.4)

Significance of Fear of Crime for Designers:

- It influences people to use or avoid urban public spaces.
- It undermines the intention of public spaces to be democratic places for all.
- With people avoiding public spaces, these become less vibrant, visually unattractive and less stimulating for residents and visitors

Perception of crime restricts individual mobility; it impacts on individuals' health and well-being, hinders outdoor participation, leisure activities, and contributes to dissatisfaction with public spaces, neighbourhood and overall life (Blobaum & Hunecke, 1998).

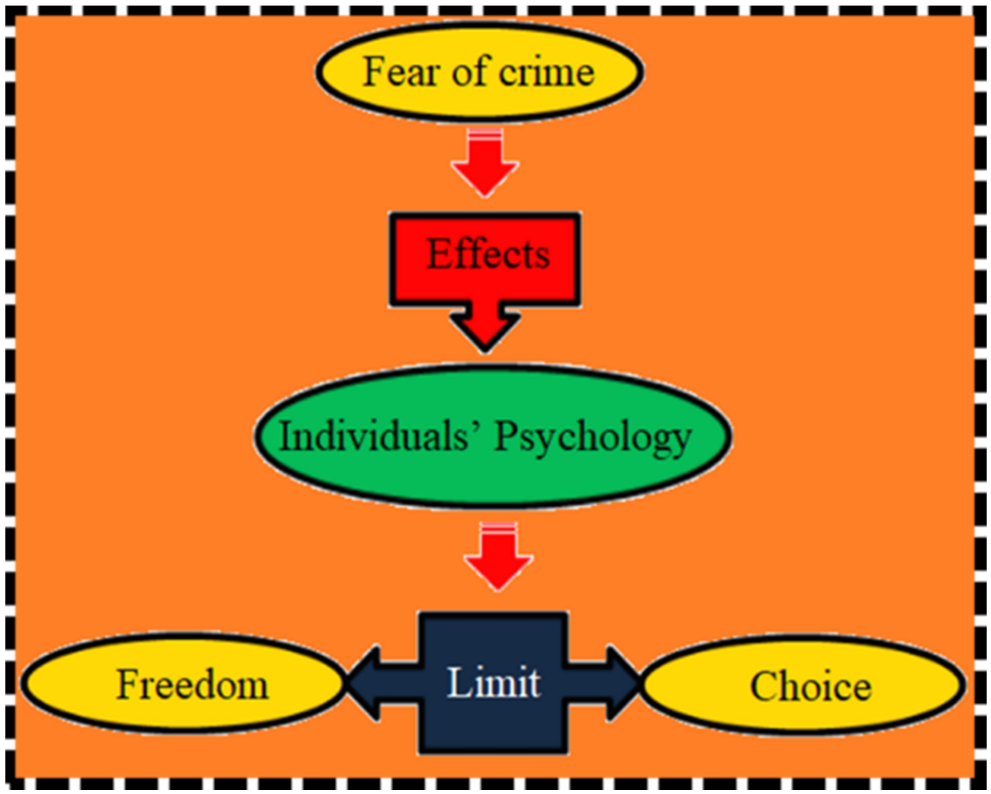


Fig 1.10 FEAR OF CRIME

Theories of Fear of Crime are related to:

- Environmental design
- Socio-cultural variables

Fear of Crime includes:

Fig 1.11 ACTIVITIES RESULTING IN FEAR OF CRIME

Fear of Crime is related to the Broken Window Concept which states that there are certain factors that leads to misbehaviour and crime which finally causes Fear of Crime.

Those factors include:

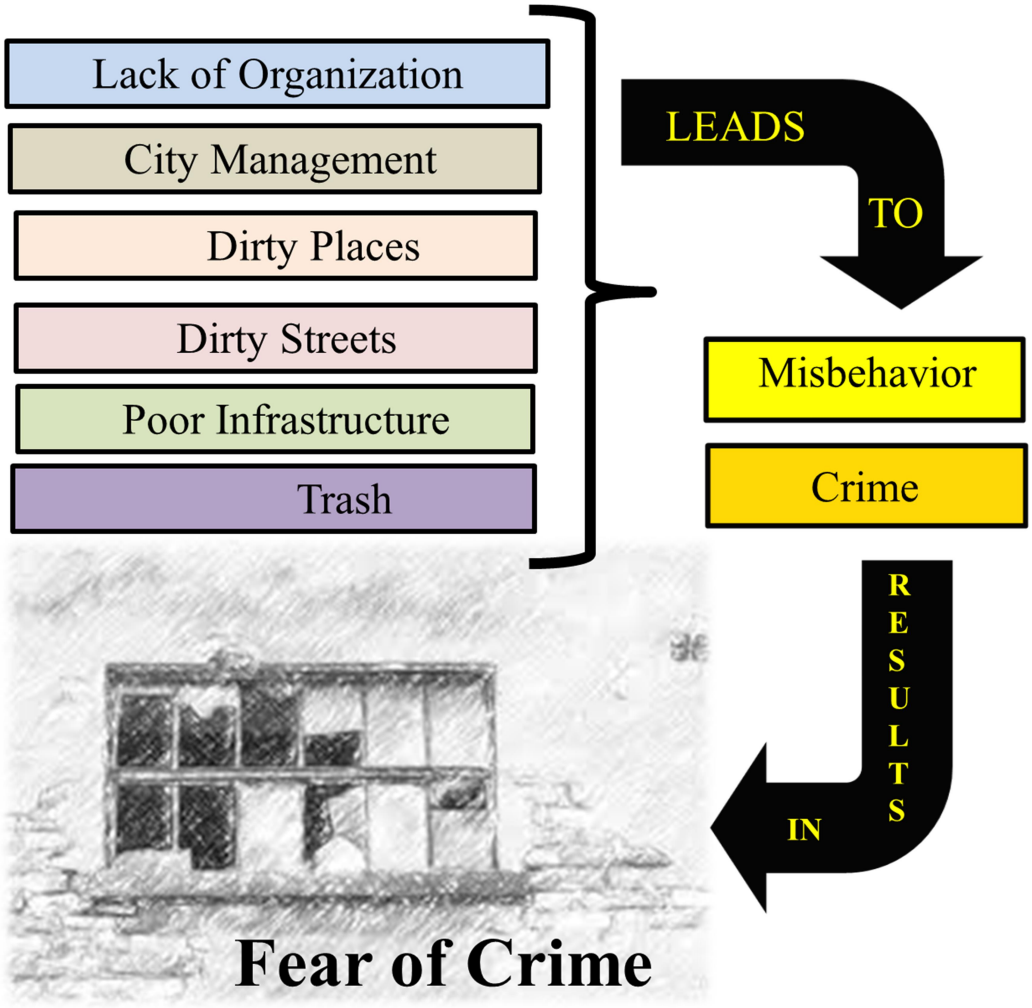


Fig 1.12 FACTORS CAUSING FEAR OF CRIME

Setting that provokes fear in the minds of people are:

- Lack of concealment
- Lack of surveillance
- Lack of area for refuge
- Lack of escape routes for Individuals
- Lack of maintenance
- Presence of deteriorated or abandoned buildings and graffiti.

(Marusic, 2010; Newman, 1972).

1.1.3. Related Concepts

There are various concepts and theories in an urban design process. Out of these, some of the theories are related to 'Crime Prevention' technique.

1.1.3.1 Concept of **Defensible Space:** By Oscar Newman in Early 1970's

Oscar Newman
Sept. 30, 1935 - April 14, 2004

Fig 1.13

- The physical environment can endanger feelings of belonging & ownership or alienation & anonymity
- Some places are more vulnerable to crime than others
- Restructure the physical layout of communities to allow residents to control the area around their homes for an enhanced sense of community
- The built environment is more easily manipulated making it potentially more influential on crime prevention
- Construction of boundaries are required to reinforce natural human territoriality in order that residents would intervene and prevent crime in their spaces.

Elements of 'Defensible Space':

- Territoriality - Maintaining perceived boundaries & outsider quietly recognized, observed

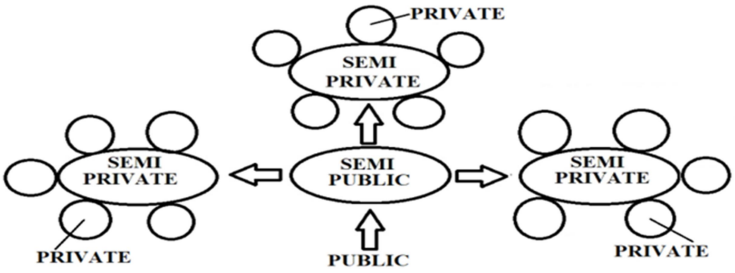


Fig 1.14 TERRITORIALITY

- Natural Surveillance - Casually & continually observe public areas
- Image & Milieu -Design to counteract the perception that the area is isolated & vulnerable to crime
- Safe Area - High degree of observation by police

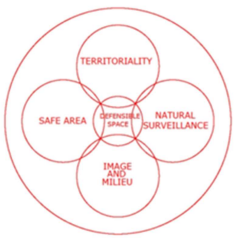


Fig 1.15 ELEMENTS OF DEFENSIBLE SPACE

(Source :Oscar Newman, Defensible Space [New York: Macmillan, 1972])

1.1.3.2 Concept of **Eyes on the street:** By Jane Jacobs

- Clear demarcation between what is public space and what is private space.
- Wide sidewalks allow for more pedestrians. Streets with a steady flow of pedestrians tend to be safer
- High walls obstruct views of the street, contributing to a lack of security. When people inside buildings can easily observe street life, streets are safer. The buildings on a street must be oriented to the street. They cannot turn their backs or blank sides on it and leave it blind.
- Quality public spaces are attractive to people. And the more people in these spaces, the safer they become.
- Efficient lighting throughout the day and night ensures that public spaces are consistently safe.

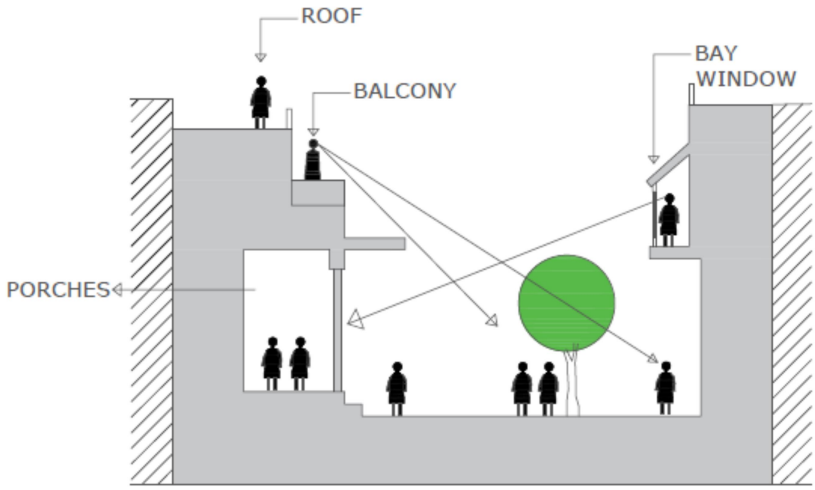
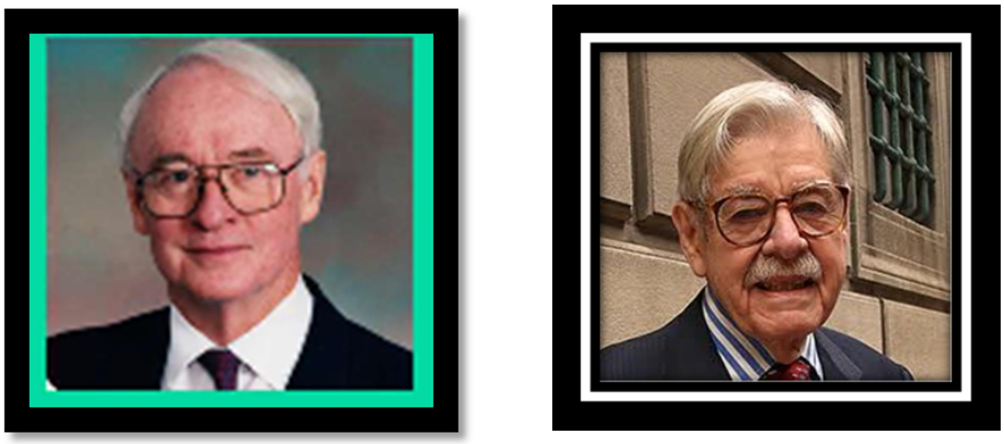


Fig 1.16 EYES ON STREET CONCREPT

Fig 1.17 JAMES JACOB

1.1.3.3 Concept of **Broken Window**: By James Q. Wilson and George L. Kelling in 1982



James Q. Wilson George L. Kelling

Fig 1.18

- Each problem that goes unattended in a given environment affects people's attitude toward that environment and leads to more problems
- Targeting minor disorder could help reduce more serious crime
- Crime generally occurs in areas where there is less care, less cleanliness & less orderliness
- Root causes matters
- Opportunity & vulnerability to crime

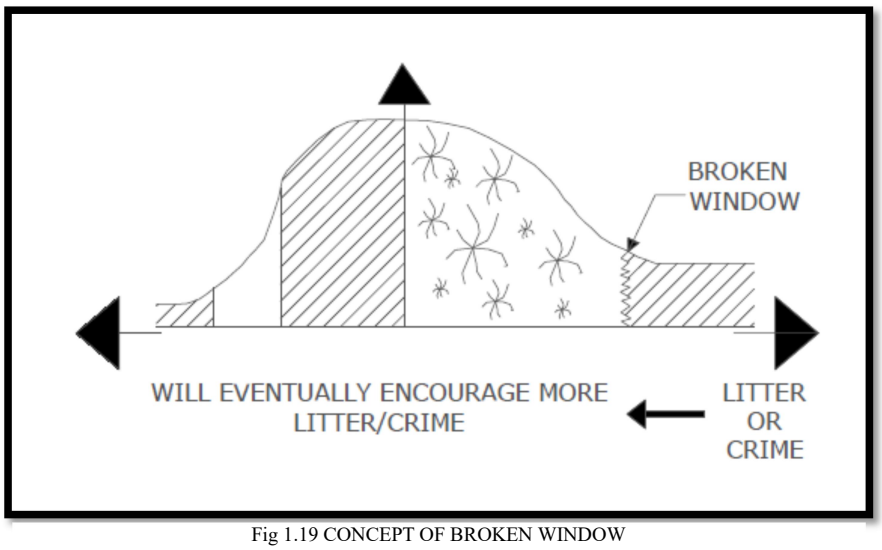


Fig 1.19 CONCEPT OF BROKEN WINDOW

1.1.3.4 **Woonerf Concept**: Developed by Dutch traffic specialist Hans Monderman

- It is a street or square where cars, pedestrians, cyclists, and other local residents travel together without traditional safety infrastructure to guide them

- Sometimes called a "shared street," it is generally free of traffic lights, stop signs, curbs, painted lines, and the like

- The basic idea is that once these controls are stripped away, everyone is forced to become more alert and ultimately more cooperative

- Through less restraint comes greater focus

Hans Monderman.

Fig 1.20

4 Principles of Woonerf

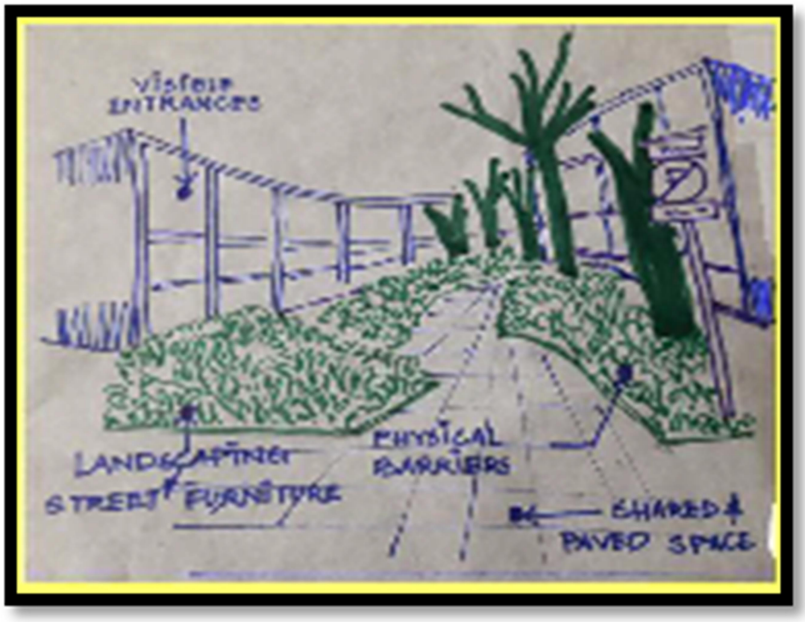
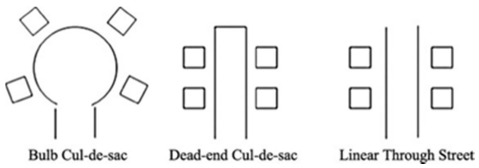


Fig 1.21 PRINCIPLES OF WOONERF

1.1.3.5 Cul-de-sac Concept:

- A dead end is a street with only one inlet/outlet
- To limit through-traffic in residential areas.
- Reduces noise, air pollution and the probability of accidents.
- Allow cyclists, pedestrians or other non-automotive traffic to pass through
- Offers quiet, safe streets where children can play with little fear of fast-moving traffic
- A discontinuous short-street system, unlike the grid, may promote familiarity and neighbouring
- hierarchical, discontinuous street systems have lower burglary rates than easily travelled street layouts
- criminals will avoid street patterns where they might get trapped



Streets Design Types
Source : Google

Fig 1.22

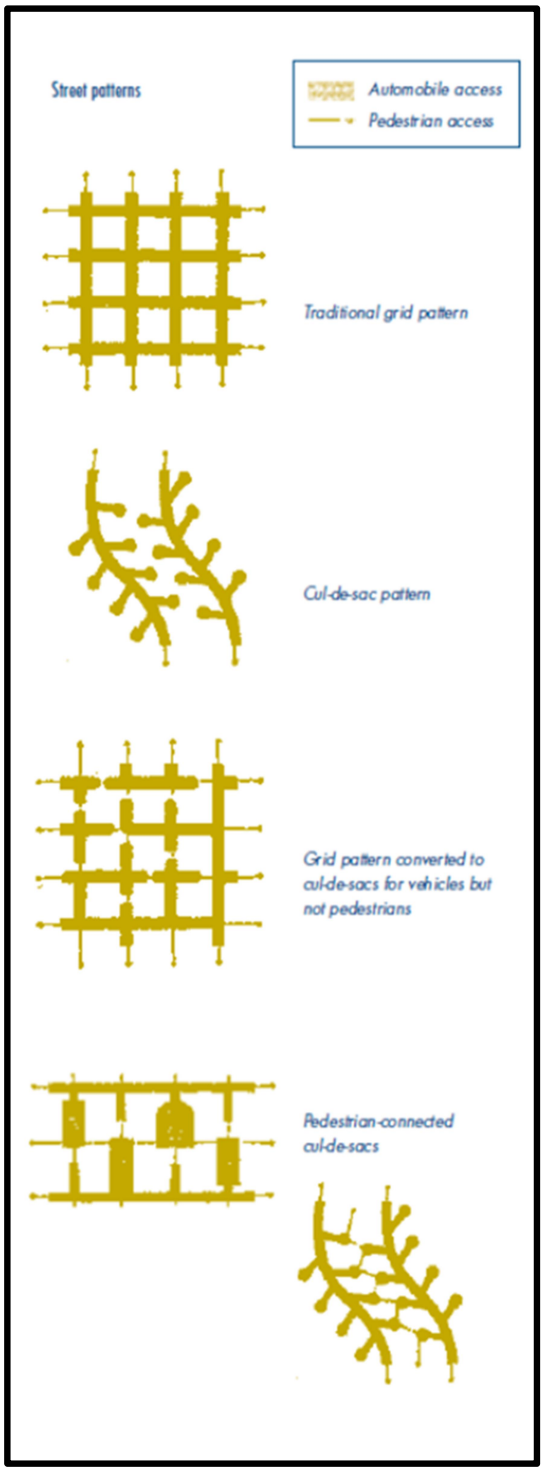


Fig 1.23 STREET PATTERNS

(Source:http://www.accessmagazine.org/spring-2004/reconsidering-cul-de-sac/)

1.1.3.6 Placecheck Concept:

- It is a method of assessing the qualities of a place & how it can be changed for the better.
- It developed from the approach described in the book 'The Connected City' published by Urban Initiatives in 1997
- It is the simplest way of finding out what a place and its people can tell us
- A Placecheck can be carried out for a street, a park, a neighbourhood, a town centre or any other place
- The core method was written by Rob Cowan
- The street placecheck system was developed by a team of volunteers including Matthew Thompson, Rob Cowan & Robert Huxford.

It consists of the following:

- One or more walkabouts
- Discussion of the information
- Opinions they form
- thinking about the next steps

Placecheck gets us asking a series of questions:

- About the place
- About its accessibility
- Regarding its safety
- Features making the place planet-friendly

Questions for checking safety of a place:

- What makes this place – and its street(s) and public spaces – safe and pleasant? What detracts from that?
- How successful are the streets and spaces underfoot? What could be improved?
- How can the place be made safer and more pleasant?
- How do people enjoy nature here? What is missing?

1.1.3.7 Space Syntax Concept: Conceived by Bill Hillier, Julienne Hanson and colleagues at The Bartlett, University College London in the late 1970s to early 1980s

Bill Hillier.

Julienne Hanson

Fig1.24

- It is a computer based multi-dimensional framework for describing and analysing the relationships between spaces of urban areas and buildings
- The spaces are understood as voids which include streets, squares, rooms and fields, between walls, & fences
- Spaces restrain pedestrian movement or the visual field
- It assumes that most people, most of the time, will take the simplest route to their destination i.e. , the route to involve the fewest changes of direction
- Spaces can be broken down into components
- Represented as maps and graphs that describe the relative connectivity and integration of those spaces

Three basic concepts:

- Convex space
- Axial space
- Isovist space

The spatial structure, measured is represented by using syntactic maps

(i) Convex map

(ii) Axial map

(iii) Isovist map presents the areas that are visible from convex spaces or axial lines

Fig 1.25 BASIC CONCEPTS

These maps can be transformed into graphs:

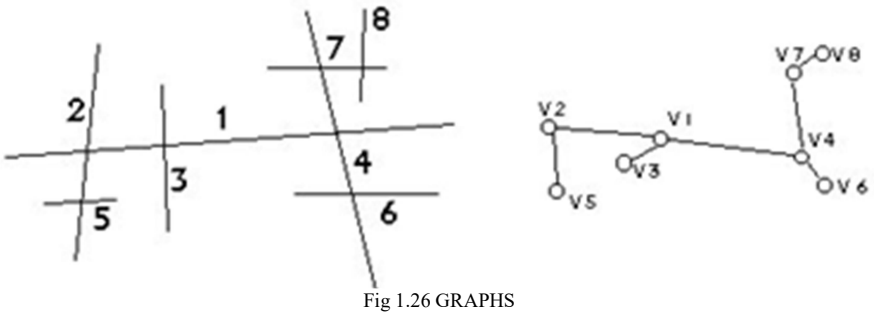


Fig 1.26 GRAPHS

Fig-An axial map and its graph showing the relationship of access between all the convex spaces or axial spaces in the area

The four syntactic measures that can be calculated are:

- Connectivity
- Integration
- Control value
- Global choice

Inferences:

- Routes with increasing numbers of right-angle turns are psychologically longer than routes with fewer right-angle turns

- If you can't estimate the length it seems longer

'

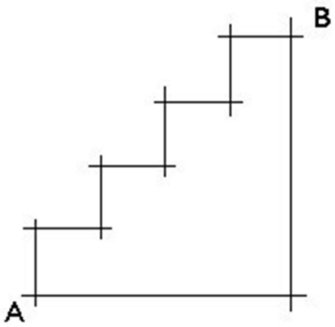


Fig1.27 SHOWING DISTANCE ESTIMATES INFLUENCED BY THE ROUTE STRUCTURING

Space Syntax &Safety:

- Urban forms with a grid shape have higher flow of people and traffic than cities with a tree-like shape.
- In the grid-like city the junctions create meeting spots for people.
- The shape of the city affects the level of clarity and to read the space.
- The possibility to choose an alternative route increases the level of safety.
- Time aspect decides how much extra time are we willing to spend by choosing the longer, safer route, than the shortest.
- Normally we feel more comfortable with people around us so that if we are attacked or feel scared there is a third party that can help us.
- The shape of the buildings matter as well.
- The length of the facade matters.
- If we can't make a turn anywhere, we feel uncomfortable.
- If the location has too many small streets and hideaways we wouldn't want to pass there at night.
- If it's narrow between the houses or wall the "forced" movement forward is stronger than when you can choose which side of the street you want to use.
- Poor lightning in combination with isolated places with few sight lines and lack of other people, creates uncomfortable surroundings.
- If you have to trespass a dark tunnel or stand at a very open place to take the bus, and at night, this creates fear.

1.1.3.8 CPTED(Crime Prevention Through Environmental Design: Originally coined & formulated by criminologist C.Ray Jeffery

- CPTED is an approach built on a combination of scientific research and the common sense.
- It is a set of design principles used to discourage crime
- It anticipates the thought processes of a potential offender and creates an environment that discourages his negative action
- It encourages honest citizens to keep a watchful eye
- It was initially developed in the 1960s and 1970's in the USA

C. Ray Jeffery

Fig 1.28

The Five Principles of CPTED :

- Natural Surveillance
- Natural Access Control
- Territorial Reinforcement
- Maintenance
- Activity Support

➢ **Natural Surveillance measures:**

- Keep areas well lit.
- Eliminate hiding spots. Cut down hedges and remove trees, bushes, fences, dumpsters, etc. that create blind spots or hiding places.
- Low, thorny hedges work well around windows, as they don't obstruct the view in or out, and they don't provide a comfortable place to hide.
- Use Closed Circuit Television (CCTV) to view areas without natural sight lines.

The result: A potential offender should feel like they are being watched, and that the surroundings offer no easy escape routes.

➢ **Natural Access Control**

- Use maze entrances in public lobbies to cut off straight-line access to a potential target, such as a bank teller or cashier.
- Use curbing and landscaping to direct automobile and foot traffic into a controlled, visible area.

The result: A criminal should never feel like they have the upper hand when approaching a facility.

➢ **Territorial Reinforcement**

- The purpose of this principle is to create a clear distinction between public and private property.
- This is important for two reasons:
- Legitimate occupants have a sense of ownership
- Will notice, and even challenge, people who don't belong;
- Intruders, have a hard time blending in.

The result: Occupants gain a feeling that "this is my space," while intruders are immediately put on the defensive.

➢ **Maintenance**

- It is related to territorial reinforcement
- It sends the message that people notice and care about what happens in their area
- Discourages vandalism and other crimes

➢ **Activity Support**

- Criminal acts can be discouraged in public spaces when we encourage activities by resident, visitors and other legitimate users.

In addition there are 3 quick steps one can take to increase the security of their property.

These are known as the 3 "L's" of crime prevention:

- Locks,
- Lighting, and
- Landscaping

1.2 PARAMETERS OF STUDY

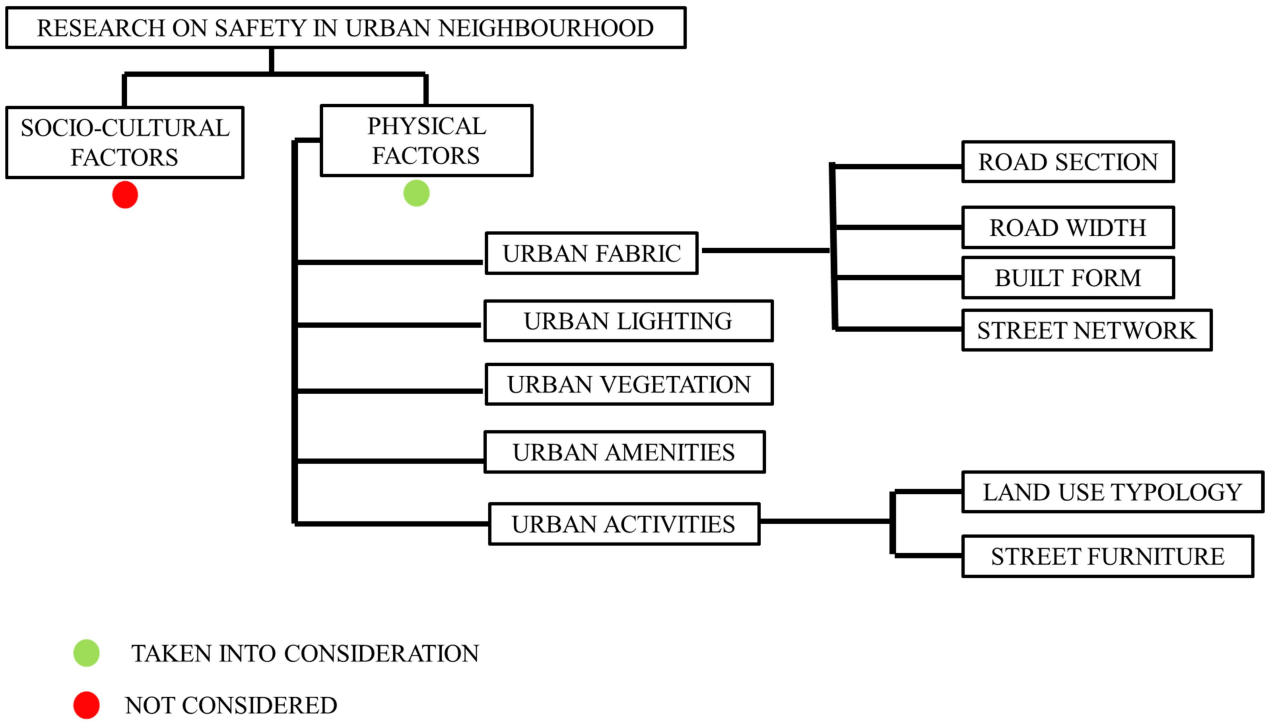


Fig 1.29 PARAMETERS OF STUDY

1.2.1Urban Fabric

1.2.1.1 Road Section

Different types of road sections were identified from various, personal on-street experiences in Kolkata.

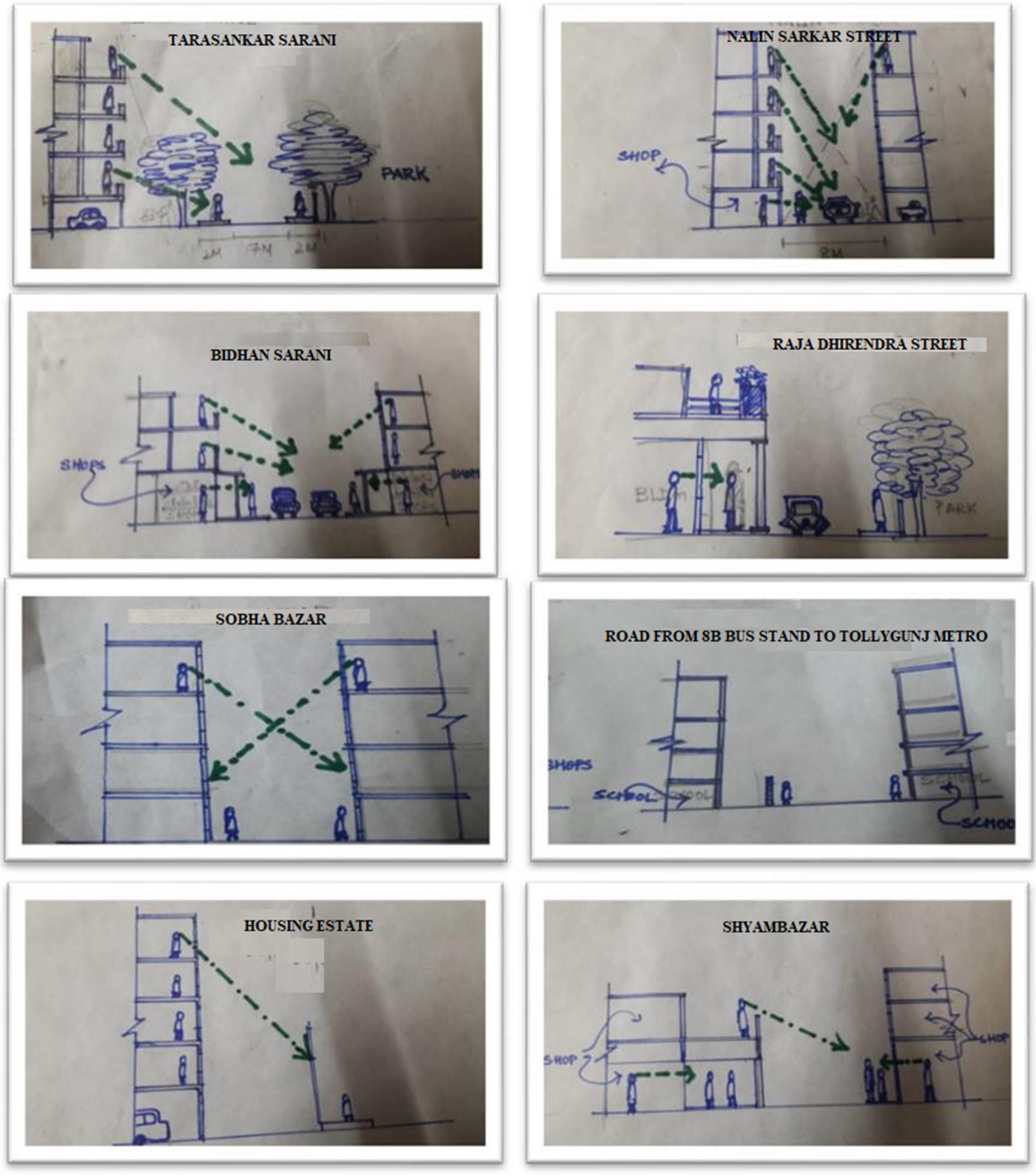


Fig 1.30 DIFFERENT ROAD SECTIONS

Road sections should be such that it provides natural surveillance by ensuring streets are overlooked and well used.

Road Width

Based on the width of roads different areas have been recognised.

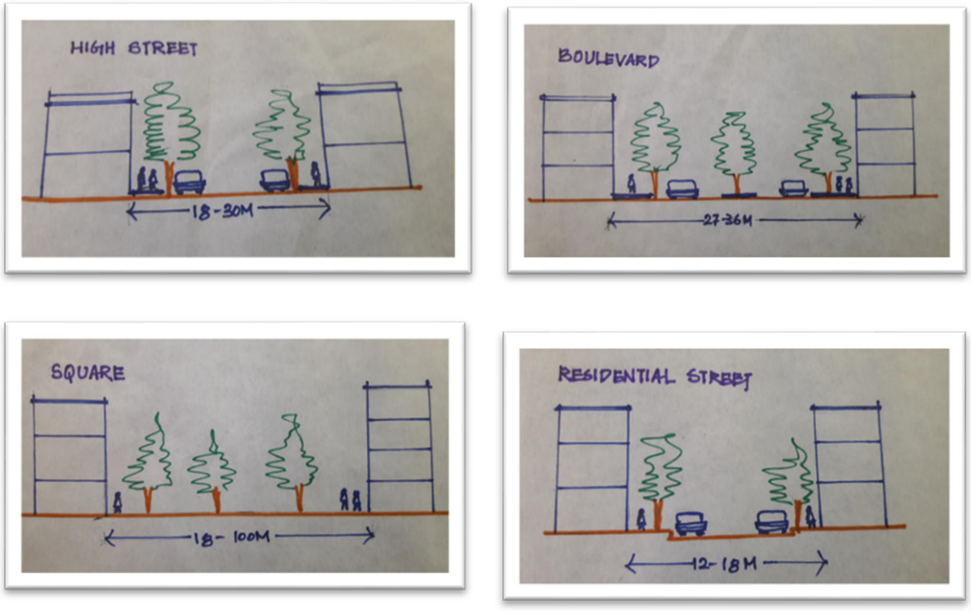


Fig 1.31 DIFFERENT ROAD WIDTH

High Street is the main street of a town, and a site for most shops, banks, and other businesses.

Boulevard is a wide street in a town or city, typically one lined with trees.

Square is an open, typically four-sided, area surrounded by buildings in a town, or city.

Residential Street is a lightly trafficked street which is mainly built up on both sides with residential or a mix of residential and local facilities, shops and is not be part of a designated lorry route or wide-load route or a high-load route.

Fig 1.32 HIGH STREET

Fig 1.33 BOULEVARD

Fig 1.34 REIDENTIAL STREET

Fig 1.35 SQUARE

1.2.1.3Built Form

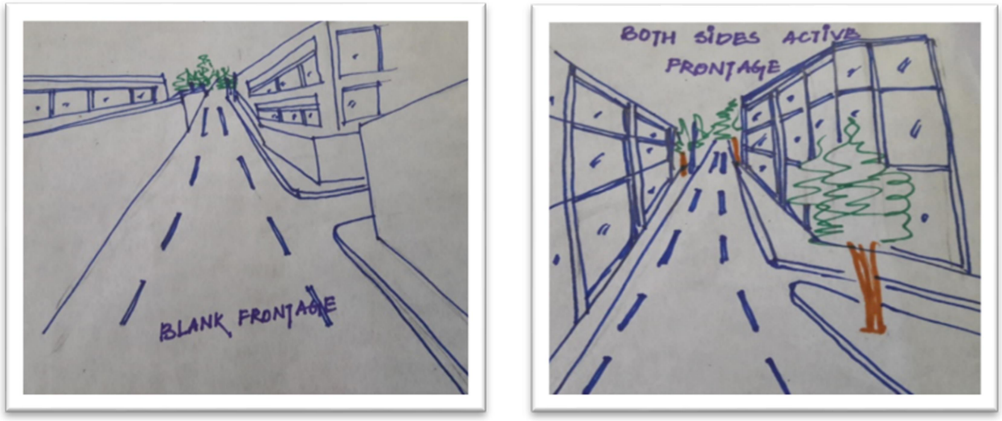


Fig 1.36 BUILT FORMS

Active frontage to all streets and to neighbouring open space should be an aim in all developments. Blank walls can be avoided, even on the return at junctions, with specially designed house types.

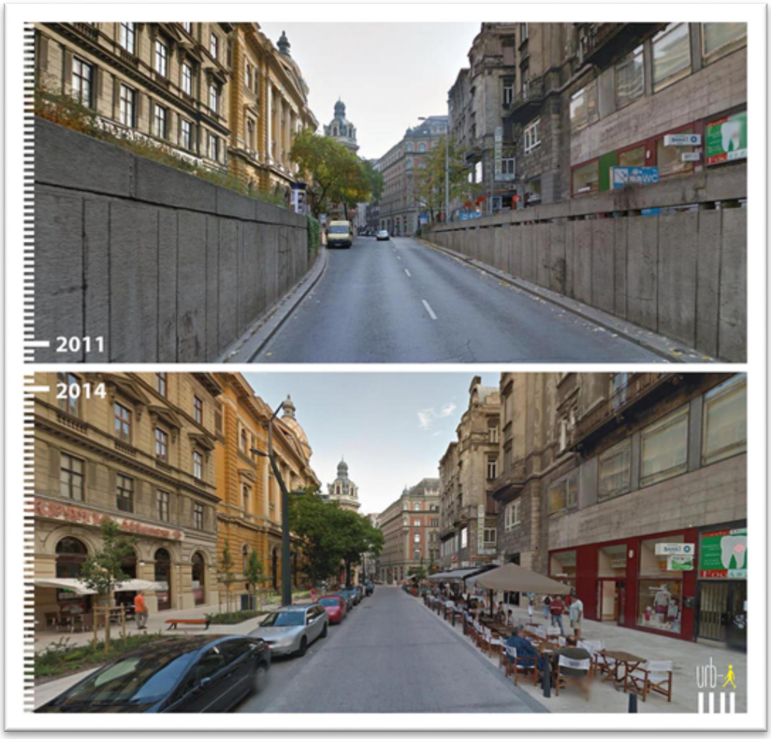


Fig 1.37 THE IMAGE DEPICTS HOW A BLANK FRONTAGE CAN BE CONVERTED TO AN ACTIVE FRONTAGE BY REDUCING BLANK WALLS.

The image depicts how a blank frontage can be converted to an active frontage by reducing blank walls.

1.2.1.4 Street Network

- Internal permeability is important but the area also needs to be properly connected with adjacent street networks
- Areas of local amenity should be more evenly distributed with good connectivity, so that the overall layout encourages access by walking or cycling, and shortens the distances travelled by motorised vehicles
- Layout encourages access by walking or cycling, and shortens the distances travelled by car
- A development with poor links to the surrounding area creates an enclave which encourages movement to and from it by car rather than by other modes
- High permeability is conducive to walking and cycling, but can lead to problems of anti-social behaviour if it is only achieved by providing routes that are poorly overlooked

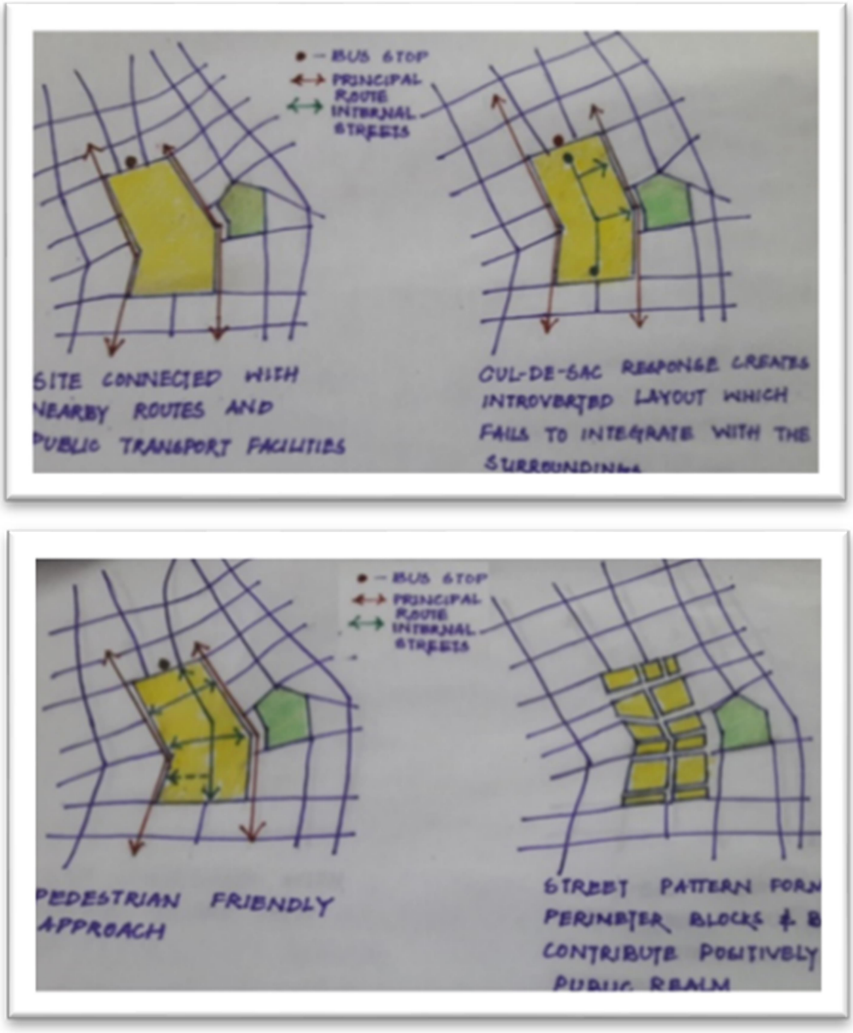


Fig 1.38 STREET NETWORK

1.2.2Urban Lighting

- The lighting on street should appear continuous & uniform.
- Special lighting should be provided at critical points & areas , such as bends , crossroads , bridges ,tunnels ,underpasses , level crossings , etc. such that it does not alter the appearance of continuity of the lighting of the road. *(Source : BIS code of practice for lighting/clause 4.2.1.5)*
- Recommended Mounting Height – 7.5 meters to 10 meters
- Where ever the roads are bordered by trees – less than 7.5 meters
- The trees and the luminaires should be so sited relatively that shadows of trees do not fall across the carriageway or footway
- Spacing – Space-height ratio should generally be greater than 3
- Overhang – Should not exceed one-fourth of the mounting height
- Single side luminaires – When the width of the road is equal to or less than the mounting height
- Staggered arrangement- When the road width is 1 to 1.5 times that of the mounting height
- Opposite mounting – When the road width is more than 1.5 times that of the mounting height
- Axial mounting – When the road width is narrow & does not exceed the mounting height

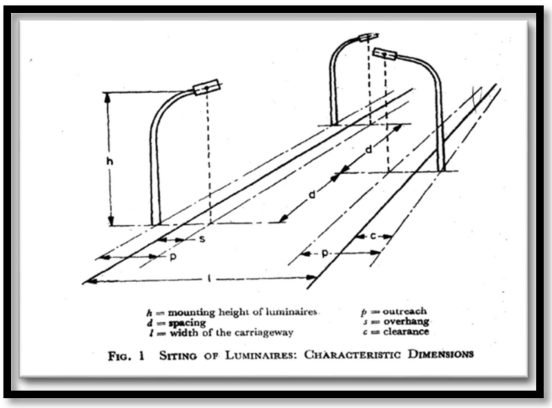


FIG. 1 SITING OF LUMINAIRES: CHARACTERISTIC DIMENSIONS

Source : Manual for Streets

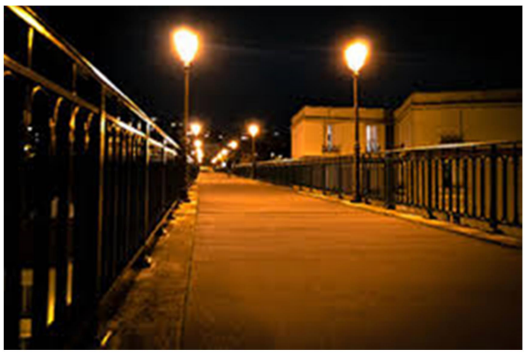
TABLE 1 CLASSIFICATION OF LIGHTING INSTALLATION AND LEVELS OF ILLUMINATION

(*Clauses* 5.1 *and* 5.7)

CLASSIFICATION OF LIGHTING INSTALLATION	TYPE OF ROAD	AVERAGE LEVEL OF ILLUMINATION ON ROAD SURFACE
(1)	(2)	(3)
		lux
Group A1	Important traffic routes carrying fast traffic	30
Group A2	Other main roads carrying mixed traffic, like main city streets, arterial roads, throughways, etc	15
Group B1	Secondary roads with considerable traffic like principal local traffic routes, shopping streets, etc	8
Group B2	Secondary roads with light traffic	4

(Source : BIS code of practice for lighting

Fig 1.39



Benefits of Bright Lighting in Public projectlink.com.au

Why do we need street lights throughout quora.com

Fig 1.40

1.2.3Urban Vegetation

- Maximum height of landscape should be 3ft for shrubs and minimum height of tress need to be 6ft for clear visibility to maintain safety of people
- Prickly vegetation(Ex.-flowering bougainvillea, cactus) below external windows should be preferred.

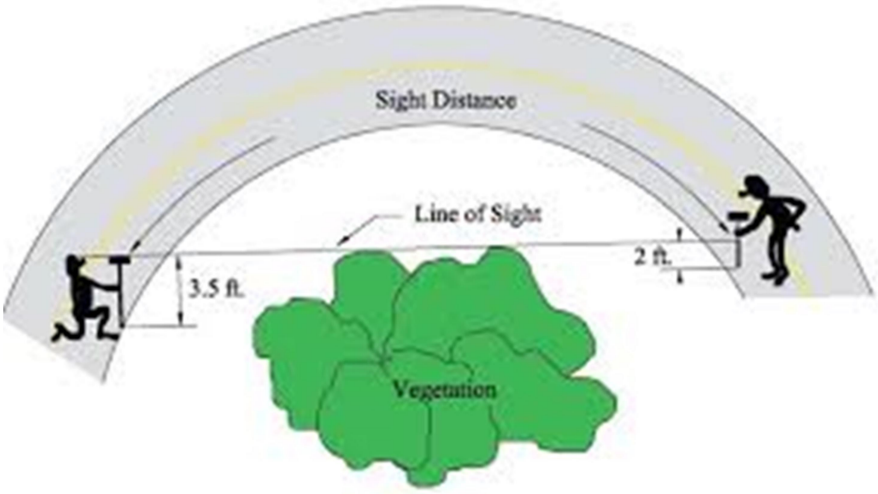


Fig 1.41 VEGETATION MIN HEIGHT

Vegetation Control For Safety
safety.fhwa.dot.gov Fig 1.42

1.2.4 Urban Amenities

Various amenities in an urban area are:

- Convenience stores
- Access to public transit
- Schools and professional services
- Parks
- Public squares
- Recreational facilities

Convenience stores

Access to Public Transit

Schools and professional services

Parks

Public squares

Recreational facilities

Fig 1.43 URBAN AMENITIES

Areas of local amenity should be more evenly distributed, with good connectivity, so that the overall layout encourages access by walking or cycling, and shortens the distances travelled by car

1.2.4Urban Activities

- The public realm should be designed to encourage the activities intended to take place within it.
- Streets should be designed to accommodate a range of users, create visual interest and amenity, and encourage social interaction.
- This can be satisfied by providing a mix of streets of various dimensions, squares and courtyards, with associated 'pocket parks', play spaces, resting places and shelter.
- The key is to think carefully about the range of desirable activities for the environment being created and to vary designs to suit each place in the network.

Fig 1.44 URBAN ACTIVITIES

1.2.4.1 Land-use Typology

Types of Land-use Zones in India

- Residential Zone
- Commercial Zone
- Industrial Zone
- Public & Semi-public zone
- Utilities & Services
- Parks, Playgrounds & Open-Spaces
- Transportation & Communication
- Mixed Land Use
- Agricultural Land

1.2.4.2 Street furniture

- The most obvious example of this is seating, or features that can act as secondary seating.
- In addition, street features such as play equipment may be appropriate in some locations, particularly in designated Home Zones, in order to anchor activity.

1.3 AIM:

Urban Design intervention for prevention of crime and creation of a safe neighbourhood through Space Syntax Analysis of Amherst street, Kolkata

1.4 OBJECTIVES:

- To study the aspects of a neighbourhood with respect to various urban design parameters.
- To understand the aspects of safety in urban space & its interrelationship with the design parameters.
- To analyse the aspects of safety parameter in urban design for case study typology.
- To prepare or record the urban safety aspects of urban design in areas.

1.5 SCOPE OF WORK:

To provides natural surveillance by ensuring that the streets are overlooked and well used-
Scope – (i) Opening new shops
(ii) Reopening closed shops of ground floor
(iii) Providing balcony where ever required
(iv)Widening roads

To reorganise existing built forms-
Scope – (i) Improving the building facade for active frontage

To reorganise the existing street network-
Scope – (i) Creating new road network

To provide adequate amount of lighting on street-
Scope – (i) Providing continuous and uniform lighting facilities where ever required
(ii) Maintaining the distance between lighting fixtures
(iii) Proving Special lighting at critical points &areas , such as bends
(iv)Maintaining the tree heights and positions

To provide adequate facilities for informal activities-
Scope – (i) proving space for street vendors

To provide adequate public facilities and services-
Scope – (i) Creating open spaces
(ii) Providing proper amenities

To reinforce mixed land use encouraging compatible activities-
Scope – (i) Preserving the existing residential area
(ii) Improving old structures
(iii) Demolishing unsafe old structures

LIMITATIONS:

- The thesis does not deal with crime related to buildings
- It does not deal with crime in any means of transport
- It does not deal with eliminating fear of crime concept
- Non-residential neighbourhoods are excluded
- Organized crimes or crimes that involve acquaintances or for the purpose of revenge such as assaults and murder are excluded
- It deals with crimes on road or other public spaces

1.6 METHODOLOGY:

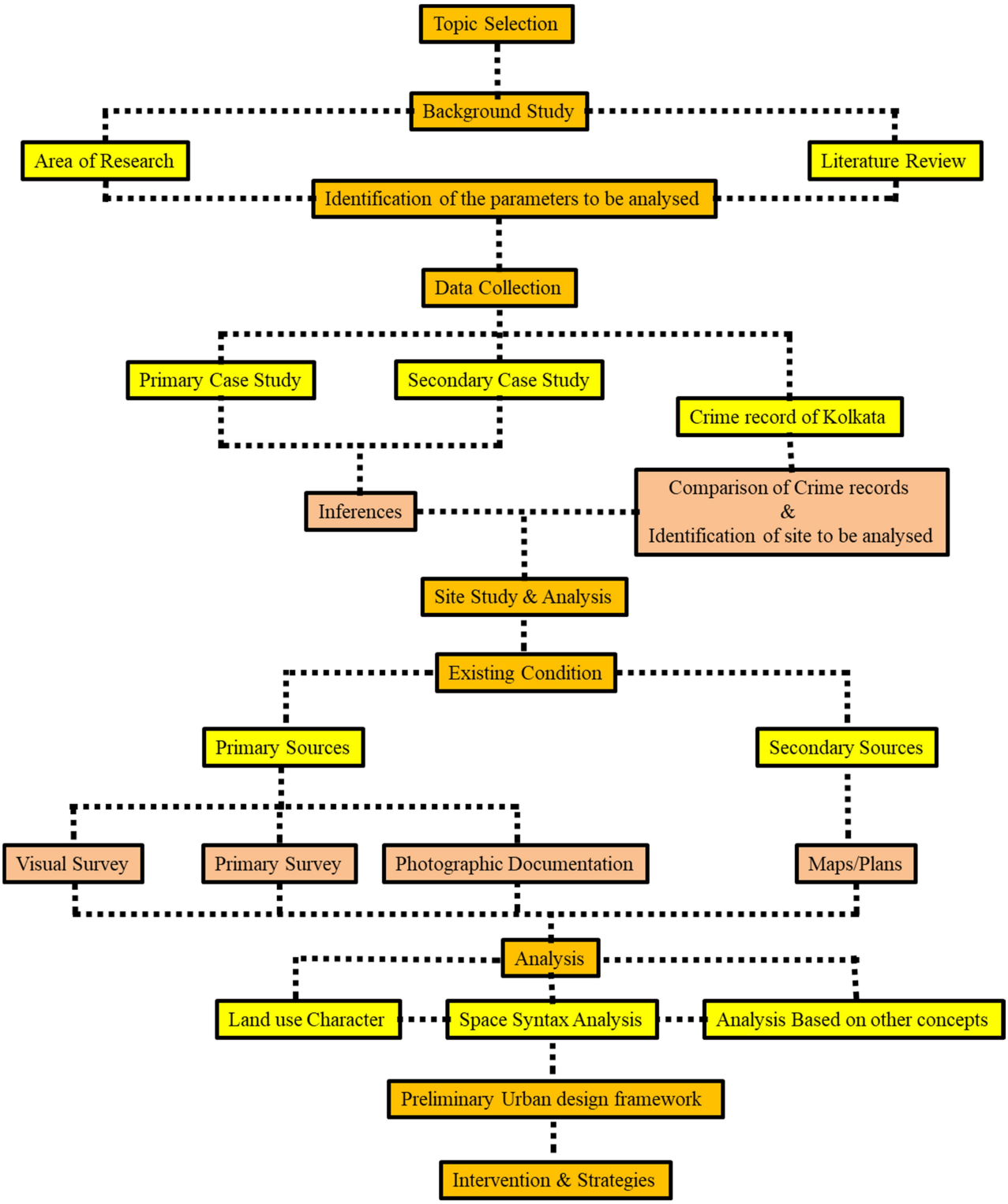
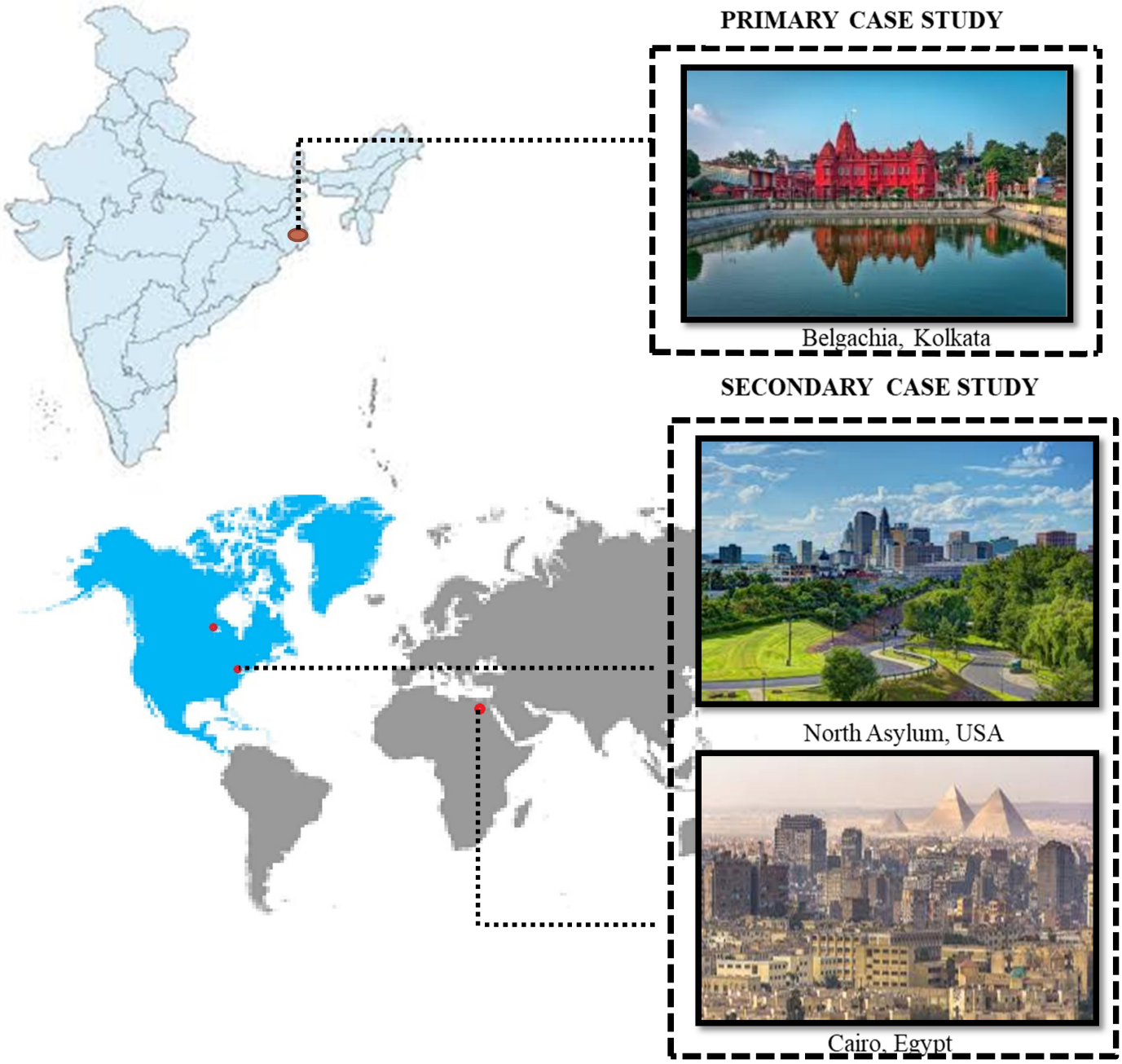


Fig 1.45 METHODOLOGY

CHAPTER 2 – CASE EXAMPLES



2.1 SECONDARY STUDIES

2.1.1 Example 1 - The Hartford Neighbourhood Crime Prevention Program

Introduction:

The Hartford project was an experimental effort to reduce residential burglary and street robbery/purse snatch and the fear of those crimes in an 'urban residential neighbourhood'. In 1973, the Law Enforcement Assistance Administration(LEAA) and National Institute of Law Enforcement and Criminal Justice began a neighbourhood rejuvenation project which would concentrate on crimes of opportunity.

Description of Work:

- Two inner-city districts with mixed land use and high crime rates were selected for study.
- One area chosen was composed primarily of a white, largely transient population; while the other was primarily a non-white, low-income area containing a large amount of public housing.
- The challenge was finding the method to blend three types of resources-physical design, citizen participation and police techniques-to achieve the primary goal of reducing urban residential crime and fear.

The Hartford Neighbourhood Crime Prevention Program was designed to integrate-

- Police resources and techniques,
- Citizen mobilization
- Physical design concept in a combined strategy of crime prevention.

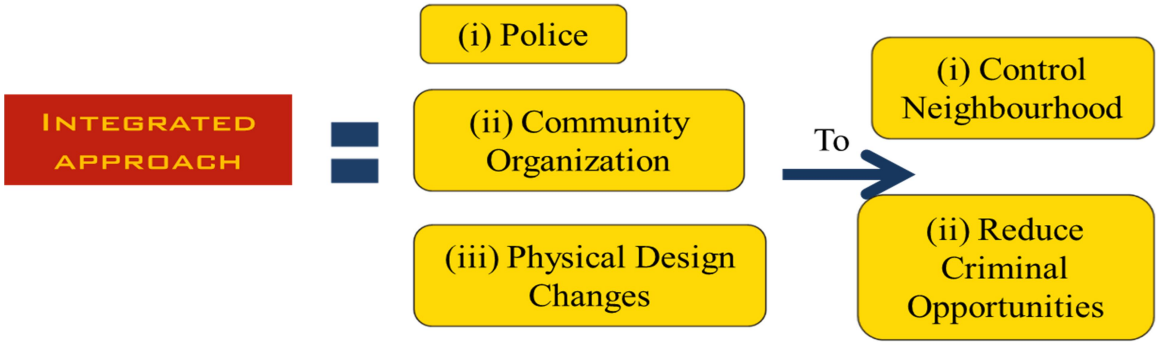


Fig 2.1 INTEGRATED APPROACH TO CRIME PREVENTION

Work Schedule followed:

The original schedule was for 18 months.

- First six months, the problem was to be analysed and a model program proposed
- Next three months, the program would be implemented
- Six months later, the impact of the program would be evaluated
- Three months to prepare a final report

(Source: Fowler, Floyd 4, Jr. :Reducing Residential Crime and Fear: The Hartford Neighbourhood crime Prevention Program)

Analysis of the crime in the area reported that

- Physical environment was working to destroy the residential character of the neighbourhood
- Cars and pedestrians from outside dominated the streets and depersonalized them.
- The streets created an ideal environment for potential offenders.

When the analysis process began, three separate research and analysis efforts were undertaken simultaneously:

i. The physical design team
ii. Team headed by criminologist was observing police activities and interviewing police & offenders
iii. Team carrying out a survey of residents

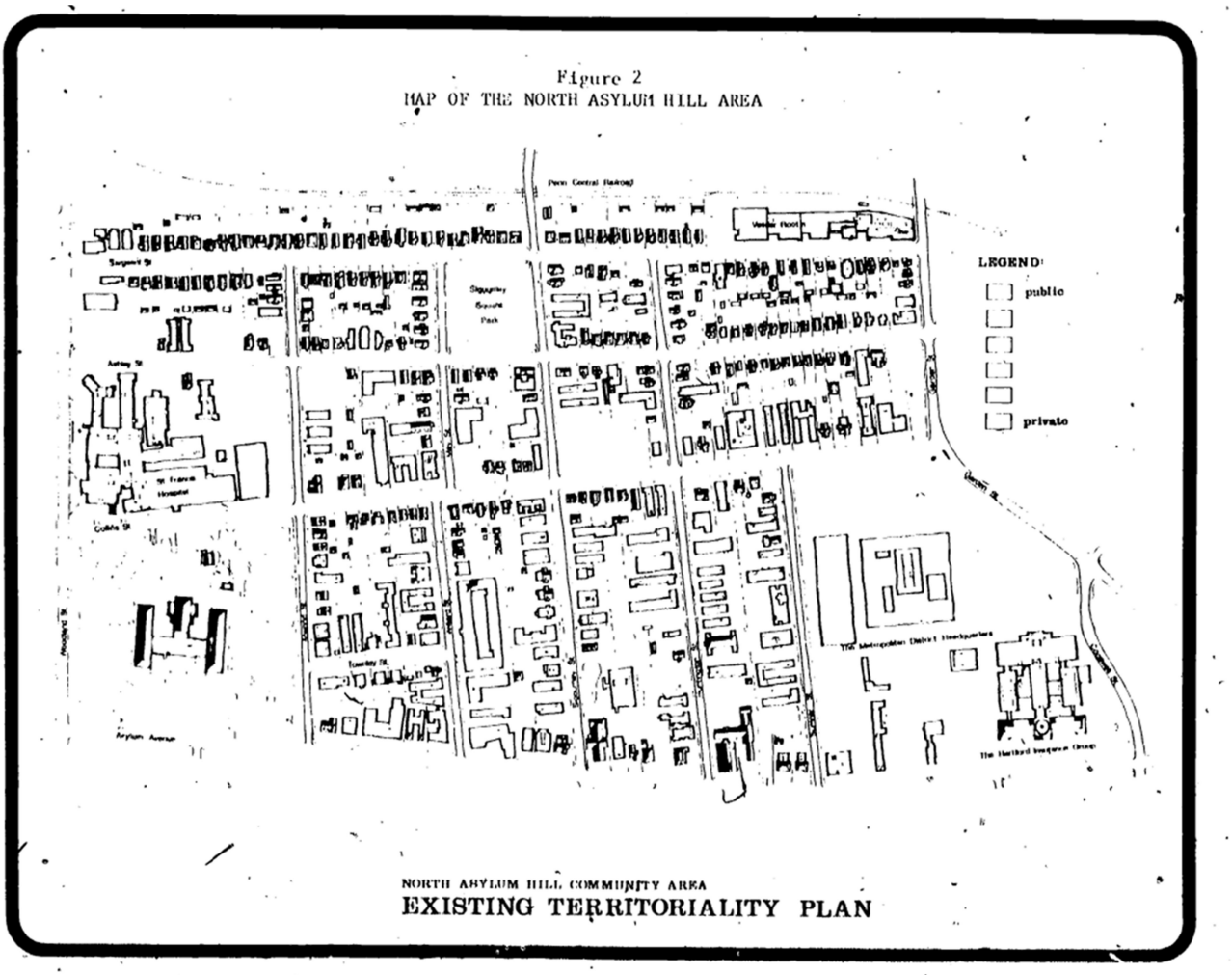


Fig 2.2

Analysis of Physical Environment Team

- **Area :** Less than one square mile

- **Description:**
- Consists of about 15cityblocks
- Can walk easily from one side of the neighbourhood area to the other in less than15 minutes.

- **Population:** In 1970 was. 5000 people approx.

- **Dwelling Units**: 2500 approx.

- **Bounded by:** Three busy streets along which were primarily commercial land uses and by a railroad track.

- **Predominant land-use type:** Residential

- **Surrounding land:** Non-residential

- **Housing Stock:**
- Primarily apartments and multi-unit houses
- Dictated by rental population
- Less than 5 % owner occupied
- Structurally sound, but was not new

- **Generators:**
- Insurance companies
- Hospital
- Park

- **Three schools**
- An elementary school
- A middle school
- A high school

- **Circulation patterns:** Four streets through the residential area connecting the major border streets

- **Vehicular Traffic:** Around ten thousand cars per day

- **Transition zones:** Not clear

- **Semi-private spaces**: Not defined

- **Interior spaces:** Lack of definition of interior spaces

- **Porosity:**
- Lack of fencing along the railroad tracks
- Presence of numerous voids , parking lots and vacant lots which allowed easy passage

Summary:

- The area was surrounded by institutions and facilities that generated use of the neighbourhood by non-residents.
- Major public space in the middle of the neighbourhood, the park, was the focus of activity considered undesirable and fear-producing by the majority of neighbourhood residents

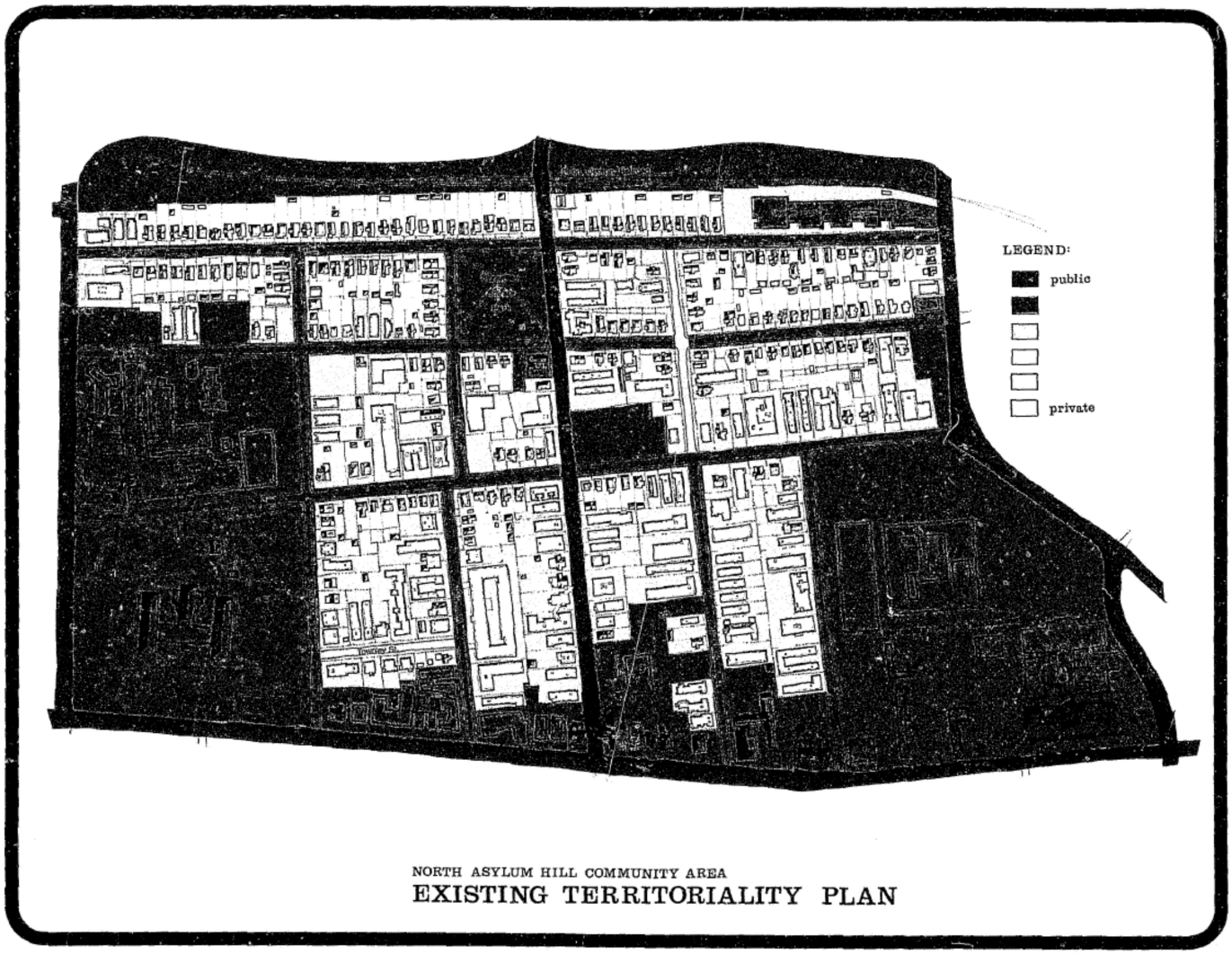


Fig 2.3

Analysis of the Hartlord Police Department :

- **The size of the Hartford Police Department was**: 480 sworn officers

- **The-organization**: Centralized

- **The Record Keeping System**:

- Attempted burglaries & purse snatching were not considered as robberies
- Lack of computerization

Summary:

- The centralized nature was not particularly well-suited
- Lack of a good information and record keeping system created considerable barriers to on-going crime analysis and strategic deployment

Analysis of Residential Population:

- **Population:** In 1973 was. 5000 people approx.

- **Dwelling Units:** 2500 approx.

- **Household Types:**

- Small apartments and multi-unit houses
- 60% rented
- Single individuals under 40 living alone and persons 65 or old living alone
- Less than 20 % contained minor children

- **Socio-economic characteristics** : Education levels and income levels of residents were higher than the average for the city of Hartford

- **Ethnically :**

- Neighbourhood was heterogeneous
- 1973, about 60 percent of the residents of were white
- Only 30 percent were black
- Balance were Spanish.

- **Social cohesion of the neighbourhood** : Variable

- **Use of space :** Residents avoided their neighbourhood streets

Summary:

- High proportion of the population was transient, having recently arrived and expressing plans to leave soon.
- It was a heterogeneous neighbour-hood with a growing minority population.
- There was evidence of a low level of social cohesion
- The public spaces were used at a low rate by residents, and residents generally found it difficult to distinguish non-residents using the streets from residents.

Analysis of Offender Population:

- Offenders were generally young, with three-quarters being under 25.
- Street crimes were committed predominantly by black offenders against white victims
- Those committing burglaries were approximately half white and half black
- Half of the offenders in both categories were Known drug users
- Crimes were relatively un-planned
- Majority of crimes of concern were being committed by outsiders.
- Robbery and burglary, were committed on foot
- **Time of burglaries:** During the day.

- **Purse snatches :** During the day, concentrated in the early evenings
- **Robberies:** Early evenings early and late evenings.

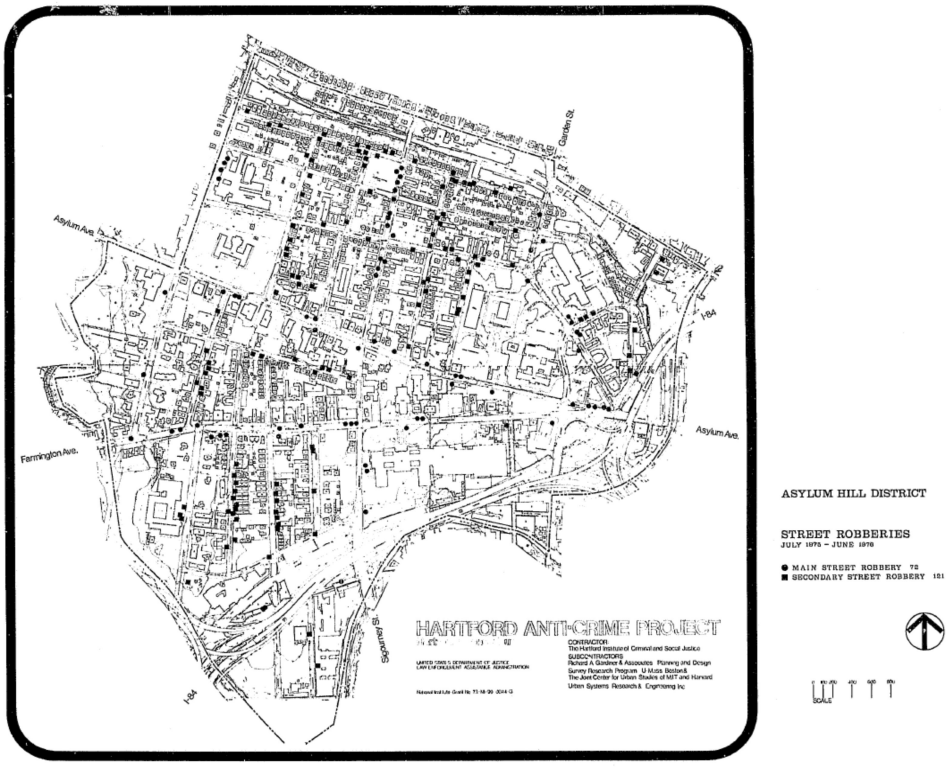


Fig 2.4

Proposal for Physical Design

Vehicular traffic :

- Reduce the number of through streets from four to one (an east-west street) or two (an east-west and a north-south street)
- Blocking some streets at intersections, creating cul-de-sacs.
- Proposal for treatments of a number of side streets
- These treatments included creating cul-de-sacs, changing two-way streets to one-way streets, and creating "gateways" by simply narrowing the entrance to a street to make it appear clearly residential rather than a through street.

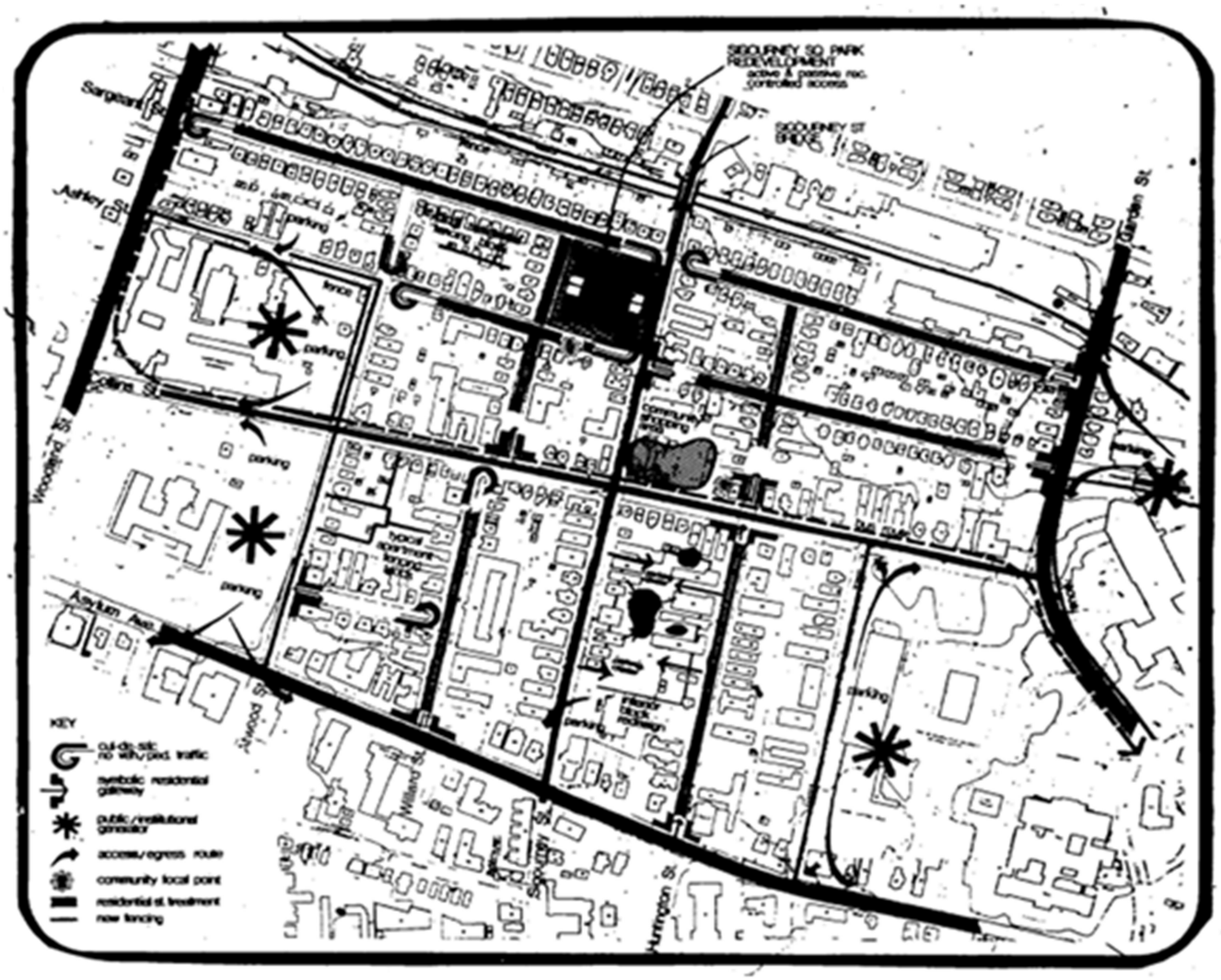


Fig 2.5 PROPOSAL FOR PHYSICAL DESIGN

- To create "entranceways“ on as many of the streets entering North Asylum Hill as possible
- These entrance ways would consist of street narrowing with attractive landscaping to give a visual sign that land use was changing and that, one was entering a residential neighbourhood
- "mid-block treatments“- breaking up the longer blocks by narrowing the streets , by putting an island in the middle of the street , with attractive landscaping to create a number of subunits

Open spaces or voids:

- To encourage landlords to fence their parking lots
- To decrease the likelihood that people would pass through parking lots into residents' backyards and other private spaces
- To encourage the owners of vacant lots and abandoned buildings to up-grade them
- To encourage cleaning up the park and defining certain spaces within it for use by small children and elderly people

11 street changes were constructed:

- There were four cul-de-sacs preventing through passage of all but emergency vehicles
- Seven gateways
- One street was made one-way
- Only two through streets in North Asylum Hill, Sigourney Street running north and south and Collins Street running east and west
- The park was cleaned up. and benches were painted.

Results Noticed :

- Residential Burglary :Showed 42% reduction in the first year after implementation
- In the remaining neighbourhood, the burglary rate remained at its previous level, while elsewhere throughout the city of Hartford, the burglary rate continued to rise between 1975 -1977.
- There was no indication of crime displacement from the target neighbourhood to surrounding areas
- There was 27.5% reduction in street crime-robbery and purse snatch
- The rising trend of street crime was halted

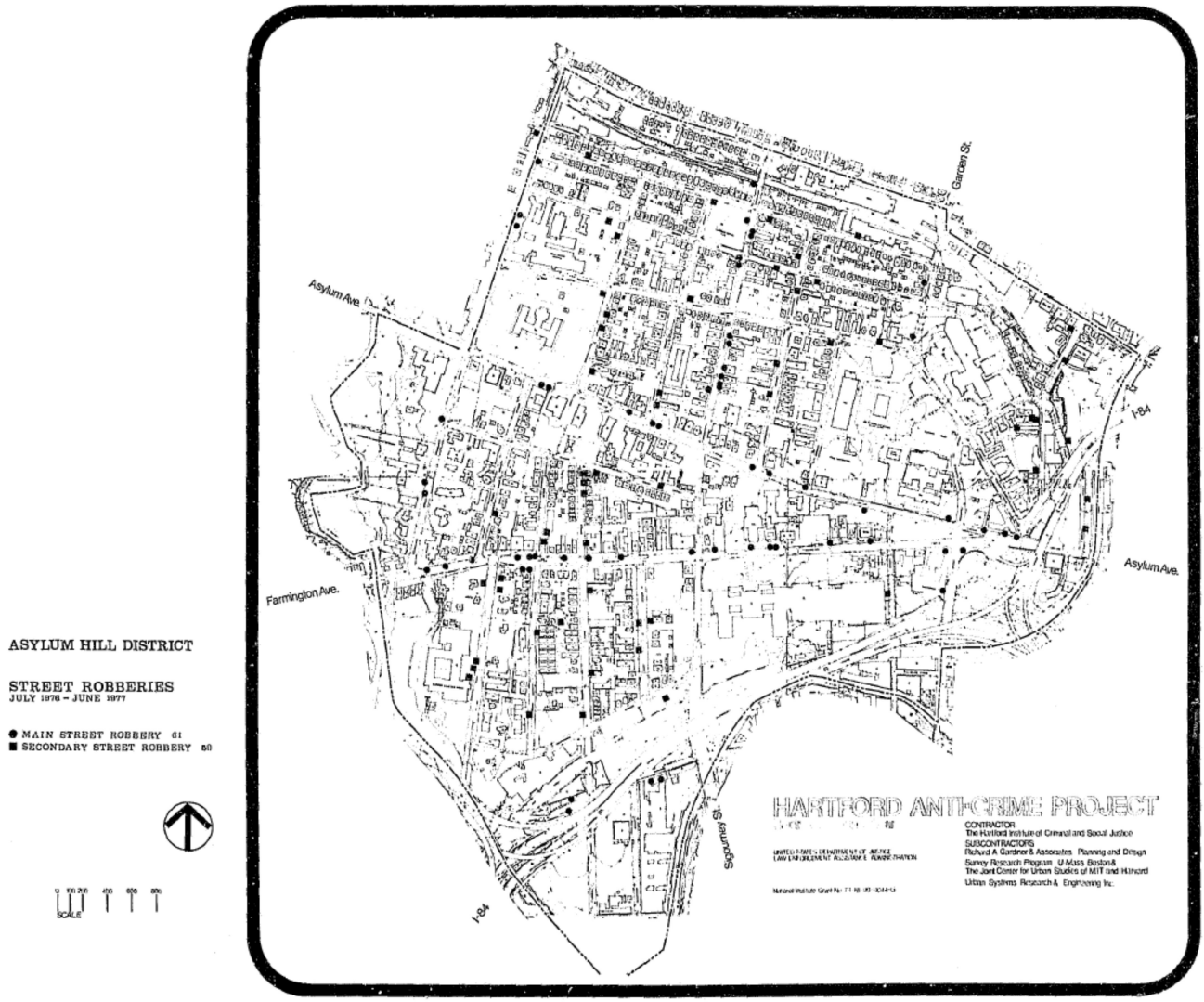


Fig 2.6

Analysis of North Asylum Hill

PARAMETER OF STUDY	ANALYSIS	REMARK
Urban Fabric	-Primarily low-rise apartment buildings and Multi-Unit frame structures were seen	-
	-Bounded by three busy streets and by a railroad track.	Complying to Woonerf Concept
	-Four streets through the residential area connecting the major border streets	Complying to Woonerf Concept but against Cul-De Sac concept
	-Can walk easily from one side of the neighbourhood area to the other in less than15 minutes.	Against Cul-De Sac concept but complying Space Syntax Analysis
	-Presence of numerous voids , parking lots , vacant lots and **abandoned buildings**which allowed easy passage	Against Broken Window Concept
Urban Lighting	-	-
Urban Vegetation	No proper landscaping was provided	Against Woonerf Concept
Urban Amenities	Schools, hospitals ,Parks were provided	-
Urban Activities	-Predominant land-use type was residential surrounded by non-residential land use type	-
	-Residential area was surrounded by institutions and facilities that generated use of the neighbourhood by non-residents	Against Concept of Defensible Space
	-Major public space which were in the middle of the neighbourhood like the park, was considered undesirable and fear-producing by the majority of neighbourhood residents	Against Concept of Eyes on Street
	-There was lack of fencing & hence semi-private spaces were not defined	Against Concept of Defensible Space, Eyes on Street& CPTED
	-Cars and pedestrians from outside dominated the streets	Complying to Woonerf Concept

2.1.1 Example 2 - The Greater Cairo Region

Introduction:

The role of this project was to identify urban circumstances related to crime occurrence within the Greater Cairo Region, and to propose different ways to reduce these crimes. Consecutively, agglomeration's main districts were scrutinized according to social analysis, street-network pattern and land-use.

The objectives were to do the following:

- Increase the awareness of the relationship between urban planning and crime occurrence and how to consider this in planning.
- Investigate urban planning approaches in crime prevention.
- Understand the relationship between crime patterns in Egypt and urban planning aspects.
- Suggest possible urban planning precautions/considerations in order to help in crime prevention commensurate with the Egyptian environment.

Limitations of the project:

- Due to the wide scope of the study, it was not possible to conduct the analysis at all of the region's districts; therefore, the main agglomeration districts were selected to be analysed.

- The study period was identified for five-years starting from2004 till 2008 for the following reasons:

- Large number of urban crimes committed during this period.
- Crime statistics were available starting from 2003 till 2008; statistics before that period were difficult to obtain.
- Last census (2006) took place in the middle of the selected period; therefore, the resulting values could be considered as an average of the five years of the study.

- The research studies crimes were only related to geography and were linked to specific physical environment, including the following:

- Crimes against persons: homicide and attempted murder, assaults including battery with serious injury or death, kidnapping, sexual harassment and rape.
- Crimes against property: robbery, arson, housebreaking, shoplifting, rusting and car theft.

Space syntaxanalysis had been used in this research. This involved:

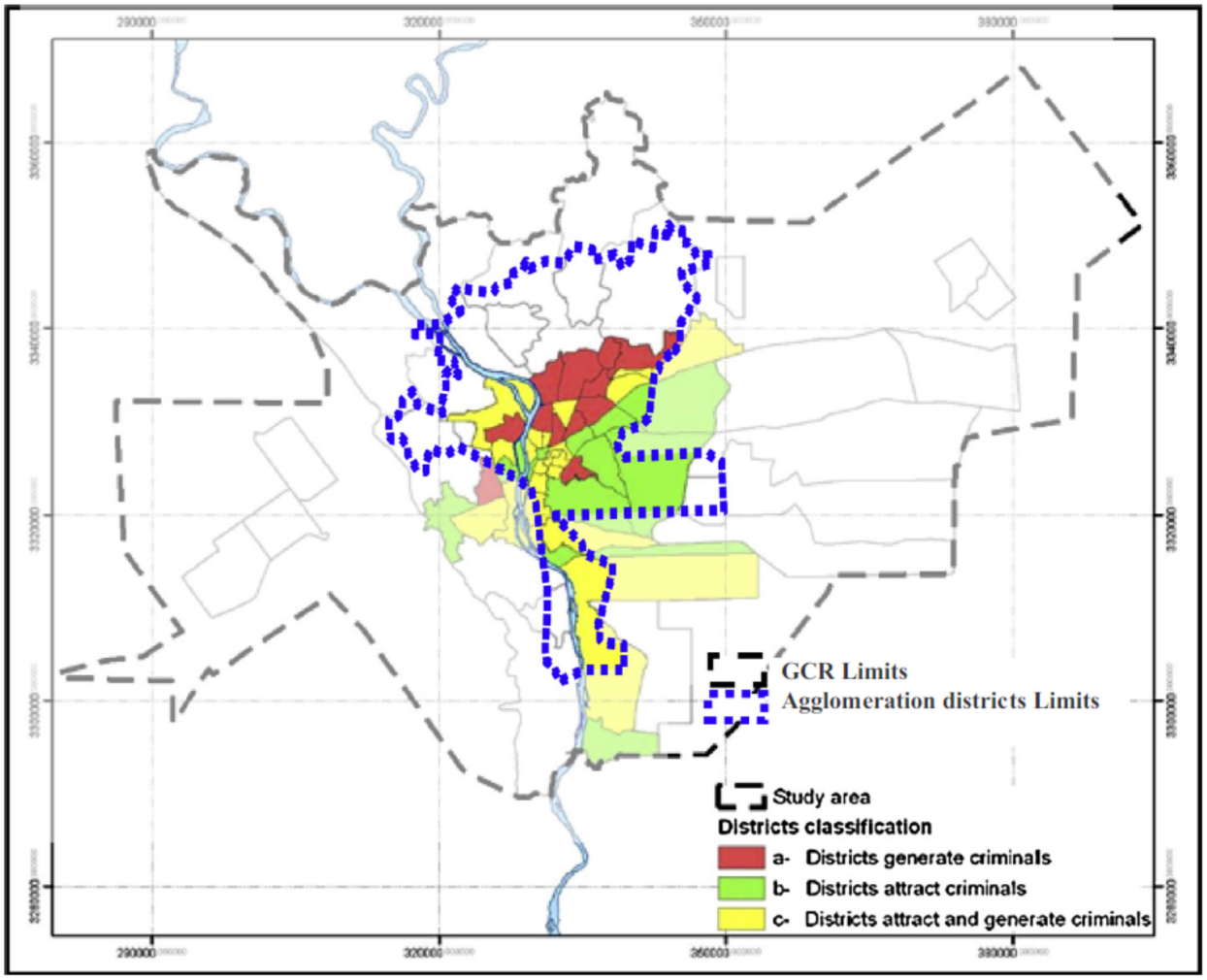
- Movement analysis in general.
- Strategic issues such as retail locations, distribution of land uses and locations of crime.

The research believed in the theory that a good spatial layout generates automatic movement which increases the probability of interactions by unplanned encounters. The increased social interactions then increase the risk for a criminal to get caught and hence prevent him from committing the crime.

Space syntax technique was used in this research to identify the relationship between street networks and crime rates.

Methodology:

- The main agglomeration's districts were selected for investigation.



Agglomeration districts classification.

Fig 2.7

- Following analyses were done depending on the correlation between crime rates of the selected districts and the rates obtained from different factors:

- Social analysis
- Street network pattern analysis
- Land use analysis

Social analysis:

In this part, crime rates were correlated with different social factors including illiteracy rate, unemployment rate, and internal migration studies, and these factors were considered as an indicator of social deterioration within any society, which was primarily responsible for generating criminals and increasing crime rates.
According to the mentioned methodology, results showed that total crime rate was significantly and negatively correlated with all studied social factors except the internal migration rate, where a negative but not significant correlation exists. This also applied to person and property crimes. So, it could be concluded that districts with high socially deteriorated residents have low crimes rate.

This result can be explained in two directions. On the one hand, the increase of socially deteriorated residents within a district is considered as an indicator of the increasing of the district's poverty rate. On the other hand, most of these districts help in creating criminals-due to their bad living conditions-than being places of crimes.
Based on the previous explanation, a conceptualization of ''districts attracting criminals" and ''districts generating criminals" had been proposed by comparing districts' social conditions with their crime rates through :

- Ranking values within each of the studied factors in groups, for example:
  - values P0, <10 have rank= 1;
  - values P10, <20 have rank= 2;
  - values P20, <30 have rank= 3, etc.,

Then, summing up the resulted ranks over each district

- Identifying high socially deteriorated districts by calculating the region's rank; higher rank values are considered an indicator of high socially deteriorated districts.
- Identifying high crime rate districts by calculating the region's crime rate; higher values are considered an indicator of high crime rate districts.

According to that, the main agglomeration's districts were classified according to the following figure into three types:

- **Districts generating criminals** rather than being vulnerable to crimes, including socially deteriorated districts with low crime rates.

- **Districts attracting criminals** rather than generating them, including socially developed districts with high crime rates.

- **Districts attracting and generating criminals** at the same time, including both socially deteriorated districts with high crime rates and socially developed districts with low crime rates. It was noted that criminals of this type of districts may not be those who commit crimes within. It could be possible that these districts attract criminals from outside and expel their criminals outside at the same time, as higher risks of detection and apprehension exist within theirresidence districts.

Physical analysis:

I. Street network

- Based on the assumption that criminals always choose places that require the least amount of time and energy to commit their crimes, a sample of the first and second districts types was selected to be analysed.
- This involved the selection of districts that were socially and spatially different from each other so that, any relationships between crime and space across the areas were unlikely to be due to social factors.
- The selected districts included the following: Al-Mataria, Manshyet Nasser and Boulaq Al Dakrour as districts generating criminals
- Districts ofMasr Al Gadida, Madinat Nasr 2nd and Dokkiwere selected as districts attracting criminals.

Table 3 Social characteristics of the selected districts and their crime data during the study period (2004–2008). *Source:* Social characteristics recalculated by the author according to the last census results, Crime data recalculated by the author according to Public Security Bureau's (PSB's) statistics.

District	Illiteracy rate	Unemployment rate	Internal migration rate	Average family size	Rate scramble	Population density	Crime rates	Crime against person	Crime against property
Districts generating criminals									
Mataria	19.29	13.69	10.94	3.93	1.18	80,077	411.50	7.62	403.88
Manshyet Nasser	47.05	4.31	11.99	3.91	1.51	47,183	507.54	7.63	499.90
Bolaq AlDakrour	18.87	12.22	13.86	3.92	1.15	61,717	327.81	7.03	320.79
Districts attracting criminals									
Masr AlGadida	6.31	8.48	16.48	3.31	0.83	12,411	2737.41	26.41	2711.01
Madinat Nasr 2nd	12.33	13.85	17.74	3.91	1.14	4387	1730.84	13.17	1717.67
Dokki	6.37	6.76	22.95	3.23	0.80	18,427	1843.68	23.45	1820.24

Fig 2.8

- The above table indicates social characteristics of the districts being investigated and their crime data.
- As for the third type, which included districts that attract and generate criminals at the same time, it was difficult to identify whether criminals were insiders or outsiders, especially that most of these districts were located within the downtown which attracted people from different areas, whether criminals or not. Thus the third type was ignored.

To identify the relationship between street networks and crime rates, space syntax analysis has been used.

- **Drawing methodology**

  As axial models depend on visibility, therefore, achieving the natural surveillance, some elements had to be taken into account while drawing. Based on surveys done within the selected districts, these elements included the following:

Middle islands: according to surveys, they can be classified into the following:
a. Wide planted fenced islands, with low-rise fences, shrubs, and trimmed trees.
b. Non-fenced wide planted islands with low-rise shrubs and trimmed trees.
c. Narrow islands.

Fig 2.9

Example of wide planted middle islands, KhalifaMa'mon St., MisrElgadida district

Fig 2.10

Example of narrow middle islands, Sudan St., Dokki District.

It is notable that most of them are easily passable and don't impede vision; therefore, they can be considered as spaces.

Nodes and open spaces: Most of them are non-fenced containing simple sculptures, fountains, shrubs, seats, etc.

Fig 2.11
Examples of nodes and open areas, roxy square-Misr El-Gadida District (Above) and Galaa Square-Dokkidistrict(Below)

It is notable that those sculptures, fountains, shrubs, seats,etc. don't impede vision, so they were ignored while drawing the axial maps; and considered as spaces.

Some private vacancies included the following:

a. **Fenced areas** (such as Military uses, private lands): the majority of these lands had high-rise fences that impede vision, as their main purpose was to secure the space surrounded by; thus, they could be considered as objects.

Fig 2.12

Example of fenced private areas, Madinet Nasr 2nd district

b. **Non-fenced** areas which was classified into the following:

I. Buildings' intermediate spaces: These spaces –especially within the districts attracting criminals – were usually used as building entrance, garage entrance and in some cases used as storage areas while a small percentage had been used as internal routes or open spaces; therefore, they were considered as objects.
II. Buildings' open spaces: These spaces usually were planted, but the lack of maintenance of these plants made them grow thicker and impede visibility for residents. Therefore, they were also considered as objects although, some were passable.

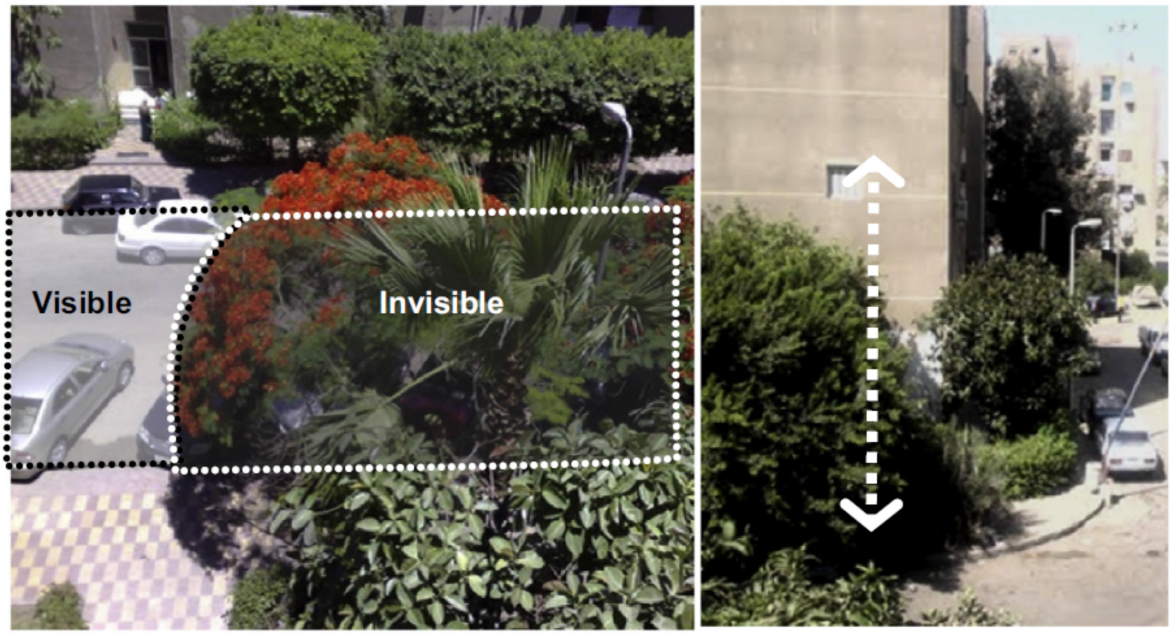


Fig 2.13
Example of building open spaces that impede visibility, EmtdadRamsis Buildings-Madinet Nasr 2nd district

So it was concluded that, in order to study the effect of natural surveillance and movement on crime, middle islands, nodes and open areas were considered as spaces, while all private vacancies were considered as objects.

- **Space syntax analysis**.

Depending on the selected sample, two questions needed to be answered.

- The first was: ‘‘Are there spatial differences between districts generating criminals and those attracting criminals that affect crime rates?”
- The second was: ‘‘Are there particular street patterns attract criminals?”

Therefore, there were two primary types of variables used extensively in the analysis:

i. The values obtained through Space Syntax analysis as the independent variable
ii. Crime rates as the dependent variables.

The values obtained through space syntax were as follows:

- Global Integration
- Local Integration R=3
- Local Integration R=10
- Connectivity.

The relationship between each of these values and crime rate was explored to examine their effects on crime occurrence in the selected districts.

For the first question which relates to the spatial differences that affect the crime, the correlation between each of values obtained through space syntax and crime rate was calculated. Comparing Districts generating criminals with districts attracting criminals, these results were consistent with Hillier and Sahbaz, 2005.

Table 4 Districts generating criminals and districts attracting criminals. *Source:* Author.

		Districts generating criminals						Districts attracting criminals			
		Global integration	Integration $R = 3$	Integration $R = 10$	Connectivity			Global integration	Integration $R = 3$	Integration $R = 10$	Connectivity
Mataria		1.2140	2.2324	1.3544	4.7314	Masr Al Gadida		1.7721	2.4021	1.7723	5.3157
Manshyet Nasser		0.6157	1.6170	0.9960	3.3198	Madinat Nasr 2nd		0.7874	1.6219	0.9913	3.3833
Bolaq Al Dakrour		1.1348	2.2441	1.3122	4.2582	Dokki		1.4723	2.0799	1.4848	4.5362
Total crimes	$r =$	−0.8219	−0.8926	−0.8299	−0.6826	Total crimes	$r =$	0.8001	0.8671*	0.8406	0.8617
	$t =$	−0.4511	−0.4716	−0.4535	−0.4057		$t =$	4.0034	6.5271	5.2754	6.2298
Crimes against person	$r =$	−0.4063	−0.5285	−0.4192	−0.2036	Crimes against person	$r =$	0.9962**	0.9783**	0.9876**	0.9805**
	$t =$	−0.2889	−0.3458	−0.2954	−0.1691		$t =$	265.3883	45.1300	79.6578	50.3207
Crimes against property	$r =$	−0.8230	−0.8935	−0.8310	−0.6840	Crimes against property	$r =$	0.7950	0.8629	0.8360	0.8573
	$t =$	−0.4515	−0.4719	−0.4538	−0.4062		$t =$	3.8785	6.2935	5.0985	6.0101
Significant at level		0.000***	Critical value		636.619	Significant at level		0.000***	Critical value		636.619
		0.01**			31.821			0.01**			31.821
		0.05*			6.314			0.05*			6.314
The total crime rates were negatively – though not significantly-correlated with all the spatial factors which means that, crime rates decrease with increasing the global integration, local integration $R = 3$, $R = 10$ and connectivity values, and vice versa. This also applied to both crime against person and crime against property rates						The total crime rates were positively and significantly correlated with all the spatial factors which means that, crime rates increase with increasing the global integration, local integration $R = 3$, $R = 10$ and connectivity values, and vice versa. This also applied to both crime against person and crime against property rates					
Integration values: Results support that the presence of more people appears to provide higher risks of detection and apprehension to potential criminals. Higher Integration values are usually associated with higher levels of movement at different scales—pedestrian and vehicular. Consequently, more people—and eyes—are present which in turn, spell potential trouble for those attempting to commit any criminal act. These findings agree with Jacob's thesis through the presence of high density neighborhoods characterized by strong social interactions as mentioned previously						Results support that the presence of more people appears to provide higher risks of being exposed to crimes. Higher integration values provide overcrowded areas with a larger number of potential targets especially, that most of these spaces are desirable locations for retail and other public services because of their high accessibility. Criminals find it easier to commit their crimes in crowd and escape using crowds to impede victims and blending into them. This doesn't mean that there are no eyes on streets, but it can be said that crowd, the existence of a larger number of victims, the lack of social interactions between residents, etc., dominate the eyes on street which makes these areas more vulnerable to crimes			
Connectivity values: Results also showed that although higher connectivity values provide more escape routes, lower incidents occurred. This agrees with the rational choice theory where criminals, in general, compare between the risks of being caught – or being recognized by the insiders – and escaping with rewards gained (Felson, M. and Clarke, R.V., 1998); it is obvious that the probability of escaping with rewards is less. This means that either those areas have low standards of living, or high natural surveillance exists, or may be both						Results also showed that higher connectivity values provide more escape routes; therefore, higher crimes occur, so it can be interpreted that criminals find the probability of escaping with rewards is higher than being caught -or being recognized by the insiders. These findings agree partially with Newman's defensible space theory; both share the idea of minimizing the permeability – including the ease of entry to and exit from the area – to control the numbers of people using the space, while the idea of creating isolated neighborhoods from strangers to achieve territoriality is unacceptable for the studied cases			

Fig 2.14

‘‘Overall, it was said that urban integration and the increase in movement and levels of activity that it brings has a double effect. It produces

- More natural surveillance
- Safety in numbers and so reduce crime

This meant that potential criminals also used integrated streets, and so made more accessible locations more dangerous.

Both effects undoubtedly exist, and a key variable is the degree to which there is a residential culture in more active areas. Where it exists, crime risk is reduced, where is does not, risk is increased. But these benefits do not seem to pass through the intervening variable of community formation.

A residential culture, it might be conjectured, is first a culture of civilized co-presence, and only second, and after due time, a culture of community formation. As both Jane Jacobs and Oscar Newman observed, a society which does not civilize its streets cannot be civilized”.

As for the second question, which relates to the various network patterns and their relation to crime, streets within each of the attracting criminals’ districts were classified to include linear, radial, organic and curvilinear patterns. Taking integration and connectivity values into account, results showed that person crimes were positively correlated at (0.01) level with grid and radial patterns, while there is no correlation with property crimes. Table below shows correlation results between crimes and network patterns.

Table 5 Correlation values between street patterns and crime rates during the study period (2004–2008). *Source:* Author.

	Masr Al Gadida	Madinat Nasr 2nd	Dokki	Total crimes		Crimes against person		Crimes against property	
				$r=$	$t=$	$r=$	$t=$	$r=$	$t=$
Global integration									
Grid	1.7139	0.8374	1.5311	0.7346	2.7680	0.9999***	8054.1958	0.7288	2.6877
Radial	2.1342	0.0000	1.9170	0.6584	1.9272	0.9925**	133.1170	0.6520	1.8733
Organic	0.0000	0.7471	1.1290	−0.9041	−0.4748	−0.3888	−0.2800	−0.9077	−0.4758
Curve	1.8699	0.8669	0.0000	0.8342	5.0313	0.2539	0.3403	0.8388	5.2052
Integration R = 3									
Grid	2.3014	1.8379	2.1724	0.7826	3.6005	0.9983**	592.9196	0.7773	3.4909
Radial	3.0891	0.0000	3.0510	0.5946	1.4670	0.9793**	47.2163	0.5878	1.4261
Organic	0.0000	1.4567	1.4480	−0.9953	−0.4988	−0.6769	−0.4037	−0.9961	−0.4990
Curve	2.5091	1.8917	0.0000	0.6127	1.5819	−0.0704	−0.0658	0.6194	1.6272
Integration R = 10									
Grid	1.7142	1.0984	1.5450	0.7804	3.5529	0.9985***	675.1323	0.7750	3.4450
Radial	2.1342	0.0000	1.9196	0.6575	1.9198	0.9924**	130.6467	0.6511	1.8661
Organic	0.0000	0.9151	1.1401	−0.9583	−0.4893	−0.5234	−0.3436	−0.9606	−0.4900
Curve	1.8699	1.0780	0.0000	0.7556	3.0919	0.1263	0.1446	0.7611	3.1866
Connectivity									
Grid	4.2596	3.6316	4.3130	0.5275	1.1164	0.9596*	23.7568	0.5203	1.0845
Radial	12.0000	0.0000	12.4750	0.5584	1.2646	0.9693*	31.5923	0.5514	1.2290
Organic	0.0000	2.8435	2.6050	−0.9996	−0.4999	−0.7271	−0.4210	−0.9998	−0.5000
Curve	7.2857	5.1408	0.0000	0.6531	1.8823	−0.0183	−0.0180	0.6594	1.9364
Significant at level	0.000***	Critical value		636.619					
	0.01**			31.821					
	0.05*			6.314					

Fig 2.15

II. Land Use

- **Residential areas**

- **Formal Housing areas:**
  - Results showed that total crime rates were positively and significantly correlated with the existence of old deteriorated housing areas. Table below shows the correlation values and their significance.
  - Results also showed that most crimes committed within districts attracting criminals, and those attracting and generating criminals at the same time – including property and person crimes – are supposed to be committed within old deteriorated housing areas.
  - As for districts generating criminals, no significant correlation was found which means that most of crime incidents committed within those districts are located outside those areas.

Table 6 Correlation between the existence of studied formal housing areas and crimes rate during the study period (2004–2008). *Source:* Author.

		The existence of old deteriorated housing areas	The existence of public housing areas	The existence of shelter housing areas
Total crimes	$r=$	0.3227^{**}	−0.2229	−0.0915
	$t=$	3.0882	−1.1813	−0.5431
Crimes against person	$r=$	0.3225^{**}	−0.1799	−0.2017
	$t=$	3.0842	−0.9884	−1.0876
Crime against property	$r=$	0.3216^{**}	−0.2227	−0.0899
	$t=$	3.0727	−1.1802	−0.5344
Significant at level	0.000^{***}	Critical value	3.551	
	0.01^{**}		2.423	
	0.05^{*}		1.684	

Fig 2.16

- **Informal Housing areas:**
  - Results showed that total crime rates were negatively and significantly correlated with informal areas which mean that as the percentage of the informal housing increases, crime rate decreases. This also applied to crime against person and crime against property rates. Table below shows the correlation values and their significance.

Table 7 Correlation between the existence of informal housing areas and crime rates during the study period (2004–2008). *Source:* Author.

		The existence of informal areas	The percentages of informal areas
Total crimes	$r=$	-0.5670^{*}	-0.3546^{*}
	$t=$	−2.3450	−1.6966
Crimes against person	$r=$	-0.4954^{*}	−0.2242
	$t=$	−2.1469	−1.1870
Crime against property	$r=$	-0.5659^{*}	-0.3549^{*}
	$t=$	−2.3421	−1.6977
Significant at level	0.000^{***}	Critical value	3.551
	0.01^{**}		2.423
	0.05^{*}		1.684

Fig 2.17

- **Other land uses.** Studied land uses include residential, commercial, industrial, cemetery, vacant lands, agriculture lands and deserts.

  - Results showed that total crime rates were positively correlated with commercial areas and deserts and negatively correlated with residential, industrial, cemetery areas, vacant and agricultural land. This also applied to crime against person and crime against property rates. Table below shows the correlation values and their significance.

Table 8 Correlation between studied land uses and crime rates during the study period (2004–2008). *Source:* Author.

		Residential	Commercial	Industrial	Cemetery	Vacant lands	Agriculture	Desert
Total crimes	$r=$	-0.3638^{*}	0.2208^{*}	−0.3230	−0.0533	−0.3408	−0.3067	0.2502^{*}
	$t=$	−1.7286	1.8369	−1.5821	−0.3280	−1.6472	−1.5210	2.1622
Crimes against person	$r=$	-0.3616^{*}	0.2429^{*}	−0.2140	−0.0263	−0.1385	−0.2159	0.1129
	$t=$	−1.7209	2.0788	−1.1425	−0.1752	−0.7886	−1.1507	0.8250
Crime against property	$r=$	-0.3625^{*}	0.2198^{*}	−0.3231	−0.0541	−0.3420	−0.3067	0.2509^{*}
	$t=$	−1.7244	1.8261	−1.5827	−0.3324	−1.6515	−1.5211	2.1708
Significant at level	0.000^{***}	Critical value		3.551				
	0.01^{**}			2.423				
	0.05^{*}			1.684				

Fig 2.18

  - Results also showed that most of the ‘‘districts attracting criminals” crimes – including property and person crimes – are supposed to be committed within their commercial areas.

  - For districts generating criminals, most of person crimes are supposed to be committed within their industrial and agricultural areas, while property crimes results did not show any significance with the studied uses.

This supports space syntax results, as criminals offending within the first type find it easier to commit their crimes in crowd and escape using crowds to impede victims and blending into them, while those offending within the second type find the presence of more people provide higher risks of detection and apprehension and they tend to commit their crimes within segregated areas.

  - As for districts generating and attracting criminals at the same time, most of person crimes are supposed to be committed within their commercial areas and cemeteries. This confirms that this type of districts contains a mixture of the other two types, as crimes tend to occur in both crowd and deserted areas.

Conclusion:

From the above analysis, it is evident that most criminals search for accessible places, easy to move through and tha tprovide high opportunities for escape to commit their crimes. It is also evident that the agglomeration's districts can be classified as below into three types based on their social characteristics and crime rates:

- **Districts generating criminals:** Analysis showed that the presence of more people in those districts appears to provide higher risks of detection and apprehension to potential criminals; therefore **most criminals commit their crimes within segregated areas**. Analysis showed that those **segregated areas include old deteriorated housing, industrial as well as agricultural areas**.

- **Districts attracting criminals:** Analysis showed that the presence of more people in those districts appears to provide higher risks of being exposed to crimes; therefore **most criminals commit their crimes within overcrowded areas**. Moreover, it showed that those **overcrowded areas include commercial areas with grid networks**.It is obvious that grid networks provide clearer and more direct and predictable routes and therefore attract more potential offenders, while the existence of commercial uses helps in attracting more potential targets. Since more potential offenders will see more potential targets, more crime opportunities will be provided.

- **Districts generating and attracting criminals:** Results showed that those districts are a mix of the previous two types; therefore incidents occur within both overcrowded and segregated areas almost with the same proportions.

Recommendations:

According to the findings of this research, in order to provide a secured environment – have to cover two different processes:

- First is to improve the urban environment
- Second includes the upgrading of population especially in the socially deteriorated districts.

Improving the urban environment:

The researcher recommends that this process can be achieved through a set of parties which have to work with each other within the whole system. Those parties include the following:

- **Legislators:** represented by the members of the People's Assembly– need to work in two directions:

a. The amendment of the existing laws or the enactment of new ones – whether related to the criminals themselves or the urban environment where those crimes were committed– in order to increase the effort of crime.

b. Allocating more resources of the general budget to deliver public services and utilities to underserved areas especially, street lighting. Here comes the role of local governance

- **Local governance:** Local governance at different levels (governorates, cities, districts and villages) has the responsibility to distribute those resources within their jurisdiction. It is recommended that this distribution covers three basic tasks:

a. Survey areas suffering from bad living conditions and classify them according to their physical, social, economic conditions, etc.

b. The establishment and management of all public services/utilities within socially/physically deteriorated areas.
c. The quick removal of informal housing areas and their replacement with formal ones.It is notable that the mentioned tasks depend on planners and designers significantly.

- **Planners and designers:** They are the key factors for crime reduction through their cooperation with local governance and legislators. The result of this cooperation appears in identifying different design principles/measures to be adopted in laws or regulations, and therefore secures the urban environment of future projects. Analysis of this research has recommended a set of principles\measures which activate the role of both insiders and outsiders in maintaining natural surveillance through the following:

a. Mixing of uses in order to pool different groups of people at different times of the day, create opportunities for positive social interactions between insiders and outsiders; taking into account the avoidance of incongruous uses.
b. Reducing the grid network patterns in both limited and exaggerated movement areas.

- **Criminologists:** Criminologists have to provide decision makers with a snapshot of criminality and criminal behaviour which provide them with an understanding of crime patterns and trends. Without this understanding of both crime patterns and criminal behaviour, people who have to make decisions that affect the safety and security of communities will not have access to the vital, synthesized information essential to good planning and strategy

- **Upgrading of population:** This process can be achieved through organizations within different ministries by strengthening the sense of belonging and citizenship in the community, increasing social interactions among residents at different levels in addition to, building their capacity. This includes the following:

  - **Ministry of education**

  a. Strengthening the concepts of belonging and citizenship through the development of education curriculum in schools.
  b. Focusing on the role of the school in the process of education so as not to be restricted to curriculum issues and to be extended to monitor students' behaviour in addition to, strengthening the relationship between home and school.
  c. Giving attention to schools' activities – especially in summer – in order to reduce juvenile crimes and delinquency.

  - **National council for youth**

  a. Raising youth awareness about citizenship and the legal system through targeted programs.
  b. The establishment of youth centres and sports clubs – in the underserved areas – to highlight the talents of young people and their abilities, in addition to strengthening social relationships among them.
  c. Conducting training courses for youth employment through improving their skills and abilities, such as computer skills.

  - **Ministry of social solidarity**

  a. Raising families' awareness about citizenship and the legal system through targeted programs.
  b. Encouragement of volunteer work as a mean of strengthening social relationships within community.

c. Conducting training courses for employment through improving residents' skills and abilities, such as crafts making and tailoring.

Finally, for both processes, organizations within ministry of interior have to do the following:
a. Improve law enforcement
b. Develop new strategies for crime reduction and present them to the legislative authorities.

Analysis of Greater Cairo Region

PARAMETER OF STUDY	ANALYSIS	REMARK
Urban Fabric	Urban integration and the increase in movement and levels of activity produce more natural surveillance and safety in numbers and so reduce crime	According to the Concept of Eyes on Street
	Person crimes were positively correlated with grid and radial patterns, while there was no correlation with property crimes	According to Cul-De Sac concept
	Total crime rates were positively correlated with commercial areas and deserts and negatively correlated with residential, industrial, cemetery areas, vacant and agricultural land	-
	Crimes tend to occur in both crowd and deserted areas.	-
Urban Lighting	-	-
Urban Vegetation	Wide planted fenced islands, with low-rise fences, shrubs, and trimmed trees(or) Non-fenced wide planted islands with low-rise shrubs (or) trimmed trees/Narrow islands are easily passable and don't impede vision	According to the Concept of Eyes on Street
	Buildings' open spaces where there are plants, if not maintained (plants), make them grow thicker and impede visibility for residents.	
Urban Amenities	-	-
Urban Activities	Sculptures, fountains, shrubs, seats, etc. don't impede vision	-
	Presence of residential culture in more active areas reduce crime and with its absence crime risk is increased	-
	Crime rates were positively and significantly correlated with the existence of old deteriorated housing areas	According to Broken Window Concept
	Reducing the grid network patterns in both limited and exaggerated movement areas	-
	With percentage increase of the informal housing, crime rate decreases	-
	Most criminals search for accessible places, easy to move through and that provide high opportunities for escape to commit their crimes	Against Eyes on Street Concept
	Mixing of uses in order to pool different groups of people at different times of the day, create opportunities for positive social interactions between insiders and outsiders	Against Eyes on Street Concept

2.2PRIMARY STUDIES

4.1.1 Example 1 – Belgachia, North Kolkata

Belgachia is a neighbourhood of north Kolkata, earlier known as Calcutta, in Kolkata district in the Indian state of West Bengal. One can reach Belgachia either by bus/car or metro or by train.Pareshnath temple is one of the major points of attraction of the place. Tala tank is located in this area. One of the major hospitals, R.G.Kar Hospital is located in this area. The people settled in and around Belgachia are follow different religions. The majority of people are of Hindu and Muslim community. Pareshnath temple is one of the major points of attraction of the place. There is a mosque and a few small temples in the area. The people staying in this area are primarily those people who have been staying here for more than fifty years. The two major roads running along this area are Tara Shankar Sarani and Indra Biswas Road.

Fig -2.19 LOCATION MAP OF BELGACHIA

ANALYSIS OF THE SITE: BELGACHIA (CASE EXAMPLE 1)

- **Urban Fabric :**

- **Road Section**

Buildings with different sections have been identified

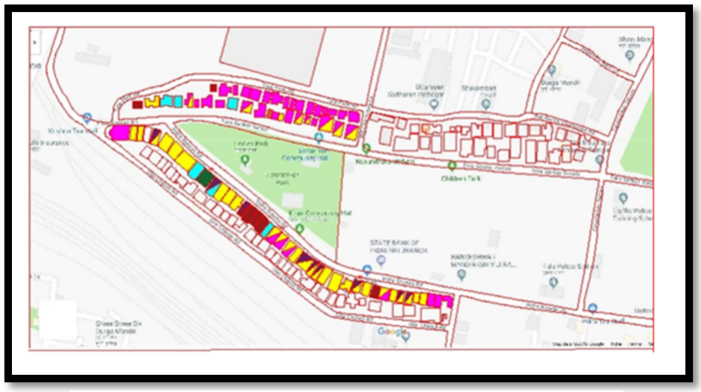


Fig 2.20 PLAN SHOWING BUILDING SECTION

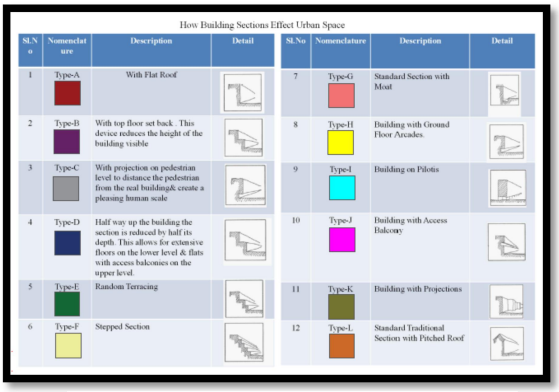


Fig 2.21 DIFFERENT BUILDING SECTIONS

Fig 2.22 IMAGE SHOWING DIFFERENT BUILDING SECTIONS

Fig 2.23 IMAGE SHOWING DIFFERENT BUILDING SECTIONS

Most of the buildings have access balcony. Many of them have arcades in the ground floor. There are a few with ground floor as garage and the top floors supported on columns. Only one of the buildinghas random terracing.

- **Built form and Open Spaces:**Buildings with different heights have been identified.

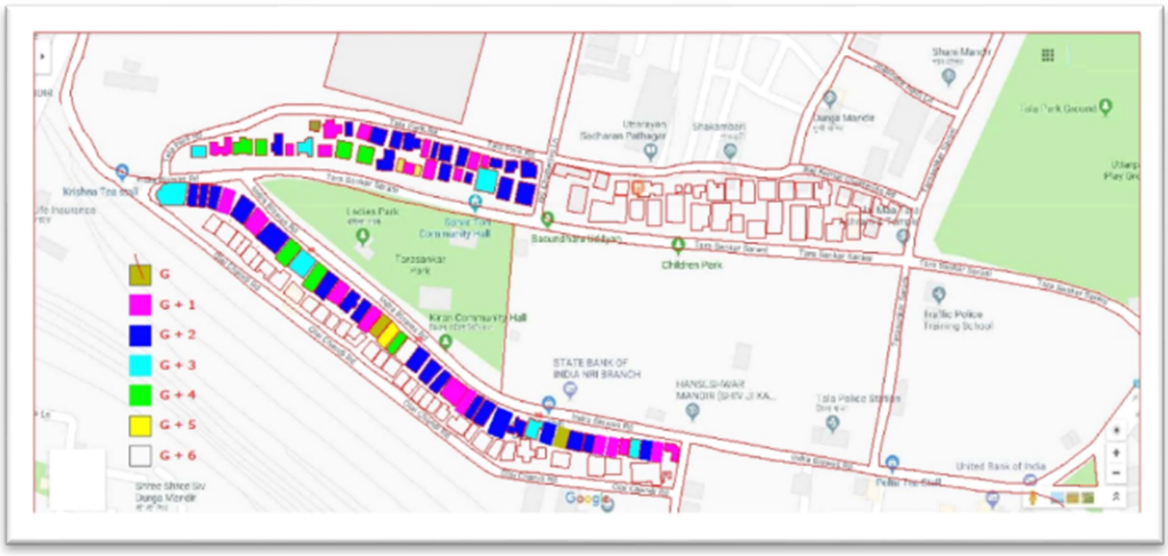


Fig 2.24 PLAN SHOWING BUILDING HEIGHTS

Maximum buildings in this area are either of one floor, two floors, three floors or five floors. The area is a residential area with large open spaces for parks and playgrounds.

Fig 2.25 PLAYGROUND AT BELGACHIA

Fig 2.26 PLAYGROUND AT BELGACHIA

Fig 2.27 LADIES PARK AT BELGACHIA

Fig 2.28 LADIES PARK AT BELGACHIA

Fig 2.29 LADIES PARK AT BELGACHIA

- **Street Network:**

The area consists of two continuous running streets – Tarasankar Sarani and Indra Biswas Road.

Fig 2.30 STREET NETWORK OF BELGACHIA

Fig 2.32 INDRA BISWAS ROAD, BELGACHIA

Fig 2.31 INDRA BISWAS ROAD, BELGACHIA

Fig 2.33 INDRA BISWAS ROAD, BELGACHIA

Fig 2TARA SANKAR SARANI

Fig 2.35 INDRA BISWAS ROAD, BELGACHIA

- **Urban Lighting:**

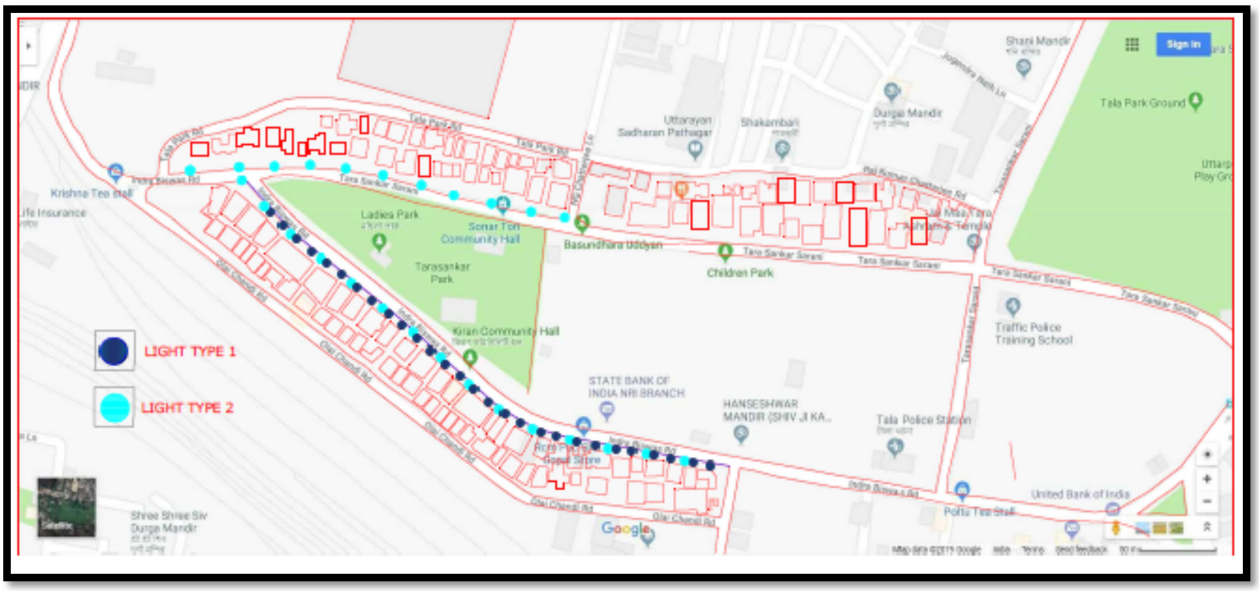


Fig 2.36 MAP SHOWING LIGHT TYPES ON STREET

Fig 2.37 TYPES OF LIGHT FIXTURES ON STREET

The streets have sufficient lighting both during day time and night time.

- **Urban Vegetation**

Fig 2.38 MAP SHOWING VEGETATION ON STREET

Figure 3 IMAGE OF TREES ON ROAD

Figure 2.40 IMAGE OF TREES ON ROAD

Figure 2.41 IMAGE OF TREES ON ROAD

Figure 2.42 IMAGE OF TREES ON ROAD

Height of trees is within 10ft to 20ft.

- **Urban Amenities:**

The area has open spaces, parks, play grounds, a primary school, a dispensary, a montessori school and three temples. The area has only one shop and hence lacks utility shops. Only para transit mode of transport on this road is the cycle-rickshaw.

- **Urban Activities:**

- **Land Use Typology:** The area has residential buildings with no traces of mixed lad use type. There are two community centres and only one shop.

- **Street Furniture:** There is hardly any visible street furniture along the roads other than the street lamps. The steps of some of the buildings are used as seats by people for resting and chit-chatting.

Positive Inferences:
Maximum buildings has front access balcony which enabled the residents to keep a clear watch on the street happenings
Some buildings with ground floor arcades make the footpath clearly visible from the ground floor
The roads are connected to the adjacent street network
The lighting on street appear continuous & uniform
The street are well lighted
The trees are high such that they do not affect watching street from houses

Negative Inferences:

There is no proper activity associated with the street
The street runs straight for a long stretch making the speed of vehicles uncontrollable
There is only one shop selling basic items on the street.

Analysis of Primary Case Example : Belgachia, North Kolkata

PARAMETER OF STUDY	ANALYSIS	REMARK
Urban Fabric	Maximum buildings has front access balcony which enabled the residents to keep a clear watch on the street happenings	According to the Concept of Eyes on Street
	Some buildings with ground floor arcades make the footpath clearly visible from the ground floor	According to the Concept of Eyes on Street
	The roads are connected to the adjacent street network	-
	There are shared streets which run straight for a long stretch making the speed of vehicles uncontrollable	According to Woonerf Concept but against Cul-De Sac concept
Urban Lighting	The lighting on street appear continuous & uniform	According to the Concept of Eyes on Street
	The street are well lighted	According to the Concept of Eyes on Street
Urban Vegetation	The trees are high such that they do not affect watching street from houses	According to the Concept of Eyes on Street
Urban Amenities	There is only one shop selling basic items on the street.	-
Urban Activities	There is no proper activity associated with the street	Against CPTED Concept
	The area is predominately residential land use type and not mixed land use type	-
	Roads and street are well maintained	According to Broken Window Concept

CHAPTER 3- CRIME DATA ANALYSIS

The types of crimes which are identified as road crimes are:

- Pocket Picking/Pick Pocketing
- Snatching
- Bi-cycle Theft
- Private Car/Jeep Theft
- Taxi Theft
- Motorcycle Theft

Fig 3.1 PICK POCKETING

Fig 3.2 SNATCHING

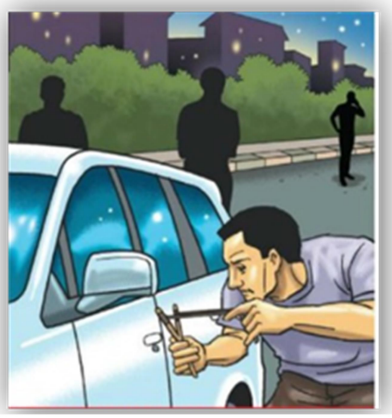


Fig 3.3 PRIVATE CAR THEFT

Fig 3.4 BI-CYCLE THEFT

Fig 3.5 TAXI THEFT

Fig 3.6 MOTOR CYCLE THEFT

3.1 Crime data of North and South Kolkata was collected from Lalbazar Police Station. A comparative chart of the data of North and South Kolkata was made.

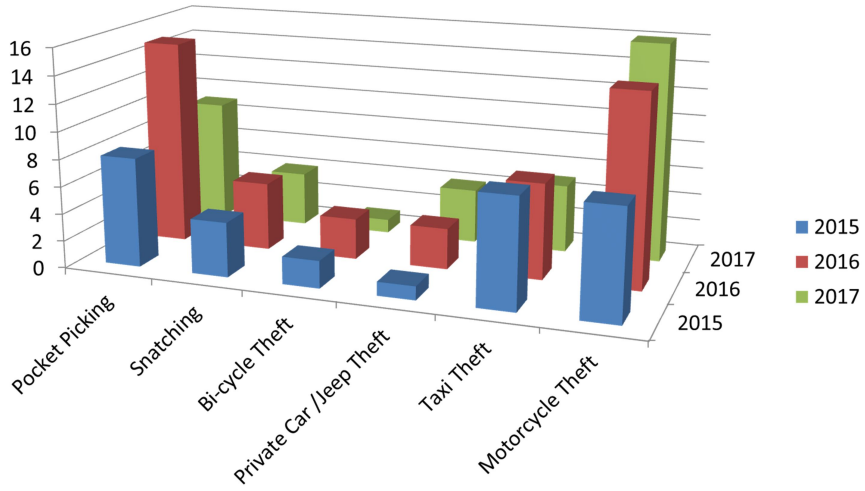


Fig 3.7 GRAPHS SHOWING TH VARIOUS ON-ROAD CRIME IN NORTH-SOUTH DIVISION IN KOLKATA

North Division includes of the following places:

- Shyampukur
- Jorabagan
- Bantalla
- Amhar Street
- Cossipore
- Chitpur
- Tala

South Division includes of the following places:

- Park Street
- Shakespeare
- Hastings
- Maidan
- Bhowanipur
- Kalighat
- Tollygunge
- Lake
- RabindraSarobar
- Alipur
- New Alipur
- Chetla

3.2 Crime detail of North Kolkata

North Division includes of the following places:

- Shyampukur
- Jorabagan
- Bantalla
- Amhar Street
- Cossipore
- Chitpur
- Tala

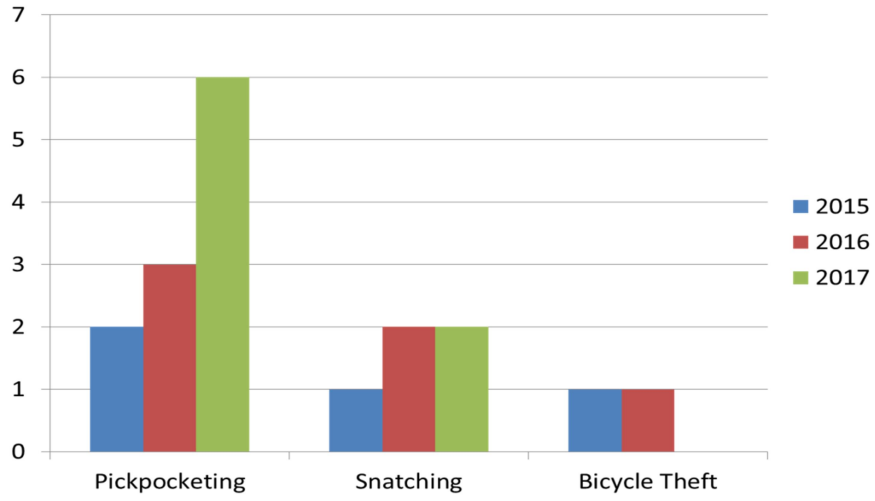


Fig 3.8 GRAPHS SHOWING THE PICK POCKETING, SNATCHING & BICYCLE THEFT IN NORTH KOLKATA

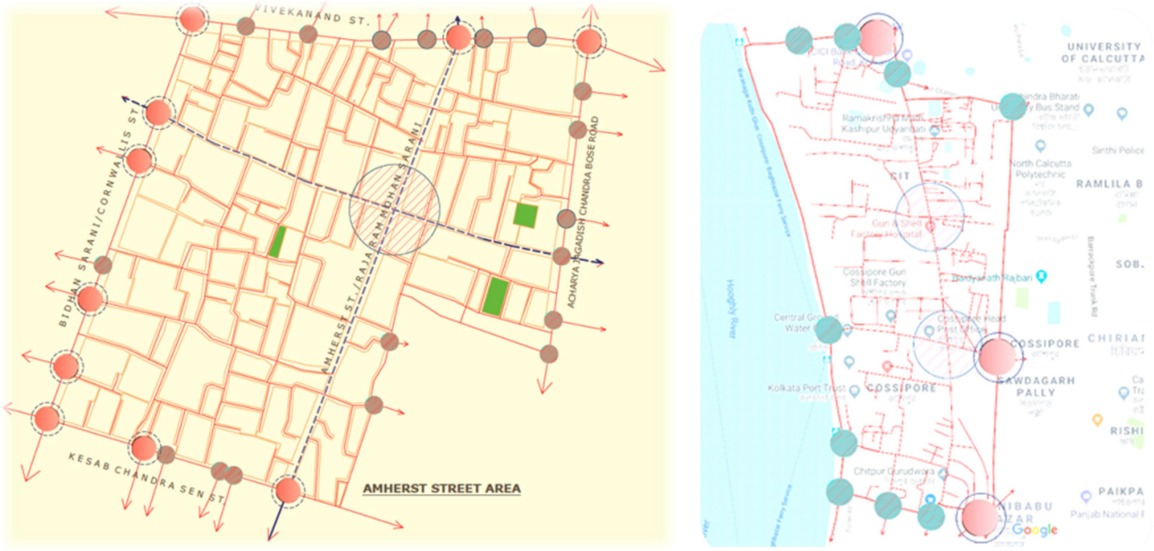


Fig 3.9 AREAS WITH MAXIMUM CRIME IN NORTH KOLKATA

Note:

- Peripheral roads can be reached from every internal roads
- This makes it easier for the offenders to flee from the area because of the excellent road network.
- The roads are narrow & easy to flee by foot or on bicycle or on motorcycle.

North Division includes of the following places:

- Shyampukur
- Jorabagan
- Bantalla
- Amhar Street
- Cossipore
- Chitpur
- Tala

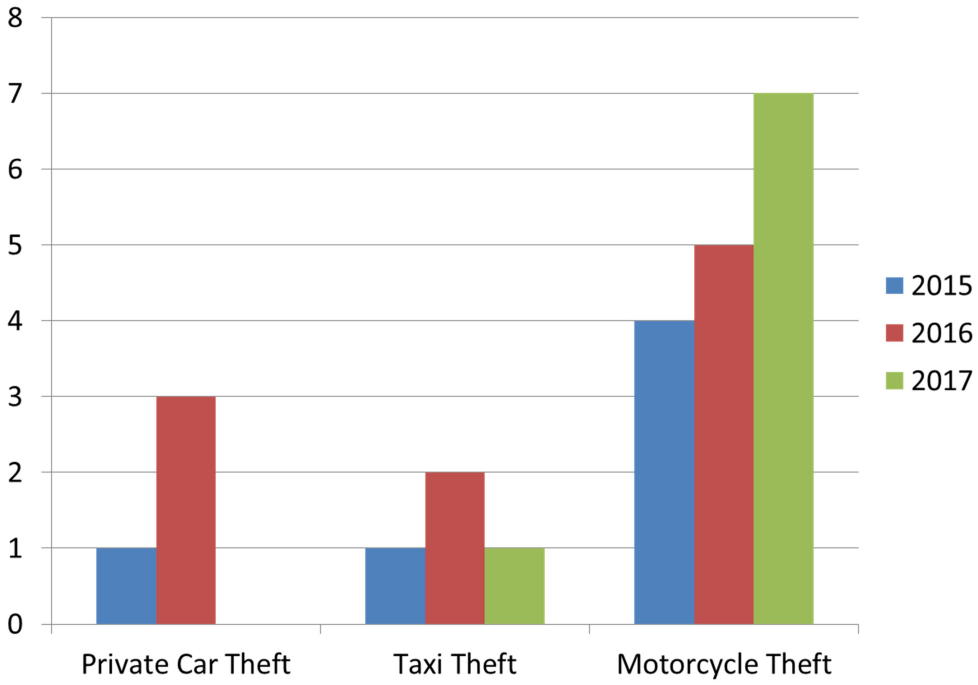


Fig 3.10 GRAPHS SHOWINGPRIVATE CAR THEFT, TAXI THEFT & MOTOR CYCLE THEFT IN NORTH KOLKATA

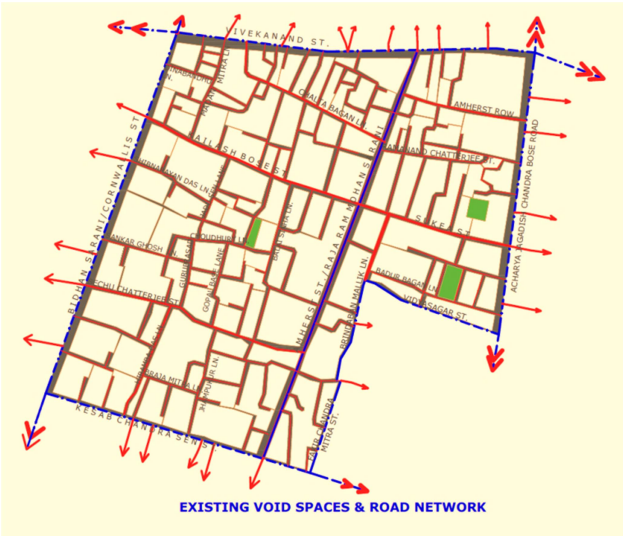


Fig 3.11 AREAS WITH MAXIMUM CRIME IN NORTH KOLKATA

Note:

- An East-west road crosses North-South running road in both the areas
- Width of some of the roads allow the movement of only bicycle & motorcycle

3.3 Crime detail of South Kolkata

South Division includes of the following places:

- Park Street
- Shakespeare
- Hastings
- Maidan
- Bhowanipur
- Kalighat
- Tollygunge
- Lake
- RabindraSarobar
- Alipur
- New Alipur
- Chetla

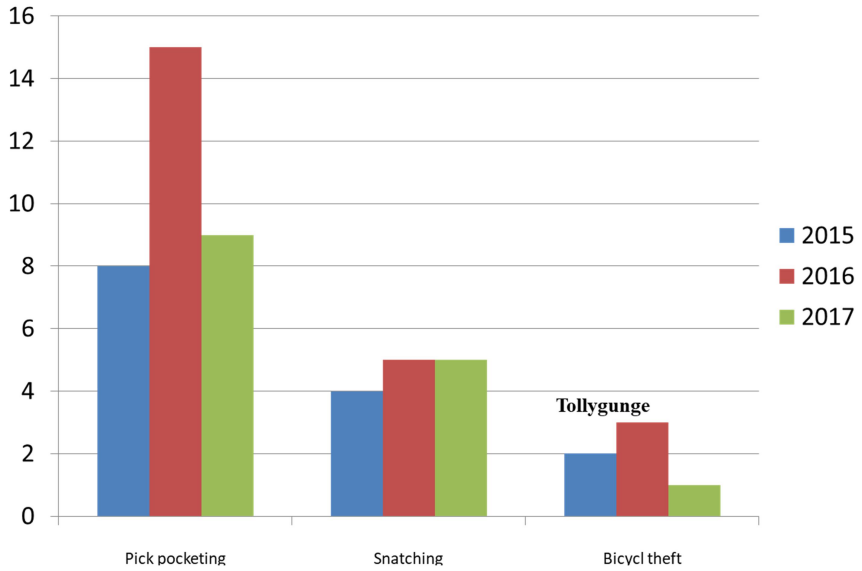
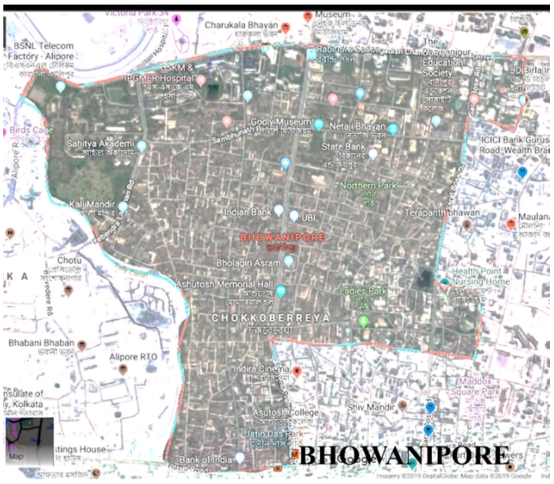


Fig 3.12 GRAPHS SHOWING THE PICK POCKETING, SNATCHING & BICYCLE THEFT IN SOUTH KOLKATA



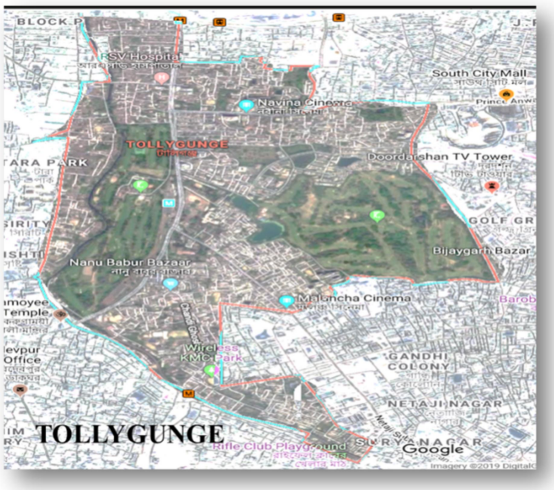


Fig 3.13 AREAS WITH MAXIMUM CRIME IN SOUTH KOLKATA

South Division includes of the following places:

- Park Street
- Shakespeare
- Hastings
- Maidan
- Bhowanipur
- Kalighat
- Tollygunge
- Lake
- RabindraSarobar
- Alipur
- New Alipur
- Chetla

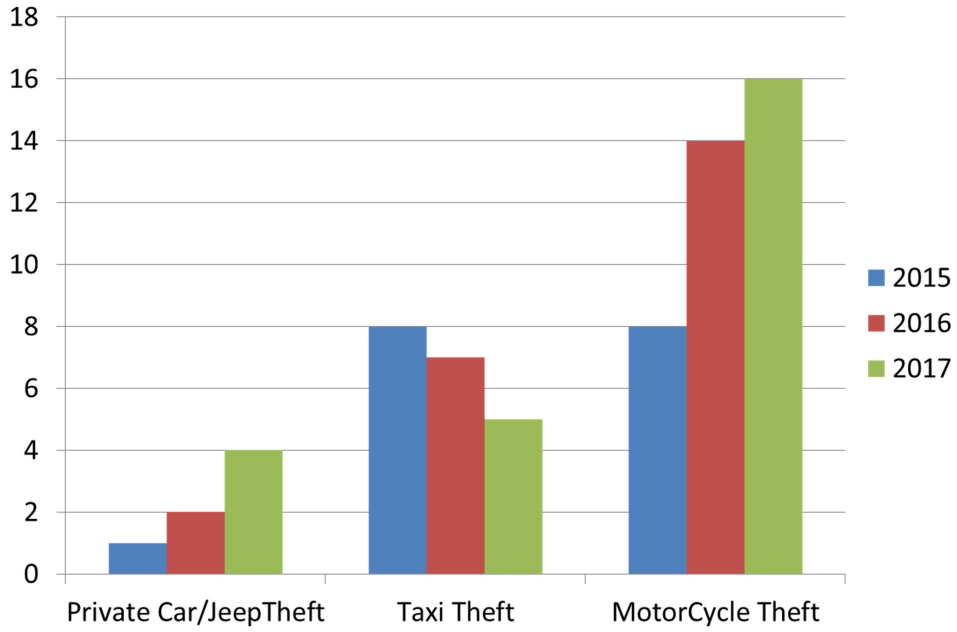
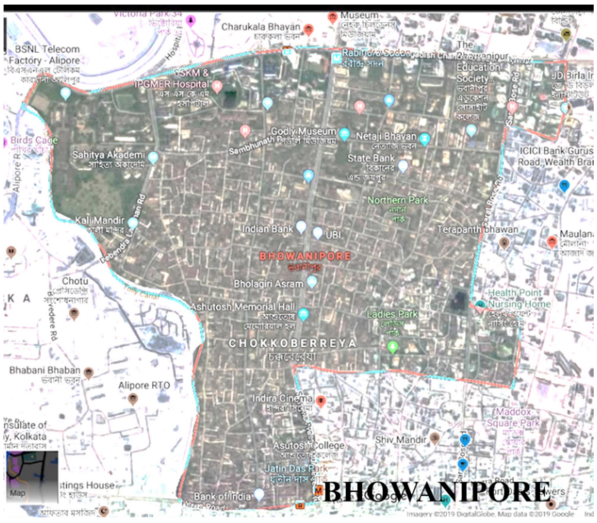


Fig 3.14 GRAPHS SHOWINGPRIVATE CAR THEFT, TAXI THEFT & MOTOR CYCLE THEFT IN SOUTH KOLKATA



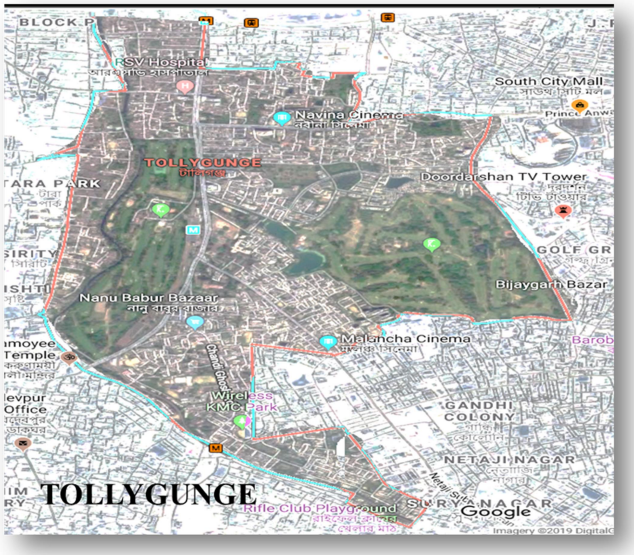


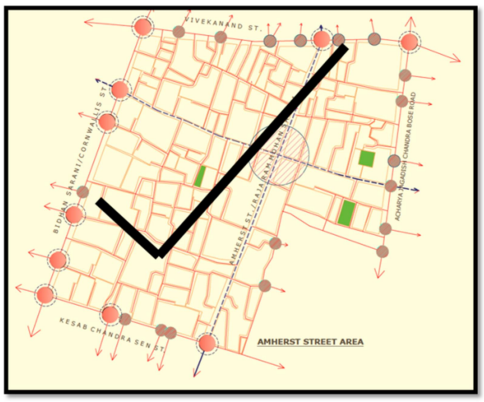
Fig 3.15 AREAS WITH MAXIMUM CRIME IN SOUTH KOLKATA

3.4 Analysing the crime data of North & South Kolkata and Selection of application site:

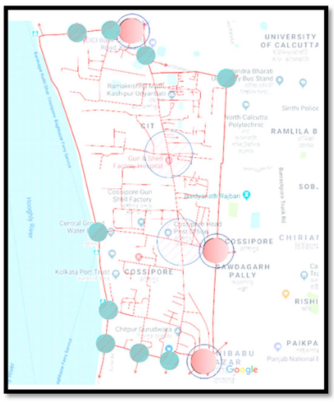
Analysing the Crime data of North Kolkata & South Kolkata the areas which are maximum prone to crime are:

North Kolkata:
- ✓ Amherst Street
- ✓ Cossipore

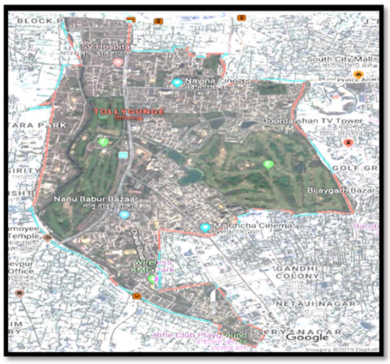
South Kolkata:
- ✓ Tollygunge
- ✓ Alipore
- ✓ Bhowanipore



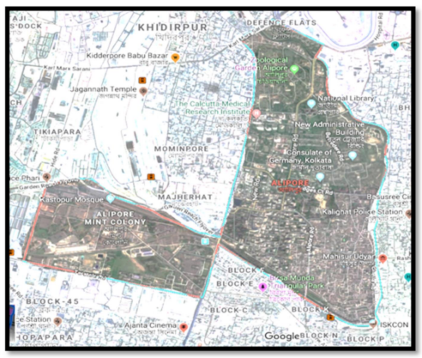
Amherst Street



Cossipore



TOLLYGUNGE



ALIPORE

BHOWANIPORE

Fig 3.16 AREAS WITH MAXIMUM CRIME IN NORTH & SOUTH KOLKATA

Out of all these areas I have chosen the case application site at Amherst Street.

CHAPTER 4 – SITE STUDY

4.1 Introduction

Amherst Street is a north-South Street in central Kolkata in West Bengal. The street was named after William Amherst, 1st Earl Amherst. It is also known as Raja Rammohan Roy Sarani after Raja Ram Mohan Roy.It falls under part of Ward No. 27 & part of Ward No.38 under Kolkata Municipal Corporation.

It is bounded by these roads:

North end ------ Vivekananda Road
South end ------ BepinBehariGanguly Street

William Amherst, 1st Earl Amherst, after whom the street was first named. He was Governor-General of India between 1823 and 1828.

Fig 4.1 WILLIAM AMHERST

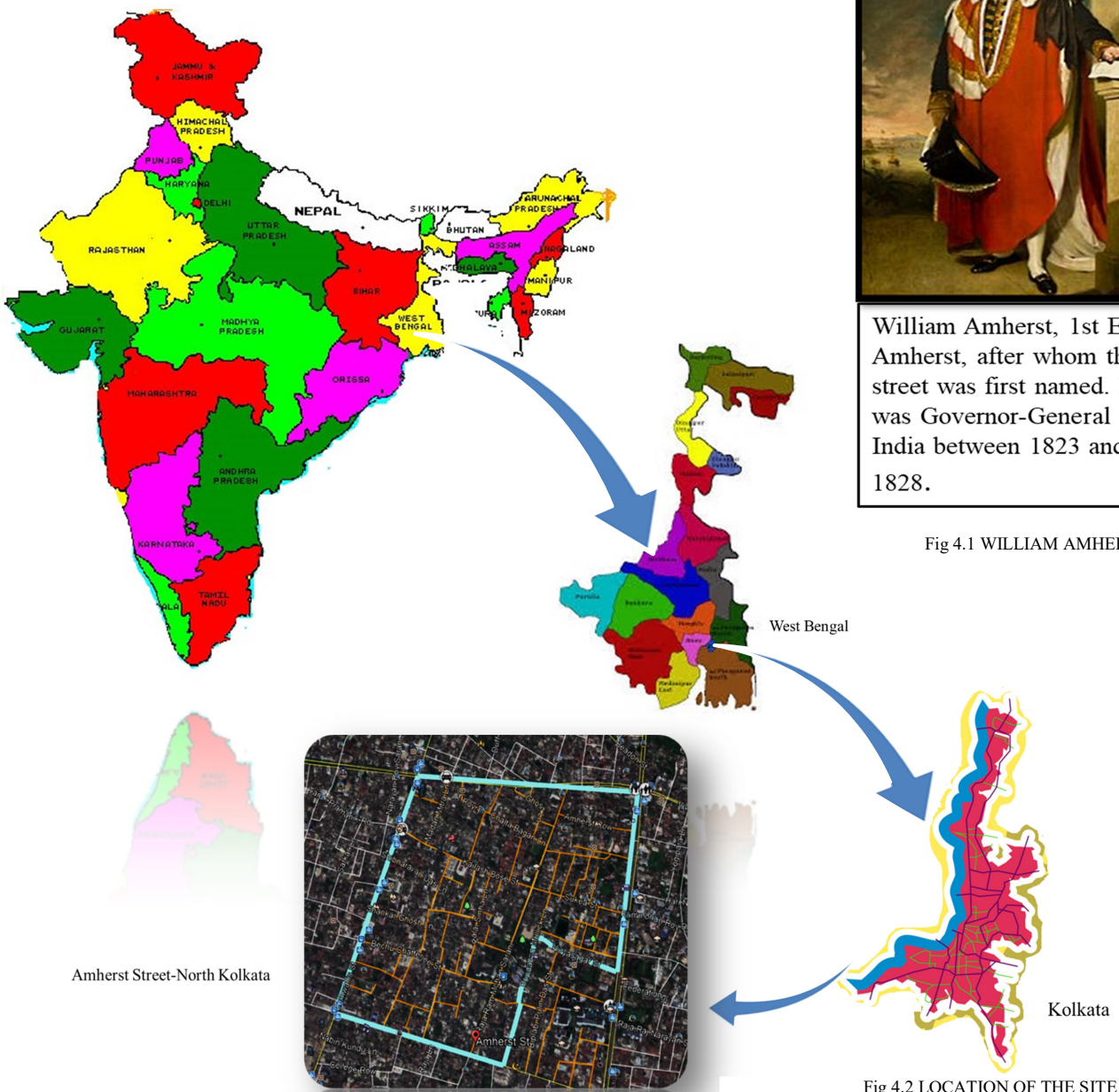


Fig 4.2 LOCATION OF THE SITE

Population:
As per 2011 Census of India ,the selected area had a total population of 28,869

- Males : 15,877 (55%)
- Females : 12,992 (45%)
- Population below 6 years was 1,627.

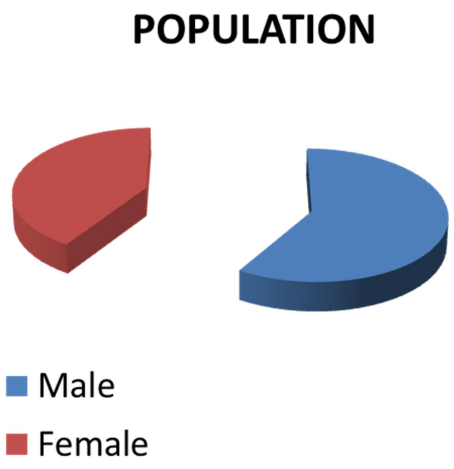


Fig 4.3 PIE CHART OF POPULATION RATIO

Colleges:

- St. Paul's Cathedral Mission College (estd. 1864)
- City College, Kolkata (estd. 1881)
- Anandamohan College (estd. 1961)
- Rammohan College (estd. 1961)

Landmarks:

- Amherst Street Post Office or Raja Rammohan Sarani Post Office
- Trinity Church
- Union Bank of India
- Shree VishudhanadSaraswati Marwari Hospital
- Lawrence Day School
- Bose's Clinical Laboratory
- Shardhananda Park
- Lady Dufferin Hospital

4.2 Road Network Study

Existing Road Network:

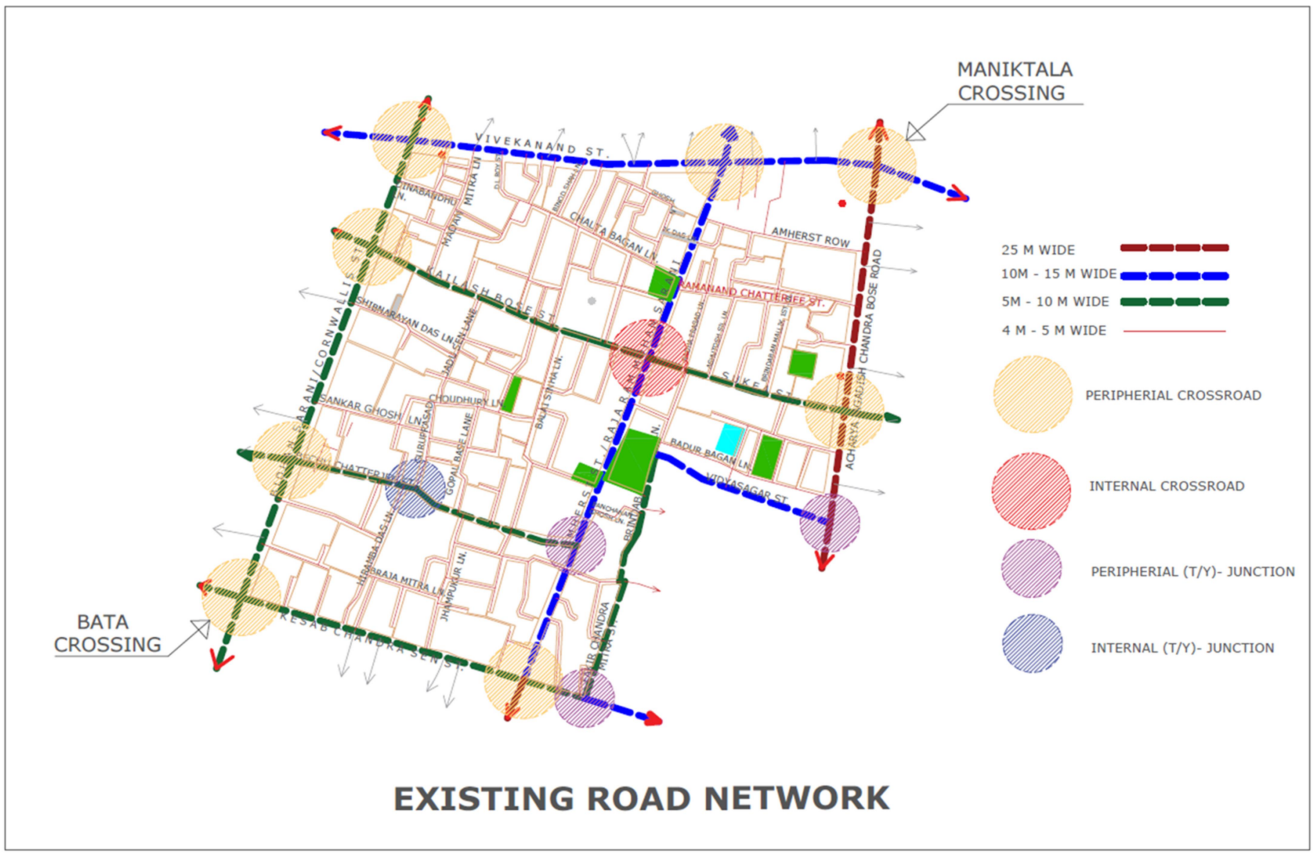


Fig 4.4 EXISTING ROAD NETWORK

4.3 Classification of Zones

Classification of Site Based on Road Network

Zone I & IV- Part of Ward No.27

The ward is served by Burtolla and Amherst Street police stations of Kolkata Police

Zone II & III – Part of Ward No.38

The ward is served by Amherst Street police station of Kolkata Police

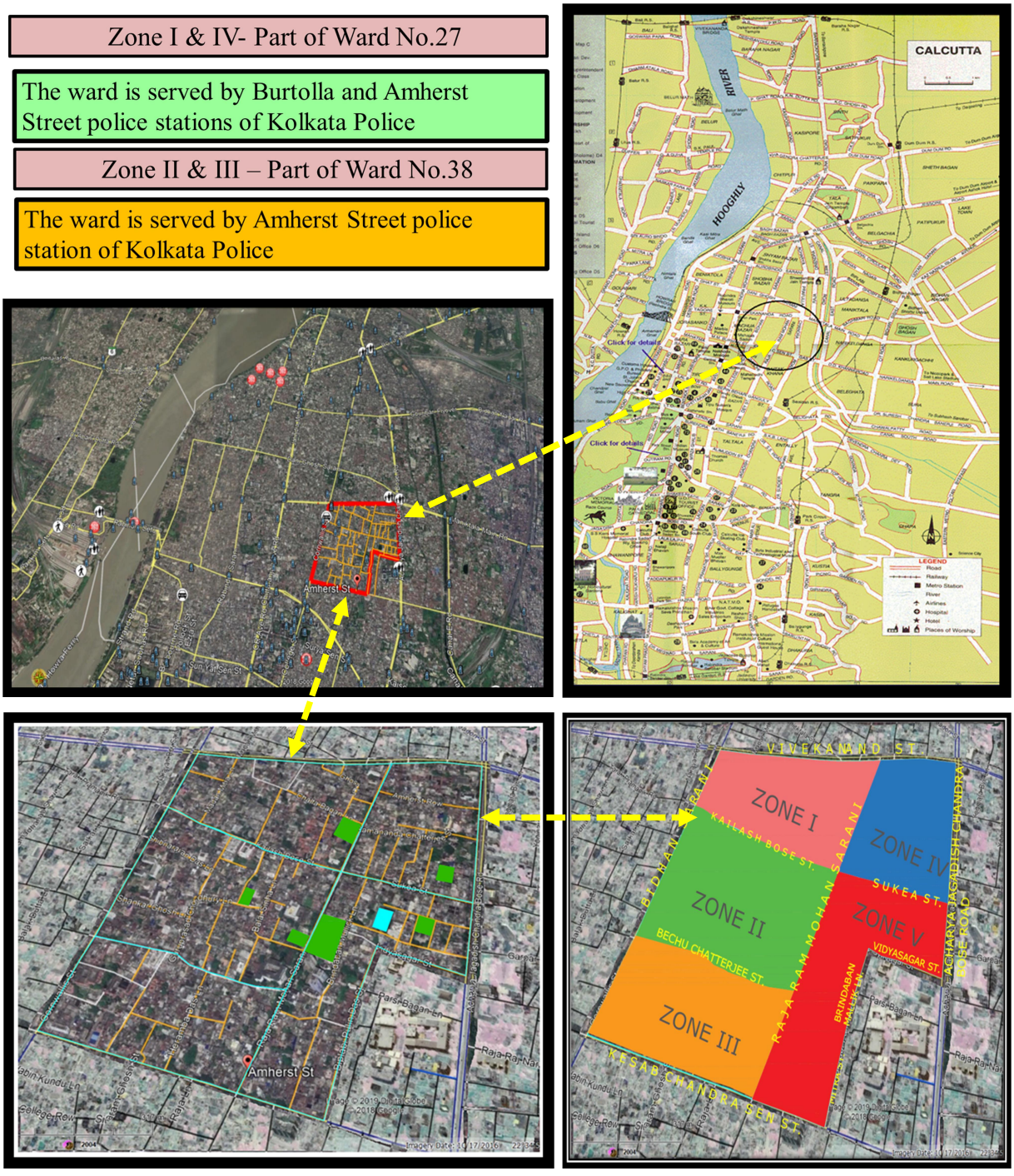


Fig 4.5 CLASSIFICATION OF SITE INTO ZONES

4.4 Zonal Level Study

- **Zone I**

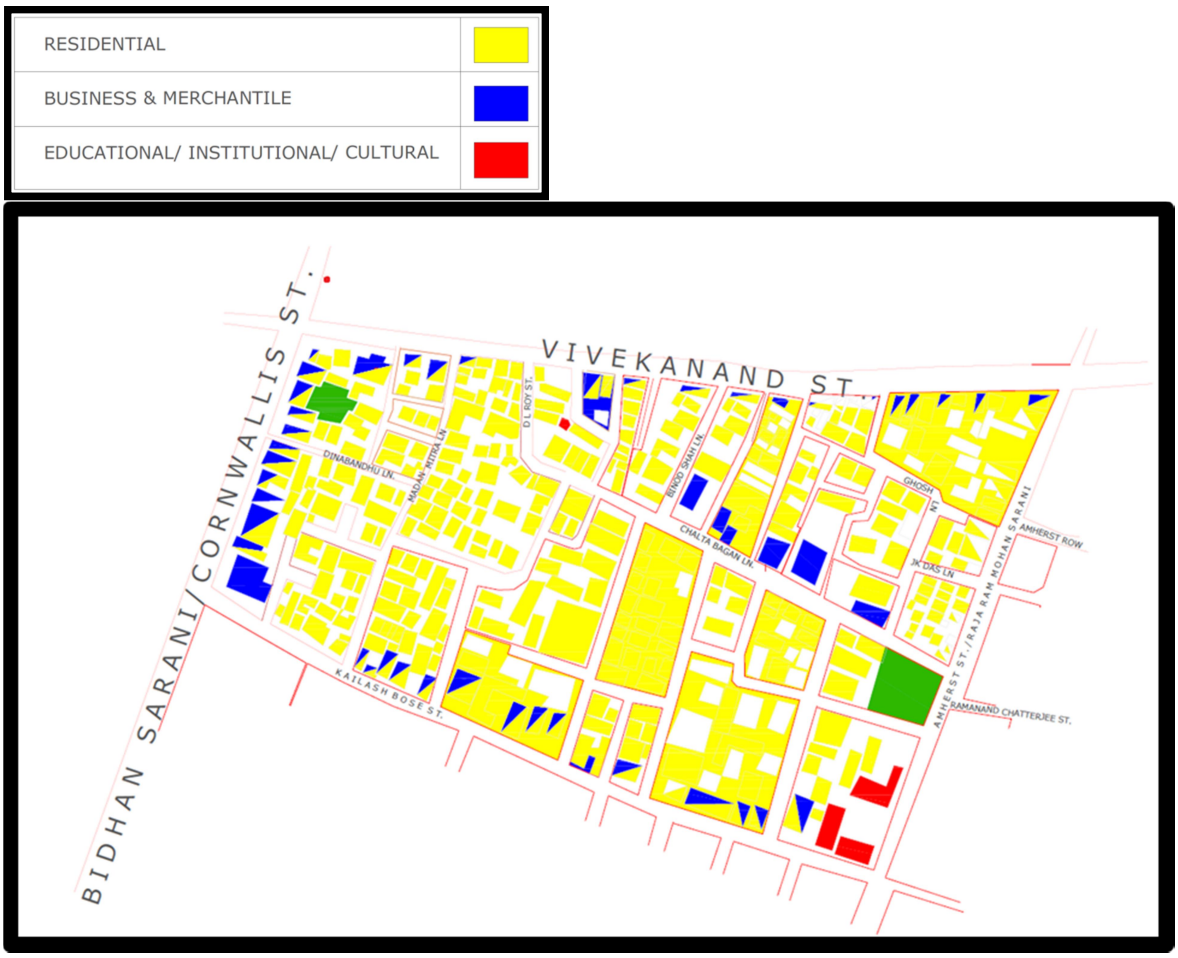


Fig 4.6 LAND USE PLAN OF ZONE I

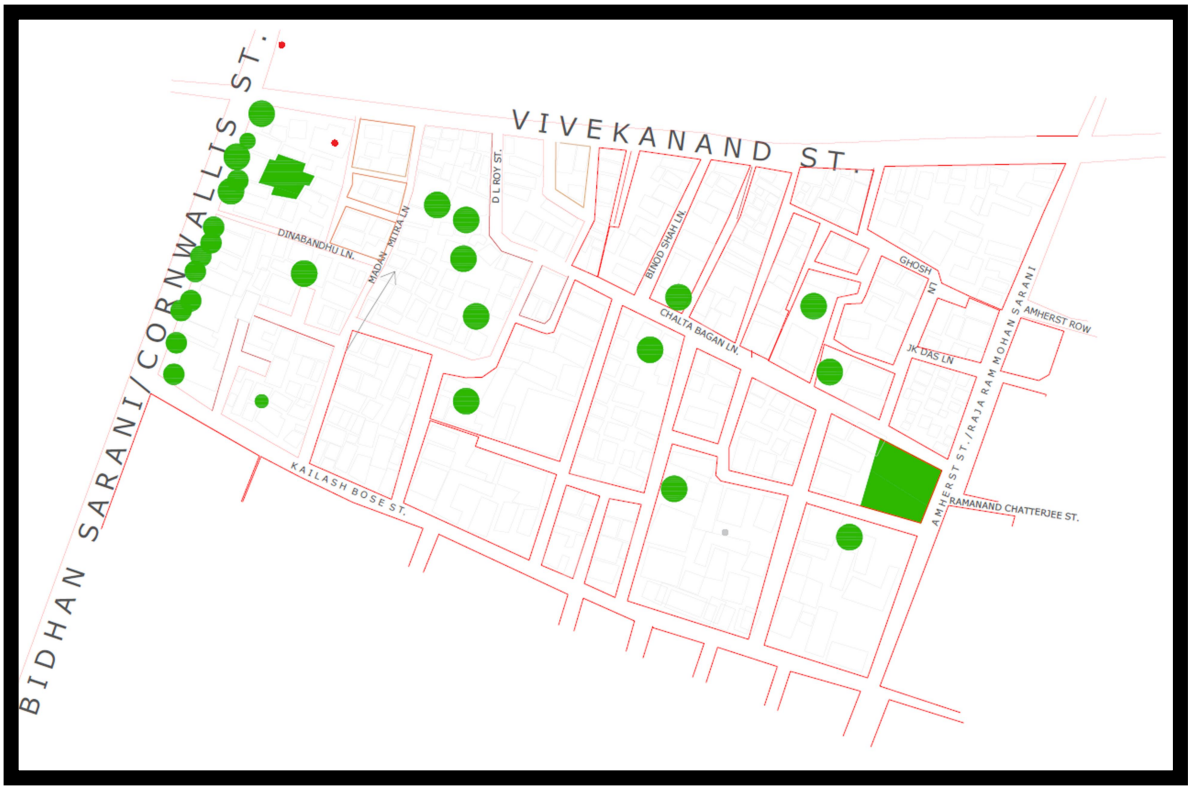


Fig 4.7 VEGETATION ON STREET OF ZONE I

Observations:

- **Land use:**
- Maximum residential use plots
- Some mixed land-use at the peripheral streets
- Institutional Building – Ram Mohan College

- **Vegetation:**
- Trees seen on the side of Bidhan Sarani
- Open green area near Ram Mohan College

- **Traffic:**
- Predominantly private owned vehicles seen on roads
- Motorcycles & cycles are mainly used
- Para transit mode of traffic includes rickshaw

- **Lighting:**
- Proper lighting on roads
- Miscellaneous:
- Ground floor of many buildings are closed & not in use

4.5 Application of Space Syntax Analysis

Maps made manually

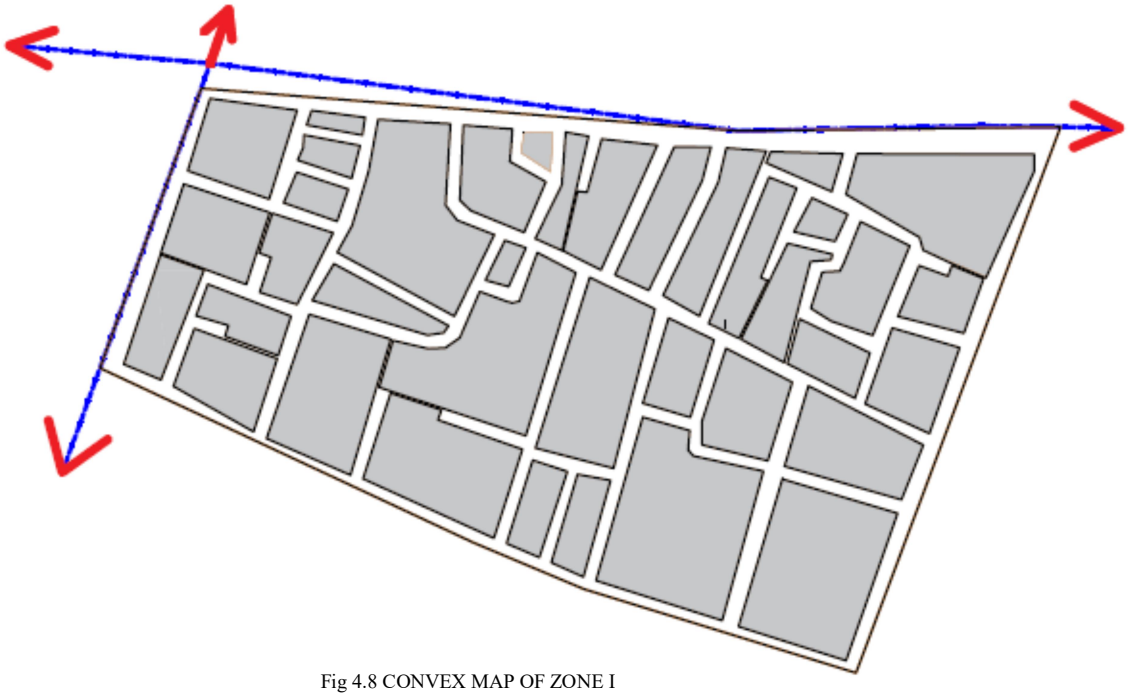


Fig 4.8 CONVEX MAP OF ZONE I

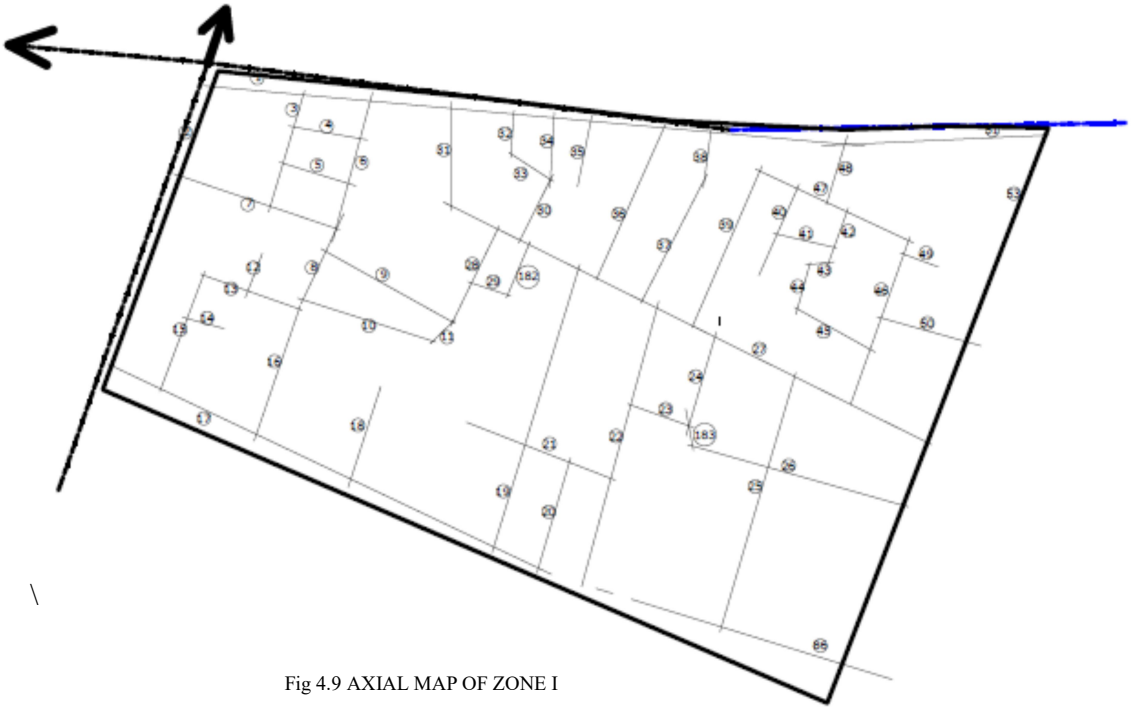


Fig 4.9 AXIAL MAP OF ZONE I

Graphs got from DepthmapX software

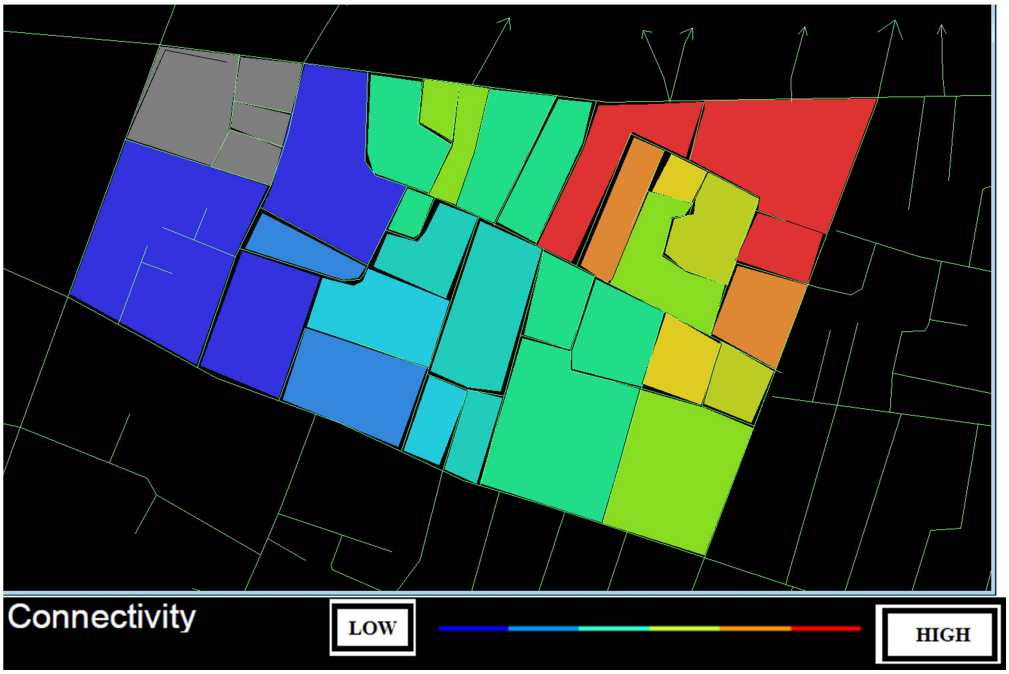


Fig 4.10 CONNECTIVITY MAP OF ZONE I

Fig 4.11 AXIALY MAP OF ZONE I FROM SOFTWARE

Observations –

Areas marked with red colour have maximum connectivity

Naming of Spaces for Space Syntax Analysis(Done Manually)

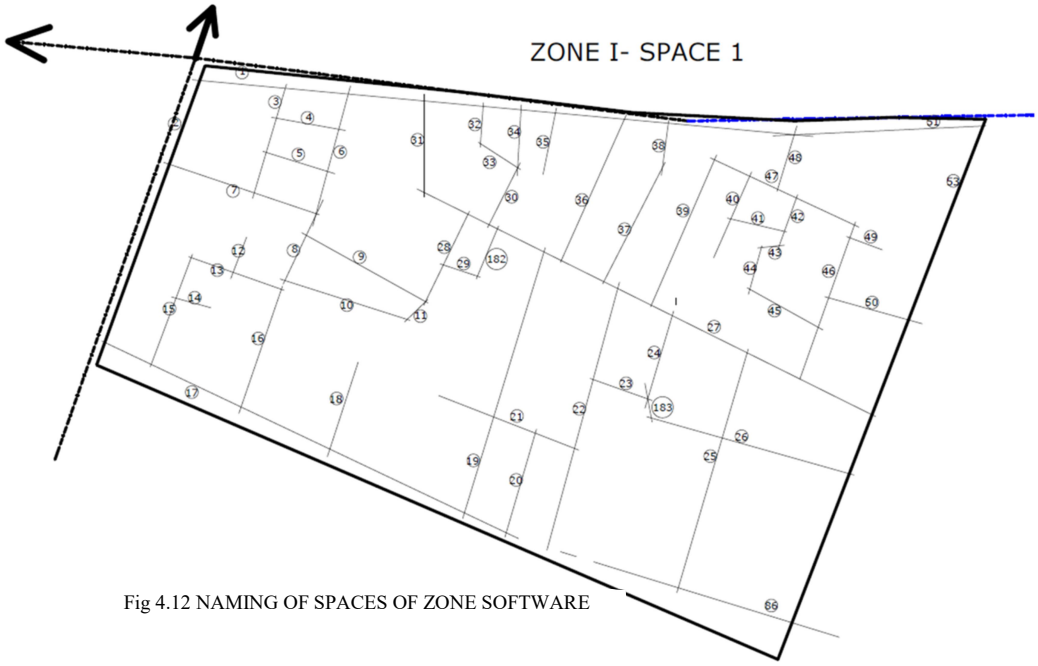


Fig 4.12 NAMING OF SPACES OF ZONE SOFTWARE

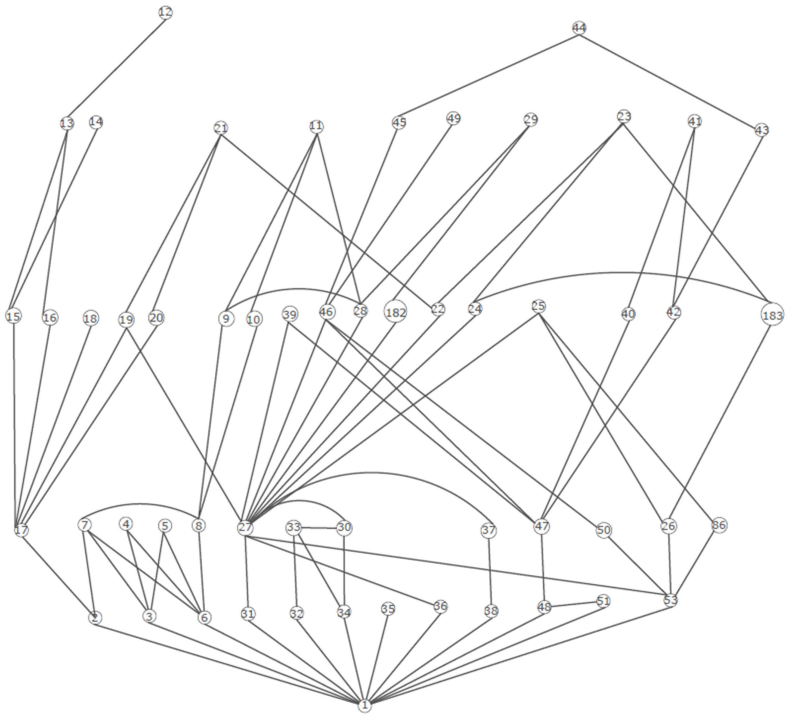


Fig 4.13 ANALYSIS OF DEPTH FROM SPACE 1(DONE MANUALLY)

Calculation of Connectivity,Depth,Integration& Control Value for Space 1 (Done Manually)

CONNECTIVITY OF
SPACE 1=12

GLOBAL DEPTH=1*12 + 2*13 + 3*17 + 4*10 + 5*2
=12 + 26 +51 +40 +10=139

MEAN DEPTH=(1*12 + 2*13 + 3*17 + 4*10 + 5*2)/54
=(12 + 26 +51 +40 +10)/54=$\frac{139}{54}$=2.574

INTEGRATION=1/2.574=0.389

CONTROL VALUE=$\frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \frac{1}{2} + \frac{1}{2} + \frac{1}{3} + 1/1 + \frac{1}{2} + \frac{1}{2} + \frac{1}{3} + \frac{1}{2} + 1/5$
=
CONTROL VALUE=$3*\frac{1}{3} + \frac{1}{4} + 2*\frac{1}{5} + 5*\frac{1}{2} + 1$
=1 + 1/4 +2/5+5/2 +1=2+0.25+0.4+2.5=5.15

Fig 4.14 CALCULATION OF CONNECTIVITY, DEPTH,INTEGRATION & CONTROL VALUE FOR SPACE-1

4.6 Areas Identified where Crimes were performed:

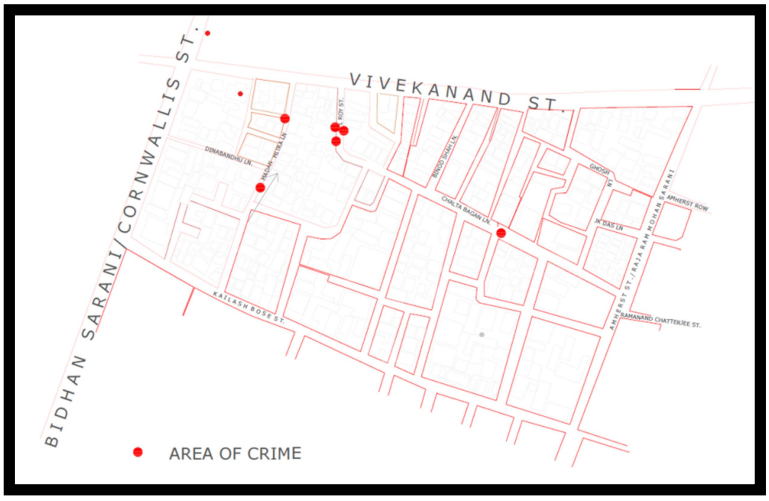


Fig 4.15 AREAS IDENTIFIED WHERE CRIMES WERE PERFORMED

Space Syntax Analysis of the Area Connectivity Map

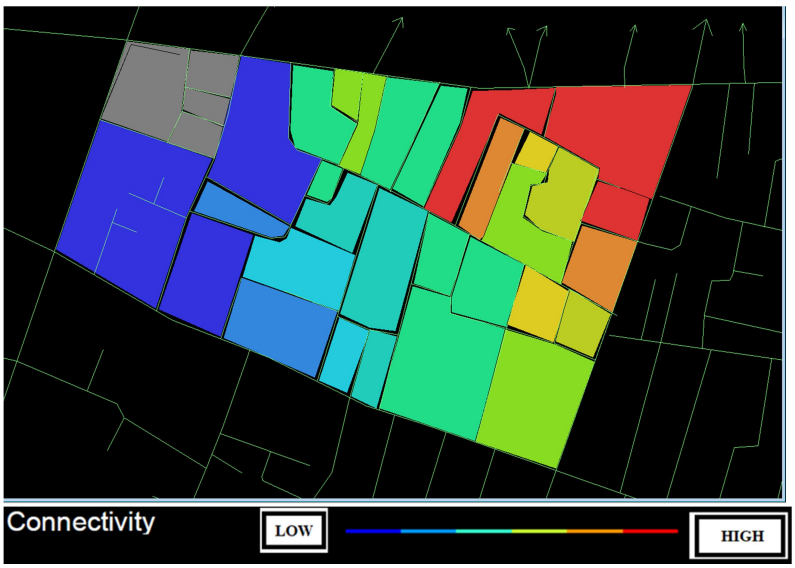


Fig 4.16 CONNECTIVITY MAP OF ZONE 1

Comparing the Crime Committed Areas & Connectivity Map

- Maximum crimes have been committed in those areas where the SSA connectivity map shows least connected area
- The area with best connectivity has no crime committing record

4.7 Analysis of Zone 1 as per Space Syntax Analysis:

- The area has urban forms with organic shape. This causes low level of clarity to read the space.

- There is more than one possibility to reach one space from another. Hence, the possibility to choose an alternative route increases the level of safety.

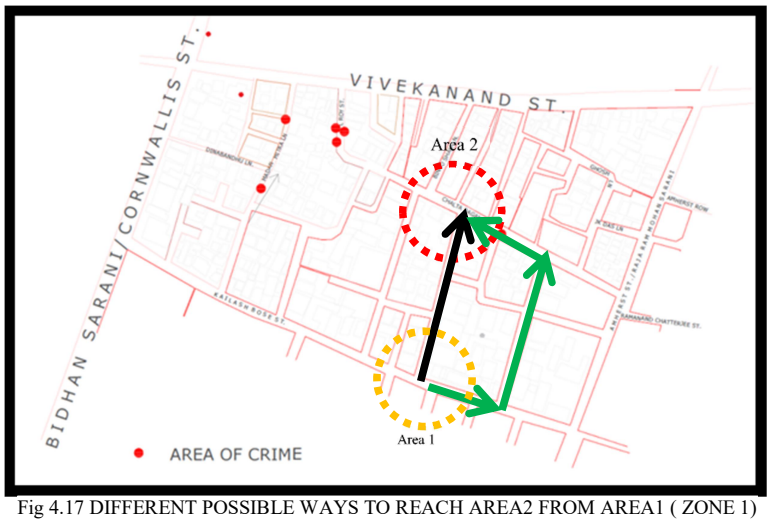


Fig 4.17 DIFFERENT POSSIBLE WAYS TO REACH AREA2 FROM AREA1 (ZONE 1)

There are many possible ways to reach Area2 from Area1.These possibilities increase the level of safety.

- There are certain streets with barely any people around. This makes the street slightly uncomfortable to pass through at night

- There are certain streets on which we can't make any turn , hence making it unsafe.

4.8 Analysis of Zone 1 as per other concepts:

No clear demarcation between public space and private space. (Against the concepts of Eyes on street & Defensible space)

Certain streets have high walls which obstruct views of the street, contributing to a lack of security (Against the concept of Eyes on street)

There is absence of quality public spaces. So these spaces do not attract people. (Against the concept of Eyes on street)

Presence of building which are not maintained makes it more vulnerable to street crime. (As per Broken Window Concept)

ZONE 1:

Fig 4.18 MADAN MITRA LANE (ZONE 1)

Fig 4.19 CHALTA BAGAN LANE (ZONE 1)

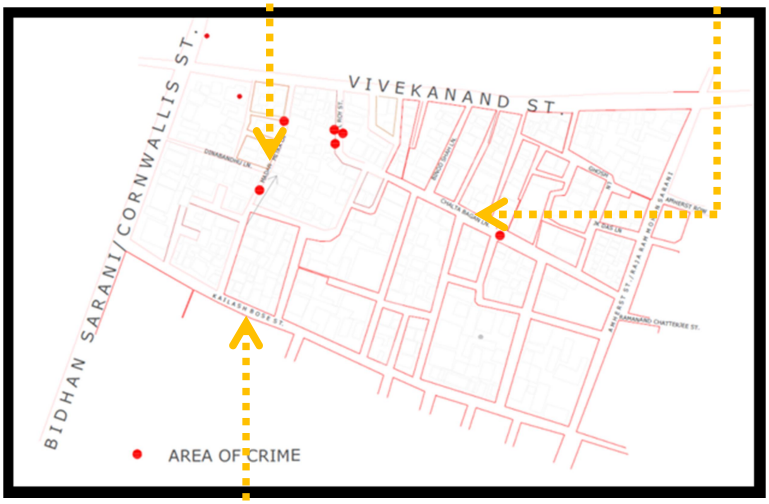


Fig 4.20 ZONE1

Fig 4.21 KAILASH BOSE STREET