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# THE SEARCH FOR SPATIAL ORDER IN SQUATTER SETTLEMENTS

## A CASE STUDY OF NEW DELHI, INDIA

A Thesis submitted to the Faculty of Graduate Studies and Research
In partial fulfilment of the degree of Master of Architecture

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# ABSTRACT

## Spatial order is inherent in all settlements

This statement forms the basic premise for the proposed research study. An attempt has been made to search for the inherent order in the seemingly "unplanned" squatter settlements.

Spatial order, an expression of the socio-cultural milieu of the residents, needs multi-disciplinary analysis. The research methodology selected encompasses the principles of spatial (morphological) analysis and the field work techniques of ethnography. Data has been collected empirically from the field. Since the proposed research uses a case-study research design, analysis and interpretation is qualitative rather than quantitative.

The study has been conducted in a trial and error, sequential process. Various models and methods have been used in this search for spatial order. The process tested the hypothesis at different levels --- geometric, functional and social, and finally documented the residents' viewpoints. This was deemed essential as the residents are the actual generators of this built environment. The first two levels could not verify the hypothesis on their own accord but when overlaid by the third component, all three added-up to indicate the existence of order in squatter settlements.

## L'ordre spatial est inhérent á toute communauté

Cette déclaration définit les principes premiers de l'etude proposée. Cette étude tente de révéler l'ordre inhérent à toute communaute de squatter qui affarait "non planifiée". L'ordre spatial en èntant l'expression socio-culturelle de l'environnement des habitants nécessite une analyse multi-disciplinaire. La methodologie de recherche sélectionée englobe les principes d'analyse spatiale (morphologique) et les recherches techniques ethnographiques de cas particuliers les données ont été synthétisées de maniére empirique. Etant donné que l'etude proposée repose sur des principes de recherche sur des études de cas, l'analyse et l'interprétation sont plus qualitatives que quantiatives. L'étude a éte élaborée suivant un procédé de sélection basé sur une échelle d'erreurs. Des modèles et méthodes variés ont été

utilisés pour cette recherche. Le procédé testait les hypothèses à des niveaux différents — géometrique, fontionnel et social, et finalement documentait l'opinion des habitants. Ceci frit essentiel puisque les habitants sont actuellement les générateurs de leur environnement construit. Les deux premiers niveaux n'ont pu corroborer l'hypothèse d'eux - mèmes mais aussitòt rattachés au troisième élément, tous trois permettaient alors de démontrer l'existence de l'ordre dans les communautés illêgales de squatter.

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# CHAPTER 1: INTRODUCTION

## 1.1. PREFACE

For centuries human beings have built residential agglomerations to satisfy their physical and social needs. Whether the shelter erected took the form of a simple tent, a cluster of huts or it occurred within the framework of towns and cities --- it expresses spatially the human need for social contact with other fellow human beings. The variety emerges as a direct consequence of the way this trait is interpreted by a given group of people at any given time. This trait, when translated to spatial systems, generates various settlement forms and patterns. Systematising of space, in turn, provides a framework for the desired social intercourse in any settlement. So spatial systems are not only a result of, but also provide a guide to the convention of behaviour and civil conduct for any society at a particular time.

In the present context, urban developments represent a high degree of social, cultural and spatial sophistication. The city is characterised by a large variety of settlement patterns and forms, coexisting in dynamic equilibrium within a single spatial system. The patterns generated are a result of complex micro- and macro-level influences. Among the different problems that beset the city, housing forms a major issue. In the context of continuous rural-urban migration, the speedy provision of mass-scale housing becomes critical. Although many approaches have been attempted to solve this problem, little success has been achieved through conventional methods. On the other hand, the people have responded to their housing problems by building squatter settlements. These settlements represent an entirely unique housing solution. Inspite of being labelled as chaotic and haphazard, they meet the housing needs of nearly half the urban population in the third world countries. It is, then, pertinent to study these settlements in terms of their value as spatial expressions of a particular client group. Or to rephrase the above statement --- What do these settlements mean to architects and planners?

This question has been the focus of many studies in previous years. A large proportion

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emphasize on the study and documentation of these dwellings in squatter settlements. (see literature review, section 1.2). But what is missing, perhaps, is the knowledge of the spatial systems in which these dwellings are grounded. The spatial configuration of any environment is dictated by the socio-economic levels and cultural values of the people using the space. Spatial organisation is also a measure of the human attempt to use this territory efficiently, a definition which focuses on the ecological processes by which resources are utilised. All these being characteristic features of a given society, when translated to spatial systems, generate order and organisation of space for the society to function in. This order may not be apparent or evident at a cursory glance. But any space capable of being used, must logically have some spatial order. This, then, formed the basis for the current study that attempts to begin a search for this innate and natural order in squatter settlements.

## 1.2 NEED IDENTIFICATION AND RATIONALE

Starting with the premise that all human settlements possess order, the search for this order in squatter settlements can be given shape only through defining the contextual background of these settlements in existing literature. At this point, it becomes pertinent to chronicle how squatter settlements have been perceived by different literature sources. The review encompasses perspectives from the fields of architecture, planning, economics, geography, ethnology and anthropology.

### 1.2.1. The Squatter Settlement in Focus

The beginning was marked by the pioneering efforts of Turner in the 1970s. His insight into the whys and hows of squatter settlements crystallized these settlements as symbols of contemporary planning alternatives. He viewed these settlements as the residents' successful and effective articulation of their needs and priorities. Based on this perception, Turner advocated a new direction for housing which placed the users at the centre of the decision-making process. (Turner, 1976).

This radical reconceptualization led to increased awareness and interest in squatter settlements and also gave birth to the concept of self-help housing. Numerous studies

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conducted thereafter have debated and enriched the ideology presented by Turner. Interest in squatter settlements also increased through the study and documentation of vernacular settlements. The well-known exhibition "Architecture without architects" (Rudofsky, 1965) brought to light the elements of vernacular architecture —— an architecture built without the design professional. As an extension, researchers started to analyze squatter settlements in the same context. (Rybczynski, 1984).

Today, an astoundingly large volume of research is available on different aspects of squatter settlements. It was necessary, therefore, to categorise and classify the literature reviewed into the following:

## 1.2.1.1. The Dwelling

Many studies focus on the dwelling units and their various features in the squatter settlements. This is usually supplemented by a discussion of the physical setting of these dwellings. Documentation may either be in the form of measured drawings (Rybczynski, 1984) or, as is usually the case, be predominantly in the form of photographs, plans and sketches (Musandu,1993; Popham, 1993; Tipple, 1991; Dulgeroglu & Akcali, 1991; Duchhart, 1989; Vigier, 1987). These studies, coupled with a large number of articles from journals like the National Geographic and the UNESCO Courier (Bergamo & Camarotti, 1996; Putman, 1994; Montes & Montes, 1993; Hasan, 1991) reveal the physical characteristics of low-income settlements in different parts of the world. Through an overview of this literature it becomes evident that squatter settlements all over the third world have similar physical characteristics. Some examples are the:

- high density of the resident population, (can be as high as 400-500 persons per acre)
- use of temporary, scrap materials for the construction of the dwellings,
- extension of nearly all household activities into the public realm of the street,
- development of ghettos within the squatter demarcating different clans and / or economic and political factions, and an
- expression of the strong clan interaction spatially.

Despite culturally varying regional types, the presence of such similar basic elements tie the

different settlements together. This makes the research findings analyzed for any one settlement relevant to other settlements in different contexts.

## 1.2.1.2. Constraints as Determinants

The cultural, social, economic, demographic and political factors / constraints which determine the physical environment in squatter settlements have been documented by a number of studies. "Survey of slum and squatter settlements" by UNCHS (Habitat) in 1982 may be viewed as a handbook that discusses these issues within the context of the third world. The interest in such studies seems to have declined in the recent years (Hyland, 1985; Rent & Rent, 1978; Dwyer, 1975). Generally, this kind of study either forms the prerequisite for research involving evaluation of housing proposals and discussions on planning policy (Choguill, 1994; Oushi, 1994) or is considered a common known denominator understood by the reader.

Enumeration and analysis of the economic constraints under which people build squatter settlements form the focus of another category of research studies (Norton, 1990; Buckley, 1989; Reid, 1962; Foote, 1960). This constraint is, often, the primary determinant for the emergent built environment in squatter settlements.

## 1.2.1.3. Social Issues

There is a large volume of research discussing the social problems which characterise squatter settlements. High population density coupled with low-income levels resulting in unhygienic conditions and health related problems, issues related to women and children and various other social and moral issues are some of the main areas of focus. (Smith, 1994; Malombe, 1992; Cotton and Franceys, 1991; Rent & Rent, 1978; Pacey 1978; Dwyer, 1975).

## 1.2.1.4. Evaluations and Solutions

Many studies attempt to explore new approaches to solve the problems besetting squatter settlements. Accompanied with the proposed solutions, usually, is an evaluation of the

same. These studies deal with various issues related to self-help housing, resettlement proposals, slum upgradation, community participation and enablement (Banerjee & Verma, 1994; Baum, 1994; Peattie, 1994; Siddiqui & Khan, 1994; Ajibola & Deshmukh, 1992; Hamdi, 1991; Quadar & Weber, 1990; Linden, 1986; Buckley, 1985; Ward, 1982; Turner, 1976) and post-occupancy evaluations (Choguill, 1994; Dulgeroglu, 1991; Diacon, 1990; Schmidt-Kallert, 1990; Rent & Rent, 1978). A number of studies also discuss innovative building techniques used within the context of the squatter settlements as solutions. (Tipple, 1992; Hasan, 1991; Skinner, 1991).

## 1.2.1.5. Planning and Policy

Another major focus for research studies is the analysis of housing policies and their effect on the funding, control and development and improvement and upgradation of squatter settlements. (Caldrich & Sandhu, 1995; Lee, 1995; Chant & Ward, 1993; Watson & Potter, 1993; Wilkinson & Kardash, 1992; Potts & Mutambirwa, 1991; Essayed & Shembesh, 1987; Lohman & Martens, 1986; Moser, 1989; Angel & Boonyabanche, 1988; Murison, 1980).

## 1.2.1.6. Results of the Review

The purpose of creating the above categories was to:

- identify the major research areas which may be useful for the proposed study. The review presents information ranging from micro- to macro-level issues. This review was hence necessary to establish the context for the proposed research.
- highlight the necessity of including the expertise of the social sciences in the study of squatter settlements. Hence, the review paves the way for adopting a multi-disciplinary approach for the proposed research.
- pinpoint the absence of any attempted search for the ordering principles of the squatter settlements.

The squatter environment has been researched for its physical, social, cultural and economic features. However, the theoretical abstractions (if any), which may be derived from these

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observations have not been conceptualized. The review, therefore, validates the need for the proposed study, by identifying a "gap" in the research base.

## 1.2.2. The Research Hypothesis

The study is based on the premise that spatial order is inherent in all settlements. This, then, is the statement which forms the hypothesis for the current study.

At this point it is appropriate to further strengthen the need for this study by citing a research closely related to the selected topic. An article by Kellet and Napier (1995), Squatter architecture? A critical examination of vernacular theory and spontaneous settlement with reference to South America and South Africa, underlines the need to understand not only the product but also the process dynamics of spontaneous settlements. The authors delve on the supercilious attitude of mainstream architecture to vernacular and squatter settlements. Through this comparison, they spell-out the lack of information about the spatial patterns and configurations seen in the squatter settlements. (pp. 7-8).

The proposed research study raises a pertinent question. This study, may not be able to derive conclusive evidence due to the small sample size, but will necessarily bring out the major issues related to the topic. Further, the knowledge of the spatial order in these settlements may give an insight into the spatial patterns created by the people's needs and priorities. This can aid in the sensitive upgrading of low-cost housing settlements --- providing solutions which are responsive to the existing spatial patterns. An understanding of the existing phenomena of squatter settlements can induce a positive attitude within the professional community working in close proximity with these settlements. This results through a scientific rationalization of spatial configuration and recognition of the role of the residents in the generation of this built environment.

## 1.3. BUILDING A THEORETICAL FRAMEWORK

### 1.3.1. The Key Words: Settlement, Spatial Order, Determinants

The delineation of the research question is followed by the need to define the key words for

the proposed study. The key words present a gradation of information — "settlement" provides the context, "spatial order" the actual research area, and "determinants" the elements and factors resulting in spatial order. This gradient has been highlighted by a series of questions, which are as follows:

### 1.3.2. How can settlements be defined ?

Doxiadis (1968) defines settlements as being characterised by:

- "man (and society) or the content, and
- the physical settlement or the container" (p. 21).

This definition encompasses both the natural and man-made elements of settlements. The above two basic elements may be further sub-divided into the following elements:

- "Nature, providing the foundation upon which the settlement is created and the framework within which it can function
- Man
- Society
- Shells, or the structures within which man lives and carries out his different functions
- Networks, or the natural and man-made systems which facilitate the functioning of the settlement" (Doxiadis, 1968, p. 21).

However, to study any settlement, it is essential to analyse the interplay of these five elements.

### 1.3.3. What does this interplay generate ?

The interplay of the elements and their functions finds abundant expression in the spatial relationships in any given settlement. The order in the built environment is characterised by an organisation of

- "Space
- meaning
- communication, and

- time." (Rappaport, 1979, p.36).

It is evident that organisation permeates any given built environment at different levels. The organisation of space results in generating organisation of meaning, communication and time. In other words, built environments represent physical expressions of the ordering systems of time and context. "These ordering systems are the result of an universal property of the human mind, the need to impose order on the world and make it meaningful." (Rappaport, 1979, p. 38).

### 1.3.4. How can this order be defined ?

Order usually conveys a "reduction to simple geometrical shape and standardisation...favouring basic physical function over expression." (Arnheim, 1977, p. 162). This definition has been coloured by the patterns of apparent geometrical symmetry and harmony in natural forms and man-made settlements. However, when comprehended as being "indispensable to the functioning of any system...order is possible at any level of complexity." (Arnheim, 1977, p. 162). This definition highlights the inherent nature of order in any system. Having established the settlement as a system consisting of man, time and space, it follows that order is a necessary component of all settlements.

### 1.3.5. But, what are the determinants of spatial order ?

The five elements of settlements spelt out by Doxiadis present the basic determinants of spatial order. However, these elements interact with each other to add spatial, social, cultural and temporal dimensions to the settlement. Varying degrees of this interaction result in diversity --- "diversity" here may be classified into two distinct forms, emerging due to the fact that

> "Some societies appear to invest much more in the physical patterning of space than others, while others have only seemingly informal and 'organic' patterns." (Hillier & Hanson, 1984, p. 18).

The first type evolves spatial patterns that are based on a universal rationale derived through intellectual reasoning. The second results in "organic patterns" which express individual

choices at the micro-level. But the question arises as to why should these patterns differ across different societies. "Could it be that different types of society requires different kinds of control on encounters in order to be that type of society?" (Hillier & Hanson, 1984, p. 4). This points to the fact that settlements across the globe vary not only in physical configurations but also in the "degree to which ordering of space appears as a conspicuous dimension of culture." (Hillier & Hanson, 1984, p. 4).

Therefore, socio-culture criteria form a major organisational force in the settlement. This viewpoint is further elaborated by Rappaport (1979), "the way cities, regions and countries look depend, in the final analysis on the design activity of many individuals and groups at different times." (p. 35). So in order to study settlement patterns it is essential to analyse the socio-cultural features of the people who generate these patterns.

### 1.3.6. How can spatial order be analyzed ?

Some major approaches are:

- Morphological analysis: It is a technique which studies the spatial characteristics of settlements. Understanding the spatial organization of settlements is undertaken through an analysis of the functional and the volumetric layout. Data collection is empirical. (Nanda, 1991, pp. 26-36; Georgalli, 1989, pp. 13-18; Vigier, 1987, pp. 24-29; Hakim, 1986, pp. 63-101).

- a-analysis of settlements: This model of analysis "sees a settlement as a bi-polar system arranged between the primary cells or buildings and the carrier (world outside the settlement)." (Hillier & Hanson, 1984, p. 82). The objective of the analysis is to permit the quantitative analysis of the spatial patterns.

- Ethnographic models: A large number of studies analyze settlements through a study of behavior patterns, lifestyles etc. The advantage of this model is that it provides means of describing the group or culture. It uses fieldwork techniques and "judgmental sampling techniques are [often] used." (Fetterman, 1989, p. 19).

- Geographical Information Systems (GIS): The typical GIS is founded on several basic concepts. "First, real-world features on the Earth's surface are related to a map grid

coordinate system and recorded in the computer. Second, map features can be displayed or plotted at any scale. Third, a GIS can analyze spatial (locational) relationships among the map features." (Korte, 1997, p. 8). These spatial relationships are usually a series of factors of physically or socially related to the land. Examples are topography, land cover, road network, soil types, density of built-up areas etc. (Laurent, 1990, p. 2).

- Anthrophysical Analysis: This method studies the morphology of a built environment through documenting human behavior over long time periods. "This approach is termed anthrophysical to emphasize the contention that physical design cannot exist independently of human need." (Vickery, 1972, pp. 3-5, 41-71). It is a very effective method to intertwine the socio-cultural and physical attributes of any settlement. This method has been tried for village and tribal communities. These settlements are not as complex as the urban environment and are thus amenable to this kind of timestaking, hands-on approach.

These models present some viable approaches towards the solution of the current query. The choice of the appropriate model will be governed by the resources available as well as the nature of data collected from the site and physical surveys.

## 1.4. GOALS AND OBJECTIVES

This study aims to provide a theoretical conception of the squatter settlement. Through the conceptualization of the planning principles of the squatter settlements, an understanding of the strengths and limitations of the settlement as a prototype will be attained. This will, in turn, aid in the generation of:

- effective upgrading programs
- targeted investment policies
- cohesive community organization, and
- viable strategies for the management and upkeep of the spatial structure.

Therefore, the objectives of the proposed study are:

- To comprehend the spatial typology for squatter settlements, and to use it

- To determine the existence of spatial order in these settlements; and thereafter to quantify it.

The goals and objectives of the study, themselves, pinpoint the intended target or audience of the proposed research to be the professionals working for and in the squatter settlements. These may include economists, bankers, government and other bureaucratic officials, architects, planners, social scientists and NGOs and other voluntary organizations working on-site, as well as future researchers.

## 1.5. RESEARCH METHODOLOGY

Based on the literature review presented, it may be concluded that spatial order is a direct reflection of the social networks and ordering of the society at large. As a consequence, this study relies on data collection and analysis based on:

- the selection of an appropriate method to study spatial order in any settlement (through review),

- the documentation of the physical elements and their inter-relationships in the built environment,

- the qualitative study of the lifestyles and activities of the residents, and the researcher's and residents' perceptions of the cultural connotations of the existing spatial patterns.

### 1.5.1. The Research Design

To study the above effectively, a case study design of research has been followed. Defining the case study as a research design, Young states that "case study is a method of exploring and analysing the life of a social unit, be it that of a person, a family, an institution, cultural group or even the entire community." (Ghosh, 1982, p. 215). The aim of the case study is explain the complex behavioral patterns of a unit. This method may be used for the discovery of new facts and the formulation of valid hypotheses

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## 1.5.2. Data Collection

Principles of housing and ethnographic research have been be utilised to collect data. The researcher has collected empirical data through the various methods listed below.

### 1.5.2.1. Secondary Sources

Before embarking on the field surveys, it was essential to formulate a framework for the research study. This entailed an understanding of the critical issues related to the key elements of the research question, namely "settlement", "spatial order" and its "determinants". A significant part of the review, however, has been to enumerate the various methods used by previous researchers to study spatial order in settlements. Based on this review and the resources available to the researcher, an appropriate method for the study was selected. Secondary sources included primarily books, articles, government reports and survey of previous unpublished theses, lectures and class notes.

### 1.5.2.2. Reconnaissance Survey

Prior to the final selection of the case study, a quick survey of the region was undertaken. This helped to streamline and rationalize the analysis of the spatial patterns of the settlements.

### 1.5.2.3. Field Work

Fetterman (1989) has described fieldwork as "working with people for long periods of time in their natural setting." (p. 41). Fieldwork conducted by the researcher can be divided into the following categories:

- Observation formed a vital tool in the analysis of settlement patterns. Varying degrees of participant and non-verbal observation has been undertaken to interpret the behavioral patterns of the residents. Participant observation may be defined as "...participating in the lives of the people under study with maintenance of a professional distance that allows adequate observation and recording of data." (Fetterman, 1989, p. 45). This method relies on interviews predominantly. Non-verbal

techniques, on the other hand, involve a recording of on-going behavior of a community without the need of any intrusion as may be caused by interviews. (Pelto & Pelto, 1978, p. 103-104).

- Interviews help to achieve quantification, representativeness, specificity and comparability in observation. General interview types included structured and semi-structured (verbal approximations of a questionnaire), informal (casual conversations with specific agenda) and retrospective interviews. (Pelto & Pelto, 1978, pp. 77-78; Fetterman, 1989, p. 48).

- Sampling Design selected was purposive or non-probability type, that is "the researcher relies on his / her judgement to select the most appropriate members of the subculture or unit, based on the research question." (Fetterman, 1989, p. 43).

### 1.5.2.4. Recording of Field Work

This was undertaken by making "diary notes". These notes contain details of non-verbal observations and interviews. They have been further supplemented by sketches and diagrams. Dairy notes have been helpful during the indirect and interpretative analysis. It was necessary to add-on measured drawings of some critical areas. Still photography proved invaluable in documenting lifestyles, daily activities and space usage in the settlement. This technique was able to provide an alternative for measured drawings at some points.

### 1.5.3. Analysis and Interpretation

The data collected by the above methods has then been analysed qualitatively. Some of the major heads for analysis are listed below:

- Spatial layout to study the morphological features (typology of open space)
- Activities delineating patterns of space usage.

### 1.6. SCOPE AND LIMITATIONS

Due to the constraints of time and other resources available to the researcher, the study is restricted to the analysis and interpretation of six squatter settlements in New Delhi, India.

The reason for the selection of New Delhi as the urban setting for the case study were as follows:

- The researcher, being a resident of New Delhi for the past twenty years, has a thorough understanding of the influences which affect the spatial systems of the city — or in other words the macro-level contexts of the case study are well understood.

- The knowledge of the socio-cultural environment of the squatter settlements, which forms a prerequisite for this study, is also available to the researcher.

Data collection for defining the cultural meaning of spatial patterns entailed discussions with the residents of the settlement. Care was taken to represent the perceptions of the residents of different age groups, genders and income levels. Due to its small sample size and restriction to one city, the findings can only serve as a pointer for further research.

## 1.7. THESIS ORGANIZATION

The thesis is divided into seven chapters. The second chapter builds-up the theoretical framework discussing various connotations of space and the evolution of the concept of spatial order. The third section embarks on the first part of the analysis — the morphological analysis. The fourth chapter presents statistical data defining quantitatively the findings of the third chapter. The fifth chronicles the procedure and results of the researcher's observations on-site. The sixth discusses the findings of the residents' interviews undertaken. The final unit presents the conclusions and recommendations.

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FIGURE 01.01: THESIS REPORT

**CHAPTER 1**: INTRODUCTION
**CHAPTER 2**: THEORETICAL FRAMEWORK
**CHAPTER 3**: ANALYSIS PART 1 – MORPHOLOGICAL ANALYSIS
**CHAPTER 4**: A NUMERICAL POINTER
**CHAPTER 5**: ANALYSIS PART 2 – ON SITE
**CHAPTER 6**: THE RESIDENTS PERSPECTIVE
**CHAPTER 7**: CONCLUSIONS AND RECOMMENDATIONS

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# CHAPTER 2: THE THEORETICAL FRAMEWORK

The preceding chapter delineated the key words of the current study. It also spelt-out the methodology, scope and limitations of the study. The current chapter will update the theoretical concepts mentioned in the previous unit. This section, therefore, formulates and synthesises the conceptual framework for the study. The information presented encompasses:

- The definition of spatial order, and

- its physical and social determinants.

The context of the term, spatial order, is provided through a study of its different connotations and images by different researchers. The section concludes with an analysis of the implications of spatial order in squatter settlements. This chapter is, therefore, a prerequisite for the analysis which follows in the next chapter.

## 2.1. UNDERSTANDING SPACE

Human interaction with the environment results in an imminent need to delineate and define space — a need originating from the desire to endow order, meaning and context into the diversity of events and actions performed in space. (Schulz, 1971, p. 9) The very basis of human existence is dependent upon the ability and efficiency with which these events and activities may be segregated into spatially defined boundaries — these boundaries being essential in generating social patterns and networks which, in turn, govern human behavior. The search for a meaning of space is, hence, a necessary prerequisite to any exploration of the physical realm of design.

"Space" as a conceptual entity can be studied in a variety of contexts. The multiplicity of its meaning is mirrored in the very usage of the term. The Shorter Oxford English Dictionary gives no fewer than 15 meanings for the term, including a "continuous expanse in which things exist and move", "an amount of this taken by a particular thing or available for particular purpose", and an "interval between points or objects." These definitions reflect

some of aspects of the term's understanding as used in day–to–day parlance. Human beings also establish relationships with space which then affects their response to it. Many spatial relations are used almost unconsciously — inside, outside; far away, close by; separate, united and continuous, discontinuous being only some illustrations.

Since the use of space is an almost intuitive, innate human response, for any study delving into the attributes of socio-spatial phenomena, the complexity of its connotations must be understood and unified. The following discussion delves into some theoretical descriptions and definitions of "space".

### 2.1.1. Absolute and Relational Space

In the last three centuries, philosophical discussions within the social sciences have been dominated by a dichotomy of "space" being perceived as an absolute versus a relational entity. The pioneer of visualizing "space" as absolute was Isaac Newton, who defines spaces as "containers of infinite extension or duration." Aristotle also describes space as "the container of all objects." (Madanipour, 1996, p. 5).

Leibniz, provided the first major opposition to the above concept by defining space as "the order of co-existing things, or the order of existence for all things that are contemporaneous." (Bochner, 1973, p. 297). This implies that space consisted in the relationships between non-spatial, mental items. (Speake, 1979; Smart, 1988). Kant defines space as "belonging to the subjective constitution of the mind and not an empirical concept - -- beyond our subjective condition, the representation of space has no meaning whatsoever." (Madanipour, 1996, p. 5). Some other scholars preserved the reality of space by asserting that "the container is not logically distinct from the things it is said to contain." (Speake, 1979, p. 309).

Both these concepts actually describe the same phenomenon. To quote Einstein, both these conceptions of space "are free creations of the human imagination, means devised for easier comprehension of our sense experiences." (Madanipour, 1996, p. 7).

## 2.1.2. Space: Mass and Void

Architectural space can be distinguished in two ways: the first, is "to make space distinct", a normative dimension encompassing the arts and architecture, and the second, is "to state the precise nature of space", a descriptive dimension that is the concern of philosophy, mathematics and physics. However, it is the enclosure of space, rather than the space itself, which is significant. (Tschumi, 1990, p. 13).

Zevi (1957) follows the same line of thought to categorize urban space as "voids" that have been limited to create an enclosed space. "Since every architectural volume...constitutes a boundary, a pause in the continuity of space, it is clear that every building functions in the creation of two kinds of space: its internal space ... and its urban space, defined by that building and others around it." (p. 30). This concept highlights space as being organized into meaningful form through a process of limitation.

The most critical argument in this abstraction is its dependence upon human perceptions. The impressions of mass and void are interdependent on the human experience of a particular environment.

## 2.1.3. Physical And Social Space

Space may be defined as social and built space. The social space is "the spatial implications of social institutions...[whereas, the built component focuses on]...its morphology, the way it affects our perceptions, the way it is used, and the meanings it can elicit." (Colquhoun, 1989, p. 223). Physical and social space may be equated to form and function as seen in architectural language. For any study of the built environment, it is only logical to analyze both these components.

## 2.1.4. Abstract Space

The form of the "social space" referred to above can be specified as "encounter, assembly, simultaneity." (Lefebvre quoted by Liggett & Perry, 1995, p.1). Space, in this context, is no longer dead, undialectical and immobile. (Lefebvre quoted by Liggett & Perry, 1995, p. 1)

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Lefebvre identifies a system of perceived, conceived and lived spaces as the basic kinds of social space, which are linked through dialectical interrelationships. The first refers to the way space is organized and used. The second segregates "conceptualized space, the space of scientists, planners, urbanists... the dominant space in any society...[signifying] a system of verbal signs." (Lefebvre quoted by Madanipour, 1996, p. 17). The third reflects upon representational space — "space as directly lived through its associated images and symbols. and hence the space of inhabitants and users." (Lefebvre quoted by Madanipour, 1996, p. 17).

This attempt to integrate the social and physical dimensions of space, or to contextualize the physical space into human practices, is a necessary viewpoint for understanding space. But this conceptualization will not be complete, or even valid, without taking into account the factor of time. "By analyzing the social processes involved in making of space...the element of time will be integrated...space arrived at in this way is dynamic: space at all possible scales...all changing yet embedded in their social context, allowing multiple but interrelated identities." (Madanipour, 1996, p. 30). Thus, space has physical, social and symbolic dimensions simultaneously. This, therefore, defines the line of research pursued by the current study.

The above discussion coerces the need to evaluate each of these different dimensions independently. The current study is restricted to the first two dimensions only, namely the physical and social. So only these two will be elaborated upon through further review.

## 2.2. THE PHYSICAL DIMENSION

One of the physical attributes of space, which can define and codify it, is "form". Although the Shorter Oxford Dictionary attributes many meanings to "form", such as shape, configuration, structure, pattern, organization, and system of relations, the concept is significant only in its relation to space — space acting as a setting for form to exist. In reference to the urban setting, form can represent the spatial pattern of elements composing the city — its networks, buildings, and spaces. "Form is a resultant of many forces or determinants interacting in a diverse manner through space and time." (Batty & Longley,

1994, p. 42). Therefore, the study of form, without considering the processes that give rise to it, is meaningless.

> "The association of form with process has two clear dimensions. The first is growth which...loosely embraces all types of change, and involves the notion that...objects are transformed through the diverse interaction of their forces. This has led to the term 'organic form'. The second dimension relates to function. The various processes which determine form have specific functions." (Batty & Longley, 1994, p. 42).

"The science of form" is morphology. (Shorter Oxford Dictionary, 1970). Morphology studies the "shape, form, external structure or arrangement, especially as an object of study or classification." (Shorter Oxford Dictionary). In biology, it has been defined as the study of "not only the shape and structure...[of organisms], but also of the size, shape, structure, and relationships of their parts." (The Encyclopedia Britannica). This term was first coined by Goethe as the "study of unity of type of organic form. Morphology is the study of form and process, growth and form, form and function." (quoted by Batty & Longley, 1994, p. 43).

Urban morphology may, then, be categorized as the systematic study of the form, shape, plan, structure and functions of the built fabric of towns and cities, and of the origin and the way in which this fabric has evolved over time. (Clarke, 1985; Small & Witherick, 1986; Goodall, 1987). Any system has two components — its statics and dynamics, the first impling structure and the second behavior. The form and structure of any system often provides a basis for classification which can then give an insight into the dynamics of the system.

The concepts of form and morphology are critical to the comprehension of space and its physical attributes. The study of form in the urban context can be conducted at different scales and in both two and three dimensions, referring to single buildings, blocks, urban quarters, the entire urban fabric and combinations of these. Another focus can be the space between these parts — generating the patterns of streets and squares.

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## 2.3. THE SOCIAL DIMENSION

"Human societies are spatial phenomena...It is through the society's realization in space that we can recognize its very existence." (Hanson & Hillier, 1984, pp. 26-27). But a society does not only exists in space; it also defines space by "...[locating] people in space to give rise to varying patterns of movement and encounter..." (Hanson & Hillier, 1984, pp. 26-27).

Therefore, spatial order is one of the most striking means by which the existence of cultural variations between one social formation and another, that is, differences in the ways in which those societies live become evident. This points to the social determinants of spatial order as being culture and human behavior.

### 2.3.1. The Dimension of Culture

Culture presents a code for abstracting and symbolizing behavior. Human response to the environment is mediated by symbols, which are, in turn, determined by cultural attitudes and values. These symbols condition a society's perception of its environment, in that they act as "filters" for human interaction with the environment. This cultural control is exerted in two different ways:

- human beings only perceive what fits into their existing concepts and symbols, and further

- culture attributes relative values to things that are perceived. (Gory & Pippin, 1981, p. 20).

The variety of cultural controls prevalent in different societies, therefore, contribute to the diversity of spatial forms which have been developed. These cultural variations through time and across the globe today highlight that:

- "Human interaction with the environment is active rather than passive.

- Human response to space is variable.

- The function of territory in humans varies from one cultural level to another." (Gory & Pippin, 1981. p. 20).

These three factors mentioned above highlight the need to enumerate the various aspects of

human behavior as a co-determinant of spatial order.

## 2.3.2. Human Behavior versus Spatial Order

Space acts as a setting for human actions. The primary behavioral forces shaping the environment are shown in Figure 02.01. The force vectors representing these basic behavioral drives must interact in space. This spatial field of interaction is commonly known as territory. The concept of territory reflects a progression of scale, that is, from micro to macro. "At any point in this scale continuum of territories, the basic drives...as force vectors always seem to be present in some form, varying enormously in degrees of organization and co-operative reinforcement." (Figure 02.02) (Williams, 1980, pp. 95-96). The concept of territory implies that there is a "correspondence of social groups and spatial domains", and that the dynamics of "spatial behavior will be concerned primarily with maintaining this correspondence." (Hanson & Hillier, 1984, p. 6).

Another direct consequence of the space-behavior interaction is the delineation of the four zones of spatial distances. The decisive factor in the formulation of these zones is the level of intimacy concomitant to each zone. These zones are:

- Intimate distance: 18" - physical contact
- Personal distance: 18" - 4'0" primary group relationships
- Social distance: 4' - 12' secondary group relationships
- Public distance: more than 12' formal communication (Linder, 1974, p. 27)

Although these zones are different for different cultures, they do highlight the universality of space as the physical attribute of human behavior. Space simultaneously orders human interactions and responses and gets ordered itself in the process.

The discussion above paves the way for examining the regulatory functions of space. Space controls social interaction by:

- separating or unifying people by distance (as mentioned above) and
- segregating them with boundaries.

Through these two controls, spatial structures pervade and order everyday life.

## Figure 02.01: The Primary Behavioral Forces

"Smallest spatial field of human interactions and performances — the setting of the smallest social groupings, conversation, work tasks, play etc. Arrows indicate force vectors which tend to shape the physical setting."
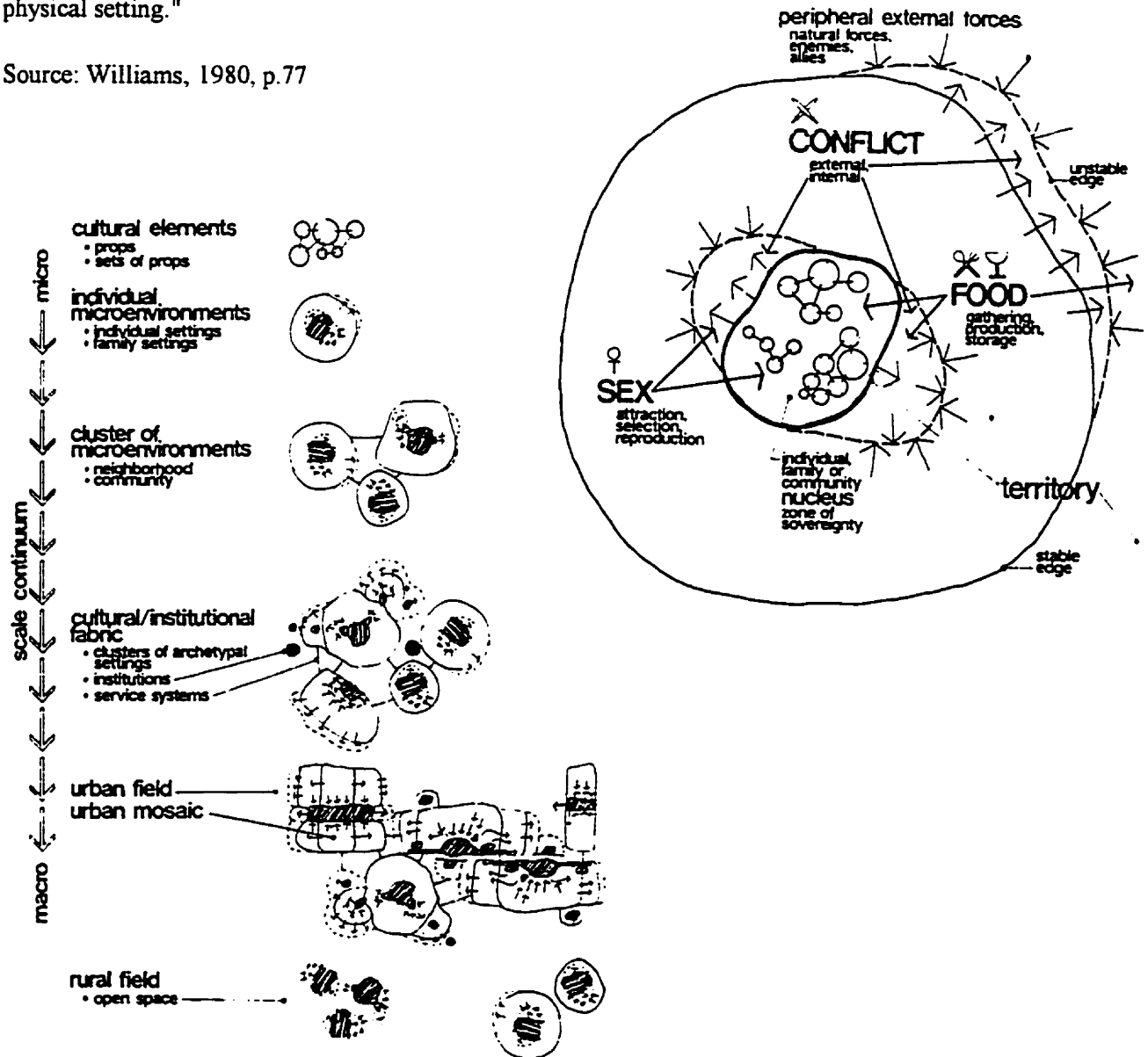
Source: Williams, 1980, p.77



## Figure 02.02: Territorial Scale Continuum

"Progression of territorial zones from the most intimate archetypal settings to community clusters in the urban and rural field."

Source: Williams, 1980, p. 96

All the components of human behavior discussed so far may vary for each individual community. Different cultural codes often alter the spatial expression of different societies to such an extent that it may become impossible at times to sift out the universal principles of the existing order. Whether a society lives in a dispersed or in a densely aggregated settlement form, the spatial order is based on generic principles of some kind. Any form of social grouping is necessarily an agglomeration and repetition of a "similar family of characteristic spatial themes." (Hanson & Hillier, 1984, p. 27). This elementary socio-spatial unit, hence, forms the basic building block of spatial order. It is through interrelationships of such units that patterns of spatial configurations emerge. An illustration is the family unit among the Iranian nomadic tribes, where each family unit is represented by a tent.

However, this concept of the family unit determining the spatial expression of the dwelling becomes extremely complicated in the delineation of the Islamic family at the village and / or urban scale. In the Islamic society, due to complexities of marriages, it becomes increasingly difficult to define the family unit itself.

> "Most marriages are of the exogamous type and even the composition of the family is not understood as being formed by the residence rule. For this reason, they cannot be recognized by their residence. Sometimes a poorer family becomes the ward of a wealthier and stronger family. This wealth is the main determinant of the political structure. Sometimes families may divide into smaller units, often living in different dwellings...In all cases, they are all still under the [same] head of the family but they are not economically supported by him." (Moayeri, 1975, pp. 44-45).

But even then, it is possible to isolate the family — not as members under a single patriarchal head (a definition more akin to the social sciences rather than this study) but as economically independent units capable of and maintaining a distinct identity.

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## 2.4. SPATIAL ORDER: PATTERNS OF SOCIO-SPATIAL GEOMETRIES OF SPACE

It is now valid to envisage urban patterns as the

> "geometry of a socio-spatial continuum. In this continuum, individual elements, with both physical and social dimensions, are combined progressively through their interrelationships shaping complex combinations...[An analysis of urban form] refers to the way physical entities, singly or in a group, are produced and used, their spatial arrangements, and their interrelationships." (Madanipour, 1996, p. 33).

The blueprint for these assemblies and combinations is "order". Order, as defined in the Shorter Oxford dictionary, is "a method by which things act or events take place; a natural, or social system in which things proceed according to definite laws." This implies the establishing of certain precepts and rules, which stem from the human need to systematize and rationalize any given process.

Order can be seen as a tool of the human mind for comprehending and endowing meaning to the living environment. The term, order "...is a desire of the mind" (Scott, 1924, p. 205), an attempt "to establish a fragment of [logic] in the infinite variety of our environment." (Schulz, 1965, p. 79) — a systematization of the space which the mind and body inhabit. Order to Kahn (1991) is an embodiment of the principles of mathematics, physics and aesthetics.

> "Design is form-making in order...
>
> In order is creative force...
>
> Order does not imply beauty...
>
> Order supports integration..." (Kahn, in Latour, 1991, pp. 58-59).

Order embodies meaning, context and definition to the spatial arrangements and patterns developed by man to structure his activities. Emerging as a consequence of human activities, spatial order, encompasses socio-cultural and behavioral dimensions. Therefore,

it is merely logical to analyse spatial order not simply as an abstraction but as a real-life concept, which is well grounded in the social networks of the human world.

### 2.4.1. Spatial Order in History

One of the most significant generators of spatial order is the human body itself. By moving through space and time, or even through their mere presence, human beings impose "a schema on space...In addition, the body can also represent any bounded system like a house, territory, group." (Pearson & Richards, 1994, p. 10). The concept of order is, hence, as old as human beings themselves. Spatial order in history has either been derived based on the human body or on the cosmos and / or environment as a representation of the Supreme Being. What follows is a brief evolutionary history of the changing concepts of order as expressed spatially from prehistoric agglomerations to modern – day urban centres. In the Western thought, human life exists in two extremes --- movement and settlement. Temporary, makeshift dwellings characterize the beginning of human civilization. The shelters erected were simple and easily dismantled. The rules governing the physical layout of these temporary "settlements" were based on:

- Climatic considerations
- Mobility
- Maintenance of the natural balance
- Social factors such as maintaining harmony within the band, fostering mutual co-operation and coexistence

Illustrations may be seen in the dwelling–clusters of the Bedouin camps, Bushmen villages' etc. (figure 02.03). The first manifestations of spatial order can be witnessed in the "dwellings and burials of the Lower and Middle Palaeolithic ages." (Pearson & Richards, 1994, p. 11).

### 2.4.1.1. Permanent Settlements

Various practical aspects led to the development of permanent settlements --- the continuous supply of spring water, a solid outcrop of land accessible yet protected by a river / marsh,

**Figure 02.03: A Typical Bushmen Village Settlement**

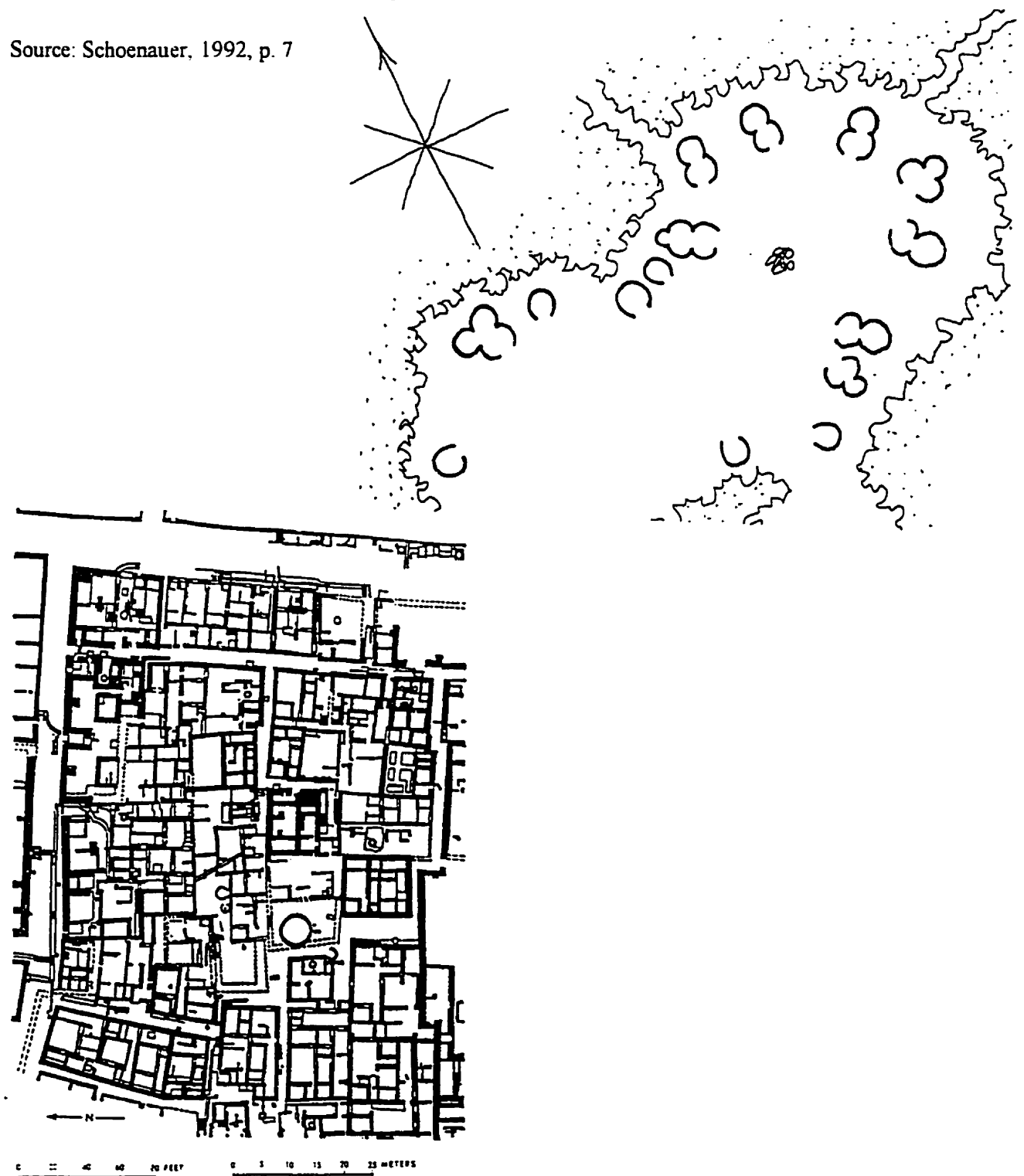Source: Schoenauer, 1992, p. 7

**Figure 02.04: A City in the River Valley Civilizations**

Source: Encyclopedia Britannica

abundant source of food nearby could be some factors. With the discovery of rudimentary forms of agriculture and the domestication of animals, permanent settlements became increasing the acceptable pattern of life. During this period, the spatial patterns generated spatially expressed the social life of the inhabitants quite literally. Based on a direct and straightforward interpretation of the kinship patterns within the band organization, these settlements embody the social codes of conduct. As an example, the round huts face each other if their residents are 'friends' and face away from each other if their occupants are not on good terms. (Schoenauer, 1992, p. 8).

It is also possible to perceive spatial patterns as a consequence of the woman's dominant role in the society. According to Mumford (1961), "woman's presence made itself felt in every part of the village...security, receptivity, enclosure, nurture --- these functions belong to the woman." (p. 12). The village formed through a permanent association of families, livestock and storage spaces, was necessarily self-sustaining. "[This] stability of the village, along with its maternal enclosure and intimacy and its oneness with the forces of nature" (Mumford, 1961, p. 15) formed the spatial order of the Neolithic settlements.

2.4.1.2. The First Cities

The River Valley civilizations were the first milestones in the history of the city. The city brought about a union of a variety of functions, previously scattered and unorganized, within a limited area. The components of the village were kept in a state of dynamic tension and interaction. The city, as a representation of the cosmos, "proved not merely a means of expressing in concrete terms the magnification of sacred and secular power,...it also enlarged all the dimensions of life." (Mumford, 1962, p. 31).

The pyramids and ziggurats portray the need to endow "order" (as a superior / divine power or emotion) onto human activities and existence. (Pearson & Richards, 1994, p. 39). The Indus Valley civilization had a strong emphasis on planning --- with a rectilinear grid ordering the space of the city. (Figures 02.04). The essential features of the first cities may be listed as the walled enclosure, street, house-block, market, temple precinct with its inner courts, administrative precinct and the workshop. (Mumford, 1961, p. 37, 63). These cities

symbolize the use of some elementary mathematical and scientific principles to attain a logical and comprehensible built environment.

### 2.4.1.3. The Greek Era

The first people to use the term "order" in reference to design and architecture were the Greeks. To them order implied the placing of different parts in relation to one another to attain an elegant composition. Order was a prerequisite to beauty. They developed a sophisticated geometry which contributed significantly to their architecture and planning. The environments they developed were designed to reflect the divinity, beauty and truth. "The chief forms of beauty are order, symmetry and definiteness...Beauty is a matter of size and order...to be beautiful,...every whole made of parts, must present a certain order in its arrangement of parts." (Aristotle quoted by Stevens, 1990, p. 82). Order, to quote Vitruvius, "gives due measure to the members of a work considered separately, and symmetrical agreement to the proportions of the whole." (Johnson, 1994, p. 235). These principles find greater expression in the Greek temples and other public buildings rather than the towns and cities.

The grid was used to display the wealth and power of the city. However, the Greek city, after the seventh century, was no longer only restricted to the grid as a model of urban expression. The Greek city now took-on two distinct forms --- on the mainland and its islands, largely spontaneous, irregular and organic, and systematic and regular in the Asia Minor region. (See figures 02.05, 02.06).

### 2.4.1.4. The Roman City

The Roman philosophy reflected Greek thought to a fairly large extent. Beauty, as to the Greeks, was an attitude of God, not a property of things.

> "One way to seek God is the contemplation of aesthetic perfection. Of course, such perfection is achievable only through the application of mathematics to artistic creativity...A building must be built with the correct proportioning, each part related by some ratio to each other...True beauty thus obtained reflects in stone

**Figure 02.05 and 02.06: The Greek City took two distinct forms — irregular and spontaneous (eg: Athens), and systematic and regular (eg: Miletus).**

Source: Schoenauer, 1992, p. 103
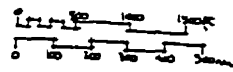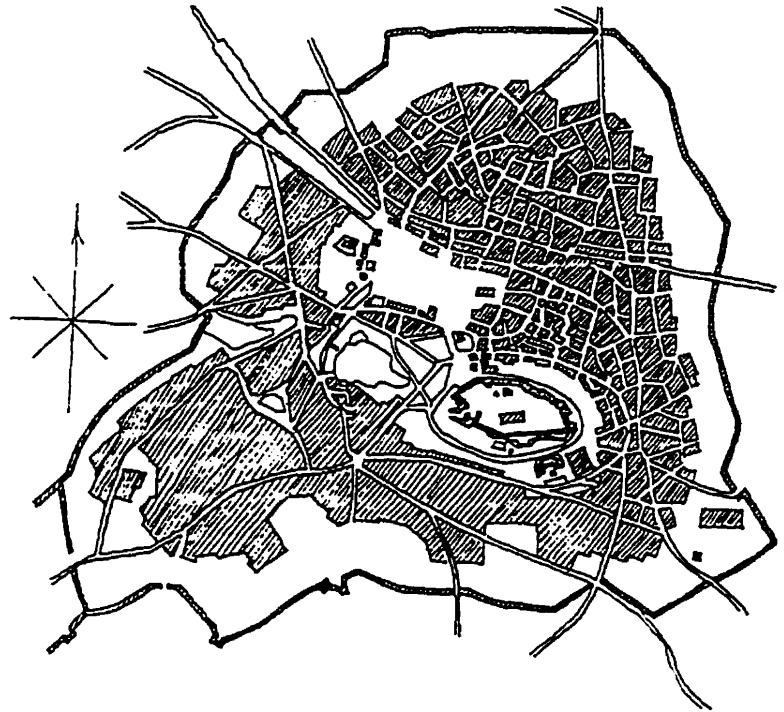


Athens: Fifth Century B.C.
after Arnold Whittick



acropolis
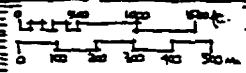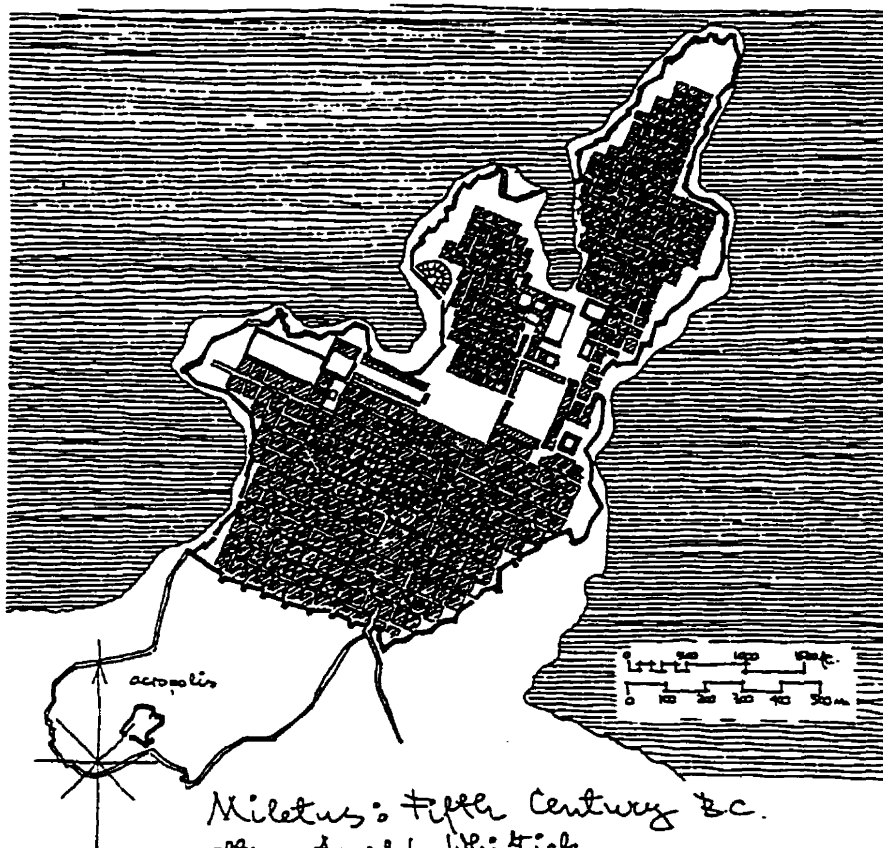
Miletus: Fifth Century B.C.
after Arnold Whittick

the higher harmony of God." (Stevens, 1990, p. 130).

This ideology led to the generation of the meticulously detailed classical "Orders". In the Roman era, order (as a representation of divine will), when translated to city planning resulted in gridiron patterns. The grid was based on the "order of the universe with its four cardinal directions." (Pearson & Richards, 1994, p. 39). The abstract objective of an ordered settlement was coupled with the need for a prototypical plan, to support rapid physical development as in military camps. Similar to the ancient civilizations, the gridiron symbolized political, religious and economic power and supremacy of the empire. The Roman City synthesized the aesthetic and practical aspects of city planning, followed, in essence, to the present day. (Mumford, 1961; Kostof, 1991; Batty & Longley, 1996). The order of these periods, hence, typified the philosophy, level of technology and expertise as well as the lifestyle and culture of the people it catered to.

## 2.4.1.5. The Medieval Town

During the Dark Ages political instability and fear of invasions led cities to be inward looking and heavily fortified. The city was totally pedestrian and the church with the market place formed its focus. (Schoenauer, 1992). The Medieval town had three basic spatial patterns which related to, either its historic origin, geographic context or its mode of development.

The first type were the towns which owed their existence to the Roman period retained their rectilinear planning systems with the monastery / church being the only addition. The second type was designed on the checkerboard pattern. The third variety, regarded as truly medieval, was developed organically. For reasons of security, rocky outcrops were often selected. On these contoured sites, the organic town allowed the streets to follow the undulations of the land, thereby generating an economical planning strategy. (Bacon, 1976; Vance, 1977) The transportation mode was pedestrian and hence negated the need for straight, rectangular street networks. (figure 02.07). These towns, as argued by Mumford (1961),

"embody a universal pattern; and their mere departures are not merely sound, but

Figure 02.07: The Medieval City : Carcassonne, Aude and Avila, Spain.
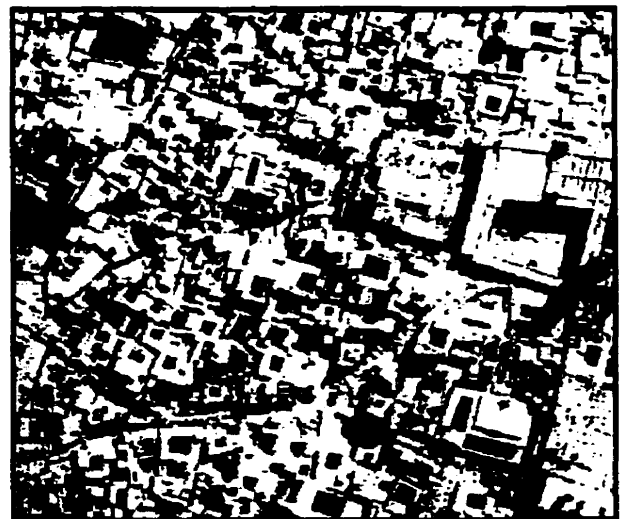
Source: Copplestone. 1963. p. 519.





Figure 02.08: Tunis — A typical Islamic city

Source: Broadbent. 1990. p. 13.

often subtle, in their blending of practical need and aesthetic insight....[organic planning] does not mean that rational considerations and deliberate forethought have not governed every feature of the plan, or that a deliberately unified and integrated design may not result." (p. 302).

Each Medieval town was, therefore, site specific — each a unique entity.

## 2.4.1.6. The Islamic City

The Islamic City was formed within the strict rules of Islam. At the macro-level, the city's fabric emerged as a result of the translation of guidelines laid down by the religion. However, at the micro or neighborhood level, individual choices and decisions determined the spatial structure of the city.

The city is formulated using *mohallas* (neighborhood), *chowks* (intersections), *streets, finas* (the semi-private space on the street just outside the house's threshold), and a complex hierarchy of these spaces throughout the city. (figure 02.08) Climatic and topographical design considerations made these cities very successful and efficient for the given geographical area. The spatial order was derived from a plethora of religious, socio-cultural and climatic factors. It thereby results in the evolution of an urban fabric rich in encounters, possibilities and variety. The spatial order is a unique illustration of how even highly restrictive and binding social structures and religious rules can be manipulated to evolve a spatial structure which has no two spaces alike. (Hakim, 1986)

## 2.4.1.7. From the Renaissance to the Twentieth Century

The re-awakening of the Renaissance brought the classical "Orders" of the Hellenistic era back into vogue. The city-form became predominantly geometric again. During this time, many ideal plan forms for city development were explored. Star shaped, circular, linear and gridiron plans and their various alternatives were studied. (Figure 02.09, 02.10). Order, symmetry and harmony became the preoccupation of all architects and planners. These abstractions were applied not only to individual buildings, but to entire cities. These conceptions of the ideal city (such as Howard's Garden city) were geared towards attaining

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**Figure 02.09 and 02.10:** Many different plan forms were experimented with --- the Star-shaped like Palmanova, and Circular being some of these.

Source: Broadbent, 1990, pp. 38
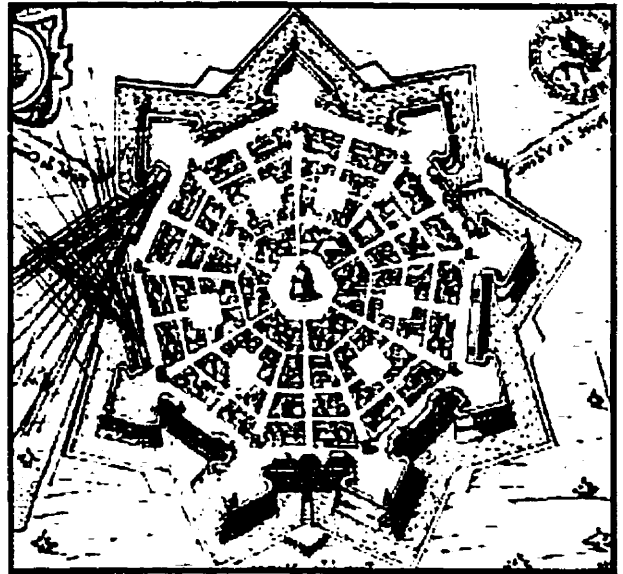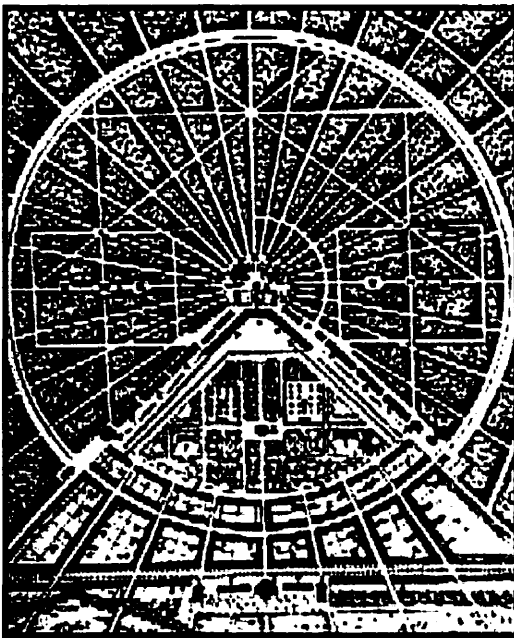
social and economic utopias.

The present century has witnessed a major shift in its city planning ideology, which is predominantly based on transportation networks. The city plan in industrialized nations in this century derived its order through emphasizing a strict segregation of uses, segregation of the green grid and overlapping these two with the transportation and neighbourhood grids.

## 2.4.2 The Present Context

But today, a categoric questioning of the existing concepts and theories has resulted in new ways of perceiving spatial order. Discussing order in design, Venturi brings to focus the need to recognize the complexity in design, not through abandoning the concept of order but by extending its meaning. According to him, "A valid order accommodates the circumstantial contradictions of a complex reality. It accommodates as well as imposes. It thereby admits control *and* spontaneity, correctness *and* ease --- improvization within the whole." (Venturi, 1966, p. 46).

The concept of spatial order and what it translates into, is based entirely on the people generating its precepts and rules. As is evident from the above discussion, human beings have, across centuries, attempted to search for appropriate principles and guidelines that can be used to order space. Each civilization has discovered what spatial order has meant to its organization. In the given contemporary context, spatial order must take-on varied dimensions so as to encompass the plethora of existing urban town forms. Today, there are industrialized cities forming one end of the spatial continuum, and informal settlements at the other end. The logic of space for each urban form is unique. The industrialized forms have been studied and theorized in great detail, whereas the knowledge pertaining to the theory of space in the informal settlements is still young and undiscovered.

## 2.5. EPILOGUE

Beginning with an exploration of the concepts of space, spatial arrangements and spatial

order, this chapter assessed the role of culture and human behavior as the social determinants of spatial order. The physical attributes of spatial order were also highlighted. The connotations of spatial order have undergone numerous alterations and modifications during history. It is now necessary to again review the concept to encompass the contemporary context. Based on this framework, the researcher will now delve into the analysis of some squatter settlements in the search for their innate spatial order.

# CHAPTER 3: IS THERE ORDER ?

In the previous chapter, one of the ways of visualizing urban space was to perceive it either as a result of the enclosing masses that give form to it, or as a limited, restricted version of natural, boundless space. Both these concepts attempt to define human perception of open space within the built environment. Refining this dimension, the discussion which follows, narrows down the literature review --- from the initial understanding of the connotations of space gained so far, the focus now shifts to urban open space and its components. This rationalizes the scope of the research at hand.

## 3.1. SPATIAL PATTERNS IN SETTLEMENTS: A STUDY OF THE HISTORY OF URBAN OPEN SPACE

Open space is a necessity of urban life. Through centuries, it has been shaped by commerce and defence, political systems and cultural traditions, climate and topography, with each society evolving its own distinctive patterns. During its formative phase, urban open space was used for community meetings --- religious, commercial and / or governmental. This prehistoric gathering space was characterized by a multiplicity of functions being performed in the same space.

The second stage was traversed by the Babylonians, who demarcated the temple compound as a separate space, by a wall around it. The market square was, as yet, left undifferentiated (in terms of the provision of a wall around it). This resulted in a "two-part division of urban open space" for the first time in human history. (Crouch, 1981, p. 7).

The Romans, taking the next step, developed three new possibilities for the delineation of urban open space. The first concept was that of an outdoor, fully enclosed room, which was created through surrounding all open spaces by colonnades. The second was to give a special identity to streets --- again, this was accomplished by erecting continuous rows of columns along important streets, and emphasizing intersections by triumphal arches. Thirdly, the idea of a common recreational open space was given form through the

construction of theatres, stadia, amphitheatres, baths etc. (Crouch, 1981, pp. 7-8; Krier, 1979, pp. 20-21).

Mediterranean towns retained some Roman features — an example being the open space at the center of the town where two main roads crossed. The medieval town and the Islamic and Oriental cities developed open spaces which were largely social and functional rather than merely visual — a sophisticated design vocabulary which evolved as a result of a preoccupation with defence, climatic and social variables, but catered, primarily, to the psychological, sensory and emotional responses of the users. This marked a stage which can, perhaps, never be slotted in any chronological era — a stage transgressing the mere physical, imbuing the built environment with socio-cultural abstractions and a high degree of refined symbolism.

The next step came in the Renaissance and the Baroque periods — an era which witnessed the "regularization...and dramatization" of the city's open spaces. (Crouch, 1981, p. 8). The Industrial Revolution obliterated the perceived need of open space in the town. This then necessitated a 'reform movement' to re-introduce open space in the urban built environment which could counteract the adverse effects of high population density. The Modern movement delineated urban space as a variable of the "space-emanating qualities of free-standing buildings." (Giedion, 1967, pp. lv-lvi). But this notion of "an abstract undifferentiated space" (Colquhoun, 1989, p.225) coupled with the city being conceived as "simple shaped volumes, floating in a sea of space" (Alexander, 1987, p. 67) came under attack in the post-modern era.

Today, it is possible to delineate three distinct built environments which are in use — the Western, Oriental and Middle Eastern prototypes and the informal settlements. The quality of space in the Oriental and informal unlike the Western ones is a consequence of a lack of dependence upon stationary structures for generating the feeling of enclosure. (French, 1978, pp. 4-8).

## 3.2. ELEMENTS OF URBAN OPEN SPACE

Since the beginning of a sedentary mode of life, urban open space has been differential into two main components --- the street and the square. These two components have their origins in the primal behavior of human beings. (Figure 03.01, 03.02). The degree of sophistication employed in the conception of these has been modified over time, but, in essence, the street and the square retain their original roles in the human environment. The street remains a symbol of movement, dynamism, growth and change, while the square emulates protection, security, enclosure, pause and rest. Today, these two elements continue to define the entire fabric of all human developments.

### 3.2.1. The Street

Defined in the Shorter Oxford Dictionary as a "paved road, a way, a path", or as something that "runs between two lines of houses or shops", the street, as a term, to a student of architectural history, brings-up a polar image --- the Medieval / Islamic organic street and the Western traffic artery. Both these types of streets embody movement of one form or the other. The street, whether it is totally pedestrian, vehicular or a varying combination of these two extremes, always embodies "an ordinary line of communication between places --- a two-dimensional ribbon, running on the surface of the landscape." (Moughtin, 1992, p. 129).

3.2.1.1. Functions of the Street

> "The street, in addition to being a physical element in the city, is a social fact. It can be analyzed in terms of who owns, uses and controls it; the purpose for which it was built, and its changing social and economic functions. It also has a three-dimensional form...the street provides a link between buildings, both within the street, and in the city at large." (Moughtin, 1992, p. 131).

But "streets [are meant] for staying in, and not just moving through." (Alexander, 1987, pp. 590-591). The street provides an arena for social expression through facilitating communication and interaction between people and groups. It generates a backdrop for

Figure 03.01: The street is as old as the human existence itself — it is an expression of the primal need to move.
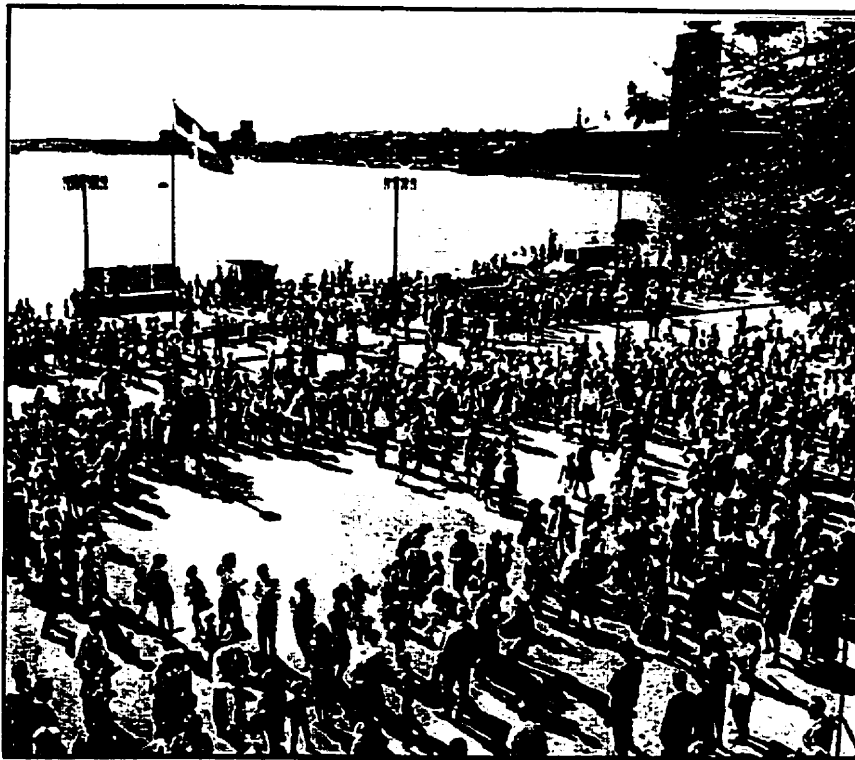
Source: Rykwert. 1978. p. 17





Figure 03.02: The human need for contact and interaction with other human beings is the basis for the development of the square as an essential component of the spatial vocabulary of any settlement.

Source: French, 1978, p. 32

casual interaction, recreation and conversation as well as a site for a spill-out of ritualistic and household activities. (Caliandro, 1978; Anderson, 1978; Czarnowski, 1978; Agrest, 1978). Hence, "streets are a primary ingredient of urban existence, [providing] the structure on which to weave the complex interactions of the archal fabric with human organization." (Celik, Favro, Ingersoll, 1994, p. 1).

### 3.2.1.2. The Spatial Form of Streets

The morphology of the street can be analyzed through a number of diverse qualities such as straight and curved, long and short, wide and narrow, enclosed and open, formal and informal etc. Street form can also be studied in terms of the scale, proportion, contrast, rhythm or connections to other streets and squares.

To comprehend the overall form of the street as an urban entity, reference needs to be made to the city itself. The two conceptions related to streets mentioned in the beginning of this discussion pertain to two distinct town plans --- "the traditional plan form with its streets in a system of differentiated open space and a contemporary one with its streets in a system of undifferentiated spaces." (Ellis, 1978, p. 115). In the traditional town, the streets "...act, both literally and metaphorically, as external rooms in the city." (Ellis, 1978, p. 117). However, in the contemporary city streets only "...displace space..."(Ellis, 1978, p. 118).

### 3.2.1.4. The Street in Slums and Squatter Settlements

Streets play a vital role in the slum by providing a "locus for primary reference groups that give their members...a sense of belonging and cohesion. Slum streets also seem to function as a safety valve and provide the setting in which residents can achieve a certain amount of freedom from the pressures of domestic life." (Levitas, 1978, p. 232). This broad conception of the street is as valid equally for North American slums as it is for those in the third world. However, the street in Asian slums allows for social interaction and communal activities. Here street life functions as a communication network within the settlement. The street is the all-pervasive element that ties the entire settlement together — it opens out and

intersects squares at some points and widens at other points to form streets that function as "elongated courtyards." (Ellis, 1978, p. 123).

### 3.2.1.5. A Brief Definition

The street is a social fact. Spatially, it is an "urban space intermediate in scale between the individual buildings and the open space immediately surrounding it ---helping to establish a hierarchy of urban spaces." (Gutman. 1978. pp. 249-251). It has two main features --- "path and place". (Moughtin, 1992, p. 133). Both these co-exist and overlap to generate the street as an embodiment of the varying patterns of human behavior.

### 3.2.2. The Square

The square has been defined as "an open area or space in a town / city enclosed by buildings or dwelling-houses" in the Shorter Oxford Dictionary. It is basically a "destination; a purpose-built stage for ritual and interaction." (Kostof, 1992, p. 123). One of the most important elements of city design, the square is a "microcosm of urban life, offering excitement and repose, markets and public ceremonies, a place to meet friends and watch the world go by." (Webb, 1990, p. 9). The square is a setting for public and commercial buildings, with human activity giving life, vitality and visual diversity to the environment enclosed by it.

### 3.2.2.1. The Square: Form

Squares have been classified according to the form they take into five major categories:

- The enclosed square is space self-contained. The overriding quality of this type of spatial type is a sense of enclosure.
- The dominated squares is characterized by one individual structure or group of buildings towards which the open space is directed and to which all other surrounding structures are related.
- The nuclear square is space formed around a center.
- Grouped squares are spatial units combined to form larger compositions.
- The amorphous square is unlimited space. (Zucker, 1959, pp. 8-17).

Moughtin (1992) also refers to linked squares, which consist of "two or more overlapping or interpenetrating spaces, quite clearly defined spaces [that] may open onto each other; [or] a series of spaces that may be physically connected by streets or alleyways." (p. 112).

### 3.2.2.2. The Square: Function

Another attempt at classifying squares has been based on the function they perform. The various types mentioned by Stübben are traffic squares, squares for public use (comprising a place for markets, parades and public festivals), landscape squares and architectural squares. Squares have also been classified by French (1978) based on the function they perform in the neighborhood into three categories — radial (for circulation), neo-classic (urban center) and residential. (p. 96).

### 3.2.2.3. The Square: Shape

Krier (1979) provides a method for analyzing urban space as systems. A typology has been formulated which groups spatial forms into three main categories according to the "geometric pattern of their ground plan." (p. 22). The groups are ordered around the square, circle and triangle. Other shapes, which have characterized the square in different historical eras, are the trapezoid, the rectangle, the L-shaped square, the ellipse and the hemicycle. (Kostof, 1992, pp. 149-152).

The square has always been an expression of the primal human need for enclosure, security and interaction — a safe haven where people meet and socialize. The square, even today, forms a significant alphabet in the design vocabulary available to towns and cities, it being the "chief method by which a town / city is both decorated and given distinction." (Moughtin, 1992, p. 123).

## 3.3. MODEL FOR ANALYSIS

### 3.3.1. Rationale for selection of the Model

As mentioned, Krier (1979) provides a model to study urban open space. Given the specific restraints of time and resources and the goals and objectives of this study, it was found that

this model is the most appropriate. This was concluded not by mere theoretical argument, but actual testing of the methods to ascertain their suitability and applicability. The major advantage of this model is its reliance on graphic techniques for documentation and conclusions as well as the possibility of imbibing a certain degree of quantitative, mathematical value to this essentially abstract exercise. Another factor was the fact that Krier's analysis recognizes the street and the square as the key components of urban open space.

### 3.3.2. Krier's Model: An Exercise in Morphological Analysis

Krier begins his study by stating his conviction that the traditional understanding of urban space has been lost in the contemporary world. So, in an attempt to seek this lost sensitivity, he analyzes examples of urban space through the Medieval, Baroque and Renaissance periods. Having isolated the street and square as the basic elements, Krier goes-on to suggest a method for formulating the typology of urban space. He divides spaces according to their ground plan into the square, circle and triangle. His analysis is, however, predominantly based on the square and its various spatial possibilities. He does not consider the triangle and / or the circle while deriving the matrices. For these two options, he only provides illustrations of actual plazas and open spaces. The mechanisms, which bring about these various patterns, are angling, segment, addition, overlapping and distortion, where:

- Angling generates a space which is a compound of two parts of the basic element with two parallel sides bent
- Segment, as the name suggests, is a portion of the basic element
- Addition implies the repetition of the basic element
- Overlapping is the merging of the basic elements
- Distortion results in spatial forms that are impossible to define (Krier, 1979, p. 8) (Figure 03.03).

Each of these mechanisms is applied to both a regular, and an irregular basic shape. Further, all these coupled with alterations of the internal angles and external dimensions, separately and simultaneously, complete the possibilities depicted in the matrix. Krier also discusses

# Figure 03.07: Krier's Basic Matrix

Source: Krier, 1979, p. 8
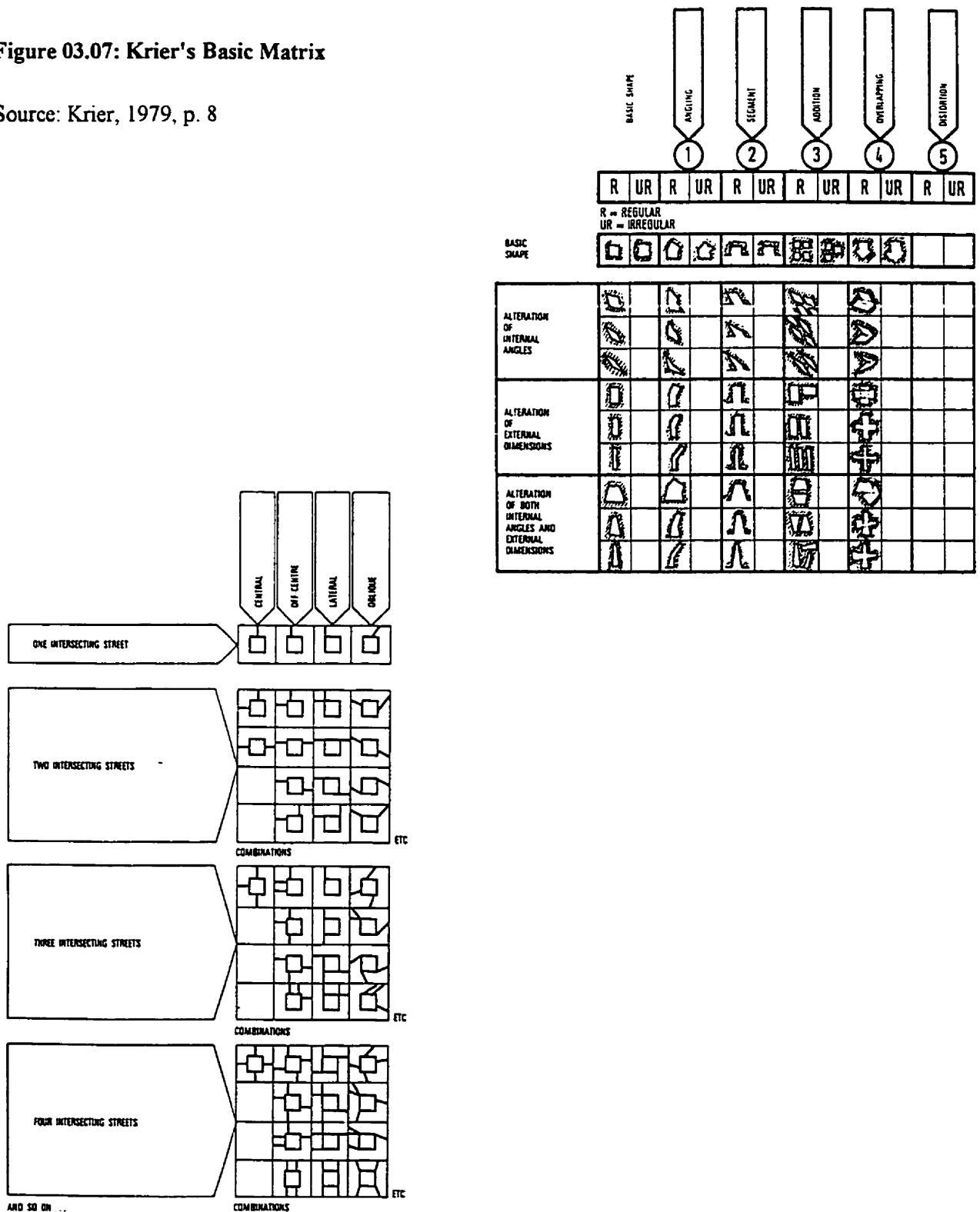


# Figure 03.08: Intersections of streets and squares

Source: Krier, 1979, p. 23

**Figure 03.09: Graphic Representation of Krier's mode of analysis**

Source: Krier, 1979, p. 10
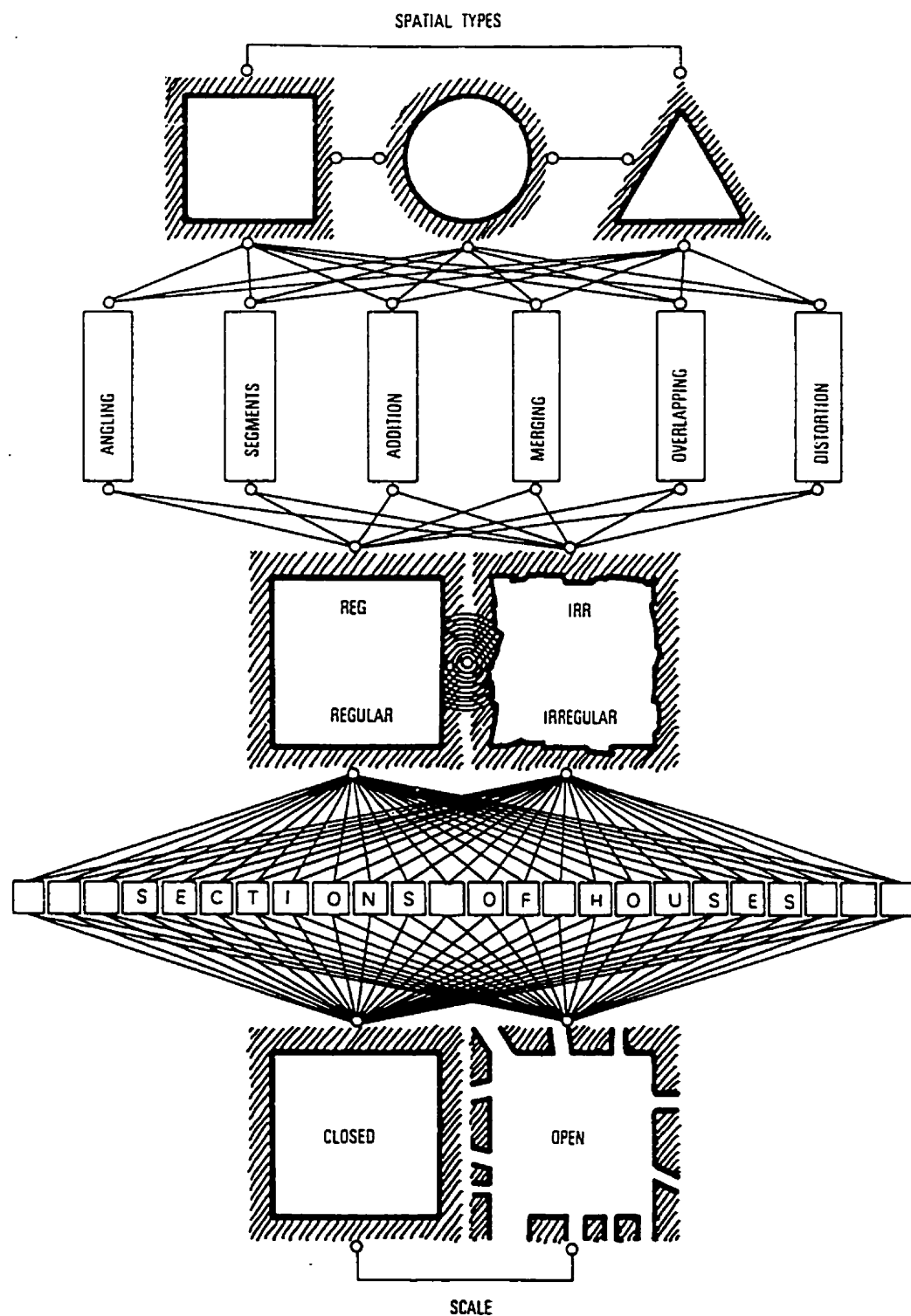
the effects of building sections and elevations on open external space.

As the next step, Krier records the intersections of streets with squares. He has worked out the possible outcomes for one to four intersecting streets at central, off-center, lateral and oblique positions. (Figure 03.04).

The exercise culminates in a graphic presentation of the method employed by him to generate these various spatial types. (Figure 03.05). To summarize this diagram, the three basic shapes (square, circle, and triangle) are affected by the modulating forces of angling, segmentation, addition, overlapping and distortion. These modulating forces can produce geometrically regular or irregular results on all spatial types. At the same time, the large number of possible building sections influence the quality of the space at all these stages of modulation. The terms "close" and "open" may be applied to all spatial forms described uptil now, that is, spaces that are completely or partially surrounded by buildings. Finally, many compound forms can be created from the three spatial types and their modulations. In the case of all spatial forms, the differentiation of scale plays a particularly important role.

This approach, clearly, documents the form and morphology of urban open space in the specified historical architectural periods. Krier, however, goes a step further by deriving a rationale for the classification of the spaces he has studied, thereby providing a quantifiable matrix to analyze spatial morphology in any given settlement.

### 3.3.3. Strengths of the Model

This model, therefore, provides an extremely succinct, lucid and logical method for studying the typology of space. Its extreme strength lies in the universality of the approach involved. It is, hence, easy to build on the model so as to render it appropriate to any informal settlement across the globe.

Another major strength of the model is the complete reliance on graphic representation to explain the space typology — this facilitates its easy comprehension and, thereafter, dissemination into the design circles. Also, through using this approach, it is possible to tackle the varied types of spaces and to simplify their analysis by classifying them

geometrically.

### 3.3.4. Limitations of the Model

A major drawback of the model is the lack of categorization for streets. There has been no attempt to define the different parameters and criteria that can define street typology. In squatter settlements, streets play a pivotal role. They not only give access, but also act as outdoor rooms — fostering communal and neighborly interaction, commercial activities and serving as household extensions for the houses flanking them. Hence, it is essential to delve into the spatial patterns formed by streets.

Another weakpoint lies in the absence of the outcomes of interactions between the square, triangle and circle, which may often happen. Further, although the combinations of intersecting streets and squares are studied, various other possibilities of square-street interactions have not been dealt with.

As mentioned earlier, his analysis is derived from the "square" ground plan. No attempt has been made to develop a logical strategy to classify the triangle and / or circle in a manner similar to that used for the square. So, the researcher tried to, firstly, use the strengths of the model and secondly, overcome, or at least dilute, its weaknesses and limitations.

### 3.3.5. The Squatter Settlements studied

For this analysis, three squatter settlements in Delhi, India, whose survey plans were easily available, were used. The settlements were arbitrarily selected from a database available at the Slum Wing, Delhi Development Authority, which lists settlements with 1500 or more inhabitants.

Krier's model was modified using one and then tested on the other two plans. The selected plans and their characteristics have been summarized in figure 03.06. The three survey plans, as obtained from the Slum Wing of the Delhi Development Authority, are shown in figures 03.07, 03.08, 03.09.

**Figure 03.03: The settlements selected for morphological study in New Delhi, India and their locational features.**

Source: Author

ALL SETTLEMENTS ≥ 1,500 DWELLINGS

### Settlement  Paharganj  Slum

- Near downtown, the Walled City
- Ample job opportunities
- Easy access to public transportation facilities
- Corner location - commercial frontage on 2 streets

### Settlement  Wazirpur Slum

- Near industrial area
- Ample job opportunities
- Easy access to public transportation facilities

### Settlement  AIIMS Slum

- Next to a National level hospital
- Near major commercial centers and upper-income residential areas
- Serves as service sector
- Along a drain

**Figure 03.05**

The second settlement is located behind India's premiere medical institution — the All India Institute of Medical Sciences (AIIMS). The settlement provides the service sector for the nearby commercial developments, upper income residential neighborhoods and the hospital. The settlement is along a drain and hence occupies marginal land. The settlement is very well established and has evaded relocation till date due to it being an enormous vote bank. There are many *puckka* (concrete and brick) houses (about 80%), highlighting the prosperity of its inhabitants. It is approached through a narrow lane which is lined with vendors and small commercial establishments set-up by the settlement dwellers.

GOVT.
LAND

COMMERCIAL
AREA

TEMPLE

SCALE 1:2000

**Figure 03.04**

The Paharganj Slum is adjacent to the Walled City of Delhi. The high commercial density of the Walled City provides the ample employment opportunities that are necessary to sustain the settlement. The Paharganj area has very high population density and is now a part of Delhi architectural heritage zone. Paharganj, due to its central location on Delhi's map, is very well connected by public transportation routes. The slum is located at the corner of two major thoroughfares — a location which facilitates the development of the commercial potential of this settlement. The settlement has been established about 20 years ago. It, therefore, is a well-structured, well-organized community. This slum has recently been relocated to the outskirts of the city, under the Slum Resettlement Policy of the Delhi Development Authority.



HOUSING

TEMPLE

R O A D

R O A D
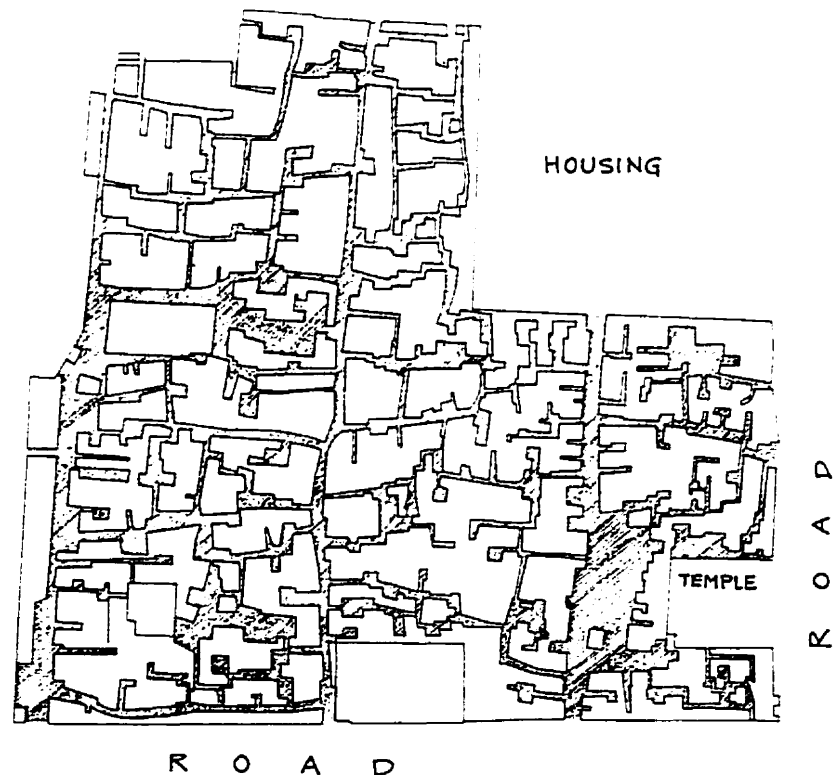
SCALE 1:2000

**Figure 03.06**

The third settlement is next to one of Delhi's major industrial areas. Located on marginal land (along a railway line and a drain), the slum faces the back of some chemical and textile plants. The slum has excellent public transportation due to its proximity of Delhi's Ring Road. But as it is behind a block of industrial plots, it has become "out of sight out of mind". The slum acts as a service sector to the industrial area and also to an urbanized village nearby.
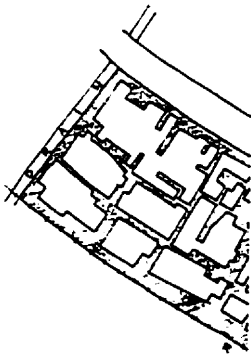
## 3.4. ADDED VARIABLES

Referring to Krier's model once again, his basic typology of the square, triangle and circle, as mentioned above, does not incorporate ground plans that are polygonal in shape. Krier has tried to deal with this situation through the mechanism of "distortion" in the matrix. However, this offers no concrete method of classification of these spaces. Hence, it was considered appropriate to re-categorize the key elements on the basis of the number of sides. The list begins at the triangle, which has three sides, the square and the rectangle come next with four sides, and the pentagon and hexagon follow suite. This goes on, finally culminating in the circle, which has n-sides. (Figure 03.10). Within this framework, what follows hereafter are refinements of the matrices developed by Krier.

### 3.4.1. Interaction between Different Point Spaces

Based on the study of the survey plans of squatter settlements, three types of interactions were identified. The square, triangle and circle interact between each other through overlapping and being adjacent to each other. When placed adjacent to each other, they may either establish contact through one or two sides. The shape may be perceived as "full" or "segmented". (Figure 03.11).

### 3.4.2. Classification of Streets and Interactions between Street Types

Streets have been categorized on the basis of quality of the line --- straight, bent and curved. Straight and bent streets were further grouped into parallel and non-parallel streets. Bent streets are also sub-divided into to account for whether the bend occurs at right angles or at some other angle. Curved streets are further classified depending upon the number of curves and the regularity of the curves. (Figure 03.12 and 03.13). Interactions between different types of streets have also been studied. The interactions can be through intersection, T-junction, sandwiching, merging (and / or division) and edge-to-edge contact. The first four can occur between streets of the same and / or different types but the fifth can take place only between streets of different types.

47

# Figure 03.10: Squares classifeid according to the number of their sides

Source: Author

**TYPE 1: Three sided squares**

**TYPE 2: Four sided squares come next**
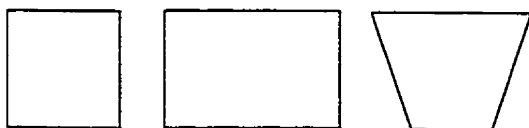
**TYPE 3: The Pentagon is the next on the list**
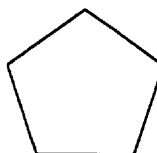
**TYPE 4: The Hexagon and Octagon continue the classification...**
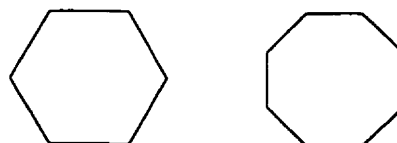
**TYPE 5: With the Circle ending it — the circle has n-sides!**
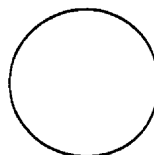


| | OVERLAPP | ADJOINING : ONE SIDE | | ADJOINING : TWO SIDES | |
|---|---|---|---|---|---|
| | | FULL SIDE | PART OF SIDE | FULL SIDE | PARTS OF SIDES |
| WITH BASIC SHAPES | | | | | |
| ALTERING EXTERNAL DIMENSIONS | | | | | |
| ALTERING INTERNAL ANGLES | | | | | |
| ALTERING BOTH | | | | | |

Figure 03.11: Interactions between squares — the square and the circle in their basic shapes only

Source: Author
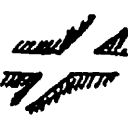
**Figure 03.12: Different Street Types**

Source: Author



| BASIC SHAPE | STRAIGHT | | BENT: PARALLEL | | BENT: NON-PARALLEL | | CURVED | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | PARALLEL | NON-PARALLEL | REGULAR | IRREGULAR | REGULAR (RIGHT ∠s) | IRREGULAR | SINGLE REGULAR | DOUBLE | | MORE THAN TWO | |
| | | | | | | | | REGULAR | IRREGUL. | REGULAR | IRREGUL. |

**Figure 03.13: Interactions between these different tstreet types**

Source: Author

| | INTERSECTION | | T-JUNCTION | | EDGE TO EDGE | SANDWICH | MERGING |
|---|---|---|---|---|---|---|---|
| | RIGHT ANGLE | ANY OTHER ANGLE | RIGHT ANGLE | ANY OTHER ANGLE | | | |
| WITH ITSELF |  |  |  |  | | |  |
| WITH NON PARALLEL |  |  |  |  |  |  |  |
| BENT REGULAR |  |  |  |  | | | |
| BENT IRREG. |  |  |  |  | | | |
| CURVED |  |  |  |  |  |  |  |

### 3.4.3. Interactions between Streets and Squares

These interactions were identified as overlapping, symmetrical and unsymmetrical, and flanking along one and / or two sides. To clarify the actual results of these interactions, the matrix developed by Krier was used. For the categories of "basic shape", "angling" and "overlapping", the shapes in Krier's matrix were superimposed by a straight, parallel street. The results highlight a rich variety of possibilities. (Figure 03.14).

### 3.5. CONCLUSIONS

Through the above analysis, an understanding of the spatial patterns of the squatter settlements was gained. Although the above may be viewed as an exercise in geometrical classification of spaces, it falls short of being able to provide a rational justification for the existence of spatial order in these settlements.

Hence, the analysis undertaken so far cannot prove that squatter settlements possess spatial order.

**Figure 03.14: Interactions between streets and Squares**

Source: Author

| | OVERLAPP | | FLANKING | | OVERLAPP | | FLANKING | | |
| | SYMMETRICAL | UNSYMMETRICAL | ONE SIDE | TWO SIDES | SYMMETRICAL | UNSYMMETRICAL | ONE SIDE | TWO SIDES | |
|---|---|---|---|---|---|---|---|---|---|
| BASIC SHAPE | | | | | | | | | OVERLAPPING BASIC SHAPE |
| ALTERING EXTERNAL DIMENSIONS | | | | | | | | | ALTERING INTERNAL ANGLES |
| ALTERING INTERNAL ANGLES | | | | | | | | | ALTERING EXTERNAL DIMENSIONS |
| ALTERING BOTH | | | | | | | | | ALTERING BOTH |
| ANGLING BASIC SHAPE | | | | | | | | | |
| ALTERING EXTERNAL DIMENSIONS | | | | | | | | | |
| ALTERING INTERNAL ANGLES | | | | | | | | | |
| ALTERING BOTH | | | | | | | | | |

# CHAPTER 4: A NUMERICAL POINTER

The first approach to try and detect spatial order in squatter settlements through classifying the spaces on the basis of geometry did not lead to the anticipated outcome. But the matrices developed point to another possibility that might be more productive.

Using the matrices as a reference, a quick frequency analysis was conducted to document the most prevalent interaction. For this study, two settlements were selected arbitrarily. The reason for selecting two settlements was to provide a qualitative comparison for the statistics presented and to confirm the validity of the results. The squatter settlements selected were the Paharganj and the Wazirpur slums. The locational details and survey plan for these slums have already been discussed in Chapter 3, figure 03.07 and figure 03.08.

## 4.1. METHOD OF ANALYSIS AND ITS REPRESENTATION

The method of analysis adopted was simple --- the number of times a space (as represented in the cells of the matrix) occurred on the survey plan was recorded. The totals were charted as bars representing each space's frequency as a percentage of the total number of spaces counted for each matrix in the settlement. The matrix-cells of the interactions that were found to be most prevalent were shaded in order to highlight them.

### 4.1.1. Types of Streets

In both the settlements selected, the non-parallel type of street is the most prevalent, with the regular bent (parallel) following suite. The other major street types are the parallel, and bent streets, both parallel and non-parallel and regular and irregular. For both settlements, the first three types of streets (that is, non-parallel, regular bent and parallel streets) constitute nearly 80% of the overall variety of sttreet types seen. Single curved streets are also seen sometimes. (Figure 04.01).

# MOST PREVALENT STREET TYPES

| | STRAIGHT | | BENT: PARALLEL | | BENT: NON-PARALLEL | | CURVED | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | PARALLEL | NON-PARALLEL | REGULAR | IRREGULAR | REGULAR (RIGHT ∠s) | IRREGULAR | SINGLE REGULAR | DOUBLE REGULAR | DOUBLE IRREGUL. | MORE THAN TWO REGULAR | MORE THAN TWO IRREGUL. |
| BASIC SHAPE | | | | | | | | | | NON-PARALLEL IRREG. | |

**Figure 04.01: Most prevalent Street Types**

Source: Author



LEGEND

▨ THE YAMUNA PUSHTA

░ WAZIRPUR SLUM

## 4.1.2. Street Interactions

T-junctions are, by far, the most prevalent interaction (86% in the Paharganj slum and 80% in the Wazirpur slum). Another fairly prevalent interaction is parallel streets joining non-parallel streets edge-to-edge (9% in the Paharganj and 14% in the Wazirpur slums). Intersections, in various different forms, constitute roughly 13 - 17% of the total number of street interactions. (Figure 04.02)

## 4.1.3. Interactions between Streets and Squares

The most common interaction is the square (basic shape, basic shape with altered external dimensions and / or internal angles) being flanked on one side by a parallel or non-parallel street (approximately 50% in both settlements). Other frequent interactions are:

- Basic shape being overlapped unsymmetrically by a parallel or non-parallel street (approximately one-fourth in both slums).

- The angled basic shape with altered external dimensions being flanked on one side by a parallel or non-parallel street (11% in Wazirpur slum).

- Basic shape with altered internal angles eing flanked on one side by a parallel or non-parallel street (8% in Wazirpur slum).

The shaded cells of the matrix in Figure 04.03 show the other prevalent interactions.

## 4.2. CONCLUSIONS

The findings of this study can only hope to be a part of the jigsaw of the overall spatial order that should exist in squatter settlements. However, with merely the qualitative (Chapter 3) and quantitative (Chapter 4) analysis of the physical component of these settlements, the existence of spatial order cannot be proven. So the next step is to couple these findings with on-site observations, which follow in the forthcoming chapter.

# MOST FREQUENT INTERACTIONS BETWEEN
# DIFFERENT STREET TYPES

| | INTERSECTION | | T-JUNCTION | | EDGE TO | SANDWICH | MERGING |
|---|---|---|---|---|---|---|---|
| | RIGHT ANGLE | ANY OTHER ANGLE | RIGHT ANGLE | ANY OTHER ANGLE | EDGE | | |
| WITH ITSELF | | | | | | | |
| WITH NON PARALLEL | | | | | | | |
| BENT REGULAR | | | | | | | |
| BENT IRREG. | | | | | | | |
| CURVED | | | | | | | |

**Figure 04.02: Most frequently occuring interactions between different street types**

Source: Author



| | Yamuna Pushta | Wazirpur Slum |
|---|---|---|
| | 31% | 29.5% |
| | 18.3% | 8.7% |
| | 21% | 17.4% |
| | 9% | 14% |
| | 16% | 15% |
| | 7.7% | 5.4% |
| | 2% | 4% |
| | 2% | 1.34% |
| | 2% | 2.5% |
| | 0 | 2.5% |
| | 0 | 1.3% |

LEGEND

THE YAMUNA PUSHTA

WAZIRPUR SLUM

# MOST FREQUENT INTERACTIONS BETWEEN STREETS AND SQUARES



| | OVERLAPP | | FLANKING | | OVERLAPP | | FLANKING | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | SYMMETRICAL | UNSYMMETRICAL | ONE SIDE | TWO SIDES | SYMMETRICAL | UNSYMMETRICAL | ONE SIDE | TWO SIDES | |
| BASIC SHAPE | | | | | | | | | OVERLAPPING BASIC SHAPE |
| ALTERING EXTERNAL DIMENSIONS | | | | | | | | | ALTERING INTERNAL ANGLES |
| ALTERING INTERNAL ANGLES | | | | | | | | | ALTERING EXTERNAL DIMENSIONS |
| ALTERING BOTH | | | | | | | | | ALTERING BOTH |
| ANGLING BASIC SHAPE | | | | | | | | | |
| ALTERING EXTERNAL DIMENSIONS | | | | | | | | | |
| ALTERING INTERNAL ANGLES | | | | | | | | | |
| ALTERING BOTH | | | | | | | | | |

Figure 04.03: Most frequently occurring interactions between Streets and Squares

Source: Author

LEGEND

THE YAMUNA PUSHTA
WAZIRPUR SLUM
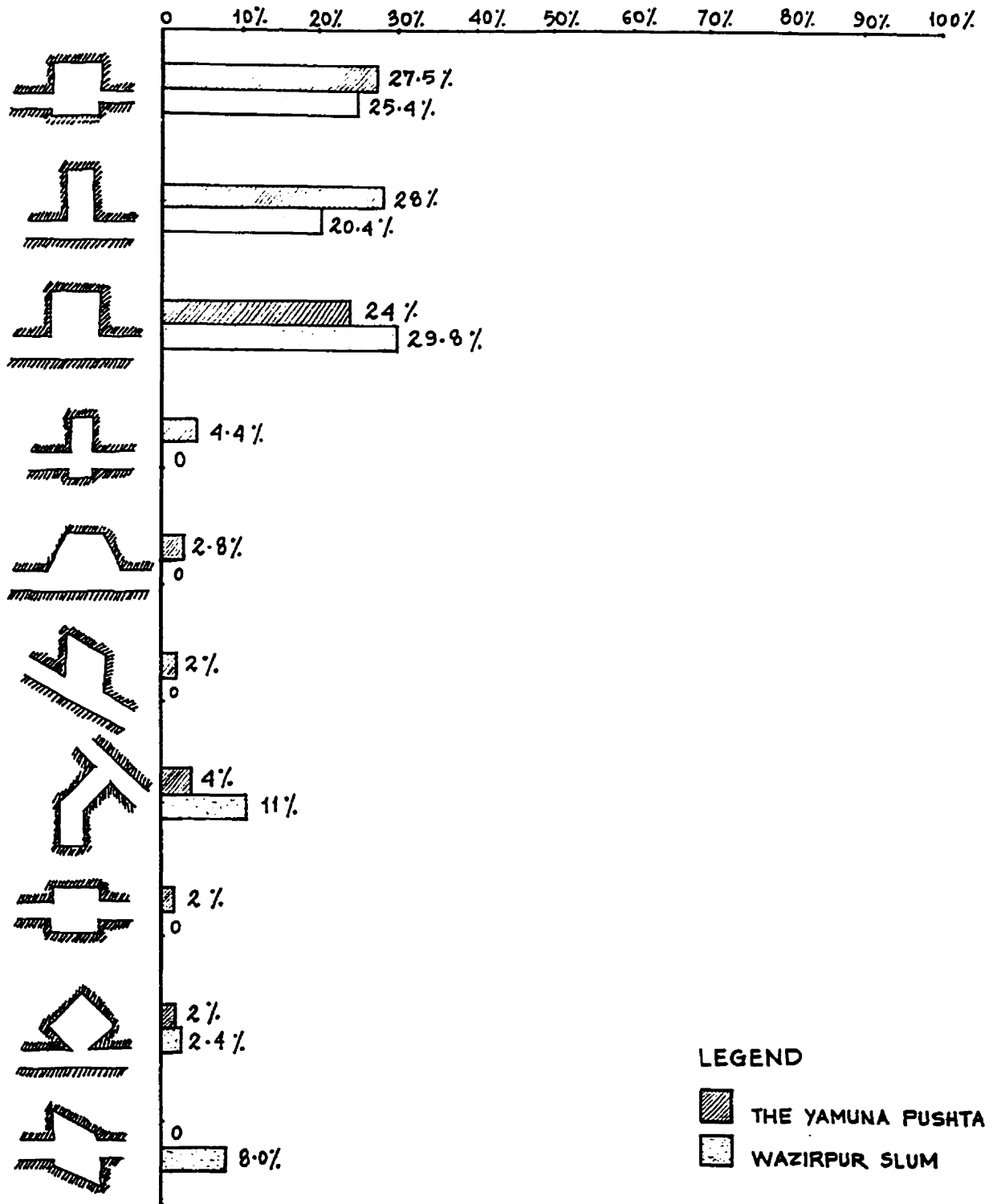
# CHAPTER 5: ON THE SITE

The previous attempt at trying to find spatial order through studying the physical structure of the settlements failed. So now, the researcher decided to visit the site instead to look for possible answers.

This chapter details out various observations and perceptions of the researcher while visiting some squatter settlements in New Delhi, India. These settlements were different from the ones analyzed quantitatively. The reasons for this decision were firstly to increase the overall number of settlements and secondly to ensure that there existed no preconceived notion of the existing plan (as the plans were not available to the researcher initially). Hence, the researcher was merely exploring, experiencing & "sensing" the order in the spatial arrangement, if any. The squatter settlements selected are served by voluntary organizations, thereby facilitating data collection in the settlement. On the basis of the number of dwellings (at least or more than 1500 --- so as to equate the settlements selected for this segment of the study with those used for morphological analysis) and the presence of voluntary organizations, three settlements were arbitrarily selected from all such settlements in Delhi, for the preliminary on-site analysis. Other features, which favored selection, are shown in Figure 05.01. A brief description of the settlements selected follows.

The Yamuna Pushta is a slum which has the unique characteristic feature of being rebuilt every year after the flood waters have receded. Moreover, it is rebuilt in exactly the same location and replicates the spatial configurations as well. This results in no survey plans being available for this settlement --- for in the eyes of the authorities it is not a settlement *per se*. This settlement is on unwanted land. The settlement is strategically located --- 10 minutes to downtown and 15 to 20 minutes from majority of the East Delhi high density areas. Excellent employment opportunities provided as a result of its location are further accentuated by good transportation links. The settlement also supports its own small-scale industries and commerce. Due to its good prospects, this area sees continuous additions in its population.

**Figure 05.01: The settlements selected for field study in New Delhi, India and their locational features.**

Source: Author



ALL SETTLEMENTS ≥ 1,500 DWELLINGS

**Settlement Yamuna Pushta**

- In the flood plain of the river
- Near downtown and high density residential areas
- Easy access to public transportation facilities
- Serves as a service sector to residential and medium-scale industries

**Settlement Preliminary Analysis**

- Near downtown and major offic complex
- Easy access to public transportation facilities
- Serves as a service sector
- On unwanted land - along railway line and drain

**Settlement Nehru Place Slum**

- Next to major Business District
- Serves as service sector for homes and small-scale industries
- Well-linked to public transportation facilities
- Secure land tenure due to its age (as old as the Business district, i.e. since the 1970s)

The second settlement selected was the Nehru Place Slum. The settlement is at least 20-30 years old. It is very well established and has its elders, its own governing committee and enjoys flourishing commerce. A large number of the houses (about 40%) are made of permanent materials. The inhabitants provide the essential service sector to one of Delhi's largest Business Districts and the nearby Government offices and residential areas. It is very well-connected by transportation links. Established in the 1970s, the slum has evaded relocation due to it being an immense vote bank.

The third settlement is near the World Health Organization Headquarters on the Ring Road. The settlement is flanked with a major railway route and a drain. This area along the Ring Road and Vikas Marg (road) is a major office agglomeration. It, hence, provides the employment opportunities for the settlement's inhabitants. With the help of the voluntary organization, the people have made their own committee. Due to the publicity this organization received by journalists, the inhabitants are no longer amenable to answering questions and / or being photographed without monetary gain. This resulted in the settlement being discarded after the preliminary survey.

The analysis that follows has been undertaken at two levels:

- The first comprises of an overview of the macro-level spatial structure of the settlements selected, presented through ordering systems. This highlights the basic distinguishing features of these settlements.
- Drawing upon the previous level as a base, the second level focused on a detailed categorization of various spatial typologies which are seen in these settlements.

## 5.1. LEVEL 1: A PREVIEW OF THE MACRO-LEVEL SPATIAL STRUCTURE THROUGH ORDERING SYSTEMS

The aim of this section is:

- to obtain an idea of the context of the settlements studied
- to comprehend their overall structure and rationale, and
- to specify the significant spatial characteristics which govern and control the logistics

of the spatial vocabulary of these settlements.

These objectives have been achieved through a combination of field observations and literature studies. During the literature survey for this section, the concept of ordering systems as a design tool emerged. This concept, by its very definition, is a useful approach for studying the macro-level features of the settlements.

Ordering systems may be seen as visual devices that allow diverse forms and spaces to co-exist perceptually and conceptually within an ordered and unified whole. In a formal design approach, ordering systems are used to distinguish between the various physical parameters which can generate order in the built environments. These systems view order as the sequence and arrangement of things or events as perceived by human experience and activities. These systems are, therefore, useful in providing a common spatial vocabulary within an open-ended framework, which can support an integrative design process.

Ordering systems identify spatial elements and assemble them into meaningful relationships. (Figure 05.02) Criteria are formulated to state the relationships between the elements and determine the way elements are ordered. So the essential tasks of an ordering system are:

"Identification of significant elements

Selection of critical qualities

Delineation of the most appropriate way to order" (White, 1973, p. 22-23) (Figure 04.03).

It thereby follows that the complexity or simplicity of an ordering system depends upon its elements, qualities and criteria, and the complexity of their mutual relationships. (Figure 04.04) The various ordering systems that may be used to achieve spatial order are:

"Function,

Space,

Geometry,

Context, and

**Figure 05.02: Ordering Systems identify spatial elements and assemble them into meaningful relationships.**

Source: White, 1973, p. 9
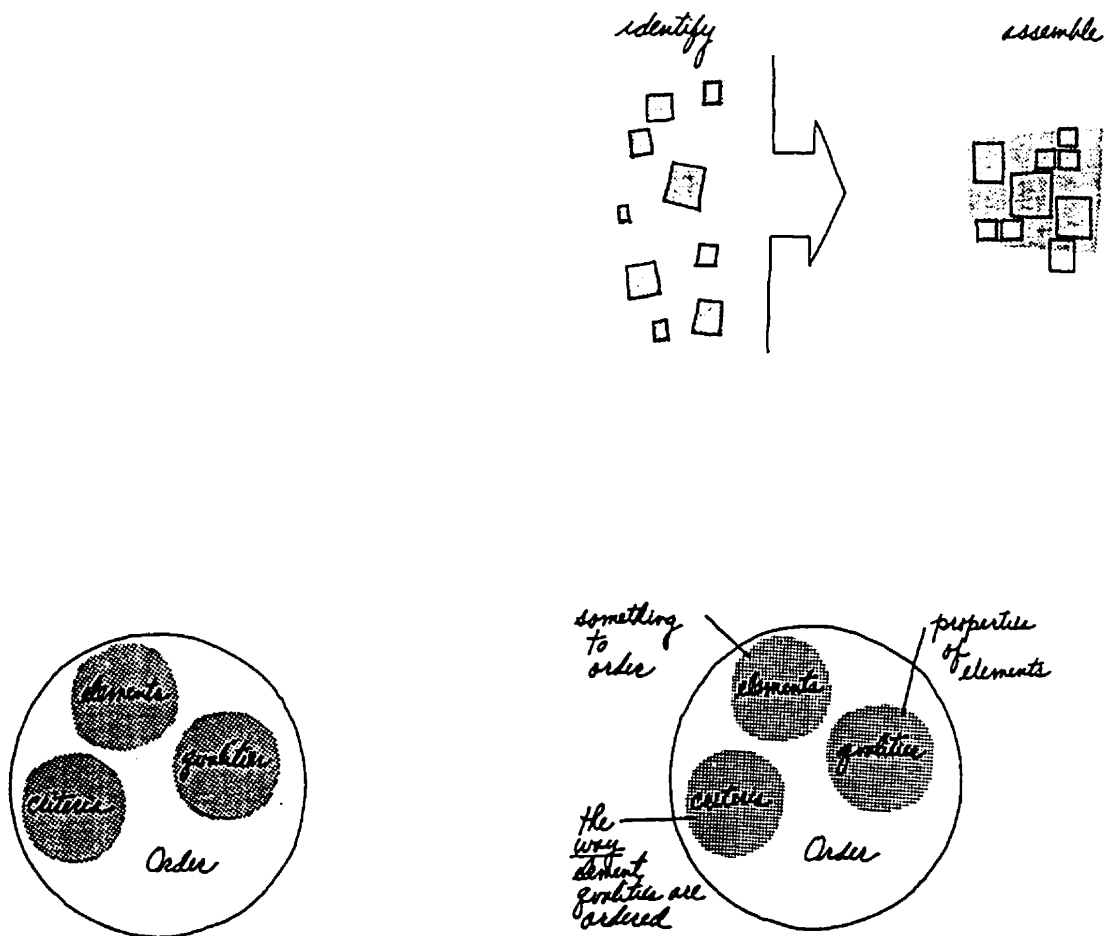


**Figure 05.03: Ordering requires elements to order, qualities of elements to order by and criteria for arranging qualities.**

Source: White, 1973, p. 22

Enclosure". (White, 1973, p. 39)

Each of these ordering systems can, independently, shape the built environment according to its own set of requirements. So, in any given built environment, these ordering systems compete with each other.

Each of these five ordering systems have been compared for formal and informal settlements. During the proceeding analysis, "formal" solutions are prototypical design proposals developed by design professionals, derived from the prevalent conceptions of spatial order. "Informal" settlements are characterized by space which, firstly, has developed empirically over time and, secondly, reflects the inhabitants lifestyle in its spatial configurations. These two urban forms are at opposite ends of the urban spatial continuum. The logic of each is unique. The primary rationale for comparing these two forms was purely functional. The formal approach has been studied and theorized in great detail, whereas the knowledge bank for the informal settlements is still young. Also by presenting informal settlements against a backdrop of the formal settlements enables them to be studied in the light of the established and understood design norms.

**ELEMENTS: ACTIVITIES**

| FORMAL DESIGN SOLUTIONS | INFORMAL COMMUNITIES |
|---|---|
| • Contained in, adjacent to and in vicinity of | • Outdoor or indoor |
| • Pedestrian and vehicular | • During day or night |
| • Conducted by man or machine | • Pedestrian or vehicular (See figure below) |
| • Direct or related (See figures below) | |

CONTAINED    ADJACENT    VICINITY          INDOOR        OUTDOOR

ACTIVITY          ACTIVITY

BY MAN        PEDESTRIAN          DAY          PEDESTRIAN

BY MACHINE    VEHICULAR          NIGHT        VEHICULAR

SOURCE : WHITE, 1973, p. 44-45          SOURCE: AUTHOR

**QUALITIES**
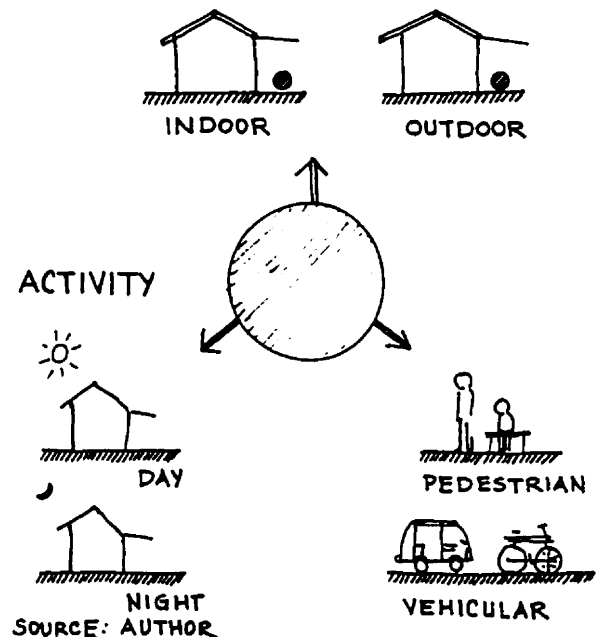
| FORMAL DESIGN SOLUTIONS | INFORMAL COMMUNITIES |
|---|---|
| • Fixed interaction system which is designed with a specific functional requirement. Growth patterns are considered for fixed time spans (continuous change and growth profiles are not considered). Conventional planning is an example of such ideology. | • There is only individual basis for the spatial patterns that are in a state of continuous change as a result of growth over time. The figure shows continuous construction over extended periods of time. Source: Author. |

- Usually different areas do not overlap --- the convention is to design single-use areas.

- There is an overlap of activities with each space being used to its full extent through multiple uses. See figures below.
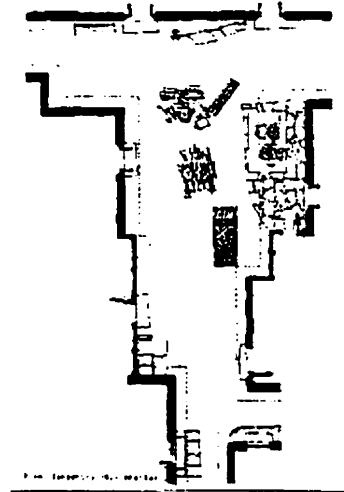


Source: Rybczynski et.al., 1984, p. 24.



Use of the passage as an area for seating as well.

- Activities are segregated by their location, whether they can be zoned internally or externally. (See figure below)



```
INSIDE        OUTSIDE

HOUSE   PEDESTRIAN   VEHICULAR
•EATING.
•SLEEPING
SOURCE : AUTHOR
```
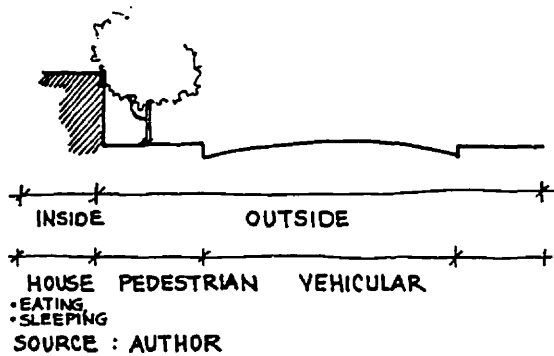
- No such fixed demarcation --- only variable is the availability of space. The figure shows one space being as house extension during the day and for sleeping during the night.



- Vehicular and pedestrian zones are segregated (See figure below)



```
PEDESTRIAN    VEHICULAR

SOURCE : AUTHOR
```
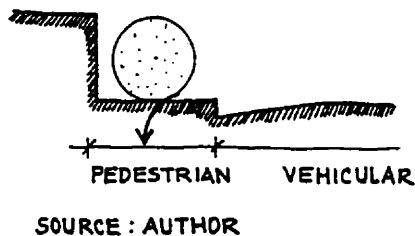
- Vehicular and pedestrian zones coexist (See figure below)



```
PEDESTRIAN + VEHICULAR
SOURCE : AUTHOR
```
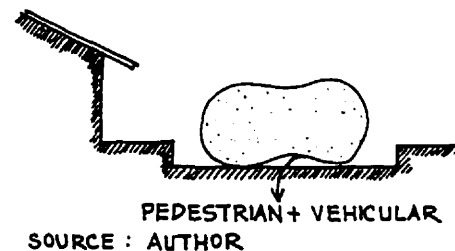
- Certain activities require specific types of environments. As an example is the concept of the neighborhood park which is solely meant for play and relaxation and is a symbol of the same.

- No specific environment is pre-conceived. On the spot, opportunistic decisions are the determining forces. Activities themselves create the necessary ambience. The figure below shows an overlap of circulation and play areas. (Source: Author)

- The main aim is to enhance functional efficiency.

- The primary aim is economic benefit.

**CRITERIA**

| FORMAL DESIGN SOLUTIONS | INFORMAL COMMUNITIES |
|---|---|

- Activity systems are grouped using time, space and value. (See below)

- Activity systems are grouped using time, economic benefits and human interactions and relations.(See Case study 1)



MASTER PLAN: MOVEMENT SEQUENCE
GROWTH OVER OF SPACE USE
TIME

SOURCE : WHITE, 1973, p. 58
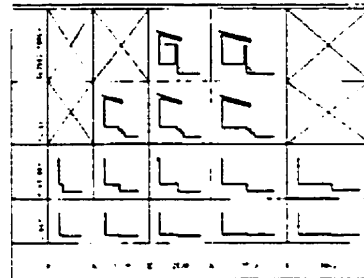


This figure shows the effect of time. Source: Rybczynski et al, 1984, p. 20.



This figure (by Author) shows maximization of economic benefit — extensions being used for commerce.

**ELEMENTS**

| FORMAL DESIGN SOLUTIONS | INFORMAL COMMUNITIES |
|---|---|
| • Spaces | • Spaces |
|  | • People |

**QUALITIES**

| FORMAL DESIGN SOLUTIONS | INFORMAL COMMUNITIES |
|---|---|
| • The functional requirements of any activity determine the size of the space. | • Opportunistic decisions by the people using the space determine the size of the space generated.    In the photograph below, the house owner has exploited the situation and built an enclosure for himself which is carved out of public space.  Source: Author<br><br> |
| • The actual shape and volume determined by geometric considerations. See below.<br><br><br><br>Source: Webb, 1990, p. 97 | • The shape and volume depends on the economic growth of the people using the space. The richer a family gets, the better is the condition of its dwelling — the first step is to make the dwelling *pukka*, and the second is to erect a second floor.<br><br><br><br>Source: Author |

- The spaces are static and dynamic --- such spaces are delineated by a physical boundary. (See figure)
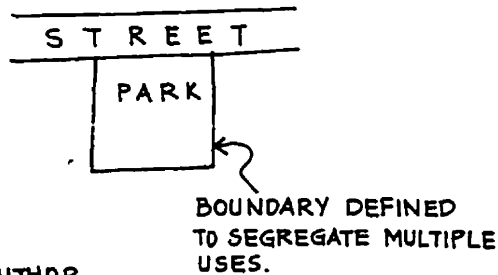
- There are only dynamic spaces --- there being no boundaries to define the free-flowing space. (See figure)



S T R E E T

PARK

BOUNDARY DEFINED
TO SEGREGATE MULTIPLE
USES.

SOURCE : AUTHOR



ONE AREA
FOR MULTIPLE
USES
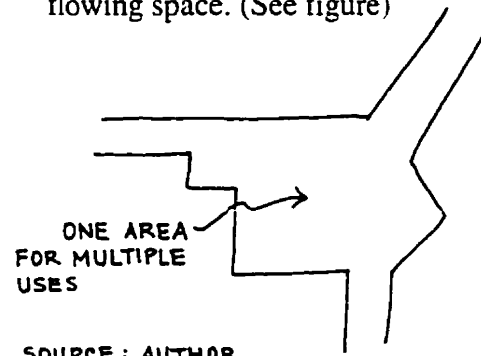
SOURCE : AUTHOR

CRITERIA

| FORMAL DESIGN SOLUTIONS | INFORMAL COMMUNITIES |
|---|---|
| • Scale can vary from intimate to monumental. | • The scale, due to space shortage, is restricted to the intimate. See below. Source: Author |



- Space is ordered using the criteria of the other systems. An example is Lutyens Delhi where space has been formed through the use of alignment (geometry); it is used for ceremonial purposes (function) etc

- Space is ordered by collective and individual choice and pressures. Refer to the case studies attached.

Although it may seem erroneous to support such a view, the elements, qualities and criteria used to geometrically order space in both formal and informal design solutions are derived from similar principles. The difference, however, lies in the consciousness of the spatial expression of the ordering system at work. Formal solutions employ geometric ordering as a deliberate attempt to reinstate Euclidean geometry. Informal and traditional settlements, on the other hand, are intuitively designed, evolving through the collective cognitive design expertise of centuries of first hand experience and traditional archetypes. The criteria for generating geometric order in informal settlements rely on an intimate relationship between not only the functional but also the social attributes. The result is an informal, non-traditional classification system for spaces — the matrices are one example of this. Another illustration is the loose system for street classification of primary, secondary and tertiary developed in the research exercise, "How the other half builds?" (Rybcynzski, 1984, p. ). The formal and informal solutions portray a living example of the rich variety possible by the use of the same ordering system — one exemplifying conventional mathematical geometry and the other personifying its antithesis, the geometry of nature.

### FOR BOTH FORMAL DESIGN SOLUTIONS AND INFORMAL COMMUNITIES

---

### ELEMENTS

- All components that possess dimension and size.

---

### QUALITIES

- The physical properties of the spaces themselves.

---

- The qualities of the spaces are tools which aid in relating the spaces into an order.

---

### CRITERIA

- Using the qualities of space volumes, ordering can be done in two ways. Spaces can be related to systems or to spaces.

---

- When spaces are related to systems, they are linked to the point or to the line.  Example is a street...



in an informal set-up...    in a formal settlement
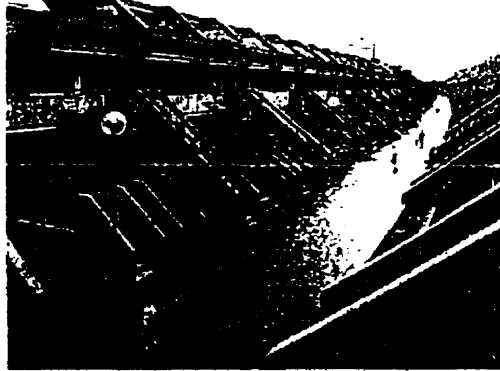
- When spaces are related to spaces, ordering involves both systems and spaces.  Spaces around a court are an illustration of this.
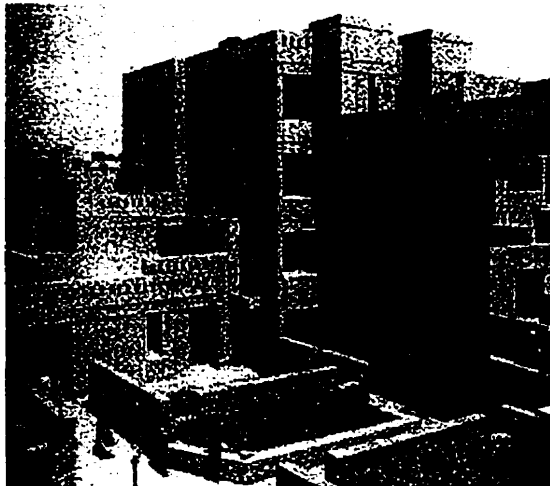


In informal and          formal settlements

Defined as the whole situation background or environment relevant to some event or product.

**ELEMENTS**

| FORMAL DESIGN SOLUTIONS | INFORMAL COMMUNITIES |
|---|---|
| • Site factors: size, shape, topography, foliage, slope, views, existing circulation patterns and linkages. See below. | • Economic and business opportunities in the area, political backing, status of the invaded land gain precedence. |
| • Climatic factors: solar and wind orientation, thermal comfort factors. | |



The qualities and criteria used to order these elements are varied and complex and are beyond the scope of the current study.

<div align="right">

**ELEMENTS**

</div>

| FORMAL DESIGN SOLUTIONS | INFORMAL COMMUNITIES |
|---|---|
| • The physical shells around the building spaces form the elements. | • The physical enclosure is not significant as a large number of activities are performed outdoors. "Outdoor room" gain precedence over the enclosed huts. |
| • The designer is concerned with relationships between the elements of the structural system, the openings, enclosing planes and their materials. | • The residents are only concerned with the economic affordability of the shelter erected. See examples below. Source: Rybczynsky, 1984, p. 6, 7. |

Through a comparative evaluation of these five ordering systems, it has been established that the ordering principles for formal, conventional planning solutions can be modified to fit informal settlements. By this, it became possible to compare both these spatial expressions on the same footing. The purpose of this exercise, then, can be stated as an attempt to provide a shared vocabulary linking these two design solutions — usually considered poles apart with nothing in common. Another objective was to clarify some of the design and planning priorities of the residents and architects of the informal settlements — thereby clarifying the context of the squatter settlement as a prototypical built environment, as it may be applied to the urban context in India.

The settlements selected in Delhi and their locational traits are specified in Figure 05.01. The two settlements which were finally taken-up for this study are the Yamuna Pushta and the slum at Nehru Place. Brief descriptions of these settlements have already been discussed in the beginning of this chapter.

## 5.2. LEVEL 2: SPATIAL CATEGORIZATION — THE MATRICES REVISITED

The previous chapter left-off at the point where the researcher realized that the matrices alone were not able to prove the existence of spatial order. So, the researcher decided to use the same matrices as a framework for her field work. The matrices, as a tool, facilitate in:

- giving a mathematical, systematic and logical form to observations on site, which are, by their very nature, impressionistic;

- complementing the morphological analysis by empirical data from the site;

- comparing the morphological analysis and actual site situations;

- providing a link between the two levels of analysis undertaken, thereby

- integrating the study of spatial order at the 'studio' (from plans and surveys as in the previous chapter) and the 'site' levels — both being evaluated using the same criteria and format.

The information presented is a combination of photographs, sketches and some measurements done on site, as well as informal interviews with the residents.

### 5.2.1. Method of Analysis

For each sub-section in any given matrix, the following steps were undertaken:

- photographs were taken that can illustrate as many cells of the matrix as is possible

- part plans were made, where necessary, to highlight dimensions and scale of the space selected

- These physical criteria were then complemented with factors such as human scale, relation of the space with adjoining dwelling, activity patterns in the given space and its ethnic and / or socio-cultural implications.

The analysis has been presented in the form of graphic plates so as to generate design aids. Please refer figures 05.04 to 05.20.

### 5.2.2. Summary of the Analysis at Level 2

Designed to be used in conjunction with the morphological analysis (Chapter 3 and 4), the

## BASIC SHAPE
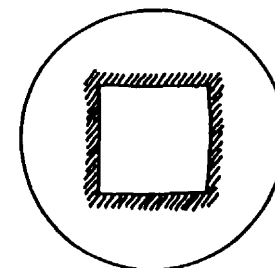
## RELATION TO ADJOINING DWELLINGS

- COURTYARD OPENS ONTO THE SPACE
- NOT USED FOR HOUSEHOLD BUT FOR 'SUPERVISED' PLAY

## SOCIO-ECONOMIC FEATURES OF USERS

- RURAL MIGRANTS FROM BIHAR. THEY WERE SOME OF THE ORIGINAL MIGRANTS WHO FORMED THE SLUM
- PLAN AREA OF HOUSE IS APPROX. 20 SQ. M.
- BRICK WALLS BUT NO PROPER ROOF

## SOCIO-SPATIAL FEATURES

- SHELTERS FOR ANIMALS ARE USUALLY BUILT NEAR THE PERIPHERY OF THE HOUSE IN RURAL NORTHERN BIHAR
- THIS AREA IS OFF THE MAIN CIRCULATION ROUTES. SO THIS SPACE ISUSED QUITE FREELY WITHOUT LOSS OF PRIVACY

PART PLAN

1.0 M
2.3 M
1.3 M
1.3 M
1.2 M

PROVIDES PARTIAL SHADE

ANIMAL SHELTER    PLAY AREA    MOVEMENT    RELAXATION
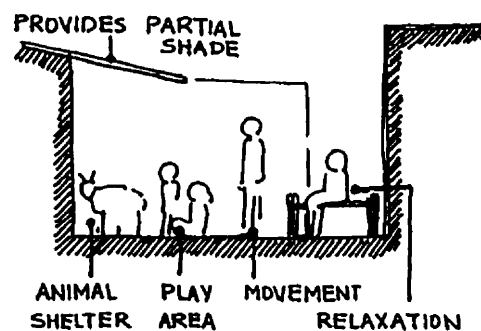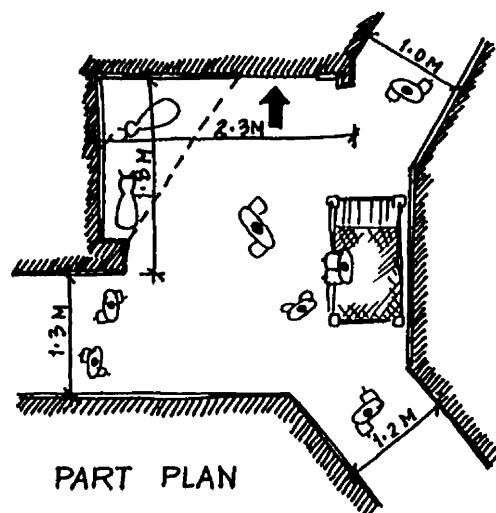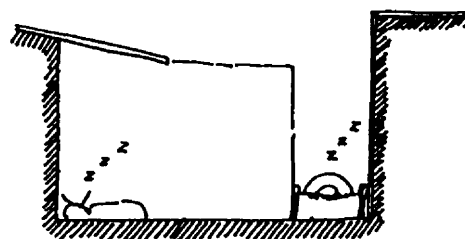
ACTIVITIES : DAY

ACTIVITIES : NIGHT

## BASIC SHAPE
### ANGLING

**PART PLAN**

1.5
3.0 M
2.0 M
4.0 M
3.0 M
0.7
1.6 M

SWING
(PLAY AREA)

MEETING
EATING
DAY: WOMEN
NIGHT: MEN

MOVEMENT
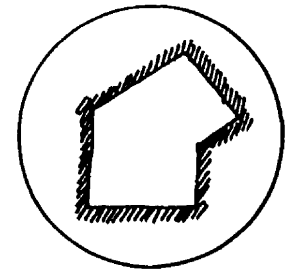
## RELATION TO ADJOINING DWELLINGS

- SPACE ACTS AS AN OUTDOOR MEETING POINT --- THE ROCKY OUTCROPS MAKE SPACE REDUNDANT FOR HOUSES

- A SHOP FACES THIS AREA PROVIDING A LIVELY ENVIRONMENT AND REASON TO PAUSE AND RELAX

## SOCIO-ECONOMIC FEATURES OF USERS

- THE SNACKS SHOP IS RUN BY A WIDOW AND HER BROTHER.

- WHITEWASH, PLASTERED WALLS, GALVANIZED IRON SHEET ROOFS.

## SOCIO-SPATIAL FEATURES

- SWINGS AND TREES ARE ASSOCIATED TRADITIONALLY

- THIS SPACE IS AN URBANIZED + TRADITIONAL AREA --- THE SNACKS SHOP ACTS AS A MODERN VILLAGE *BAITHAK* (SITTING AREA FOR MEN)

PART PLAN

## BASIC SHAPE
## OVERLAP

ACTIVITIES : DAY



DRYING      PLAY      MOVEMENT
CLOTHES        STORAGE

ACTIVITIES : NIGHT



SLEEPING   COOKING, EATING
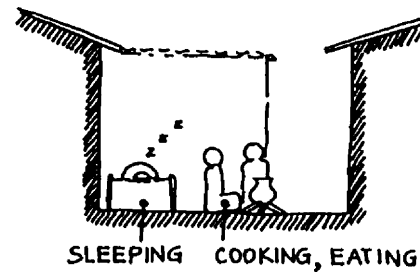
## RELATION TO ADJOINING DWELLINGS

- PROVIDES A PAUSE IN A LONG STRETCH OF STREET

## SOCIO-ECONOMIC FEATURES OF USERS

- RURAL MIGRANT YOUTH FROM BIHAR

- THEY DO NOT HAVE THEIR FAMILIES WITH THEM

- DURING THE DAY AND RETURN ONLY DURING THE NIGHT.

## SOCIO-SPATIAL FEATURES

- DURING THE DAY THE RESEARCHER FOUND THE SPACE DULL AND LIFELESS

# BASIC SHAPE

## FLANKING ONE SIDE
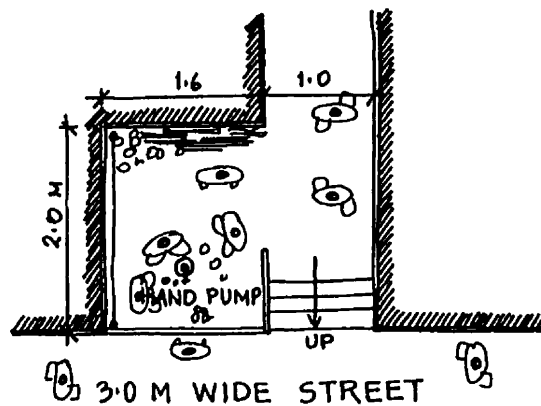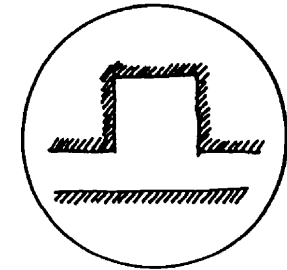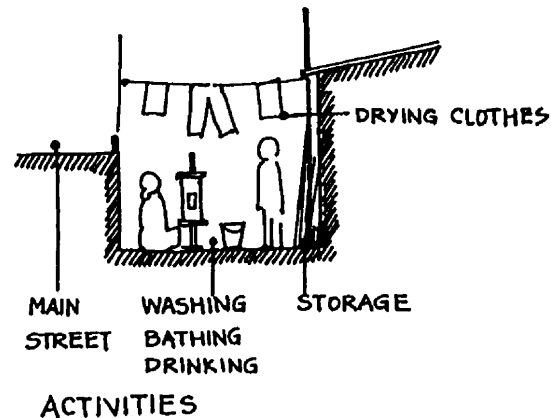
## RELATION TO ADJOINING DWELLINGS

- ONLY THE SIDES OF THE HOUSES FLANK THIS SPACE

- SPACE DEFINES THE JUNCTION AND THE CORNER

- IT IS PURELY A FUNCTIONAL SPACE

## SOCIO-ECONOMIC FEATURES OF USERS

- A TV ANTENNA REFLECTS THE PROSPERITY

- THE STREET GIVES ACCESS TO A SECTION HOUSING NEW ENTRANTS

## SOCIO-SPATIAL FEATURES

- INTERESTING USE OF LEVEL DIFFERENCE

- SPACE ACTS AS A FUNCTIONAL RATHER THAN A SOCIAL EVENT AT THE TIME OF OBSERVATION.

DRYING CLOTHES

MAIN STREET | WASHING BATHING DRINKING | STORAGE

**ACTIVITIES**

1.6   1.0

2.0 M

HAND PUMP

UP

3.0 M WIDE STREET

**PART PLAN**

# ALTERING EXTERNAL DIMENSIONS
## FLANKING ONE SIDE

**MAIN STREET**

**PART PLAN**

0.8 + 0.7

3.5 M

**ACTIVITIES**

DRAIN PIPE

DRAIN   STORAGE   ACCESS
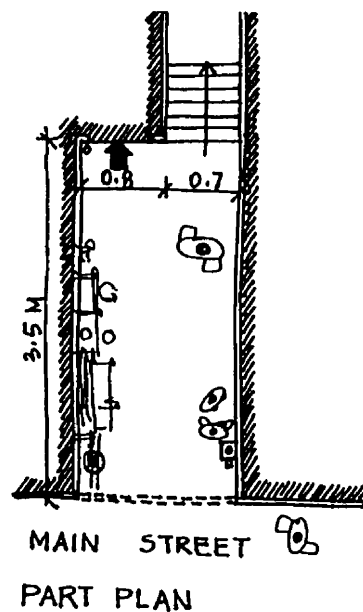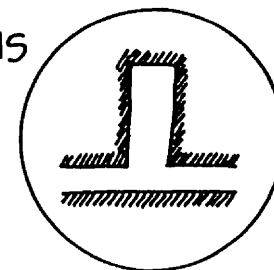
### RELATION TO ADJOINING DWELLINGS

- GIVES PRIVATE ACCESS TO TWO DWELLINGS OFF THE MAIN CIRCULATION ROUTE.

### SOCIO-ECONOMIC FEATURES OF USERS

- DRAINAGE PIPES AND BRICK G+1 STRUCTURES HIGHLIGHT ECONOMIC STABILITY.

- PLAN AREA IS QUITE LARGE, APPROX. 20-25 SQ M.

### SOCIO-SPATIAL FEATURES

- IT DELINEATES HUMAN PREFERENCE FOR PRIVACY OFF THE PUBLIC STREET

- THIS SPACE ALSO DEPICTS THE SIGNIFICANCE OF MAKING A STATEMENT, AND NOT JUST AN ENTRY.
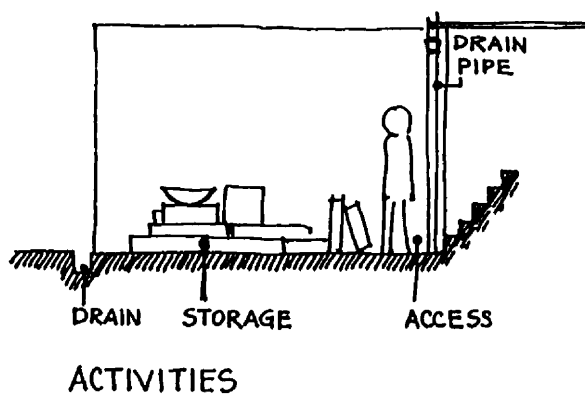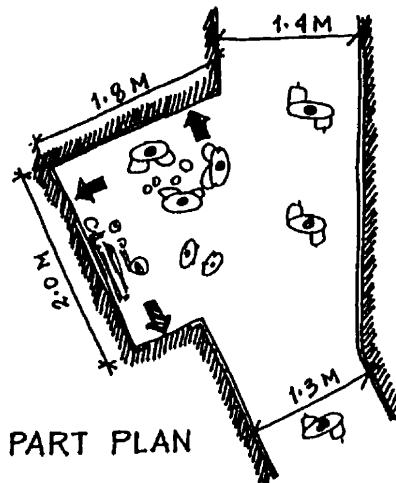
# ALTERING INTERNAL ANGLES
## FLANKING ONE SIDE

STORAGE          MOVEMENT, PLAY
HOUSEHOLD ACTIVITIES

**ACTIVITIES : DAY**

**ACTIVITIES : NIGHT**

**PART PLAN**

1·4 M

1·8 M

2·0 M

1·3 M
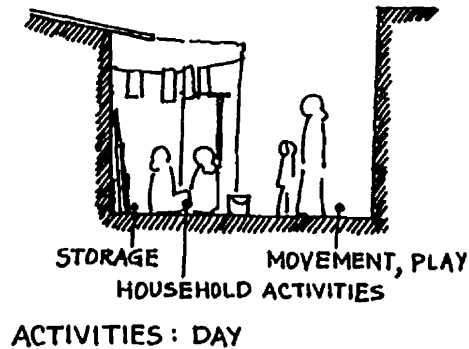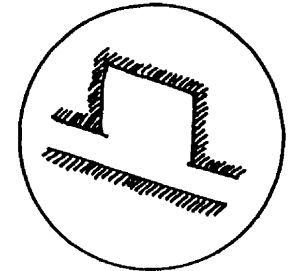
## RELATION TO ADJOINING DWELLINGS

- DUE TO BEING SHELTERED FROM THE MAIN CIRCULATION ROUTE, SPACE ACTS AS A HOUSEHOLD EXTENSION FOR THE 3 HOUSES SHOWN

- SPACE IS USED ONLY DURING LATE NOON AS ALL MEMBERS GO TO WORK

## SOCIO-ECONOMIC FEATURES OF USERS

- RURAL MIGRANTS FROM HARYANA

- PLAN AREA IS QUITE SMALL (APPROX. 4-5SQ. M).

## SOCIO-SPATIAL FEATURES

- DUE TO SMALL HOUSES, SPILLING-OUT IS NECESSARY.

- SOCIALLY, IT IS NORMAL TO COOK, WASH, GRIND ETC IN THE OPEN. SO THIS LIVING PATTERN IS QUITE SUITABLE.

# ALTERING INTERNAL ANGLE & EXTERNAL DIMENSIONS
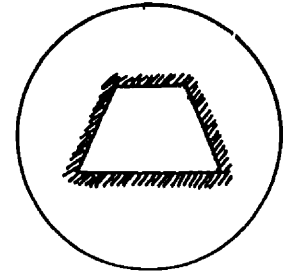
## RELATION TO ADJOINING DWELLINGS

- ACTS AS A HOUSEHOLD EXTENSION
- NOT USED EXTENSIVELY BY THE HOUSES AS AN OUTDOOR EXTENSION SINCE IT IS ON THE MAIN CIRCULATION ROUTE

## SOCIO-ECONOMIC FEATURES OF USERS

- RURAL MIGRANTS FROM HARYANA (STATE OF INDIA)
- G+1 STRUCTURE, PLASTERED CONCRETE HOUSES
- THE HOUSES ON THE LEFT "LIVE OUTDOORS" MORE THAN THEIR NEIGHBORS DO

## SOCIO-SPATIAL FEATURES

- DUE TO ECONOMIC DISPARITY, THE RICHER PEOPLE HAVE GREATER CONTROL OVER THE SPACE
- THE FRUIT VENDOR COMES FROM ANOTHER (POORER) PART OF THE SETTLEMENT.



PART PLAN



ACTIVITIES

STORAGE | PLAY | FRUIT VENDOR
RELAXATION | MOVEMENT
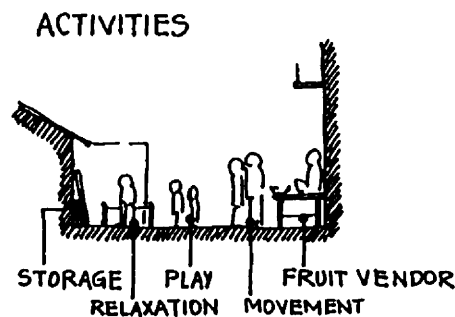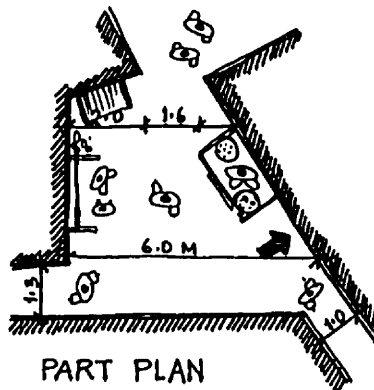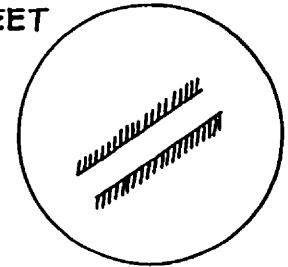
## PARALLEL STREET



**FOR EACH TYPE, IT IS POSSIBLE TO ISOLATE EXAMPLES AT DIFFERENT SCALES, SUCH AS:**

- A PRIMARY STREET

- A SECONDARY STREET

- A TERTIARY STREET

ESPECIALLY IN THE CASE OF RESIDENTIAL STREETS, THE HEIGHT TO WIDTH RATIO BECOMES CRITICAL.



DRAIN                3 M WIDE

PART PLAN



STORAGE

1.0

1.8 M

MAIN STREET
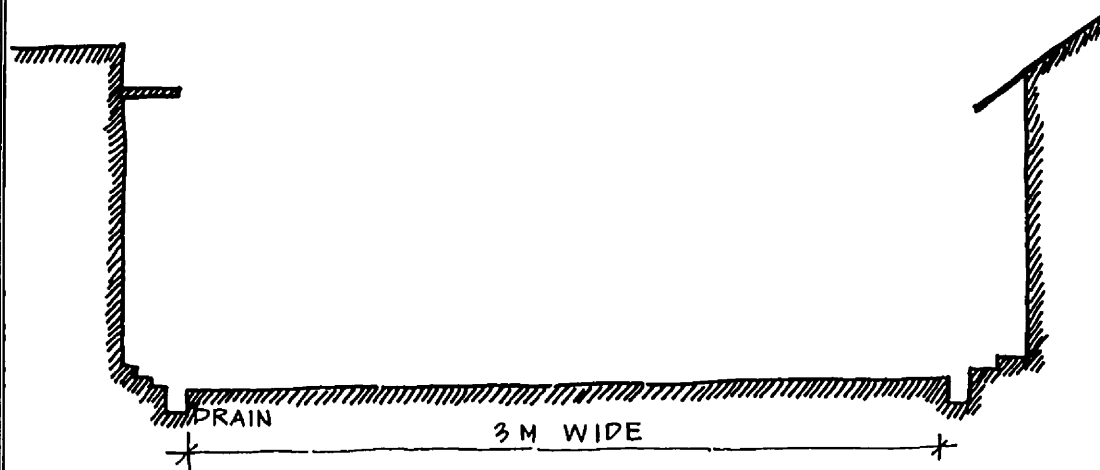
NON-PARALLEL STREET
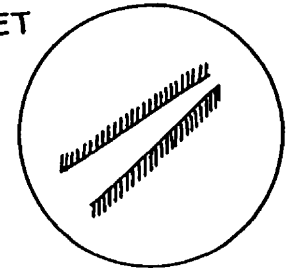


## SOCIO-SPATIAL FEATURES

- IT IS INTERESTING TO SEE THE SPILL-OVER OF HOUSEHOLD ACTIVITIES INTO THE STREET

- OUTDOOR LIVING IS A TRADIONAL WAY OF LIFE

- THIS SPILL-OVER IS ALSO NECESSIATED DUE TO FIRSTLY, THE LACK OF SPACE INSIDE THE DWELLING AND SECONDLY, THE ABSENCE OF ANY COUTYARD SPACE WITHIN THE PRIVACY OF THE HOUSE ITSELF.
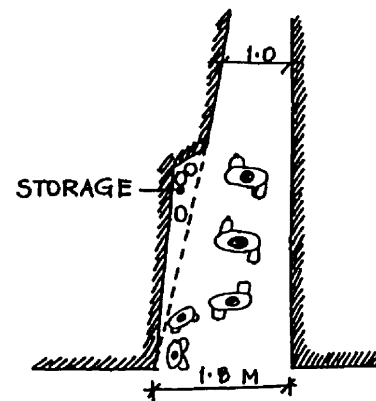
# BENT STREET
## REGULAR
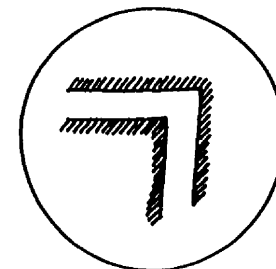
### RELATION TO ADJOINING DWELLINGS

- ALL HOUSES HAVE THEIR SIDES OR BACK TOWARDS THIS AREA SO IT REMAINS A PUBLIC COMMON RESOURCE

- PROVIDES OPEN SPACE AT STREET JUNCTION

### SOCIO-ECONOMIC FEATURES OF USERS

- RURAL MIGRANTS FROM UTTAR PRADESH (STATE OF INDIA)

- TEMPORARY MATERIALS HAVE BEEN USED FOR WALLS AND ROOF

- PLAN AREA OF HOUSE IS ABOUT 8-10 SQ. M. FOR 6-10 PEOPLE.

### SOCIO-SPATIAL FEATURES

- THE TRADITIONAL WELL HAS BEEN REPLACED BY THE HAND-PUMP

- SINCE THERE IS NO SHADE, THIS SPACE DOES NOT ACT AS A MEETING POINT DURING THE DAY

**3.5 M**    **1.0 M**

**HAND PUMP**

**3.0 M WIDE STREET**

## PART PLAN

## ACTIVITIES

**DRAIN**
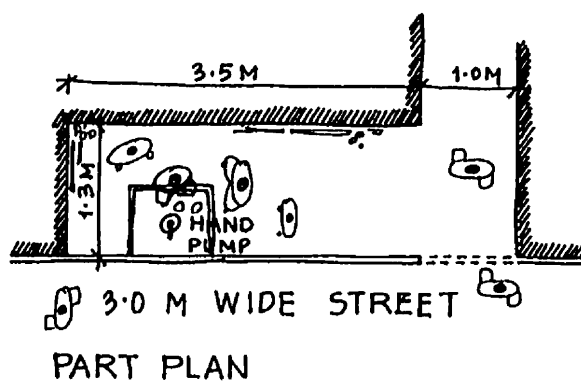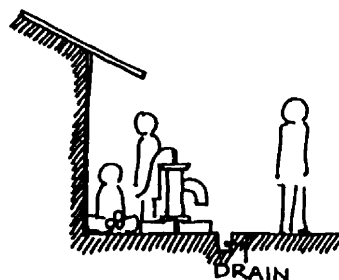
## AROUND WATERPOINT
- BATHING
- WASHING
- DRINKING

# BENT STREET
## REGULAR
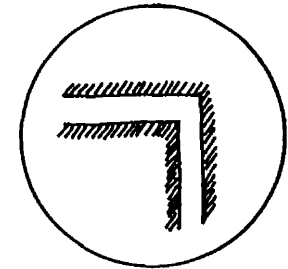


## SOCIO-SPATIAL FEATURES

- THIS IDOL MAKER HAS UTILIZED THE CORNER LOCATION OF HIS DWELLING TO HIS ADVANTAGE --- HIS GOODS HAVE GREATER VISIBILITY.

- FURTHER, HIS SHOP HAS BEEN ABLE TO CREATE A LANDMARK --- THE STREET AND JUNCTION IS NOW KNOWN IN THE COMMUNITY AS THE IDOL-MAKER'S CORNER.
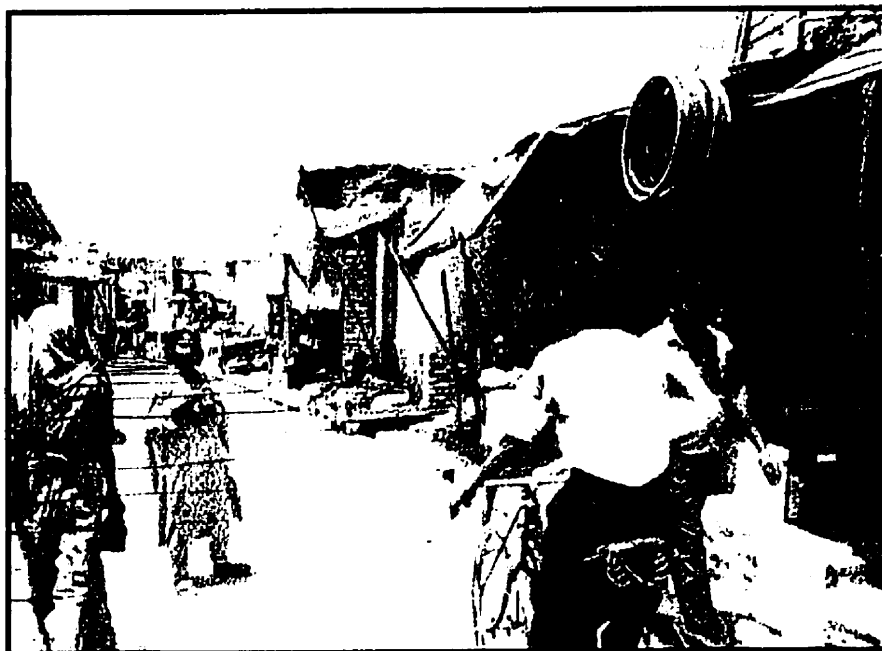
# BENT STREET
## IRREGULAR
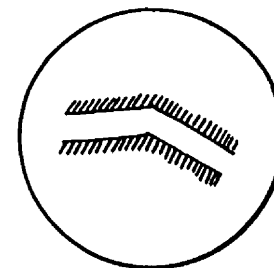


**THE EXAMPLES SHOWN HERE ARE OF:**

- A PRIMARY STREET

- A SECONDARY RESIDENTIAL STREET
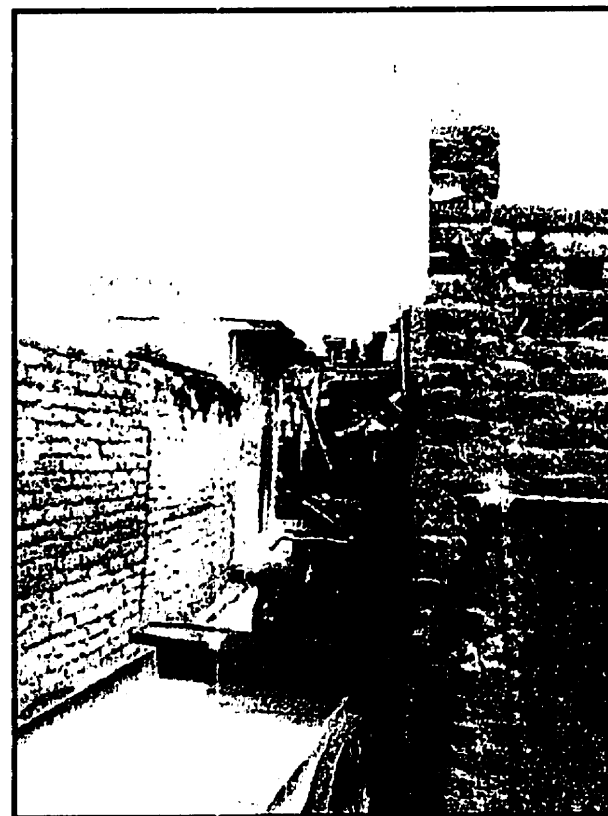
# CURVED STREET
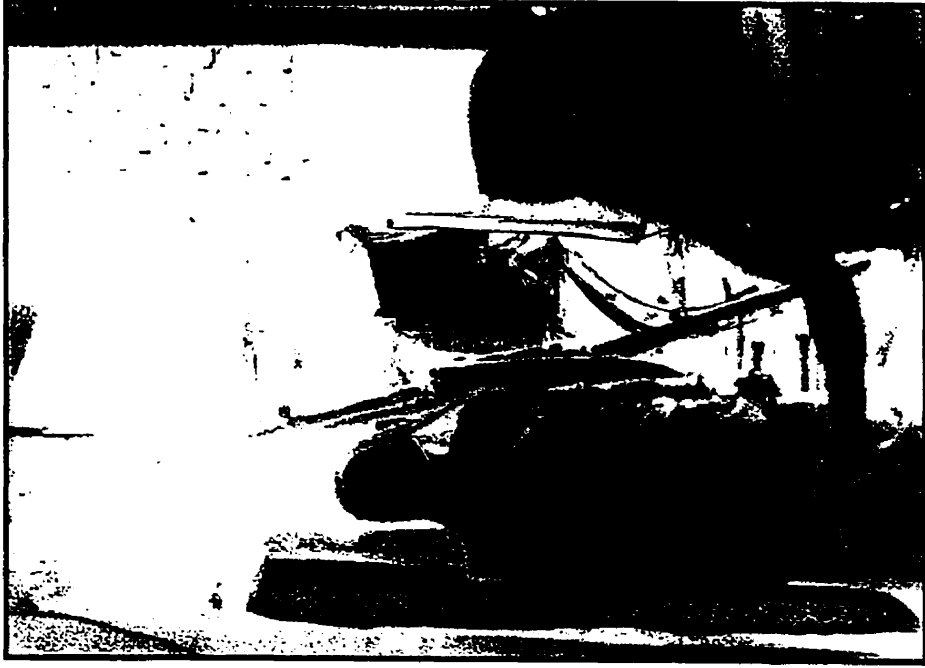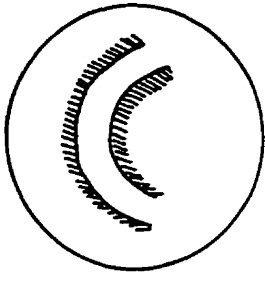
## SOCIO-SPATIAL FEATURES

- THIS IS AN EXAMPLE OF A TERTIARY RESIDENTIAL STREET

- THE CURVE IS EVIDENT THROUGH THE DRAIN.

# INTERACTION WITHIN STREETS
## T-JUNCTION AT RIGHT ANGLE
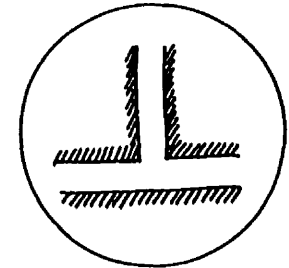


### SOCIO-SPATIAL FEATURES

- THIS IS AN EXAMPLE OF A JUNCTION
  BETWEEN A SECONDARY (RESIDENTIAL)
  STREET AND THE MAIN STREET OF THE
  SETTLEMENT.

## INTERACTIONS WITHIN STREETS
### T-JUNCTION AT ANY ANGLE
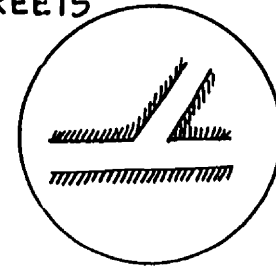
**SOCIO-SPATIAL FEATURES**

- HOUSES HAVE LITTLE OR NO PRIVACY

- THE SITUATION HAS BEEN SOMEWHAT EASED-OUT FOR THE RESIDENTS BY CREATING A "NICHE" OF SPACE WHICH CAN AFFORD SOME PERSONAL SPACE FOR THE FAMILIES USING THIS SPACE.

- DUE TO THIS NICHE, THE SPACE IS USED EXTENSIVELY AS A HOUSE EXTENSION, WITH A VARIETY OF ACTIVITIES ADDING VITALITY TO THE SPACE.

PART PLAN
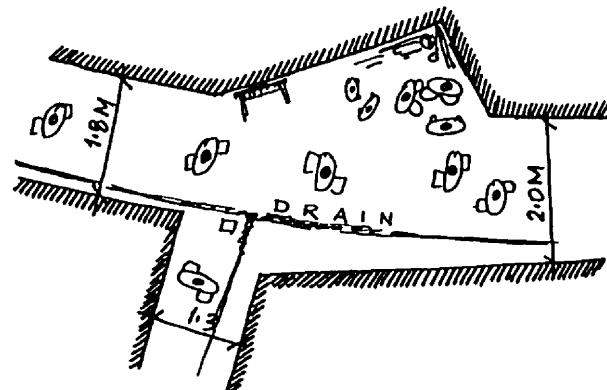
## INTERACTIONS WITHIN STREETS
### BENT IRREGULAR AT ANY ANGLE
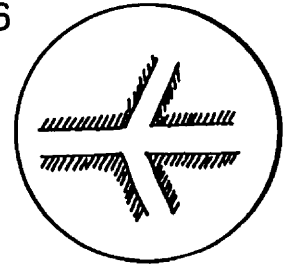
**SOCIO-SPATIAL FEATURES**

- THIS IS AN EXAMPLE OF A SECONDARY RESIDENTIAL STREET BEING INTERSECTED BY A TERTIARY RESIDENTIAL STREET.

- THE SECONDARY STREET IS 2 M WIDE AND THE TERTIARY STREET IS 1.4 M WIDE.

- THE STREET DOESNOT FEEL CRAMPED DUE TO THE SINGLE - STOREY HOUSES DEFINING IT. ALSO, THERE IS HARDLY ANY ENCROACHMENT ON THE PUBLIC SPACE OF THE STREET.

key results of this section are:

- the empirical confirmation of the validity of the morphological analysis and the matrices derived, and
- the overlay of some of the socio-cultural and ethnic attributes of the residents onto the purely physical realm of space and its types.

## 5.3. CONCLUSIONS

However, this section still does not provide the order that researcher is trying to find. It only provides a better understanding of the quality of the physical space in discussion, through highlighting its additional attributes. But it ends at that. There is no way in which these findings, even when coupled with the findings of the previous two chapters, can identify and isolate their spatial order.

So the search must continue....

# CHAPTER 6: PLANNING THE SQUATTER SETTLEMENT --- THE PEOPLE'S PREROGATIVE

The analysis conducted so far delved into the socio-spatial structure observed in squatter settlements and attempted to categorize the space into various 'types'. But the answer so far has been "CHAOS." All that the research has brought forth is an immense variety of spaces and geometric patterns. Added to that is the realization of the multitude of uses and functions each space provides for. Qualitative parameters, such as the social, economic and cultural significance for each space, further enrich the spatial connotations of these settlements.

The summation can be expressed as follows:

> **Geometry + Function + Socio-cultural significance = CHAOS**

This, then, brings up a new topic for discussion --- What is chaos? Is it possible that the concepts of chaos and disorder can provide a new direction in this search for spatial order?

The first issue, then, is to define chaos and disorder. The image that these two terms present is one of a "random and diffuse distribution with no tangible ordering cues, nothing out of which a pattern or arrangement might be created." (Johnson, 1994, p. 242). This seems to depict the squatter settlement very well !!

But, suppose, at this point, one were to analyse an extensive forest. For someone who stays within the forest, there is no perception of chaos in it. But to a stranger, a visitor, the forest might be the equivalent of chaos as a consequence of his / her feeling lost. The forest is, in itself, neither a representation of order nor disorder. The degree of order it imbibes is therefore value-loaded, based on the property of the human observer / participant. It will necessarily vary for each human being.

These queries challenge the very concept of chaos and order as being a characteristic of the

participant rather than the structure itself. This highlights the role (negative, maybe) of the cognitive and perceptual images of order acting as filters which alter the overall human view of the built environment. So, if these filters are diluted, chaos may be conceived as a state in which "...randomness reigns to such an extent that any sample of it is like any other sample...[But this in itself] implies a homogeneity..." which is a complete denial of order and structure. (Johnson, 1994, p. 243). Chaos, then, is order as well, only of a different kind. (Bohm & Peat, 1987; Gleick, 1988; Batty & Longley, 1994).

Applying this to human settlements brings us to the assertion that when people build their settlements, "different cultural systems interrelate and give form to the built world; it [the settlement] is not a direct product of any institutionalized design practice but rather the result of a general process of culture." (Agrest, 1991, p. 32). So an inherent order is but inevitable --- some codes / rules are necessary for the development and sustenance of the settlement and thereby, the society.

The key words above are "codes and / or rules", which led the researcher to begin the search for these codes and rules in squatter settlements. These settlements are not designed by professional planners and architects, so naturally the answer cannot lie in either a textbook or an office. At this point the researcher decided to revisit the settlements to ask the inhabitants, the actual designers of these settlements

## "How *they* generate these spaces?"

The settlements that the researcher decided to visit again were the Yamuna Pushta and the Nehru Place slum. The reasons for this were that the people in these settlements were very friendly and helpful to students' efforts, as was felt by the researcher in her first visit. Also, the voluntary organizations in these communities were well-established and had good rapport with the community's elders and leaders. The NGO (Non-governmental organization) in the Nehru Place slum was successfully running a children's day-care and women employment centers. This has resulted in the NGO and its workers being accepted wholeheartedly by the entire community.

The Yamuna Pushta was selected due to its unique annual rebuilding feature. Logically, this had to mean the observance of some kind of rules and codes. Thus, the settlement was an ideal case study. Also, the community is a agglomeration of a number of smaller ethnic groups. Each group has its leaders and elders, thereby providing the researcher with diverse opinions and viewpoints.

## 6.1. PERCEPTIONS AND VIEWPOINTS

When questioned in informal discussions about how they plan their settlements, the residents said that every space in the settlement is an expression of the community's concerted action. Whether it is the laying-out of streets or the generation of open spaces at different locations, the residents and community leaders get together to reach a decision about the scale of the space. The settlement is held together by mutual dependence and community will. Generally, the people plan, in the given constraints, on the basis of common day-to-day logic and traditional values and principles of settlement planning.

The act of planning is either conscious, done to gain certain economic, political or personal objectives, or unconscious, resulting in a strong ambience of cultural ethnicity. People are usually comfortable within this environment that they create.

## 6.2. CASE STUDIES

Some examples of this process of planning are given below as case studies.

### 6.2.1. Case study 1

The first case study illustrates one of the ways in which open space can be generated within the close-knit structure of the settlement. Usually, the overriding factor in the laying out of the initial settlement is the lack of space. So, the original dwellings or *jhuggis* (as in local parlance) are very tightly packed. Often the distance between two dwellings across a lane may be as little as 75 to 100 cm. However, the height of the dwellings is usually quite low, in the range of 1.0 to 1.5 m, thereby protecting the intimate scale of a large majority of spaces from becoming claustrophobic. But once the community is established, any change

in the original population results in modifications of the spatial structure. The preference is to gain as much open space as is possible. To achieve this, the residents have to fight incoming people who wish to occupy any available vacant spot.

This case study shows how the residents of the space selected were able to generate open space by using group pressure. The path at the point shown in the figure 06.01 was just about 75 cm wide. When the resident of 'A' expired, his neighbors did not allow a new *jhuggi* to be erected in its place. Also, no neighbor was permitted to expand his / her dwelling to occupy this leftover space. The result was the generation of a much-needed breather, which provides an outdoor extension to the neighboring houses and a space for children to play. (figure 06.01)

### 6.2.2. Case study 2

The same need for open space found expression in the case study selected below. In this case, the immediate residents were not directly involved. This instance was more of a community-level decision. It also highlights how individual decisions become the domain of the community and can affect the quality of the settlement's spatial structure.

The resident of the dwelling marked A (figure 06.02) decided to move away from this settlement to another part of the city. However, he did not want to give-up his right on this land entirely. So, instead of the dwelling, he wanted a small shop, as its location off the main street was commercially advantageous. He was allowed to erect a shop but no other dwellings were allowed to be put-up in that space. This generated open space, a public resource, which can be used by anyone as long as they do not enclose the space. Currently, it is being used for temporary parking and as storage for construction material for a house nearby.

### 6.2.3. Case study 3

Trees are an essential resource for the informal community — not just for providing shade but as a focal point for outdoor activities. The area around a tree is, hence, one of the most critical spatial vocabulary developed in the squatter settlement. Many such examples were
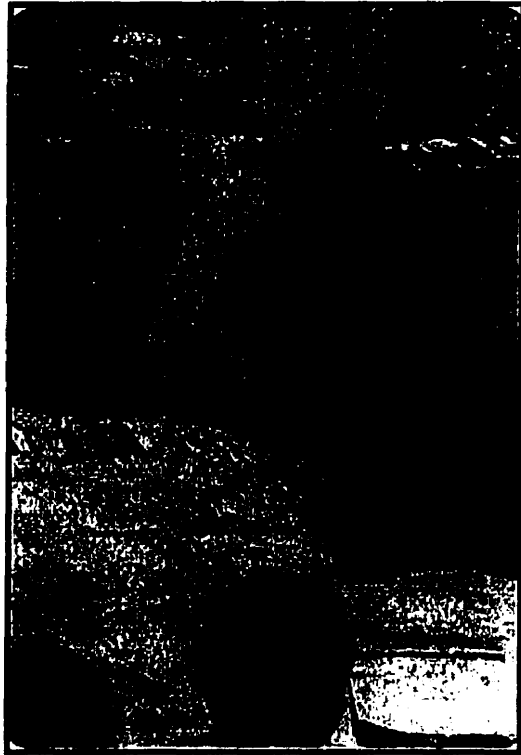
**FIGURE 06.01: SPACE GENERATED ---
CASE STUDY 1**

- THE PATH SHOWN WAS JUST 75 CMS WIDE

- WHEN THE RESIDENT OF "A" DIED, HIS
  NEIGHBORS DID NOT ALLOW A NEW
  DWELLING TO BE ERECTED IN ITS PLACE.

- THE RESULT WAS A MUCH-NEEDED BREATHER
  --- AND AN OUTDOOR EXTENSION FOR THE
  HOUSES SURROUNDING THE NEWLY CARVED-
  OUT SPACE.

PHOTOGRAPH FROM HERE

A

BEFORE

75
75
CMS.

NOW

75
300 CM
75

75    180 CMS.
       (1.8 M)
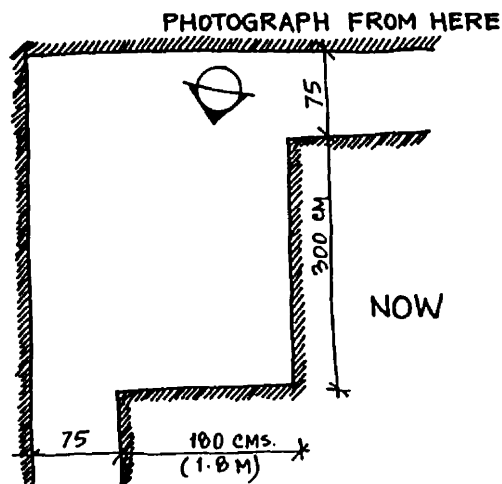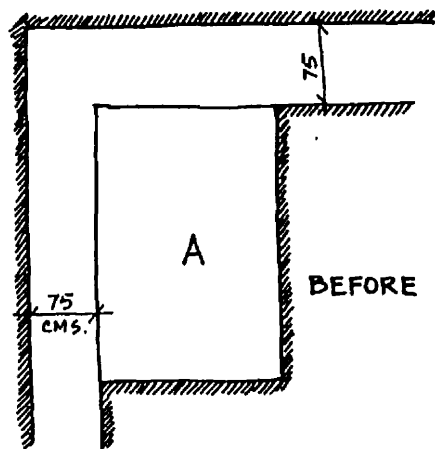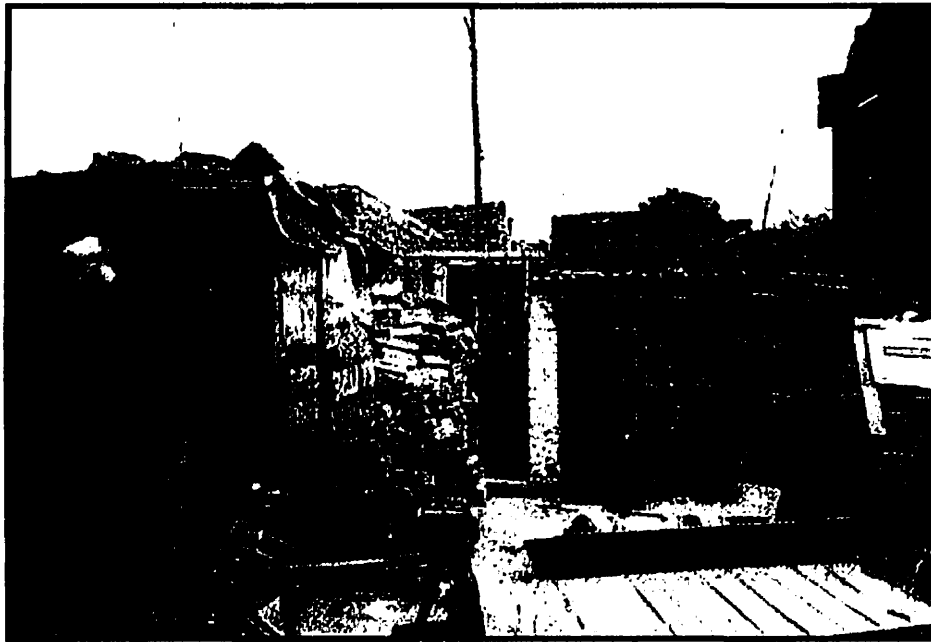
**FIGURE 06.02: SPACE GENERATED ---
CASE STUDY 2**

- THE OWNER OF "A" DECIDED TO MOVE TO
  ANOTHER PART OF THE CITY

- BUT, HE DID NOT WISH TO LET GO OF HIS
  RIGHT OVER THE SPACE IN THIS SETTLEMENT
  AS THE DWELLING WAS LOCATED ON THE
  MEIN STREET. BY VIRTUE OF ITS LOCATION,
  THIS SPACE HAS COMMERCIAL VALUE.

- SO, A PART OF THE SPACE WAS LEFT WITH THE
  OWNER TO ERECT A SMALL SHOP. THE
  REMAINING SPACE WAS LEFT OPEN, TO BE
  UTILIZED AS A PUBLIC OUTDOOR RESOURCE.
  BUT NO HOUSES ARE ALLOWED TO BE BUILT.

BEFORE REMOVAL

A

MAIN STREET

AFTER REMOVAL

STORAGE

SMALL SHOP

MAIN STREET
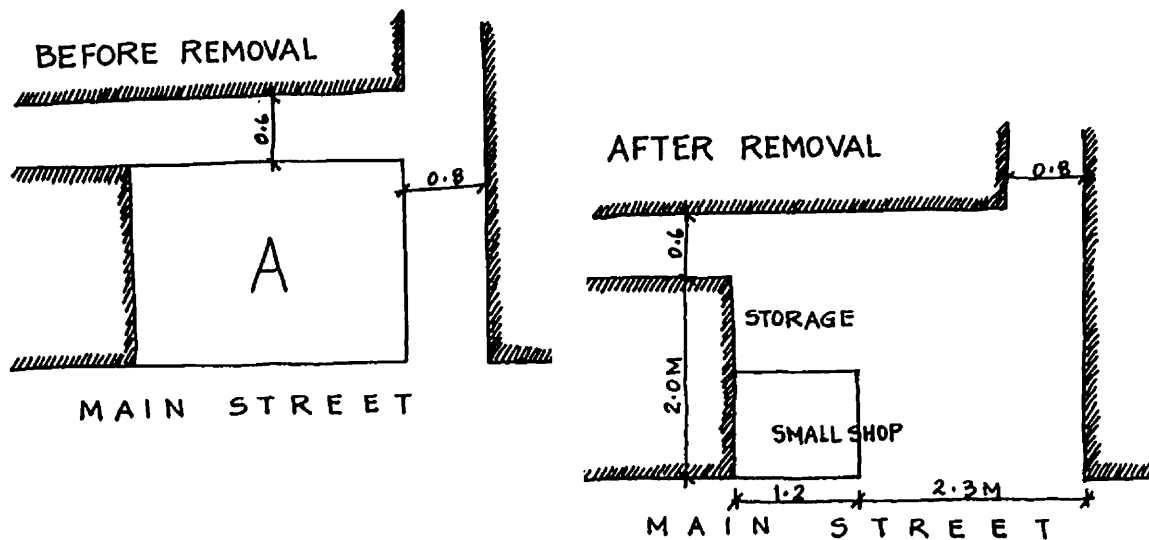
pinpointed by the respondents. Trees around or near a temple become the center of religious activities, rituals and festivals.

The case study selected is unique in that the space is hopelessly irregular and has been formed as a leftover. But even in this case, certain rules were adhered to while laying out the lane adjacent to the tree. The tree shown in figure 06.03 demarcates the temple area. The residents were not allowed to build any closer than 1.5 m to the tree so as protect the tree. This prevented the houses closing in upon the open space of the temple. In this case, the tree was recognized as providing a psychological boundary to the temple and its activities. This protected open space, offset from the movement route, offers a play area during the day and an informal gathering place for men in the evening.

### 6.2.4. Case study 4

The Yamuna Pushta has a predominantly rectilinear spatial configuration. This spatial structure has evolved to ease the re-building of the settlement after each annual flooding of the river Yamuna. The settlement has one major artery which runs across the entire length of the settlement. (figure 06.04). All the dwellings are located on smaller lanes which are (approximately) at right angles to the main street. The main street has nearly all the commercial establishments and religious buildings facing it. All vehicular circulation is predominantly restricted to the main street. The continuous influx of population is allocated to areas farthest from the main street. These areas are often run-down and derelict. Sometimes there may not be any streets at all --- dwellings may be clustered around an open space connected to a lane.

All the above features have been preserved through community action. The street widths, once laid-out, are sacred and cannot be altered without major community action. Initially, their dimensions were specified based on the economic needs of the community (example: the width of the main street is enough to let a small truck through) and continue to serve effectively till date. This case study illustrates a combination of traditional and modern town planning principles being applied to a settlement without the aid of any professionals. The community has relied on the traditional rules of the thumb, simple common sense and

**FIGURE 06.03: THE TREE AS A COMMUNITY RESOURCE --- CASE STUDY 3**

- THIS SPACE SHOWS HOW TREES CAN BE USED TO DEFINE AND DEMARCATE SPACE

- TREES AROUND TEMPLES HELP IN CONTROLING ACTIVITIES

- THIS TREE, BY ITS RELATION TO THE TEMPLE COMPOUND AND THE LANE, PROVIDES A PSYCHOLOGICAL BOUNDARY. IT DIVIDES THE SPACE FOR USE OF THE TEMPLE FROM THE LANE.

- IT ALSO PROVIDES SHADE AND CAN THEREFORE BE USED AS A MEETING POINT.

PART PLAN

LOCATION PLAN

MAIN HIGHWAY

RIVER

SETTLEMENT
LINEAR LAYOUT
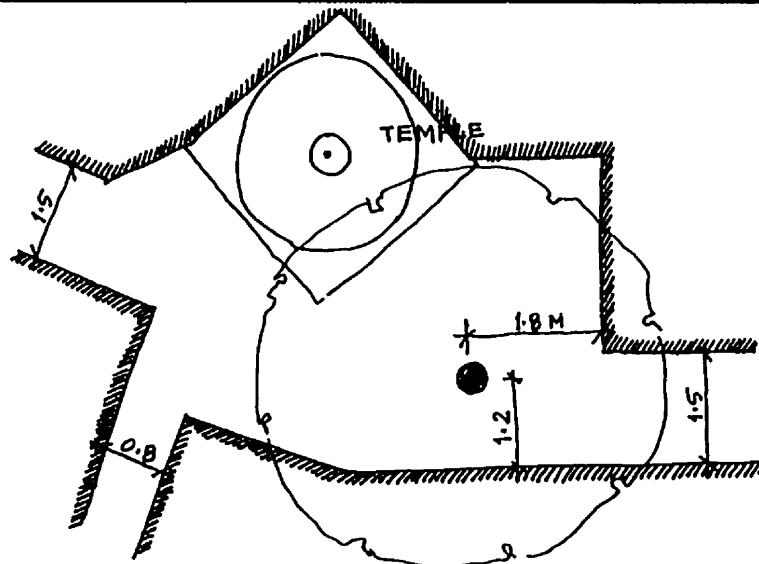
**FIGURE 06.04: THE ROLE OF COMMUNITY LEADERS AND ELDERS --- CASE STUDY 4**

- HOUSE LOTS AND STREET WIDTHS ARE USUALLY DECIDED UPON BY COMMUNITY LEADERS AND ELDERS.

- THE WIDTH OF THE MAIN STREET REFLECTS AND CATERS TO THE ECONOMIC NEEDS OF THE SETTLEMENT --- IT ALLOWS SMALL VEHICULAR TRAFFIC TO PASS THROUGH, WHICH IS NECESSARY FOR THE TYPE OF BUSINESS ENTERPRISE THAT THE SETTLEMENT CATERS TO.

- THE STREETS IN THIS SETTLEMENT ARE LAID-OUT ON A RECTILINEAR PATTERN TO EASE THE RE-BUILDING PROCESS AFTER EACH ANNUAL FLOODING.
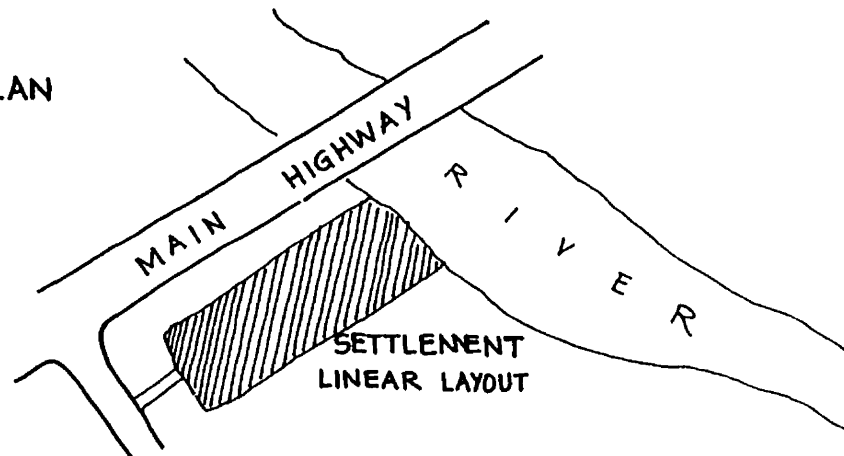
the fulfilment of their needs.

### 6.2.5. Case study 5

In the same settlement, it was also interesting to observe that people of similar ethnic and / or regional identity tended to cluster together. This is considered as a "natural", unwritten rule within the community. A vivid illustration was the areas allocated to the fishermen from West Bengal and Bangladesh. These people live together in huts typical of their regional architectural style — the bow keel roofs are distinctive. They also have their own temple complex, with an open area far exceeding the usual spatial scale of these settlements. The reason for this space is that this community indulges in large, social gatherings that include communal dancing and feasting. (Figure 06.05). Each such ethnic community has frontage on the main street so that it may not be deprived of the economic opportunities by the settlement. (Figure 06.05).

### 6.2.6. Case study 6

One of the situations these settlements have to cope-up with are the dwellings spilling-over onto the outdoor space. This may cause obstructions in movement patterns, or destroy the play space for children, or impinge upon the right of the neighbouring houses or may even completely take-over the open space. In such situations community control becomes critical.

One such example has been illustrated in the case study selected. (Figure 06.06). Here, the owner of the house on the right insisted on installing his stove outside due to the small size of his dwelling (the dwelling served 8 people and the area in enclosed was 6 sq. m.). The open space being quite large, he could not be refused. But he was neither allowed to enclose the space totally nor to erect high walls around the stove. This helped preserve the feeling of openness of this large open space.

### 6.2.7. Case study 7

Water points have interesting connotations in the traditional Indian spatial structure. In the

**FIGURE 06.05: ETHNIC GROUPINGS WITHIN THE SETTLEMENT --- CASE STUDY 5**

- THE EXAMPLE IS UNIQUE. THIS COMMUNITY HAS THIS LARGE SPACE, 20 X 10 M FOR ITS FUNCTIONS AND RELIGIOUS ACTIVITIES.

- EACH ETHNIC GROUP HAS FRONTAGE ON THE MAIN COMMERCIAL STREET TO EQUALIZE THE ECONOMIC OPPORTUNITY.
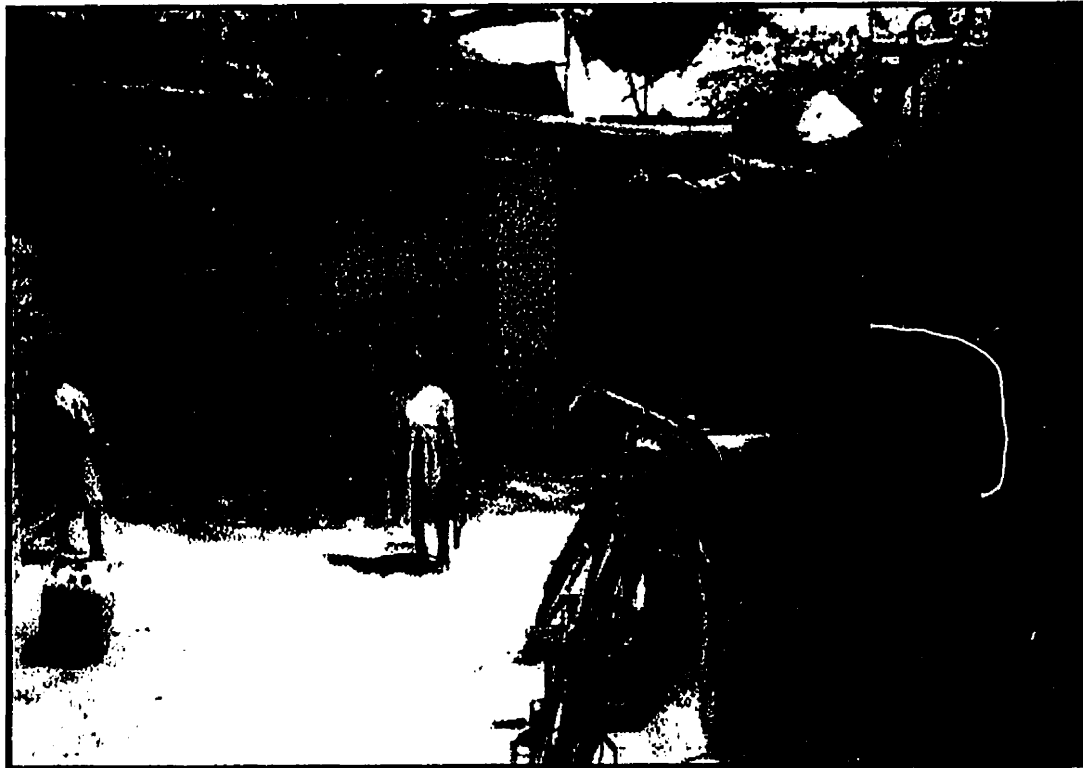
**FIGURE 06.06: EXTERNAL ENCLOSURES --- CASE STUDY 6**

- THE RESIDENT OF THE DWELLING ON THE RIGHT WANTED TO USE THE SPACE OUTSIDE TO PUT-UP A HEARTH.

- AS THE SPACE WAS LARGE (4 X 3 M), HE COULD NOT BE REFUSED.

- BUT, AT THE SAME TIME, HE WAS NOT ALLOWED TO CONSTRUCT A TOTALLY ENCLOSED STRUCTURE, SO AS TO PRESERVE THE OPENNESS OF THE SPACE.

## FIGURE 06.07: SPACE REUSED --- CASE STUDY 6

- WHEN THE NGO MANAGED TO CONVINCE THE COMMUNITY LEADERS THAT IT WAS DOING A GOOD JOB, THEY ALSO MANAGED TO GET SPACE FOR A *BALWADI* (A DAY-CARE).

- OPEN SPACE NEAR A WATER POINT WAS CONVERTED INTO A SEMI-COVERED SPACE FOR THE DAY-CARE.



1.5 M

HAND PUMP

0.9

1.2 M

SPACE NEAR WATER-POINT BEING USED FOR "BALWADI".

STREET

1.5 M

STREET
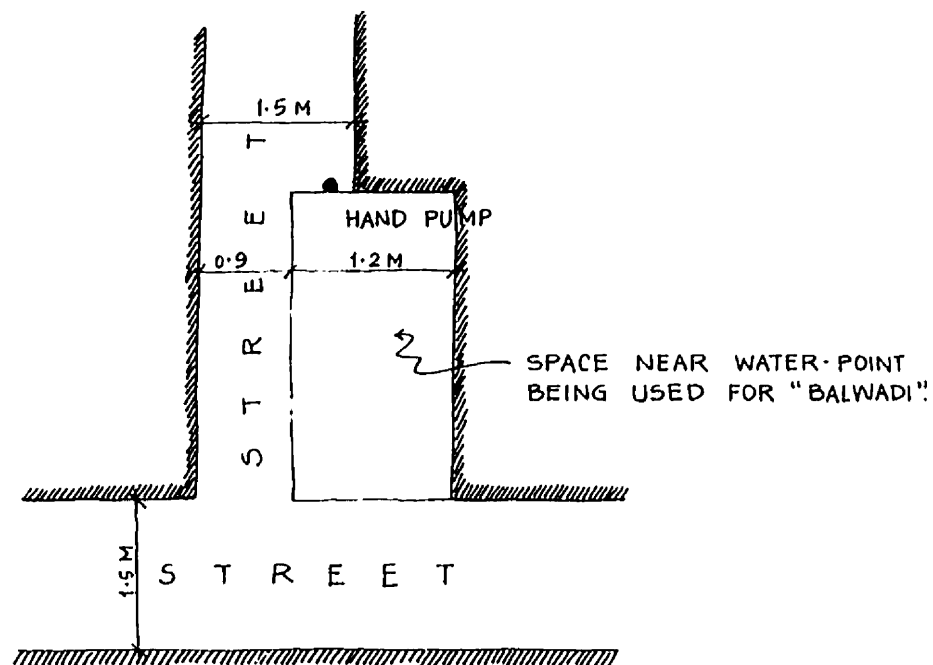
PART PLAN

villages, the wells provided the focal point for conversations, gossip and play as well as various household activities. In the cities, the wells have vanished. The water supply in the informal settlements is usually dependent upon ground water from hand-pumps. These very hand-pumps have taken the place of the well in these communities. Many examples can be cited here which can illustrate how the residents use these spaces as effective outdoor spaces.

An innovative instance was the conversion of the area around a water point into an outdoor extension for the *Balwadi* (children's day-care operated by an NGO). When room "A" (figure 06.07) was given to the NGO, it was also decided to make the space around the hand-pump available to them. The space now performs as a water point during early mornings and evenings and as *Balwadi* during the day.

But in some situations there are problems as well. In a mesh-like spatial organization, the inability of the spatial structure to provide quick exits in the case of fires or other such calamities, causes discontent. According to one resident, people are not usually willing to reduce their living space to allow for wider streets. The streets giving access to residential cul-de-sacs are usually very narrow. This is a major issue due to the acute shortage of space per family, the average dwelling size being about 8-12 sq.m. (even for large families comprising of 10-12 members). Since the community depends entirely on mutual agreements, these kinds of conflicts of interest are bound to occur.

## 6.3. CONCLUSIONS

It became increasingly evident that the people in squatter settlements generate the built environment they inhabit synthesizing economic, socio-cultural and ethnic controls with the physical attributes of spatial use. They have their own rationale for deriving the built environment that they inhabit. The equation mentioned in the beginning of this chapter can now be modified as:

> **Geometry + Function + People coupled with their various attributes and decisions = SPATIAL ORDER**

# CHAPTER 7: SPATIAL ORDER IN SQUATTER SETTLEMENTS

The last few chapters can now be added-up to present the concept of spatial order as it applies to squatter settlements. This conceptualization encompasses geometry (Chapter 3 and 4), function (Chapter 5) and most significantly, the people, the residents of the settlements. The key part of this jigsaw puzzle, which had been missing so far, are the inhabitants. Viewed through their eyes. the spatial order of these settlements becomes crystal clear.

Spatial order, to express it very superficially, finds expression in the delineation of the

- street structure
- logics of open spaces, and
- the patterns of commercial development.

However, these are the physical parameters of spatial order in any built environment. But. as mentioned above, the difference arises due to the realization that in these settlements it is the "people" who are the primary components of the spatial order --- not only endowing cultural, social, economic and ethnic coloration to it, but also generating the very physical structure itself. The complex order inherent in squatter settlements is a manifestation of two "sets" of inputs --- the physical components of streets, open spaces and enclosures, and the people coupled with their living patterns, cultural, social and religious values and economic constraints. (See figure 07.01)

Figure 07.01: Order is a manifestation of two sets of inputs



Ordering generates the cultural, social, ethnic, economic and religious patterns.

PEOPLE

PHYSICAL STRUCTURE

Ordering generates physical space --- streets, open areas and dwellings

Overlap of both these orders generates a complex manifestation of human values and physical attributes.

64
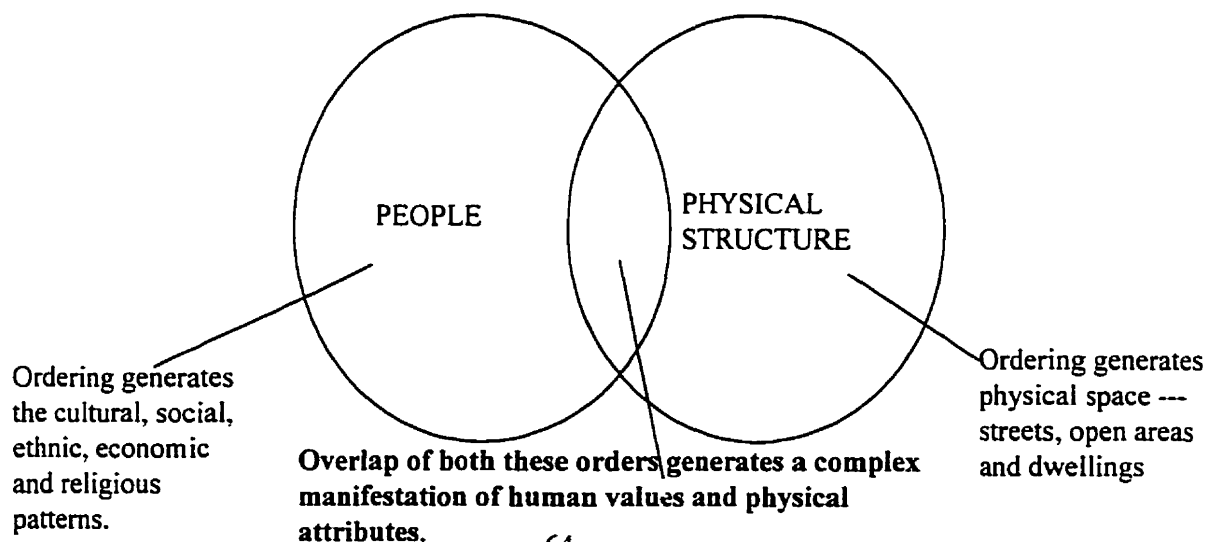
This figure shows the different kinds of 'orders' that define the spatial structure in any given human settlement. The squatter settlement is a representation of the complex order of the shaded portion in figure 07.01. These settlements are manifestations of a design solution which is "sensible" to both the parameters of any built environment — the space itself and the people inhabiting and using that space.

The question now arises as to "what is this Order?" The 'complex order' of the squatter settlements can be briefly stated as:

> - the **repetitive use of simple spatial elements** (example: square) to generate a large spatial vocabulary,
> - **dissemination** of space (and services) at various levels within the structure of the settlement, and
> - **dynamic space use** through time, changing human values, altering economic needs, and varying external forces.

All these ordering principles may sound inane. But the inability of professional and society, at large, to associate them with spatial order and more so with squatter settlements, makes this research a mandatory exercise. Squatter settlements are a case study for comprehending the mechanism of the execution of this spatial order on site.

The spatial order inherent in squatter settlements is not perceived immediately, as the order generating these settlements is more complex than that giving birth to planned settlements. The current analysis has shown that this order has two components — the physical environment and the residents. It is due to its dual nature that spatial order in these settlements has evaded structured analysis.

Another factor has been the very connotation of the abstract entity spatial order. Spatial order, in all the literature reviews (Chapter 1 and 2) so far, has been limited to being perceived as an attribute of the physical built structure only. In the literature reviewed, the

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researcher was unable to locate even a single definition of spatial order that includes the residents and users of the built environment, as a valid dimension of spatial order. To comprehend the inherent spatial order in squatter settlements, it becomes essential to qualify the physical environment with the values, attitudes and responses of the people using these settlements. (Chapter 6). Realizing spatial order as an expression of human space perception, (see figure 07.01) rather than a physical parameter, can be instrumental in a major attitudinal change among design professionals.

Hence, the conclusion derived can provide the rationale for re-defining spatial order as an abstract entity. By defining the ordering principles of squatter settlements, it has been highlighted that for a coherently ordered (not only to the designers but also to the residents and users) design solution, it is absolutely necessary to integrate the concepts of human space perception (and subsequent dynamic space use) with the physical space requirements.

The results of this research exercise can have far-reaching effects. If complemented with the recommended research exercises (see 7.1.), it can reshape one of the major theoretical concepts of architecture and thereby reformulate the very basics of our design strategy. To conclude the thesis, the researcher reiterates that

## 7.1. RECOMMENDATIONS

The recommendations suggested can be summarized by the statement, "The broader our sample — in space and in time — the more likely we are to be able to see regularities in apparent chaos and to understand better the significant differences, that is, the more likely we are to see patterns and relationships."(Rappaport, 1979, p. 32). Based on this view, the following are some recommendations suggested by the researcher:

- The present study must be replicated for squatter settlements in different regions of India in order to verify the conclusion in a cross-cultural scenario.
- Comparative studies for squatter settlements in different topographical contexts will also need to be undertaken to expand the database and verify the concept of spatial order derived in this study.

- Another area for future research is the in-depth study of the "control mechanisms" within the community, which define and regulate the evolution of various spatial patterns and configurations. The present study only mentions some of these mechanisms. Such an analysis can yield insightful information on exactly how the community regulates its spatial behavior.

- The study must also be replicated over long durations of time to document the spatial patterns through different phases of a settlement's life. Such studies will take into cognizance socio-cultural and economic influences on the spatial fabric.

- Major events in these settlements such as festivals and religious and communal functions can create ripples that can alter the spatial structure of the settlement. It would certainly be worth analyzing such events and their implications for the spatial order of these settlements.

- In-depth studies delving into individual spatial elements such as communal compounds, temple complexes, trees, water points etc. can also be undertaken to enrich the understanding of the spatial vocabulary of these settlements.

- The conclusion derived from this study can be utilized as a design tool for upgrading slums and squatter settlements.

The current design approach for rehabilitation projects has led to built environments which are defaced and mutilated by the residents. The alterations generate an environment more suited to the people's needs and values than the "planned" one. This fact, in itself, calls for future research which compares such planned settlements with squatter settlements --- these settlements being the true representation of a spatial form suited to the residents lifestyles.

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**THERE IS ORDER IN SQUATTER SETTLEMENTS.**

**HENCE THE HYPOTHESIS STANDS VERIFIED.**

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