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EDITORS NOTE

It is a moment of pride for the editorial team of the Department of Architecture and Planning, NED University of Engineering and Technology, Karachi to announce the initiation of the first issue of the NED Journal of Architecture and Planning. The university, which is one of the oldest institutions in the country, has been committed to promote research and development in almost all its disciplines. Architecture and Planning, being a prime area of research has also benefited greatly from this resolve of the university. In order to provide a stable medium for sharing and communicating research work in architecture and planning conducted nationally and internationally, a journal in architecture and planning is being launched. This journal invites contributions related to various themes of Architecture and Planning. Therefore, each issue of the journal is based on a specific theme.

The first issue focuses townscapes. The history of towns is as old as that of civilization. Towns, that have remained a reference for culture, arts, crafts, intellect and even revolution, have passed through various phases of transformation. Starting from the time periods of guilds, the transformation into industrial landscapes and factory towns was a major step forward. Changing socio-economic, cultural, political and administrative conditions has had a direct bearing on the larger spatial structure and internal spaces of the towns. From concentrated, semi organic and finite spaces in the medieval times, the open ended, broad based planned cities evolved which show a remarkable contrast with the past. Ancient city walls have given way to the expanding growth corridors, inter twined with land subdivisions. The face of townscapes has rapidly changed during the twentieth century. According to the changing modes of life styles and corresponding technologies, spatial organization, morphology of the towns has been directly affected. In some cases, it has given rise to entirely new urban forms.

The papers included in this issue provide some insight into the issues pertinent to townscapes of various kinds. The paper on Istanbul, Turkey traces down the townscape development and correlates the population growth and allied factors with the transformed urban form of the city. Two researches included in the journal focus on the minimisation of heat in urban areas through landscaping. In the same sequence, the utilization of open spaces in housing is evaluated in a paper using people's viewpoint

as the criteria. An overview paper relates city growth in the United States of America with the highway development. Another paper included in the journal analysis the pattern of urban development in the historic site of Karimabad, Hunza where several conservation based, interventions have been in progress. A comprehensive paper reflects on the concepts and characteristics of presenting urban morphology, Turkish examples as reference.

It is hoped that this very modest initiative will provide a useful medium of communicating the research and critique in the broader domain of architecture and planning in Pakistan and beyond.

Noman Ahmed
Anila Naeem

A WORLD CITY ON WATER: URBAN DEVELOPMENT OF ISTANBUL AND TRANSFORMATION OF TOWNSCAPE

Dr. Zekiye Yenen
Associate Professor,
Department of City and Regional Planning,
Yildiz Technical University,
Istanbul,Turkey.

ABSTRACT

Urban development in Istanbul has passed through various phases of transformation. These transformations have generated very distinct changes on the urban face of the city. Large scale in-migration to the city from the hinterland, development and expansion of industrial and commercial landuses and concurrent transportation network, increase in the magnitude and density of middle and high income housing and rise in the squatter settlements are some of noted aspects of the urban development.

This paper outlines the process of urban development across all the above outlined parameters drawing conclusions in the process. It also focuses the changing skyline of Istanbul on its waterfronts.

1. HISTORICAL AND VISUAL HERITAGE OF ISTANBUL

The historical destiny of Istanbul, which appears as the Late Roman, Christian Byzantine and Muslim Ottoman capital, has been woven in an interaction of geography, politics and culture. The contemporary megalopolis of about ten million still conserves some of the very important relics of her long history and conveys through them as well as through her splendid topography the images of Byzantium, Constantinople and Istanbul. (Kuban, 1996: 1,2)

Istanbul was founded in the 7th century BC as a small Greek colony on an international trade route, between the Eastern Thrace and Black Sea, with a safe harbor (Golden Horn) and a fertile hinterland. The city dominated both the Balkans, Eastern Europe and Asia Minor of the ancient world as the richest province of the Roman Empire. The city was the center of the transformation from the Pagan World, and became the seat of the Eastern Christian civilization. Constantinople also influenced the Slav World, the early Medieval West and the Islam during 11th and 12th centuries. At the end of the 16th century, Istanbul was already a city of half a million population. It was the largest city in Europe and the capital of the Ottoman Empire. It displayed a strong cosmopolitan character underlined by Romano-Byzantine heritage. Her imperial status lasted until 19th century. This historical continuity established her world status. (Kuban, 1996: 3,4,5).

One of the unique features of Istanbul has been her relationship with water. The city's built up areas enriched with the elements of the pre-Islamic past and the unique silhouette of the Ottoman capital surrounded by Roman city walls cover the hills

sloping towards the water, providing spectacular views at unexpected labyrinths. Even though the old city occupies only a small proportion of the metropolitan area and loses her identity as a 'city of waterfronts', her place in the image of Istanbul is still an eloquent manifestation of a most varied cultural history.

This paper aims to address the changing image of Istanbul as a result of her transformation of urban form due to the influence of historical events and contextually within a physical, socio-economic and cultural framework of the process of urban development.

2. SPATIAL STRUCTURE OF ISTANBUL

Historically, Istanbul has developed along the Sea of Marmara, the Bosphorus and the Golden Horn. At the macro-level, this pattern of development was determined by the particular geography of the site and the availability of areas suitable for settlement along the shorelines. Due to this location, Istanbul has always been a port city at national and international levels. Water acted both as a dividing and connecting element between different sections of the city, and provided a convenient and pleasant means of transportation. Moreover, the waterfronts have been the major sources of recreation, both active and passive.

The first bridge across the Golden Horn between Unkapani and Azapkapi

District of Galata and the Galata Tower

In the Ottoman period, till mid 19th century, the population and the urban functions of the capital concentrated mainly in the historical peninsula laying on the southern bank of the Golden Horn, and in the former Genoese town of Galata on the Northern bank. To the north of the Golden Horn, Eyüp stood out as the largest settlement. All three empires used the historical peninsula (old Istanbul) predominantly as the administrative and political centre of the city whereas Galata and later Pera (Beyoglu) as the commercial centre for trade and overseas maritime commerce, and Eyüp as an important religious precinct. On the Asian bank of the Bosphorus, facing the entrance of the Golden Horn, Uskudar was the largest settlement. Though not high in density, this suburb of the city covered an extensive area.

There were several villages, centered around fishing and vegetable gardening, scattered on both the Asian and European sides of the Bosphorus. Since these settlements were also used as resort areas, the waterfront between these villages was lined with seaside mansions of the Ottoman "bourgeoisie administration" and members of minority groups. These wooden mansions became the symbol of the Bosphorus, hence formed part of Istanbul's urban image and her identity in the collective memory (Yenen, Enlil, Unal, 1993: 116). The areas between these settlement nodes along the Bosphorus were covered with woods, orchards and gardens. They were the main areas of recreation for the residents of Istanbul.

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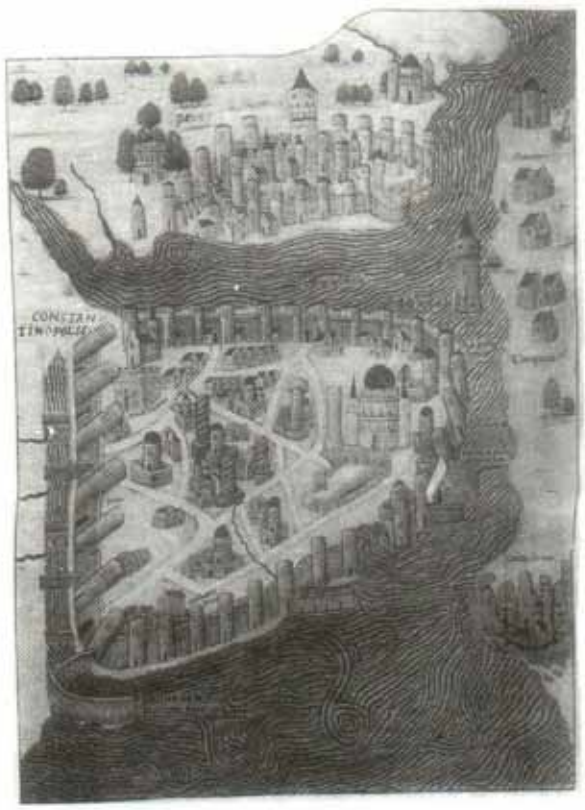
The group of settlements on both sides of the Bosphorus formed a "concentric" urban form extending over an area with a radius of 3 kilometers at its maximum.

Due to the need for communication between the sections of the city "separated" by water, especially to and from the administrative center in Istanbul, an early system of water transport was developed. Rowboats and barges connected Istanbul, Galata, Uskudar and the Bosphorus villages to each other.

3. EVOLUTION OF THE URBAN FORM

When, during the second half of the 19th century, the Ottoman lands became a supplier of raw materials and an open market for the finished goods of the industrialized West, the adjustment of old structure to the changing needs became distinctly observable. Industrialization and new institutions (military, administrative and education systems and legislation) were adopted from Europe. The industries and military establishments concentrated mainly on the shores of the Golden Horn, which has been an industrial area since the time when the arsenal was built by Sultan Mehmet the Conqueror.

Imperial palaces besides being the leisure gardens, were outcome of social and visual transformation imposed by the palace. In line with the economic and political developments within the Empire, new functions such as international finance organizations, offices, hotels, restaurants, theatres, modern schools and apartment houses emerged in Istanbul and began to concentrate in Eminönü District in the Peninsula and specially in the Galata Area. Uncontrolled growth of the industrial areas on both sides of the Golden Horn, massive neo-classical military barracks, Baroque and Art Nouveau style buildings on the shores and in the



Map of Istanbul in the travelogue of C. Buondelmonti, 15th century.

newly developing cosmopolitan neighborhoods radically altered the traditional face of the city.

Extensive infrastructure projects were undertaken in order to establish a transportation network which would connect the city to Europe and her scattered parts to each other. Hence railroad lines, train terminals, railway stations, a short subway and two bridges over the Golden Horn were constructed. A tramway company was founded and the harbor was improved. A regular steamboat service began to operate initially with the intention of serving the high ranking government bureaucrats and the Europeans residing seasonally along the Bosphorus; this service soon turned into a mass transportation system for the benefit of everybody.[1]

The increase in use of new transportation modes (trams, motor cars, buses etc.) created a need for construction of new roads outside the city between scattered parts, as well as the regularization of old pattern (widening of the existing streets, opening thoroughfares, creation of squares) within the city.

Parallel to the developments in the transportation network the city began to expand along the newly opened communication lines, enlarging its length to an area of about 5 kilometers in radius and new residential neighborhoods namely, Kadiköy and Bosphorus villages developed.

With the establishment of regular water transportation, the Bosphorus villages developed further and the summer resorts along the Bosphorus laying outside the 5 kilometer ring also began to transform into year-round residential areas. The quays of these small villages culturally and socially defined the Istanbul waterfronts. Owing to their form, scale, color, lighting, etc., the squares opening onto the quays had stimulating and relaxing psychological impact on the people.

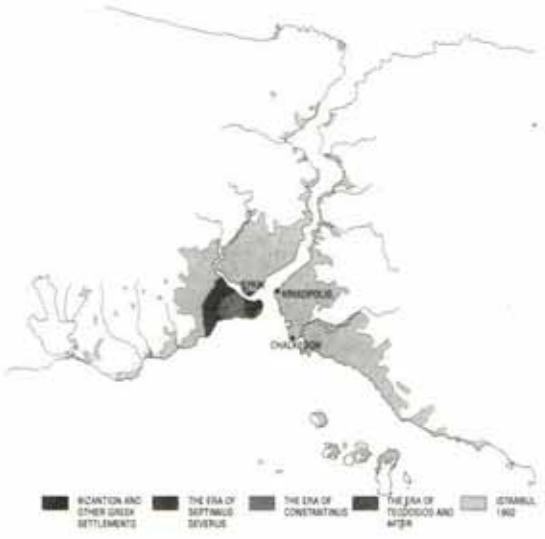
The "quay squares" preserved their functions as important waterfront areas of the city until the first few decades of the 20th century as water transportation continued to be used most heavily. Early in the 20th century, car ferries began to operate between the two banks of the Bosphorus in order to transport goods and vehicles. However, they soon became a system also heavily used by the people.[2]

4. CHANGING FACE OF ISTANBUL

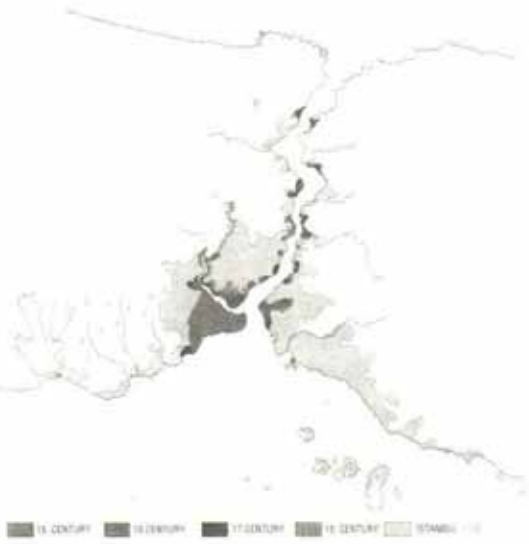
The decade of 1950 is stood out as a major period of transformation in many aspects of Turkish life. The dynamics set into motion by the economic development policies (multi-party regime, capitalistic outlook) of the early 1950's caused massive rural-urban migrations; and urbanization took its toll in the country. However, this was not a controlled migration; the Anatolian peasants came to the city in search of better life and conquered the urban territories.

From 1950's, the governmental policies, which gave priority to the construction of highway systems over any other mode of transportation, both in urban areas and all around the country, greatly effected the physical form of Istanbul. This mode of transportation became increasingly dominant in the process of transition from small manufacturing to medium sized industry within the metropolitan area in 1960's and 1970's.

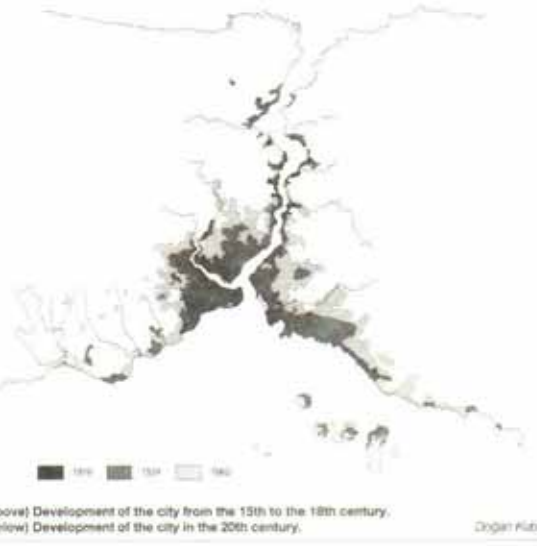
The construction of new roads and industry along the coastline was considered to be a "public good" in 1950's. However, the heavy concentration of new roads and industry built during this period along the shorelines, resulted in developments which were increasingly against the benefit of the general public.[3]



Development of the city prior to the Ottoman period



Development of the city from the 15th to the 18th century



(above) Development of the city from the 15th to the 18th century.
(below) Development of the city in the 20th century.

Development of the city in the 20th century

A pattern of high density development along the metropolitan shorelines and the environmental pollution it caused, made the healthy usage of the waterfronts rather difficult. At the same time the development of residential strips (mostly villas of the well-to-do) following the course of the coastal roads, especially in the Asian side, formed continuous built up zones between the water and the roads. Hence, the accessibility of the waterfronts to the general public was significantly reduced.

Until this period, the physical form of Istanbul was determined by micro-climatic conditions (such as orientation towards the sunlight, prevailing winds etc.) and by the physical thresholds of the natural environment such as water surfaces (Bosphorus, the Golden Horn, the Marmara Sea, the Cekmece lakes) and forests etc. Istanbul was growing as a 'linear city', and had a perceptible scale and an urban image as a 'city of waterfronts'.

However, due to rapid and unplanned urban growth, the linear pattern of urban development altered some parts of the city, and a new pattern which disregarded the natural characteristics of the site became dominant. Therefore, the role of water and the function of the city's waterfronts got disrupted to a great extent. The city dwellers were deprived of an intense contact with water, as they used to have in the recent past. Water was no longer accessible, as it used to be, both visually and for recreation purposes. Nor used intensely as a major mode of transportation.[4]

The traditional way of building in moderate densities with houses 2-3 stories high and which respected the natural environment and the neighbors[5], the citizens who lived in close contact with water, the settlements which were in pedestrian reach to the sea, now became only the past characteristics of Istanbul.[6]

5. TRANSFORMATION OF THE CITY'S URBAN FORM

The transformation, from an agricultural society to a new social structure in which the industrial activities gained importance, had a much greater impact on Istanbul than any other part of the country. Istanbul became one of the few major poles attracting migrants from rural areas as the mechanization of agriculture prompted people to move away and her population has been increasing rapidly ever since. Istanbul underwent a population explosion in the post 1950 period.

The city's population which was only about a million in 1950, doubled and reached 2.2 million in 1970. According to the 1990 census, the city has approximately 8 million inhabitants. During this process, Istanbul has become as Anatolia, not only in social structure but also in physical appearance. In spite of all efforts at planning; the city continues to develop in almost every direction, growing both horizontally and vertically, in a largely unplanned manner.

New investments on transportation network, namely the E-5 International Highway and the first Bridge over the Bosphorus have altered the city's urban form in spite of the natural thresholds. The E-5 International Highway extended parallel to the Marmara Sea coasts, sometimes 2-3 kilometers inland from the coastline, sometimes right along the shoreline. Unplanned industrial developments took place along the E-5 followed by equally unplanned residential developments on both the European and Asian coasts of the Marmara.

The Entrance to the Golden Horn/19th century

No sufficient planning controls were developed in order to regulate the effects of highways on surrounding land uses. With the construction of the Bridge and its freeway system in 1973, the city began to grow towards north following the commercial uses which developed along the routes that led to the Bridge. Since the lands here were not acquired by the public through regular systems, the land values in these areas increased dramatically. Hence, speculative developments occurred in spite of the fact that the city's potential of growth towards north should have been rather limited because of the existing forest areas, drinking water reservoirs, agricultural lands and the topography that constitute thresholds for dense urban developments in this direction.

Moreover, the cultural value of the historic and natural environment along the Bosphorus was not given due consideration, and these speculative developments harmed the architectural unity and natural beauty of the settlements along the Bosphorus.

The pressures for development along the coastlines (the accessibility of which to CBD was increased by the Bridge and its freeway system) were further intensified by the rapidly increasing population in the city and with the effects of transition to liberal economy in the country. As a result of these pressures, a very high density and expensive development pattern was permitted in the 'planned' sections of the city, especially along the western bank of the Bosphorus, in the residential areas surrounding the historic centre, and in the prestigious suburbs[7] along the Asian coasts of the Marmara Sea. In all these areas apartment buildings became almost exclusively the only type of housing built according to the "demolish-build-sell" method.[8]

During the process of metropolitan development, the middle and high income groups have always created their own suburbs beyond the most densely populated sections of the city.[9] They used ferries and suburban railroads as the major means of transportation in their daily commuting to work. However, soon after the Bridge was constructed and with the incentives given to car ownership, the major means of transportation of the commuters began to change. Indeed, within the first five years after its being put into service, private cars constituted 80% of the total number of vehicles which passed over the Bridge in one day.[10,11]

This is further supported by the fact that about 60% of the working population that lives in the Anatolian side, worked in the tertiary sector located at the European side[12]. This ratio of the working population belongs to the upper and upper-middle income groups who have a high rate of car ownership; and a majority of them spend long hours struggling with the traffic via the Bridge.

Surrounded by unplanned industrial and residential uses, the E-5 International Highway became a major thoroughfare at the metropolitan level, heavily used by the inter-city traffic. Hence, the need for a new route for the transit traffic between Asia and Europe arose at the national level. As a result of the policies of the 1980's which aimed at making Istanbul a world city, large projects were undertaken such as the Anatolia-Thrace Highway, construction of a second bridge over the Bosphorus and its freeway system, international luxury hotels, skyscrapers, office buildings etc. sprang up in succession.

None of these projects were undertaken according to a master plan, nor the effects of these projects on the waterfronts were considered. In fact, the second bridge, put into service in 1988, also enhanced the speculative developments like the first one. This attitude resulted in further growth of the city towards north, threatening the forest areas and water reservoirs, causing spontaneous land-uses and densification of the shorelines. Today, the city is in a process of a poly-nuclear growth (E. Aysu, 1986: 145), developing horizontally and vertically in almost every direction.

The examination of the metropolitan area in the light of the population data and landuse patterns reveals that on the western side while some of the older districts lost their importance, the districts 20 kilometers away from the Central Business District (CBD) entered a rapid process of development and transformation. After 1960's, a forceful direction of urban development appeared to the north-west of the historical peninsula.

Urban growth towards north from the older districts on the northern banks of the Golden Horn (Galata-Pera) accelerated, and illegal residential developments on the European side of the Bosphorus increased alarmingly. On the Anatolian side, however, the most substantial urban development took place in the areas 15 kilometers away from the CBD.

The existence of the suburban areas on both the Anatolian and European parts of the city, prevented the development of sub-centres necessary in the process of metropolitan development. Such functions developed only as extensions of the existing CBD in areas where the accessibility was increased by the developments in the transportation network.

The facts of peripheral population being more crowded and denser than the old city, creation of economic potential around the industrial and small-scale manufacturing sectors, together with the topographic characteristics of the city, allowing for definite linear development and decentralization, resulted in the services reaching the population.

Parallel to misjudgment by the long-term plans of various scales, residential areas and areas that have both residential settlement and commercial activity have increasingly assumed central functions. Especially the decisions regarding principle means of transportation and moving of small-scale manufacturing businesses outside the central city have effected their surrounding areas, and have made an impact on the formation of district centers.

In 1990's it is observed that CBD development had gone beyond what had been foreseen in the overall Istanbul Metropolitan Area. Concentration and increased population density in unexpected areas, especially along the transportation axes, had not been prevented.

With the rapidly increasing population, the city extends over an area of about 70 kilometers in length along the Marmara Sea, forming a continuously built-up area: a human settlement covering 120,000 hectares (the area enclosed by the old city defense walls amounted to only 5,800 hectares). Only about 15 kilometers of this area is occupied by uses other than industry and transportation; and of this relatively very small proportion of land stretching along the sea, only a very limited amount is taken up by recreational functions.

As a result, two main directions of growth since 1970's are observable in the Istanbul Metropolitan Area :

(a) On the western side, initially a radial pattern of growth was observed. It formed a continuously and densely built-up area radiating "inland" from the CBD and the Historical Peninsula towards north-west with no open spaces or green areas for the city to breathe. Later on, towards west, an almost linear growth pattern was observed along the transportation routes.

(b) On the eastern side, a linear pattern of development was observed along the major transportation routes and the main junctions, composed of unplanned industrial areas followed by equally unplanned residential areas.

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Source for Visuals:

1. Istanbul: (Biannual), '96 selections, published by Economic and Social History Foundation of Turkey.

2. Istanbul: Republic of Turkey, Ministry of Culture, Directorate of Publications, 1993.

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[1] Z. Celik (1986) Remaking of Istanbul, Portrait of an Ottoman City in the Nineteenth Century, Seattle & London : University of Washington Press, p.85.

[2] Even though in early 1800's a road for carriages was constructed which connected the centre of the city from inland to the furthest settlement on the western bank of the Bosphorus, and in 1871 horse-drawn tram lines were established along the shoreline (C. Aysu, 1989 : 330-333), these modes of transportation were not able to compete with water transportation. Early in the 20th century, car ferries began to operate between the two banks of the Bosphorus in order to transport goods and vehicles. However, they soon became a system also heavily used by people. The organic connection established between the Bosphorus settlements, Uskudar and the centre of the city via water has been disturbed by the enlargement of the road along the western shoreline of the Bosphorus to 30 meters during 1956-1960. This road disrupted the relationship between the Bosphorus villages and the "quay squares". It also weakened the variety and richness which resulted from the molding of the sea and land in the daily lives of the citizens. The relationship between the settlements and the waterfronts came to an almost total collapse by the construction of a bridge over the Bosphorus in 1973.

[3] G. Yigit (1976) "Kiyilarin Toplum Yararina Kullanilmasi Uzerine Dusunceler", Mimarlik, no: 147, February, p.54

[4] In spite of Istanbul's situation on water, water transport in daily trips between residence-workplace, residence-CBD etc. is steadily decreasing and accounts for only 8.4% of the total while the share of land transportation is 84.8%. These facts indicate to what extent the water has been isolated from the daily lives of the population in a 'city on water'.

See : "A Study of Urban Transportation System in Istanbul", by Istanbul Technical University, 1990, in Cumhuriyet, 30 October 1990, p.8 and M. Sonmez, "A Statistical Survey: Istanbul in the 1990's", Biannual Istanbul, Spring 1996, p. 49-50.

[5] In Istanbul, traditionally people built their houses in such a way which would not block their neighbour's view of the sea.

[6] In the last few years major waterfront redevelopment projects have been undertaken in Istanbul. Some of these projects aimed to restore the relation Istanbul used to have organically with its waterfront areas (e.g. the Golden Horn Redevelopment). However, most of these projects were undertaken to provide solutions to the transportation problems of the Metropolitan area.

[7] These areas, the locations of which were determined by the routes of the early ferry and railroad lines, were mainly summer resorts till 1940's and 1950's, and they increasingly became year-round residential areas as the population increased. A building boom appeared especially after the construction of the Bridge, completely turning these areas into year-round residential sections of the city.

[8] i.e. existing single family houses and low rises were demolished and multi-family high rises were built instead. H Kaptan (1988) Metropolitan Alan Icinde Dusuk Gelir Grubunun Yerlesme Duzeni (Settlement Pattern of Low-Income Group in Metropolitan Area), Istanbul : Yildiz Technical University, Faculty of Architecture, Department of Urban & Regional Planning, p.17.

[9] M. Kiray (1984) "Istanbul : Metropolitan Kent (Istanbul : Metropolitan City)", Mimarlik, no: 199, January, p.33.

[10] The main objective of constructing the Bridge over the Bosphorus was to provide a more efficient connection for the transit traffic between Asia and Europe.

[11] 80% of the population in Istanbul uses various means of mass transportation in their daily trips within the city. And the number of vehicles crossing the Bosphorus bridges increases year by year. However, only 12% of the vehicles passing daily through the Bridge are mass transportation vehicles. See : S. Ormanlar (1976), "Bogaz Gecislerinin Istanbul Sehirsel Gelisimine Etkileri", Mimarlik, no : 149, April, p.49.

[12] Industrial uses and unplanned residential areas are concentrated in the areas beyond the 15 kilometers radius along the E-5 corridor. In these areas the activity ratio increases to 32%. The working population here, is employed in the industry, and about 50% of them live in a walking distance to their workplace, whereas only 30% can reach their place of work without having to do with any transferring. H. Kaptan (1989) "E-5 Koridoru Planlama Calismasi (E-5 Corridor Planning)", paper presented in the Friday Conference Series, Yidiz University, Istanbul.

MINIMISING THE URBAN HEAT ISLAND EFFECT THROUGH LANDSCAPING

Naeem Irfan,
Associate Professor, Department of Architecture,
Mehran University of Engineering and Technology, Jamshoro.

Adnan Zahoor,
Divisional Forest Officer, Forest Department,
Government of Sindh.

Nadeemullah Khan,
Assistant Professor, Department of Architecture,
Mehran University of Engineering and Technology, Jamshoro

ABSTRACT

Urban areas present distinctive micro climates. In the study of causes of the special climate in cities, it is reported that "The total transformation of natural landscape into houses, streets, squares, big public buildings, sky scrappers, and industrial installations has brought about changes in climate of large cities".[1]

Temperature is one of the most important characteristics of urban areas. It is known that urban temperatures differ from those of sub-urban and rural areas. On hot summer days, one can feel the waves of blistering heat emanating from roads and dark buildings, which keep urban areas hot, even long after the sunset, where as rural areas begin to cool rapidly, depending upon topography, geological location, and anthropogenic factors. So urban areas are usually hotter than their rural surroundings. This phenomenon is described as the "Urban Heat Islands". Vegetation has a large impact on micro climate and is considered an efficient mechanism for cooling down the temperature.

The various aspects of urban heat island like causes and temperature pattern in urban heat islands, urban and rural temperatures, reasons of increase in urban temperatures and the effects of landscaping on the surrounding climate were studied. Then, to overcome their effects landscaping elements like trees and other vegetation are discussed. To know the presence and to determine the intensity of urban heat island in the cities of Pakistan, a case study of Lahore is also carried out.

This paper therefore presents the causes, magnitude and impacts of urban heat islands and suggests the beneficial effects of strategic landscaping on the climate of a particular area.

1. INTRODUCTION

The urban heat islands have major effects on energy costs and the quality of urban life.

The subsequent increased use of electricity for cooling elevates the levels of atmospheric temperature. The earth's rising temperature is one of the most debated issues in the world today. The planetry temperature has been on the rise since the industrial revolution. Today, increased energy use is one of the main contributors to rising levels of atmospheric CO_2. According to the theory of Global warming, the increased concentration of CO_2, the major "Green House Gas" is one of the main factors responsible for raising the planet's average temperature [2,3].

Vegetation has a large impact on micro climates and is considered as an efficient mechanism for cooling the communities [3,4]. Lower concentration of vegetation results in conversion of a higher portion of the net solar gains into sensible heat, thus magnifying the heat island effect.

Rural areas as compared to urban areas grow more trees/vegetation, which generate a significant cooling effect on the atmosphere by the process of evapo-transpiration. Similarly in cities, neighborhoods with more trees are cooler than those with fewer trees. Downtown areas of cities typically have the hottest temperature, as they are dominated by concrete buildings and rarely support much vegetation. An annual 4-8% total energy savings can be expected from a well-placed 25ft deciduous tree near an air conditioned home [5].

A study of plantation for energy conservation, reports that "as much as 70% - 80% of the energy conservation benefit of trees may be attributed to reduction in 'urban heat island' through the evapo-transpiration effect of trees" [6].

Therefore, vegetation is considered as one of the simplest and most effective ways to cool our communities and to save energy. It helps in protecting buildings against the scorching heat of sun in summer, and from cold winds in winter. Besides the cooling effect, vegetation also improves the urban environment by reducing noise pollution and soil-erosion.

2. REASONS OF INCREASE IN URBAN TEMPERATURE

The urbanization of natural landscape-(roads, bridges, dams, houses and high-rises) has dramatically altered the waters, soils and vegetation. In fact, the most stereotypically "urban" characteristics of cities are also those which can cause temperatures to rise. By replacing vegetation and soil with concrete and asphalt, we reduce the landscape's ability to lower daytime temperatures through evapotranspiration and lose the obvious benefits of shade. And by using dark-colored materials in the construction of roads, buildings, and other surfaces, we create cities that absorb, rather than reflect, the incoming solar radiation.

The combination of reduced "albedo" and reduced "vegetation" has resulted in the increased urban temperature. This increase in the temperature is most clear in late afternoon and early evening, when roads, side walks and walls begin to release the heat they have stored throughout the day. This increase in the temperature can be sensed more clearly while walking through the densely developed areas and thinly populated but more vegetated areas.

Although, the scientists have been aware of this phenomenon for over 100 years, but throughout the last century, increasing urbanization and industrialization have exacerbated the heat island effect.

3. CAUSES OF URBAN HEAT ISLANDS

Denuded landscapes, impermeable surfaces, massive buildings, heat generating vehicles and machines, and pollutants all help to make urban areas hotter. The replacement of vegetation or soil by concrete or asphalt reduces an urban landscape's ability to lower day time temperature through evaporation and plant transpiration. In a rural or irrigated landscape, a large amount of day time solar energy is actually spent on evaporating water, not on raising air temperatures. Trees and other vegetation perform this function through the process of "Evapotranspiration".

When a natural vegetative cover is replaced by asphalt or concrete, it loses its ability to moderate temperatures. Instead, the solar energy normally delegated to the evaporation process is left to raise the surface temperatures.

Pavements, side walks, roads and buildings, therefore, contribute to the urban heat islands in a number of ways. Since they do not have the capacity to moderate heat through evaporation, they absorb and store the day's heat and then radiate it back to the urban atmosphere at night. These buildings not only take hours to cool off every night but in addition to that, they also obstruct the natural flow of breezes, making wind speeds noticeably lower in cities.

This obstruction prevents winds from carrying heat build-up away from the city, assisting in the reduction of the heat islands.

Urban pollution also effects the heat island, depending on the time of day and season of the year. However, the severity of the heat island is determined largely by the interplay of the urban landscape and solar radiation.

Urban areas get hotter than rural settings not only because their ability to cool evaporatively is reduced, but also because they reflect less incoming solar radiation.

4. TEMPERATURE PATTERN IN A TYPICAL URBAN HEAT ISLAND

Most cities around the world today endure heat island effects. Except minor differences because of climate and geography, the overall pattern of heat islands remains the same from city to city. Temperatures are at their highest in highly built-up down town areas, and taper off towards the edge of urban areas, and deep into the countryside. While the temperature differences between urban and nearby rural areas are evident by mid day, they are at their greatest two or three hours after sunset.

The later effect occurs because asphalt and concrete structures gradually release, into the urban atmosphere, the heat they had stored during the day [7]. The solar radiation received by the surface of a building is partly absorbed and partly reflected. The radiation emitted by the sun has wave lengths of less than 3 mm. This heats the surfaces on which it falls, but as they remain much cooler than the surface of the sun, the radiation emitted by them has a much longer wave length [8,9].

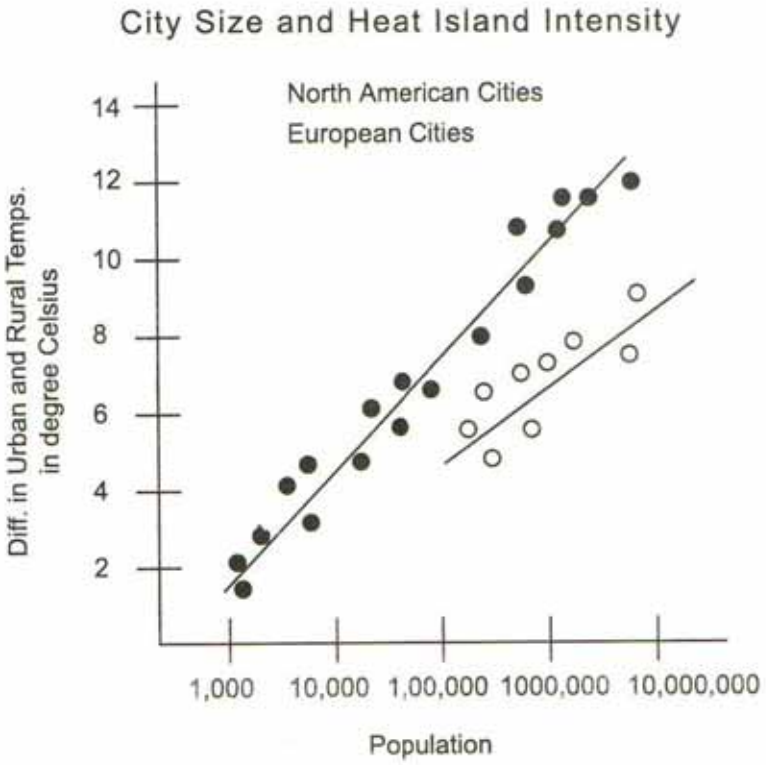

Figure # 1: Profile of a typical heat island in a hypothetical metropolitan area show temperature changes correlated to the density of development and trees [7].

Variations in the urban heat island over time are also consistent from city to city. The thermal processes causing summer heat islands occur when the sun is shining. The difference in temperatures begins to grown in mid day. The heat island, however, is most pronounced two to three hours after sunset, when paved areas and buildings slowly release their stored heat into the urban atmosphere.

The intensities of heat islands depend on a number of factors, that is, climate, topography, and physical layout of a city. Short term weather conditions also have a strong effect. Breezes in a city, for instance, prevent the formation of heat islands by mixing cooler air from surrounding areas with warmer urban air.

The increasing urbanization and industrialization have exacerbated the heat island. As cities have grown, increasing number of buildings have crowded out trees other vegetation. This loss of vegetation and its replacement by buildings or pavement causes the urban heat island to intensify. Population can also be seen as one indicator of a heat island's intensity. Studies have shown that cities with larger population tend to have more intense heat islands [7].

5. DIFFERENCES BETWEEN URBAN AND RURAL TEMPERATURES

Because of the scarcity of data directly comparing urban and rural temperatures, it is often difficult to ascertain how much of the urban warming trend resulted from changes in regional weather and how

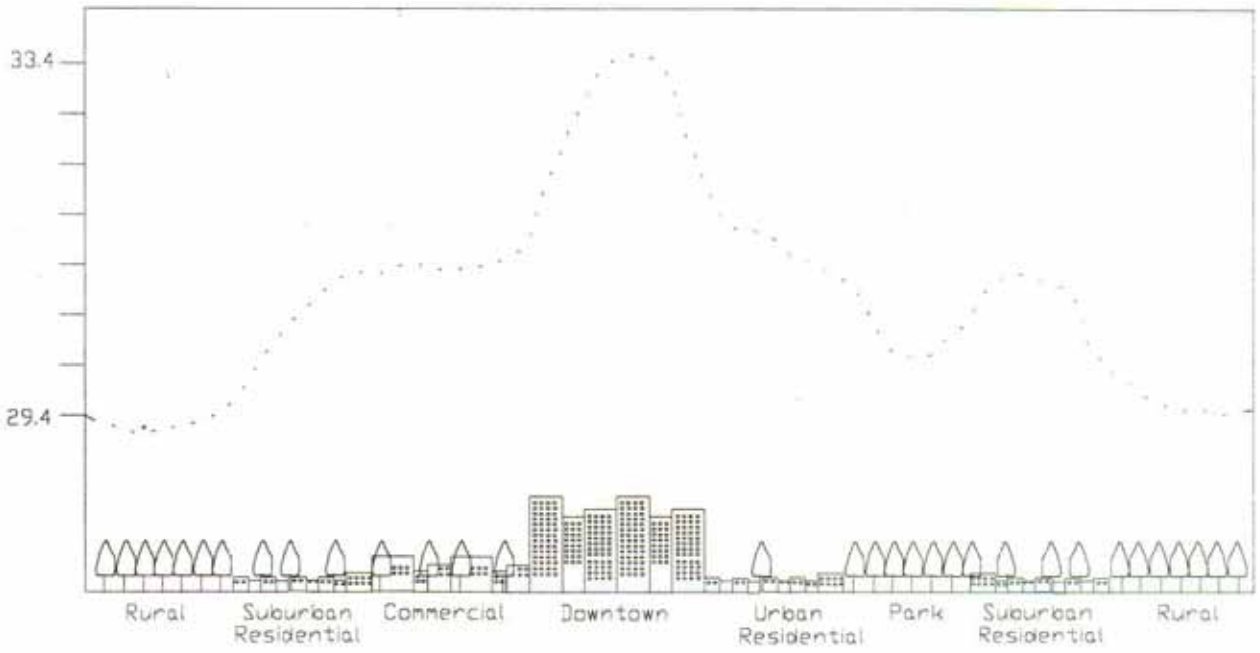

Figure #2: Maximum difference in urban and rural temperatures.

much is the result of the urban heat island effect. But the available data indicates that urban temperatures are rising faster than temperatures of surrounding rural areas. Tropical cities provide excellent examples of increasing heat island intensity. Indeed, it is not usual for average temperatures in tropical and sub tropical cities to be as much as 5.5°C to 10°C higher than surrounding areas.

Heat islands of 8.8°C have been measured in Mexico city (Mexico) and of 6°C in Mumbai (Bombay) and Poona (India) [7]. In tropical cities heat islands have detrimental impacts on energy use, as it exacerbates cooling energy use in summer. The increasing demand for electricity will continue if our cities continue to be hot.

In addition to increasing cooling energy use, heat islands and long term urban warming affect the concentration and distribution of urban pollution, because heat accelerates the chemical reactions in the atmosphere that lead to high ozone concentrations. (Polluted days may increase by 10.8% for each 3°C increase in temperature).

6. THE EFFECT OF LANDSCAPING ON MICRO CLIMATE

Landscape in the environmental context refers to the laying out and planting of trees, shrubs, grass etc., together with the provision of related features on open spaces from smallest courtyard to large parks [10]. The effect of the sun on any area will, to a large degree, be determined by the size, nature and texture of the various surfaces on which it falls. Every type of natural ground cover - such as grass, shrubs and trees; paved surfaces: walls and roofs will have a perceptible effect on the micro climate of the area.

Natural growths tend to stabilize temperatures and minimize extremes in them. Man-made surfaces, on the other hand, tend almost without exception to exaggerate them. Generally, plant life acts as an absorbent material, blotting up heat, light and sound. Since leaves give off moisture, they actually destroy a large part of the heat which falls upon them. Thus, they re-radiate far less heat than inorganic materials.

Landscaping is therefore, recognized as an effective way and help to remain comfortable during the hot summers. Open areas can be planted with shade trees, flowering and non-flowering plants, and grass lawns. Landscaping around the buildings should be so designed to take the best advantage of prevailing winds for natural cooling in the summer. Landscaping is also used to lower air temperatures through the evaporation of water from leaves and to reduce the re-radiation from the ground and paved areas.

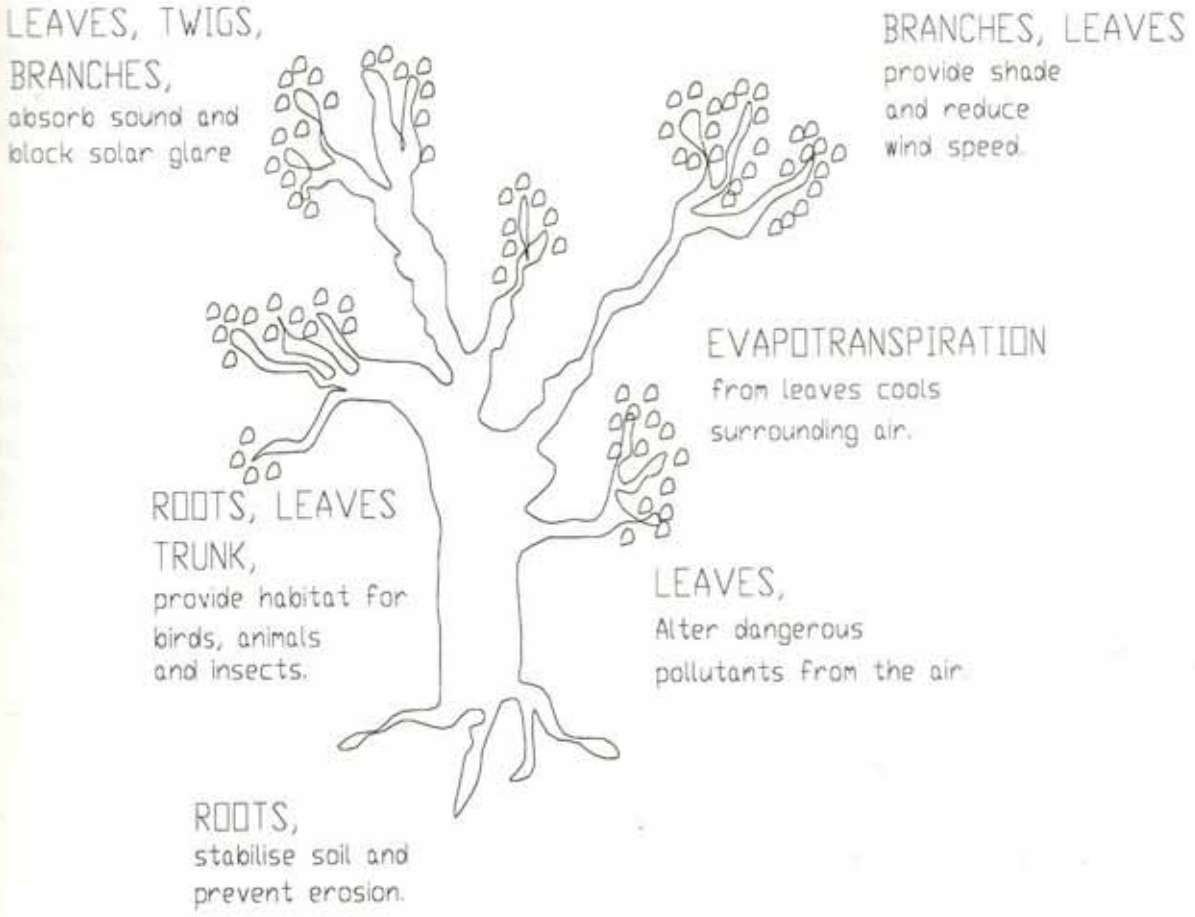

Figure # 3: The numerous ecological qualities of trees: The leaves alone can provide cooling from evapotranspiration, shelter from wind, sound absorption, and sequestering of carbon dioxide[7].

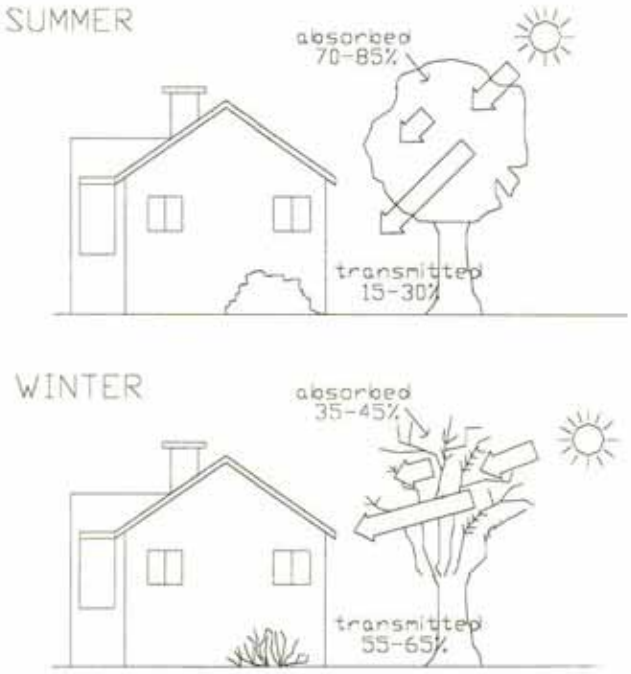

Figure # 4: Shading characteristics of deciduous trees during the summer and winter [7]

It is generally found that on sunny summer day, air temperatures at about 1'-0" above ground level are approximately 4°C and 5°C lower than those at ground level itself. Grass is also cooler than exposed soil surfaces, the difference in temperature being between 5°C and 6°C [11].

The temperature differential may be much greater between grass and paved surfaces. Further more, there is a considerable difference in temperatures between paved surfaces made of different materials. Rudolf Geiger proposed the range of temperature variations over different surfaces.

TABLE - 01
RANGE OF TEMPERATURE VARIATIONS OVER DIFFERENT SURFACES

Material	Temperature (°C)
Tar Macadam	32.6
Sand	25.9
Earth	25.0
Gravel	21.1
Grassy Ground	16.0
Clay Soil	11.2

On a bright day, concrete and similar light colored surfaces will reflect from 25 to 35 percent of the incident light, while grass surfaces, reflect only about 10-15 percent of the incident light [11].

7. SHADING WITH TREES, SHRUBS AND VINES

Plantation helps in reducing the effects of heat island in summer season, besides satisfying the instinctive need for aesthetics, leaves with viscous surfaces catch the dust and filter the air. Deciduous trees provide generous shade and that too only in the appropriate seasons so that they are quite valuable in climates where sunshine is needed in the winter and shade in the summer.

To achieve efficient shading, trees have to be placed strategically. As the sun is at low angles in the morning and late afternoon, trees should be placed facing southeast and southwest of the building. The trees will cast long shadows which can be utilized effectively on those sides which are otherwise difficult to protect from the sun's heat at this time of the day. Moreover, the type of trees used is of great importance. They should be selected from the point of view of both their appearance and amount of shade they provide [11].

Trees are classified into three major forms. The first type of trees are those with a round shape where the spread and the height is roughly the same. The second type, are of oval shape, whose spread is nearly half the height and the foliage takes an oval shape. The third type of trees are vertical and do not spread very wide, and are known as columnar trees.

Tall, full crowned trees are best for blocking the rays of the sun when it is shinning directly over head at mid day. The oval shaped trees may be used on eastern and western exposures of the buildings to provide the maximum protection to the roof and walls from solar heat gain, while allowing the access to cool breezes. The columnar trees can be used as wind barriers and dust screens. Shrubs and other low growing foliage provide shading during the morning and late afternoon when the sun is low in the sky. They may be planted between the paved areas and the building. Vines provide a very fast growing source of shade for a building, because they require little space for growth. Thus these are most useful where space around the building is limited. Figure #5.

Ground surfaces reflect solar radiation into building and decidedly have effect on building's heat gain and loss. Light colored or concerted surfaces are good reflectors and can increases the heat gain to the building. Dark colored surfaces, such as asphalt, will absorb and store large amounts of solar radiation as heat, and re-radiate it to the building at a later time. To minimize this reflected radiation, as much ground vegetation as possible should be located around the buildings in conjunction with the trees and shrubs [12].

8. MEASURING THE INTENSITY OF HEAT ISLAND: A CASE STUDY OF LAHORE

To know the effects of landscaping on the temperature characteristics, the city of Lahore is selected as the case study. Lahore has always been known as the city of gardens before and even after the independence of Pakistan.

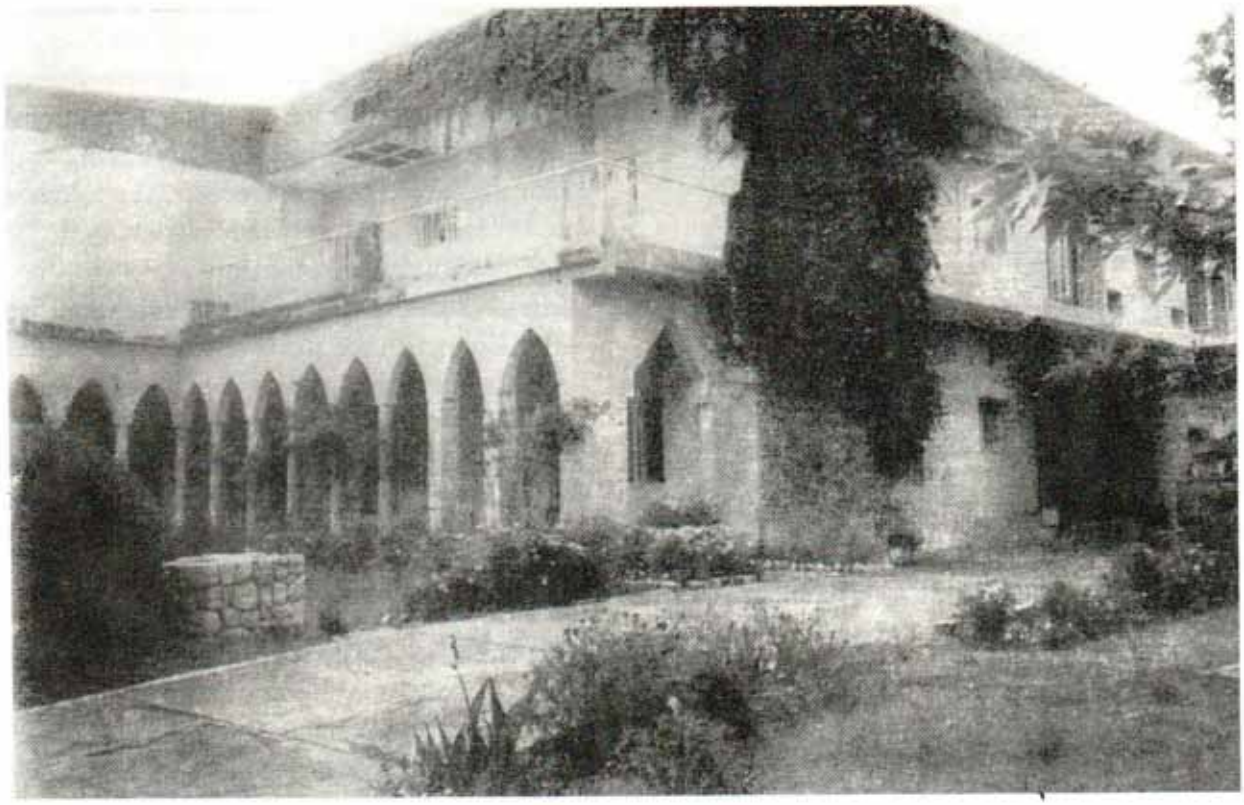

Figure # 5: Picture of Building with Vines

The selected area once had the rural surroundings and vegetation was the dominant feature. It has now turned into densely populated urban center with less tress and more roads, buildings, vehicles, etc. the weather station in the selected area is operational since 1861. This has helped in obtaining the data to be studied for the desired period of time. Climatically Lahore lies in the tropical zone with hot summers and cold winter, interspersed with monsoon rains.

There has been remarkable growth in the urbanization of Lahore since 1947. Its population rose from 0.7 million in 1947 to 5 millions in 1995. The physical area of the city has increased from 8 square miles in 1947 to 165 square miles in 1995 [13,14]. The growth of industries is also rapid. Before independence these industries were more than 1000 [14,15]. The rate of growth of Lahore in 100 years is shown in Table-2.

The increasing urbanization is also a factor for continuous replacement of the natural soil and vegetation cover of the area by artificial features like roads, buildings, etc. there is also a remarkable increase in the injection of pollutants into atmosphere.

TABLE - 02
POPULATION AND AREA GROWTH IN LAHORE FROM 1895 TO 1995 [14]

Year	Population (million)	Population Growth	Area (sq. mile)	Growth In area
1891	0.202	——	3.0	———
1947	0.760	3.76 times	8.0	2.6 times
1995	5.078	6.68 times	165.0	20.6 times

For studying the impact of urbanization on climate, the existence and intensity of the urban heat island in Lahore, data was collected in two different periods but at the same location. These periods represent the time when the area was rural in character and later the city expanded and become urban. Period-I represents rural conditions when the vegetation was the dominant land use feature while period-II represents urban conditions of a continuous built up area. The purpose of this study is the comparison of ambient air temperature "before and after" urbanization and to know the affects of landscaping on the reduction and creation of urban heat islands. Table-3,4.

Table-03, 04
PHYSICAL DEVELOPMENT IN PERIOD-I AND PERIOD-II [14,16]

Station	Landuse pattern
Period-I (1876-1895)	Rural
Period-II (1976-1995)	Urban

Periods	Year	Population (million)	Area (sq.miles)
I.	1876-1895	0.202	03
II.	1976-1995	5.078	165

The whether station chosen for this study represented similar geographical location in both periods but experienced different physical environment from 1876 to 1995. The weather station was first established in 1861 and modified in 1931, 1951, 1961, 1971 and finally in 1990 [17].

The study compares the two data sets collected at the same weather station but in different periods having a difference of 100 years. Each period consists of 20 years. The first period represents time from 1876-1895 and second period from 1976-1995. Data used in this study was the average of the month which reduces the margin of errors, if any. The months representing the monsoon season were excluded form the analysis. The months chosen for this study of annual and seasonal scales are shown in table-05.

TABLE-05
MONTHS CHOSEN FOR THE ANALYSIS

	Months
Annual	January-June and December
Winter	December-March
Summer	April-June

The effects of landscaping on temperature in Lahore was examined by comparing the temperature values of the same area with different levels of vegetation. The comparison is carried out on annual and seasonal levels and mean ambient air temperature were taken into consideration. The variations in the mean annual and mean monthly values of ambient air temperature were studied to examine seasonal variations in the urban heat island, if any. The intensity of heat island was also calculated.

It was found that mean annual temperature of the same area with lesser trees (period-II) is significantly higher than, when it was surrounded by dense vegetation (period-I) i.e. temperature in period-II is 1.1°C higher than that of period-I. At seasonal level mean monthly summer temperature is 1.9°C higher in period-II than period-I. While in winter season there is no significant difference between the temperature in both periods (Table-6).

TABLE-06
THE COMPARISON OF AIR TEMPERATURE BETWEEN PERIOD-I AND PERIOD-II AT ANNUAL AND SEASONAL LEVELS.

Periods	Mean annual temperature (°C)	Mean Seasonal Temperature (°C)	
		Winter	Summer
Period-I	21.8	15.5	30.3
Period-II	22.9	15.7	32.2

Analysis of the annual and seasonal characteristics of temperature in Lahore show than there is an increase in temperature of the city in last 120 years by 1.1°C. This rise in temperature may be because of changes in physical structure of the city and relatively fewer trees. The heat island effect of the city is clearly reflected in mean annual temperature and it displays a higher preponderance during the summer season than during the winter period.

9. DISCUSSIONS

It has been observed that heat islands have a significant impact on the temperature of the surrounding areas. The heat island are mostly formed because of the denuded landscape, impermeable and dark colored surfaces, massive buildings, heat generating vehicles and machines.

Vegetation has a large impact on the micro climate and hence plays a major part in decreasing the temperature of a particular area. The rural areas are therefore, much cooler than the adjacent urban areas. This can also be compared with neighborhoods with more trees to the neighborhoods having less trees/vegetation within the same urban area. All such spaces that are being turned into 'heat islands' need special treatment.

Since the urban heat islands are mostly created because of hard surfaces having less or no landscaping, it is important that such surfaces should be covered through a well planed and placed vegetation/landscaping.

It is, therefore, very important and necessary to study and analyses such spaces carefully and then be treated with strategic landscaping for controlling the heat island effect.

CONCLUSION

Landscaping has a definite effect on surrounding environment.

1. Landscaping is therefore considered to be the most effective way to cool our communities and to save energy.
2. It helps in protecting buildings and surroundings against the scorching heat of sun in summer, and from cold winds in winter.)
3. (Besides the cooling effect, landscaping also improves the urban environment by reducing noise pollution and controlling the dust).
4. To minimize the heat island effect through landscaping the following recommendations may be considered when trying to control the climate.

    - Deciduous trees should be used in the areas where sun's warmth is needed in winter.
    - For more cooling increase the area of lawn, number and size of trees.
    - Low shrubs to be used to make sure that the air circulation is not hindered.
    - Paving should be shaded by trees as much as possible, to prevent heat absorption.
    - Water as a landscape element can also be used very successfully to reduce the effects of heat islands.

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[1] In this process the plant draws moisture from the ground, utilizes what it needs for growth and moderating its own temperature, transpires the excess, and cools the surrounding air

THE MEANING AND USE OF OPEN SPACES IN HOUSING AREAS: RESIDENTS' RESPONSES IN NORTHERN CYPRUS

Dr. Derya Oktay
Associate Professor,
Eastern Mediterranean University,
Faculty of Architecture,
Gazimagusa, Northern Cyprus,
Mersin 10, Turkey

ABSTRACT

In this study an attempt to explore the meaning of open spaces in housing areas of Northern Cyprus has been made and these spaces have been evaluated in terms of adequacy for use by the residents.

A survey conducted on 420 residents from various areas, having people belonging to different age groups and income levels, helped in finding out the extent to which the exterior environment means to them and how they integrate it with their lives. The findings revealed a high level of desire for better integration between the residences and the open spaces around them. However, in many cases due to the poor quality of design, which lacks a sensitivity towards social and cultural values, a majority of residents showed disappointment concerning these spaces. The questionnaire designed for this specific survey comprised of questions regarding general satisfaction of the users with the open spaces, their location, size and design, their relationship with the house and the street, the quality of the greenery, provision for car parking, etc.

While studying the significance of open spaces, this paper focuses on the most common housing patterns in Northern Cyprus, considering the changing qualities of residential development in the last decade.

1. BACKGROUND TO THE STUDY

It is a general observation that the methods employed in designing housing projects usually take the user requirements into consideration only at the scale of the dwelling unit, whereas this consideration is completely neglected while planning the open spaces. In fact, open spaces around dwellings have great importance both, in creating and/or enhancing social interaction among residents and enriching the daily life in individual units - especially in the case of hot climates. Furthermore, as Marcus and Sarkissian (1986) have also highlighted in their comprehensive study on clustered housing, the success of housing depends more on how the spaces between buildings are handled rather than on interior design.

Through previous researches (Oktay & Onal 1996), it has already been established that residential exterior spaces lack responsiveness to their users' needs, their life style and their socio-cultural conditions.

Preliminary observations have also revealed that a number of problems are experienced by the residents of housing areas in Northern Cyprus, regarding the physical layout of open spaces and their general living environment. This is especially true in the case of multi-storey housing developments which contradict many social and cultural norms in Cypriot towns.[1]

Since very little baseline data exists, regarding the preferences and attitudes of people about 'residential open spaces' in Cypriot towns, for this research paper the first aim was to develop an understanding how these spaces effect their users. In order to generate substantial data, a survey was conducted using a specifically formatted questionnaire designed by keeping in view several observations and preconceptions concerning the meaning and use of private and semi-private spaces.[2]

The survey was directed in such a way that it analysed the responses of residents from different housing types. Basic themes in the survey forms were regarding 'general characteristics of the residents and their houses', 'perceptions and evaluations regarding private and semi-private open spaces and their expectations' and 'evaluations of the surrounding environment'.

Various districts in the three towns, Lefkosa (Nicosia), Gazimagusa (Famagusta) and Grine (Kyrenia) were studied for this paper. Only the most common housing patterns, i.e. the individual/detached or row houses and apartment flats were considered. 270 out of 420 dwelling units were individual houses and 150 were apartment flats.

Although the areas selected for study had varying socio-economic level, but this distinction was not significant, thus not reflected in the evaluations. Generally the residents were of moderate income level, from various areas and age groups. The distinction between different housing types was treated as significant. However, evaluations were done both in general terms as well as separately for each group of housing type.

2. SOCIO-ECONOMIC OVERVIEW OF STUDY AREAS

2.1 Apartments

The survey carried out reveals that a majority of residents in apartments live there on a rental basis. Only 36% of the surveyed apartments had owners living in them. Almost 90% of the residents have lived in their apartments between one to five years only (48% between 2 to 5 years and 50% between 1 to 2 years), whereas only 1/10 of the households have lived there for longer period. Almost half of flat residents previously lived in detached houses (Figure #1).

The apartment residents mostly fall within the age group of 18-40 years. Residents of beyond 40 years were very rare. A vast majority was within 18-25 years of age (Figure #2).

The average size of a household in apartments varies between 2 to 4 persons per family. However, 16% houses had five persons and 4% had only one person (Figure #3).

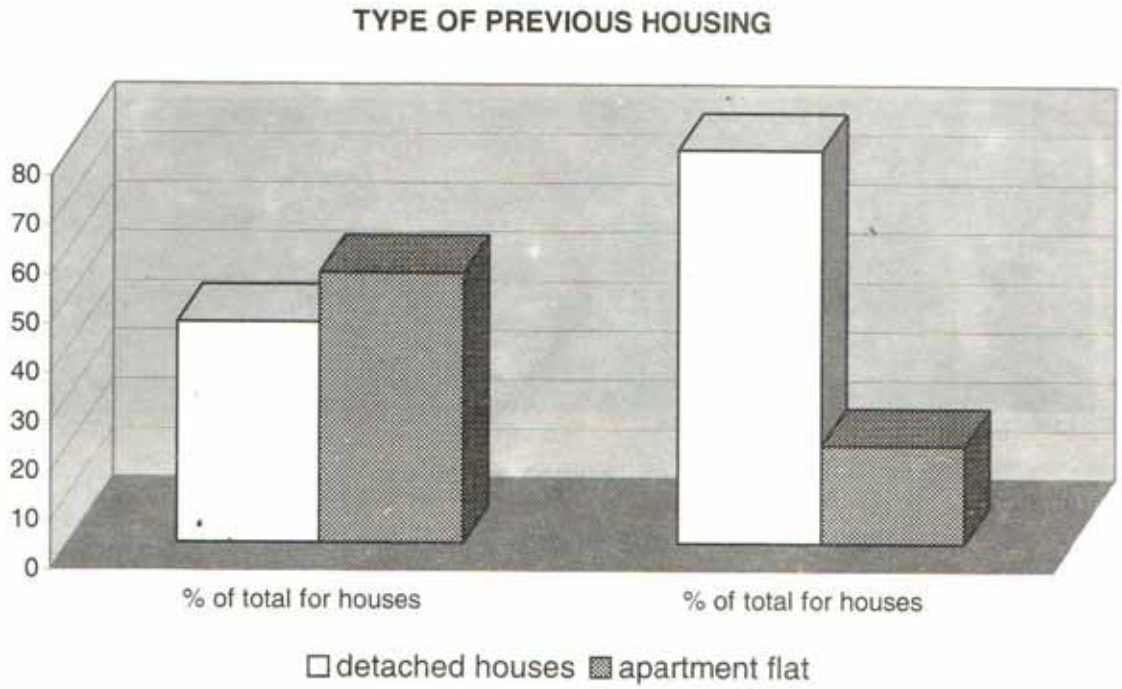

Figure #1: Types of Previous Housing

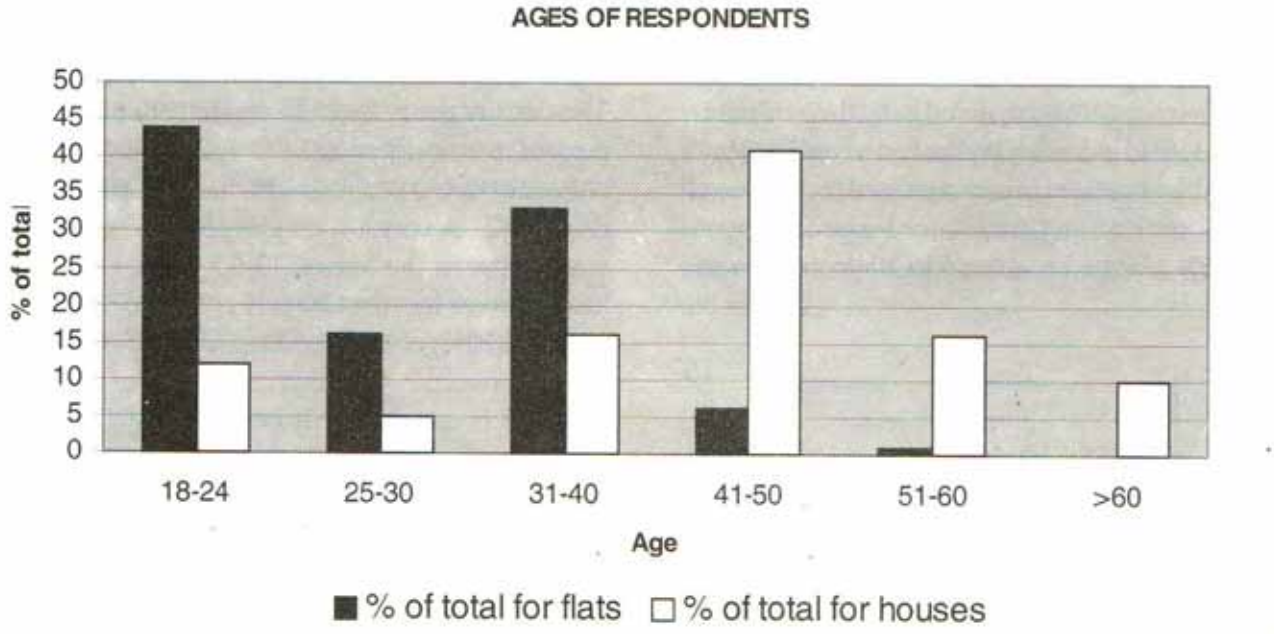

Figure # 2: Ages of Respondents

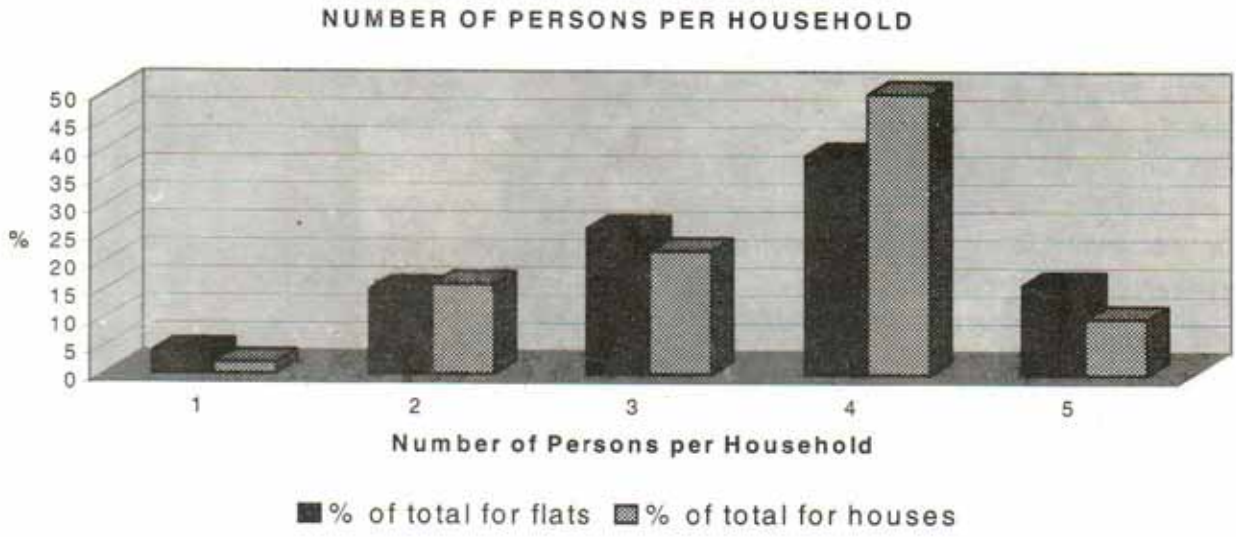

Figure #3: Number of Persons per Household

2.2 Individual Houses

In the case of individual houses, a large majority of residences are being lived in by their owners. Only 15% of individual houses had tenants in them. It can also be stated here that most of the residents have been residing in the same house for longer periods of time i.e. since 5 to 20 years or even more.

0.8%	2 years or less
14%	2-5 years
28%	5-10 years
25%	10-20 years
25%	more than 20 years

Majority of the residents were between the age of 30-60 years. Only a handful were less than 30 years (17%) or above 60 years (10%) of age. The density per household varied between 2-4 persons in majority of cases. Only 2% houses had only one person whereas 10% had five persons (Figure #2). A very low majority of the residents were between the age of 30-60 years. Only a handful were less than 30 years (17%) or above 60 years (10%) of age. The density per household varied between 2-4 persons in majority of cases. Only 2% houses had only one person whereas 10% have five persons (Figure #3). A very low percentage of households presently living in individual houses had previously resided in apartments/ flats.

3. HOUSING FORM IN NORTHERN CYPRUS AND THEIR OPEN SPACES

The traditional building form in the older parts of Northern Cyprus is the low row-house with a porch and a small front yard facing the access street and a private outdoor backyard (avlu/ courtyard) behind the house. This form of dwelling with both front-yard and back-yard provides a valuable freedom of choice between staying on the public side of the house or on the private side.

Therefore, it is quite normal that the responses of the flat residents in the survey were more negative compared to those of the house residents, as multi-storey housing is a new phenomena in Northern Cyprus and the current examples of these generally lack the possibilities that are provided by individual houses specially in terms of open spaces and recreational areas

Thus the response of flat residents regarding their open spaces was mostly negative as compared to the house residents. More than half of the flat respondents (57%) were not happy with the open and semi-open spaces in apartments. Whereas in the case of individual houses 64% residents were happy and only 1/3 were not happy with the open spaces provided for them.

The various forms of open and semi-open spaces identified in patterns of Northern Cyprus include;

- Gardens
- Balconies
- Car parking
- Common open spaces

The importance of these open and semi open spaces in the lives of Cypriots can be evaluated from the fact that the judgement of more than half of the respondents about their dwellings' quality was influenced by the character of the open spaces provided with them. About 68% of people showed their dis-satisfaction if their balconies or gardens were provided with the possibility of use for only an aesthetically pleasing view. They preferred multi functionality in these spaces. However, 32% of people showed satisfaction even if these spaces had single use.

75% of individual house residents were of the opinion that the open and semi-open spaces of their houses effected the overall aesthetic quality. In the case of apartment residents only 31% thought that open spaces play an important role in the overall aesthetics of their living environment (Figure #4).

24% of the respondents were dissatisfied with the relationship between their outdoor and indoor spaces. On the other hand, most respondents (74%) were pleased with the relationship between their outdoor spaces and the street. Regarding privacy, most residents (60%) did not complain about being exposed to the eyes of passers-by while sitting in their gardens or balconies; only two-thirds (40%) considered it a problem. In line with these considerations, most residents (76%) showed a preference to watch the activities or passers-by in the street and about a quarter (24%) did not.

3.1 Gardens

> "Architects must design gardens as much as they design buildings to be able to develop an understanding of aesthetics, to acquire mystic values and to learn how to enjoy them"
>
> Luis Barragan

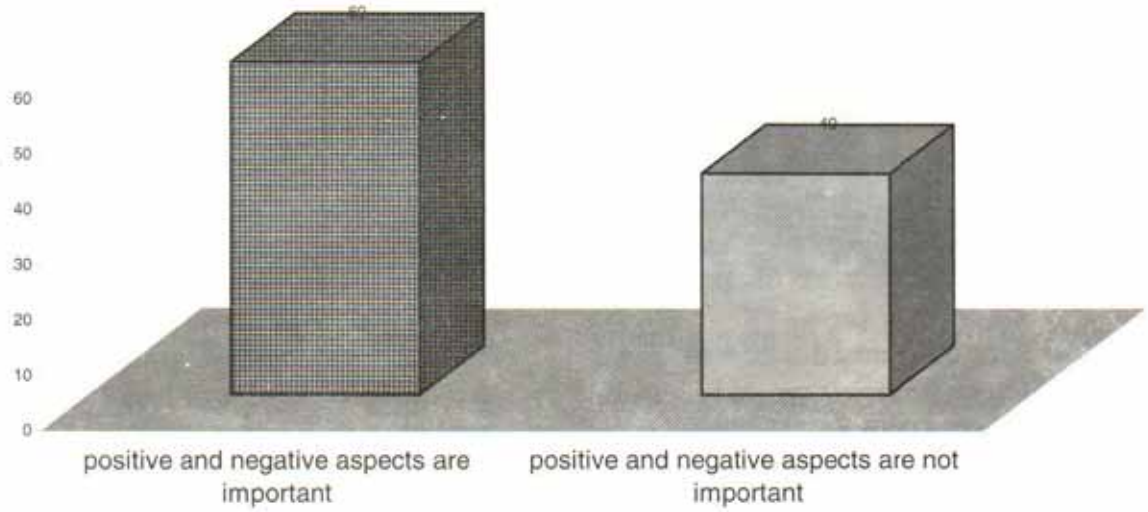

Figure # 4: Influence of open spaces on the general judgment

As this feature is found only in individual houses the apartment users were not considered for the evaluations regarding gardens. The front gardens in individual houses are used for many functions such as growing flowers, sitting, car parking, circulation passage, receiving guests, etc.

Among these growing plants is the most common function. A majority of the residents (72%) use their front gardens for this purpose; summer sitting is the second activity that most people prefer (64%). More than one-fourth of users (29%) use this space for sitting through nine months.

Other less common uses include car parking (22%), only as passage (20%), for receiving guests (17%) and growing vegetables (6%).

All residents mentioned similar problems regarding their front gardens, i.e. they are small in size, their solar orientation is not suitable, they do not provide privacy and they are too exposed to street noise. Almost (22%) of residents complained about the inefficient solar orientation, slightly less than one-fifth (18%) complained about the street noise, and less than one-fifth (17%) complained about the small size of their front gardens.

The use of residents in individual houses was quite different as compared to those of front gardens. More than half of them (52%) use their rear gardens for drying laundry, slightly less than half (48%) for growing flowers, more than one-third (36%) for growing vegetables, almost one-fifth (19%) use them for storage, slightly less than one-fifth (18%) to keep pets, less than one-fifth (18%) to sit, and less than one-fifth (17%) for other types of household chores.

3.2 Balconies

This feature is found both in apartments as wel as individual houses. Balconies can be an importat and valued amenity for some individuals, they provide a psychological outlet in addition to being a functional space (for growing flowers, sitting, eating, etc). Thus they are essential in many contexts.

Balconies came out to be the most disappointing elements of today's housing. Generally, the individual house residents were more satisfied with their balconies as compared to the apartment users.

The basic complaint of the users about their balcony was regarding its size, solar orientation, privacy and street noise. In the case of flat residents 66% complained about the small size of the balcony, 36% complained about its inefficient solar orientation, 23% were of the opinion that they had a lack of privacy and 14% considered the street noise as a problem.

Whereas, in the case of individual houses only 30% residents complained about the small size of their balconies, 20% had problem due to inefficient solar orientation and 22% of the residents complained about the disturbance due to street noise.

In both housing type the balconies were being used for a variety of functions such as sitting, receiving guests, drying laundry, watching television, etc.

In the case of apartments half of the residents use their balconies for sitting throughout the year, and one-third (55%) for the summer time only. More than one-fifth (23%) use them to dry clothes; slightly less than one-fifth (17%) to receive guests, and almost one-third (32%) to watch TV.

A large majority of the flat residents (89%) were disappointed by the lack of opportunity to grow plants on their balconies; only a handful (11%) were pleased with the situation.

On the other hand, 42% of the house residents used their balconies during the summer, around 35% for sitting throughout the year, about 29% to dry clothes, and only 21% to receive guests.

Due to the earlier mentioned reasons of dissatisfaction, the residents of both types of housing made some changes in their balconies. About 10% of the flat residents and 7% of the individual house residents changed the railings of their balconies.[3] 15% of the flat residents and 5% of the house residents introduced sun screen elements (canopies, etc.) Regarding the floor pavement, 12% of the flat residents as well as individual house residents changed the floor finish (Figure #5).

3.3 Car Parking

The percentage of car ownership is quite different for flat residents and individual house residents. Most flat residents (64%) have one car for each unit; only a handful (12%) have two cars; and very few (7%), probably students' shared flats, have three cars. On the other hand, in individual houses, slightly less than half (43%) of the residents have one car, a similar number of residents (43%) have two cars, and a tenth (10%) have three cars.

Users satisfaction about spaces for car parking also differs from one group to the other. Less than two-fifths of the apartment residents (40%) were pleased with the existing situation, but more than half (60%) were not.

In private houses, more than half (65%) were pleased with the car parking facilities; over one-third (35%) were not. A large majority (83%) of

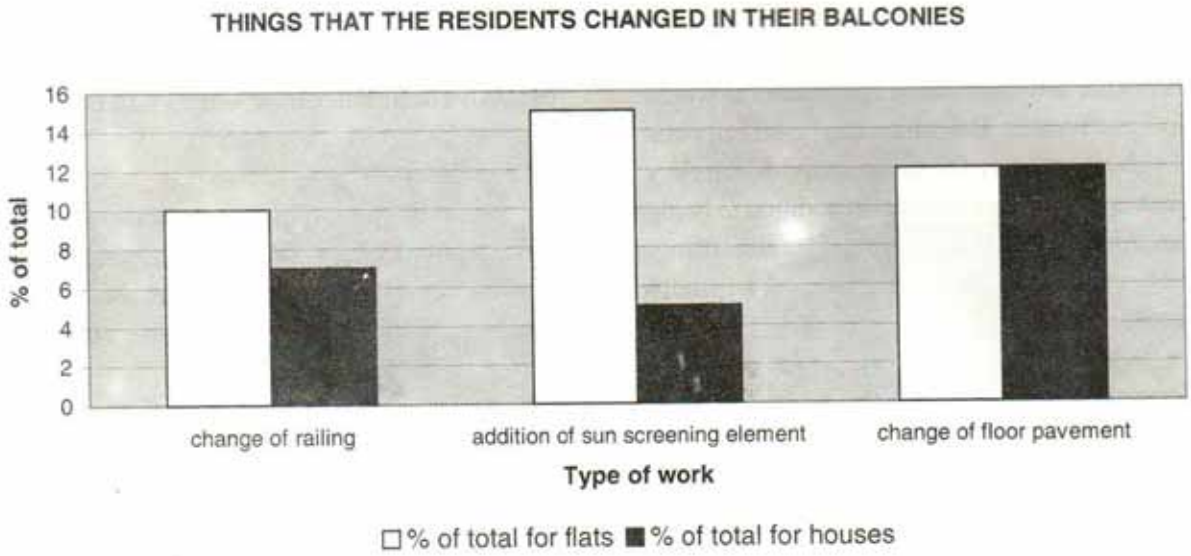

Figure #5: The things which the residents changed in their

the individual house residents would like to have their cars near to their houses; only a handful (8%) would prefer a group car parking in a nearby location.

Almost 71% of the flat residents showed a desire to have their car parking spaces adjacent to or near to their apartment; while only 28% preferred them as a group car parking far from their apartments.

Regarding guests' parking, most residents (65%) complained about the lack of facilities provided for their guests, while slightly more than one-third (35%) did not consider this as a problem.

3.4 Common Open Spaces

Open green spaces in and around cities are important for a number of reasons. These include the function of soil and its vegetation as a carbon sink; the function of the tree cover as an 'atmospheric scrubber' removing particulate pollution of green areas as protectors of flora and fauna and the maintenance of bio-diversity. In addition to these environmental functions, the green areas are used for recreation, food production and economic tree cropping.

Considering various characteristics of common spaces, residents of both types of houses expressed the same level of satisfaction and dissatisfaction.

A large majority (89%) of the residents were not pleased with the provision of common spaces and related settings. The types of common spaces which the residents showed a desire to make use of, include passive green areas (72%), sports areas (63%), common space for young people (62%) and children's play grounds (32%).

Almost one-third of the residents complained about the street noise in the common spaces, more than a quarter (27%) mentioned about their inappropriate location, more than a quarter (26%) complained about the lack of view provided through them and one-fifth (20%) stated that their visual boundaries were not clear.

Most residents (65%) were disappointed with their neighbors' concern about the cleaning of common spaces. Considering the general environment, most of the people (61%) were dissatisfied with the maintenance of the surrounding environment; the points of dissatisfaction included poor refuse collection, pavement decay in the street, clutter of electrical wires, etc.

More than half of the residents (53%) complained about inefficient street-lighting, and most residents (71%) complained about the lack of side walks in their neighborhood.[4] On the other hand, a large majority of the respondents (89%) were unhappy with the lack of greenery in their environment.

CONCLUSION

It is established through this study that open spaces are a cornerstone in the daily life of the people in Northern Cyprus and satisfaction with their dwellings greatly depends on the quality of private and semi-private open spaces provided with them. However, at the present state, these spaces lack the qualities which provide positive meaning and availability for use by the residents; furthermore, there is a serious user dissatisfaction with the provision and/or qualities of collective open spaces in housing areas.

It appears that the meaning and use of open spaces is quite different between the two types of housing; i.e. apartments and individual house. The differences are not only due to the building type, but also due to the characteristic of the residents (their ages, house ownership, duration of residence, etc.).

In general the level of satisfaction is lower for apartment type housing, where private open spaces, usually in the form of balconies, are far from being an extension of the living environment. Efficiently designed - well proportioned, well climatized, well ornamented - open spaces that are appropriate for sitting, eating, receiving guests, drying laundry, watching TV, etc. are fundamental to the success of apartment living. Maintenance of the semi-private open spaces and their surrounding environment is another issue which affects people's satisfaction with their dwellings. Therefore, these spaces must be considered early in the design process in terms of location, greenery, visual boundaries, view, protection against the weather elements such as rain, sun, etc.

The residents of individual houses also had many problems with their private open spaces. These include in ficient solar orientation, street noise, insufficie t size, lack of privacy, etc. Findings indicate that the front gardens play a very important role in the lives of people and are preferred by many for various activities. This confirms that despite the theoretical possibility of making all sides of dwellings equally important, Cypriot culture retains a strong sense of 'front and back'. Therefore, for the success of the outdoor living, front yards must be carefully considered in relation to their widths and depths so that the necessary climatic advantages can be achieved.

Thus, the experiences of residents in Northern Cyprus demonstrates the negative impact that poorly-designed open spaces can have on the quality of people's lives.

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1 It has been only ten years since multi-storey housing was comprehensively introduced in Northern Cyprus.

2 Post-occupancy evaluations of housing environments are providing architects with insightful glimpses as to how their buildings are being used, valued adjusted, and modified by tenants and management. Therefore, most of the design research in many countries takes the user surveys as the basis. In the present paper, SPSS programme has been used in the evaluation of the survey data.

3 Changes on railings were mostly related with their height, which blocked the residents' view and negatively affected the visual interaction between the balcony and the outer environment.

4 This was such a serious problem that some residents in Kara Kol, a newly developed district in Gazimagusa (Famagusta) where the average income level is high, built the sidewalks in their areas themselves.

HIGHWAYS AND THEIR EFFECTS ON THE EMERGING SHAPE OF CITIES IN THE UNITED STATES OF AMERICA

Saima Qureshy, AICP
Regional Planner, County of Los Angeles,
Department of Regional Planning,USA.

ABSTRACT

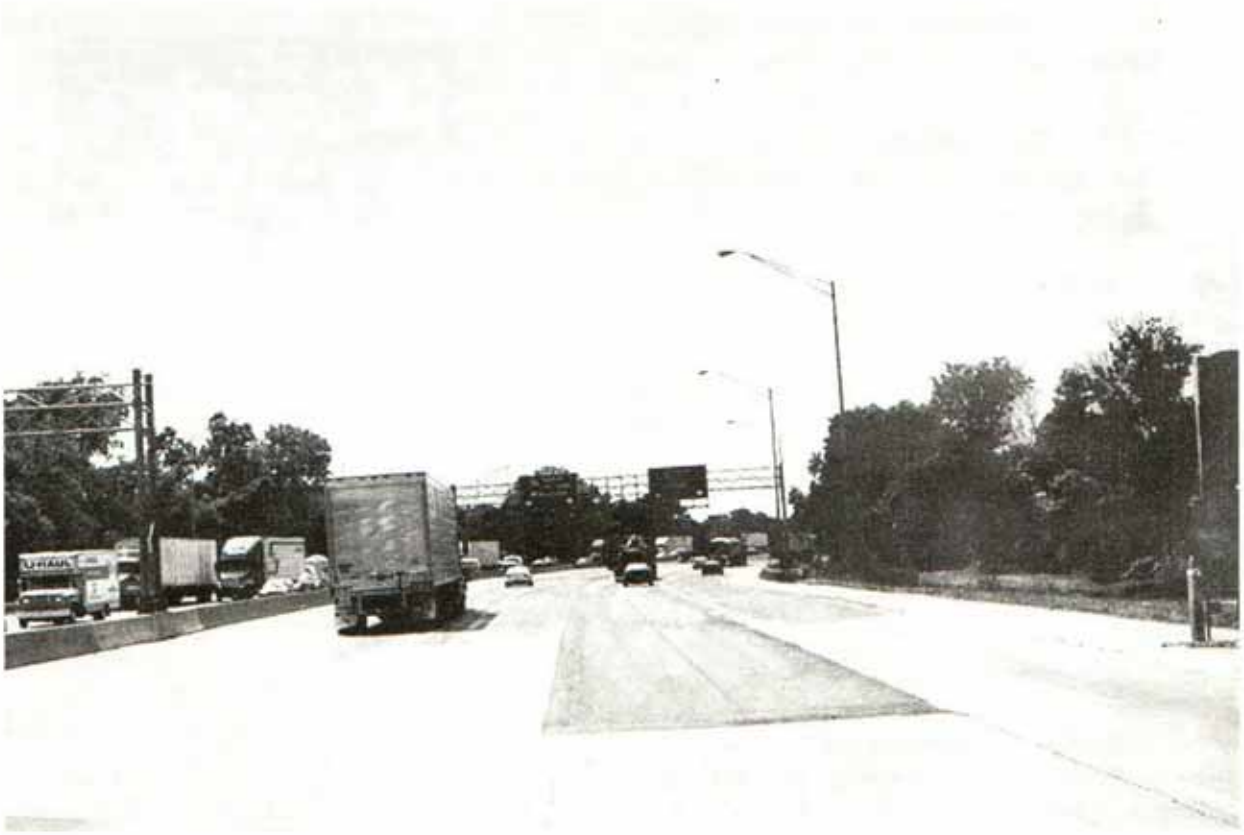
Federal and State highway departments control the production of highway facilities from planning phase to construction and operation. They wield a disproportionately large influence on the comprehensive planning process and on the pattern of decentralisation in the metropolitan areas. Because of this influence, highway departments have been able to purse the narrow objective of accommodating traffic despite attempts by the Congress to redirect transportation goals towards meeting the land-use needs of declining central cities and avoiding the adverse social, economic and environmental impacts of highways. Some of these adverse effects include isolation of central city's transit-dependent minorities from suburban employment and the creation of a massive dependence on gasoline.

The inertia of this limited purpose highway program has been sustained by massive federal funding, a bureaucratically embedded and technologically intimidating planning methodology, and a system of federal planning and impact reviews whose major effect has been to expedite the approval and construction of highway projects. These token reviews and deficient impact analysis reviews have deprived the public and elected officials of vital information about foreseeable adverse effects, and have unreasonably restricted their ability to judge highway proposals or to make decisions concerning the decentralisation of cities.

1. INTRODUCTION

As metropolitan areas grew after the Second World War, the nation's rising level of personal income permitted a massive transition by metropolitan area dwellers from bus and rail transportation to more comfortable but more expensive and space consuming automobiles. To move a given number of people, even on roads of higher quality, automobiles had to use at least four times the space required by buses and upto twenty times that required by the rail transit.

The preference of automobiles was encouraged by the changes in physical layout and spatial relation of urban areas, following Second World War. The movement, known familiarly as 'urban sprawl' greatly reduced the number of people living near the city centre and major transportation routes, while greatly increasing the number and distance between their desired destinations. The transit companies were forced to reduce the frequency of services, eliminate some routes altogether, raise prices and neglect maintenance due to declining number of people patronizing public transit.



In cities throughout the United States, increased traffic volume was channellized into street systems that were laid out before the invasion of automobiles.

Crowded traffic arteries were caused by the concentrated economic, social or other facilities on a particular street or at a particular corner.

One solution to this problem was to widen the existing streets by tearing down the buildings around them. But that would have resulted in destroying the generators of economic activities, to provide room for street widening.

2. FEDERAL FINANCE FOR HIGHWAYS

The concept of a federally financed super highway network first arose in response to the perceived needs of military security in First World War. The Roosevelt administration reviewed it as a potential public world project in 1939. The Bureau of Public Roads recommended a 26,700 miles system.

The bureau offered two major reasons;

1. Provide a system of rapid movement of man and equipment in the time of war and
2. Provide jobs during the expected post war depression

It was not until 1956 that the inter-state programme began to accelerate to its present prominence. The Highway Trust Fund was established by the Highway Revenue Act of 1956 as a mechanism to finance the highway *programme. The fund was to provide cash to* reimburse the states for expenditures on Federal Aid Highways.

In order to finance the increased authorisation, the Revenue Act increased some taxes on motor fuels, motor vehicles and associated products and also established some new taxes. Most of the cities with populations larger than 50,000 were connected by these roads.

3. MAJOR IMPACTS

After nearly 65 years and the expenditure of $80 billion from the federal funds alone, the effects of this massive public works programme are impressive. The dream of Frank Lloyd Wright's broad acre city has been materialised to some extent. Tens of millions of Americans have realised the dream of a home of their own and new employment in the suburbs. The national economy has grown enormously and nearly a fifth of its production is related to motor vehicles and highway travels.

Unfortunately, the end result of the 'highways' concept has not been achieved, as it still caused time-loss. A viscous cycle has been created between increase in the trend to use cars, and a decrease in public transit usage, resulting in the perpetual demand for more and more highways.

Some of the less benign effects are:-

Tens of millions of acres of farmland have been converted to urban uses, and hence the distance over which farm produce must be transported has increased. Sprawling development patterns has increased the cost of providing urban infrastructure and services. The effectiveness and the viability of the transit systems have been undermined.

Automobiles have become a necessity for travel to and from the employment and other necessities. The internal combustion system has become the major source of urban air pollution and the major consumer of depleting oil supplies.

4. COMPREHSNSIVE PLANNING AND HIGHWAY PLANNING METHODOLOGY

By 1962 land use planning was a well established process in local government and most cities had completed one or more long-range plans. Most state highway departments had also prepared long range plans for metropolitan areas. In many of these areas some highway elements had already been built and others were under construction. These plans reflected upon the optimistic but mistaken view in the late forties and early fifties, that improved highway access would bring about the economic revival of the inner cities.

The new regional planning agencies were only advisory and had no authority to reject or even modify the proposals of state highway departments. Because of this lack of jurisdiction and in order to expedite the approval of local projects, the regional plans produced by the planning agencies seldom went beyond the compilation of local plans.

Since there was widespread awareness that highway proposals adopted by state highway departments were almost certain to be built; the

proposed highways within the jurisdiction of local governments were usually incorporated in the regional plans as given. Planned future land uses reflected the access that would be provided by the new highways. In this way the state highway departments' plans were the basis of the regional plans from the outset.

The reports and studies that accompanied these plans invariably attributed to the decline of economic activity in central business districts (CBDs) to overly congested local streets and the absence of adequate parking. These findings led to the conclusion that the new highways in combination with a vast number of provided parking spaces would reverse the decline of the CBD.

Based on these conclusions the economic and social revival of CBD was foreseen with the construction of new highways. The need for more highways was also reinforced by the forecast of future traffic, dependent on projected population growth and the prediction of increased auto dependency.

Because of enormous volume of data involved and the extreme technical complexity of models, an aura of authority and reliability was attributed by the public to elected officials and professionals who employed those models, and to the out come of the process. Confronted with this intimidating mystique created by the interaction of voluminous data, high technology and expertise, local policy makers and local citizens understandably were reluctant to question the findings upon which the highway proposals were based and the single purpose goal of accommodating the forecasted traffic.

It is not surprising then that the continued comprehensive transportation planning process carried-on cooperatively by states and local communities, and mandated by the Congress in metropolitan areas, serves mainly to confirm the need for proposed highways and to find them to be in conformity with regional plans.

The basic relationship among the participants in the metropolitan planning process has remained the same and until quite recently the pace of sub-urbanisation has continued unchecked.

Although Congress has made substantial amount of money available for public transit since 1970, the capital improvement and operating subsidies for which those funds have been used did not

significantly affect the continuing approval and construction of metropolitan area highways or provide improved access for inner city residents to suburban employment.

After years of massive investment in the interstate highway system, the President's 1978 National Urban Policy report belatedly concluded that the construction of these highways was "the most powerful direct federal action that has contributed to metropolitan decentralisation and central city decline".

CONCLUSION

The construction of new metropolitan highways has been accompanied by the steady departure of retail, wholesale and manufacturing establishments from the central cities to the new locations on the regional highways network and by the exodus of mainly white middle income families to sub-urban subdivisions. These have left behind increasing concentration of low-income minority populations, depleted municipal resources and deficient transit systems.

In addition, right-of-way acquisitions for highways has frequently resulted in large-scale reductions in the housing supply available to low income households and has severely disrupted low-income minority communities.

All these are significant adverse social and economic impacts on the 'central city' and its inhabitants within the meaning of National Environmental Policy Act, the Civil Rights Act and the Public Hearing Requirements. Nevertheless these impacts were not considered during the planning of most metropolitan highways because those plans were developed before the requirements to consider such impacts were imposed.

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A STUDY OF CO-RELATIONSHIP BETWEEN INTERAL TEMPERATURE OF BUILDINGS AND TREE SHADING IN HOT AND DRY CLIMATE

Naeem Irfan,
Associate Professor, Department of Architecture,
Mehran University of Engineering and Technology, Jamshoro.

Adnan Zahoor,
Divisional Forest Officer, Forest Department,
Government of Sindh.

Nadeemullah Khan,
Assistant Professor, Department of Architecture,
Mehran University of Engineering and Technology, Jamshoro.

ABSTRACT

The study of tree shade on the internal temperature of a building in hot dry climate was examined using a computer – based model. Clear and hazy atmospheric conditions with solar radiation blocked (as if by trees) were considered for the study. Three shading conditions and ten shading regimes were chosen. It was found that tree shading has the most effective impact on the internal temperature of the building if the walls and roof are shaded.

Using a regression analysis a test of linearity was conducted to determine the relationship between the internal temperature of a building and an increase in tree shade. It was found that a negative linear relationship exists between the internal temperature and the amount of shade.

1. INTRODUCTION

Different studies have been carried out to determine the impact of trees on solar radiation. These studies were made through computer modeling techniques and field experiments. [1,2,3,4,5,6,7,8]. The studies are done in certain climatic regions under different conditions. A computer – based modeling technique was designed and used for an area of Lahore,(Pakistan) under clear and hazy atmospheric conditions.

2. DISCUSSIONS

It was that the internal temperature of buildings in Lahore remains reduced constantly with solar altitude, but changes with clear and hazy atmospheric conditions. Reductions in internal temperature are found to be 2.4°F with increase in ten-percent shade when both roof and walls are shaded (Table - 01).

No particular tree species were chosen to study shading impacts on the inside temperature of buildings. This study is specifically designed to quantify the effects on internal temperature of buildings by irradiance reduction through tree shading.

The primary objectives are to:

1. Estimate the impacts on the internal temperature of the buildings increasing the percent tree shading, and

2. Determine if there is a linear relation between the amount of the shade on a surface and a buildings internal temperature

2.1 Advantage of Using Computer Models

For decades landscape designers and foresters have used microcomputers and energy analysis programs to design more energy efficient homes and commercial buildings.

Enormous problems and costs are associated with measuring microclimate because climatic variables constantly change over space and time. Given these difficulties and sparse funding, computer simulation techniques have been used in a number of studies.

Following are some of the advantages which led to the use of the computer model technique in the current project:

1. Computer simulation studies allow researchers to control variables that are often uncontrollable in the field.

2. Computer modeling is also cost effective because a large number of cases can be tested in a short period of time. Hence, Computer modeling holds promise as an economical method to enhance understanding of the interactions between climate, buildings and vegetation.

3. Computer models can provide quantitative data that urban foresters/landscape designers can use to plan and manage the urban forest/ landscape for enhanced energy conservation.

4. Models can also be used by designers to assist in the development of more energy efficient landscapes.

2.2 Limitations of Models

The scope of models written to simulate the impact of tree shade on inside temperature of buildings is limited mainly because microclimate itself is very complicated; it is difficult to simulate all the factors precisely. It is unrealistic to expect computer simulation result to match exactly the actual condition, but the results obtained through such models give ample evidence of the approximate impact of tree shade on the internal temperature of the buildings.

2.3 Development of Current Computer Model

The computer model developed for this study is based upon the following discussion and what follows is taken from Thayer, Thayer and Maeda, Givoni, Mazria, Harkness and Madan, Fathy, Barre, and Heisler [5,7,9,10,11,12,13,14].

Characteristics of internal temperatures of buildings are based on the external heat load. There are various ways in which the interior of a building gains this heat, and solar radiation is the

principal source of it. Buildings derive significant portions of their heat energy from solar radiation. Solar radiation absorbed by a substance is converted into thermal energy; or heat. As heat is added to a solid material, its temperature rises. Therefore, temperature is the measure of the intensity of heat. This heat can be transmitted during the day to the building interior in a number of way.

The most important is by conduction. Solar energy reaches walls and the roof in the form of radiation, that is absorbed at the external surfaces and flows across the walls and the roof by conduction. Thermal conductivity is the property of a material which determines the heat flow in unit time by conduction through unit thickness of a unit area of the material, across a unit temperature radiant. Solar radiation absorbed by the molecule at the surface of a material accelerates heat movement. As the vibration movement of molecules in a material increases, the heat content of the material increases which is defined in terms of the movement of molecules; the more rapid this movement, the higher the temperature. Brick and concrete store and conduct heat much better than wood and are capable of transferring a large amount of heat from surfaces to interiors for storage.

Irradiance reduction from plant shade can have a substantial effect on the buildings' inside temperature. The shading can be used to prevent solar radiation from directly falling on the building. In this study, radiation reduction by tree shade was measured. Computer modeling techniques were explored to estimate the temperature reduction inside the buildings by reducing the input of solar irradinance. This technique consisted of tree shade and solar radiation, combined with a mathematical model at house surfaces.

The rate of conduction of heat depends on the thermal conductance of the building material used, the surface area receiving solar radiation, and the properties of the surface color. The extent to which plants reduce irradiance at the outside surfaces of buildings depends on:

1. The nature of the incoming solar radiation;
2. The amount of the surface area shaded, and
3. The shading coefficient of the plant.

2.4 Nature of Incoming Solar Radiation

Irradiance reduction by trees depends in part on the relative amounts of incoming direct and diffused radiation. A tree's leaves and branches absorb, transmit, and reflect both direct beam and diffused radiation. However, reduction of direct beam radiation is most important because it accounts for most radiation.

2.5 Surface Area Shaded

Simply stated, the more surface area that is shaded, the larger the irradiance reduction.

2.6 Shading Factor

It can be described as the irradiance reduction directly and is formally expressed as:

$$SF = \{ SA_s \} \{1\text{-}SC\}/SA_t$$

Where SA_s is the surface area shaded and SA_t is the total surface area and SC is the plant-shading coefficient. Engineering defines the shading coefficient of a shading object as the percentage of available solar radiation transmitted through the object.

This term can also be applied to describe the transmisivity of vegetation. Researchers have reported different shading coefficients for trees using different measurement techniques. In a leaf, coefficients range from 0.07 to 0.38. Hence the shading factor is a dimensionless number with values ranging from 0 (no shade) to 1 (complete shade).

3. METHODOLOGY

Hourly irradiance on the house surfaces for an average day on 15th June for the city of Lahore was calculated by adoption of the methods of Givoni, Harkeness and Madan, Fathy, Barre, Hartmann, Arya, Incropers, Karlekar, Jones and Ashrae [9, 11, 12, 13, 15, 16, 17, 18, 19, 20].

These methods were used in the calculation of total hourly radiation on horizontal roof and vertical wall surfaces, diffused radiation, reflected radiation from the building and transfer of heat through the walls and roof.

The input parameters used in the model are summarized in Table 1. Hourly outside temperature representing daytime hours were taken into consideration. This temperature represents temperature collected at the weather station situated in the city center which is 100 percent paved or developed. For computational purposes reduction in the inside temperature of the building in subtropical climate, for the month of June, by tree shading was modeled by making the following assumption:

1. Building is sited on flat homogeneous surface
2. Shade of the tree on the building is uniform
3. No adjacent houses
4. Housing orientation was assumed to be due east
5. No secondary effects of trees relating to energy conservation effects on air circulation patterns were assumed
6. No openings in the building
7. No ventilation
8. No inhabitant in the building

TABLE-01
INPUT PARAMETERS USED IN THE STUDY

Input Parameters	Values
Latitude	31° 35' North
Longitude	74° 20' East
Atmospheric extinction coefficient	21 percent
Solar radiation reaches the earth's outer atmosphere	429.2 Btu/h/ft.sq.
Radiative heat transfer	429.2 Btu/h/ft.sq.°F.
Diffused radiation for clear sky (hazy condition)	0.35 Ratio
Reflectivity of the concrete surface	20 percent
Width of the wall of building	6 inches
Absorption coefficient	72 percent
Convective coefficient for outside	0.756 Btu/h/ft² °F
Convective coefficient for inside	0.42 Btu/h/ft² °F
Thermal conductivity of solids	0.5 Btu/h/ft² °F
Shading factors	0-1
Declination of sun in the month of June	23.2 Degrees

A computer program was developed in Visual Basic (Microsoft) computer language and Microsoft Excel spread sheet program to draw graphic relationships between the area shaded and the inside temperature of the building. Two approaches to simulate irradiance reduction were used in this study. In the first approach, a clear atmospheric condition was chosen, while in the second approach, hazy atmospheric conditions were selected. In both the approaches irradiance reduction by tree shading was measured by running computer simulations at three shading conditions (Table-02) and ten shading regimes, i.e. 0.1 to 1.

The house radiation climate model was run for shaded and unshaded buildings for clear and hazy atmospheric conditions. Internal temperature of the unshaded building measured by hourly solar radiance on the unshaded building was calculated. In this case the shading factor of the tree was kept zero.

Secondly, the internal temperature of the shaded building was measured at ten shading factors. Climatic factors calculated in the computer model to measure the impact of the tree shade on inside temperature of the building along with mathematical expressions is summarized in Table-03 and symbols used in these expressions are listed in Table-04.

Descriptive statistics were used to assess the presence and severity of departures from the assumptions of normality. To see the relationship between the percent tree cover and the internal temperature of the building a test of linearity was carried out by using SAS (Statistical Analysis System Institute Inc. 1990) [21] and Excel (Microsoft Excel) computer programs. Regression analysis was carried out at 0.05 level of statistical significance by using Proc Reg procedure. The regression model (Ott) [22] used in the analysis is as follows:

$$\Upsilon = \beta_0 = \beta_1 x + \text{Error}$$

Where as Υ_1 is the internal temperature, β_0 is the intercept of the line, β_1 is the slope of the line and "X" is the tree shade. Regression analysis was applied on the daily averages of the internal temperature of the building generated by the model through computer simulations and "XΥ scatter graphs were drawn through Microsoft Excel.

TABLE-02
SHADING CONDITIONS

	Shading Conditions
1	When both roof and walls were shaded (full shade)
2	When only walls were shaded (wall shaded)
3	When only roof was shaded (Roof shaded)

TABLE-03
SUMMARY OF MATHEMATICAL EXPRESSIONS USED IN THE MODEL

Measurement of the intensity of direct radiation on the building.

IDN = I/Exp (E/sin (A)

Measurement of diffused radiation through the building.

IDF = k * IDN

Measurement of reflected radiation from the building

IRV = (IDN* r) /2

Measurement of heat transfer through the walls

Id = IDN*COS (A) *SF

Measurement of total Radiative heat transfer

II = Id+IDH IDF+IRV

Measurement of outside surface temperature of the roof

TSR = TA+ ((aa*II) /12) – 5

Measurement of outside surface temperature of walls

TSW = TA+ ((aa*II) /12)-2

Measurement of total outside surface temperature

TSI = (TSR + TSW /2

Measurement of convective heat transfer

q = - ((TA-TSI) / (1/CO))

Measurement of overall heat transfer into the building

TS2 = TSI –(q*(K/W)

Measurement of final inside temperature

T1 = TS2 – (Q*(1/CI)

TABLE-04
SYMBOLS USED IN THE DIFFERENT MATHEMATICAL EQUATIONS DURING THE DEVELOPMENT OF MODELS

Symbol

SF	Shading Factor
A	Altitude of sun at each hour
E	Atmospheric extinction coefficient
I	Radiative heat transfer
k	Diffused radiation for clear sky condition
r	Reflectivity of the concrete surface
W	Width of the wall of building
aa	Absorption coefficient
CO	Convective heat coefficient for outside
CI	Convective heat coefficient for inside

K	Thermal conductivity of solids
TA	Outside ambient air temperature
IDN	Direct radiation
Id	Heat transfer through the wall
IDH	Heat transfer through the roof
IRV	Total reflectivity from the building
II	Total Radiative heat transfer into the building
TSR	Outside surface temperature of the roof
TSW	Outside temperature of the walls
TSI	Total outside surface temperature of the building
q	Rate of flow of heat into the building
TS2	Conduction of heat through the walls and the roof
TI	Final inside temperature of the building

TABLE-05
REDUCTION IN THE INSIDE TEMPERATURE WITH INCREASE IN PERCENT TREE COVER ON THE BUILDING

Shading Regimes (Percent)	Atmospheric Conditions											
	Clear Shading Conditions						Hazy Shading Conditions					
	Full		Wall		Roof		Full		Wall		Roof	
	AIT[1]	AR[2]	AIT	AR	AIT	AR	AIT	AR	AIT	AR	AIT	AR
0	101.9		101.9		101.9		97.5		97.5		97.5	
10	99.5	2.4	100.1	1.8	101.4	0.5	95.1	2.4	95.7	1.8	96.9	0.5
20	97.1	4.7	98.2	3.67	100.8	1.0	92.7	4.7	93.8	3.67	96.4	1.0
30	94.8	7.1	96.4	5.5	100.3	1.6	93.3	7.1	92.0	5.5	95.9	1.6
40	92.4	9.5	94.6	7.3	99.7	2.1	88.0	9.5	90.1	7.3	95.3	2.1
50	90.0	11.9	92.7	9.1	99.2	2.7	85.6	11.9	88.3	9.1	94.8	2.7
60	87.6	14.2	90.9	11.0	89.6	3.2	83.2	14.2	86.5	11.0	94.2	3.2
70	85.2	16.6	89.0	12.8	98.1	3.8	80.8	16.6	84.6	12.8	93.7	3.8
80	82.8	19.0	87.2	14.6	97.5	4.3	78.4	19.0	82.8	14.6	93.1	4.3
90	80.5	21.4	85.4	16.5	97.0	4.9	76.1	21.4	81.0	16.5	92.6	4.9
100	78.1	23.8	83.5	18.4	96.4	5.5	73.7	23.8	79.1	18.4	92.0	5.5

[1] AIT = Average Inside Temperature (°F) at different shading regimes.

[2] AR = Average Reduction in inside temperature of a building with increase in percent tree shade with reference to unshaded building (AR was calculated by estimating the slope of the line)

Distribution of raw inside temperature data generated by the computer model was first examined using the descriptive statistics in SAS to look for outliers and asymmetry. Very little evidence of asymmetry and outliers of the raw inside temperature data was found.

Therefore, the regression model seems appropriate for the analysis of test of linearity. The test of linearity shows that a negative linear relationship exists between the increase in percent tree cover on the building and the internal temperature (p value $\leq$ 0-.05). The slope of the line (Table-06) also shows negative linear relationship between percent tree cover on the building and the internal temperature in two atmospheric and three shading conditions. This means that increasing percent of tree cover on the buildings internal temperature decreases correspondingly in both clear and hazy atmospheric conditions (Graph-01& 02).

TABLE-06
SLOPE OF THE LINE IN TWO ATMOSPHERIC AND THREE SHADING CONDITIONS

Atmospheric conditions	Shading conditions	Slope
Clear	Full	Υ = -0.24x +101.9
	Wall	Υ = -0.18x +101.9
	Roof	Υ = -0.5 x + 101.9
Hazy	Full	Υ = -0.24 x + 97.5
	Wall	Υ = -0.18 x + 97.5
	Roof	Υ = -0.5 x + 97.5

Note: Slope is estimated through regression analysis.
X is percent shade.

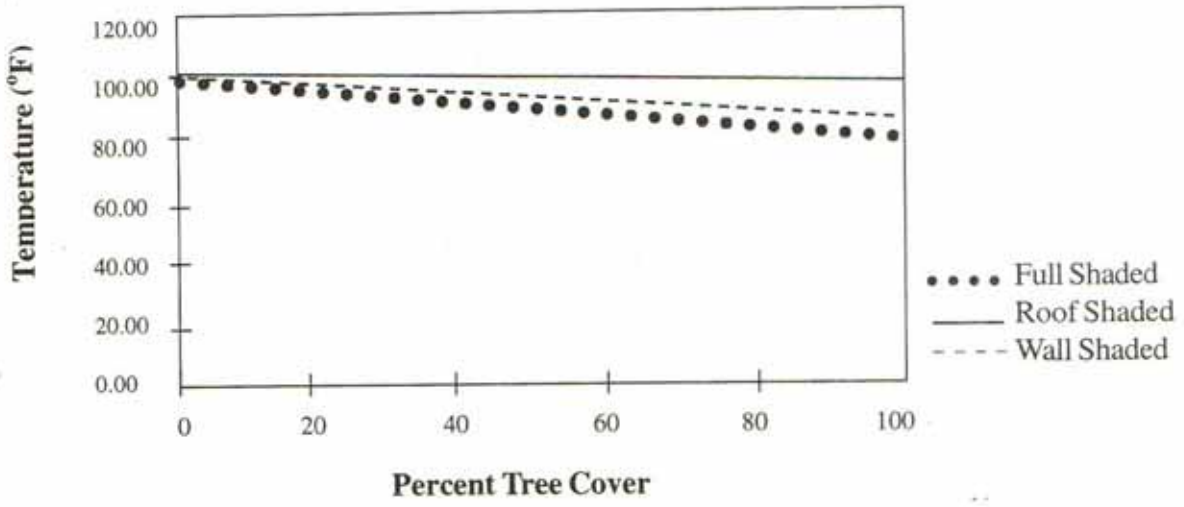
CONCLUSION

The results of the model developed for this study are very informative and several conclusions can be drawn from study. Higher internal temperature is predicted from a building without any shade. It was found that tree shading on the building reduced the substantial amount of internal temperature that in turn can reduce the cost of cooling in warm months. The reduction in internal temperature suggests that it is important to provide tree shade in the month of June. It was also found that tree shading has most impact on the internal temperature if walls and roof both are shaded.

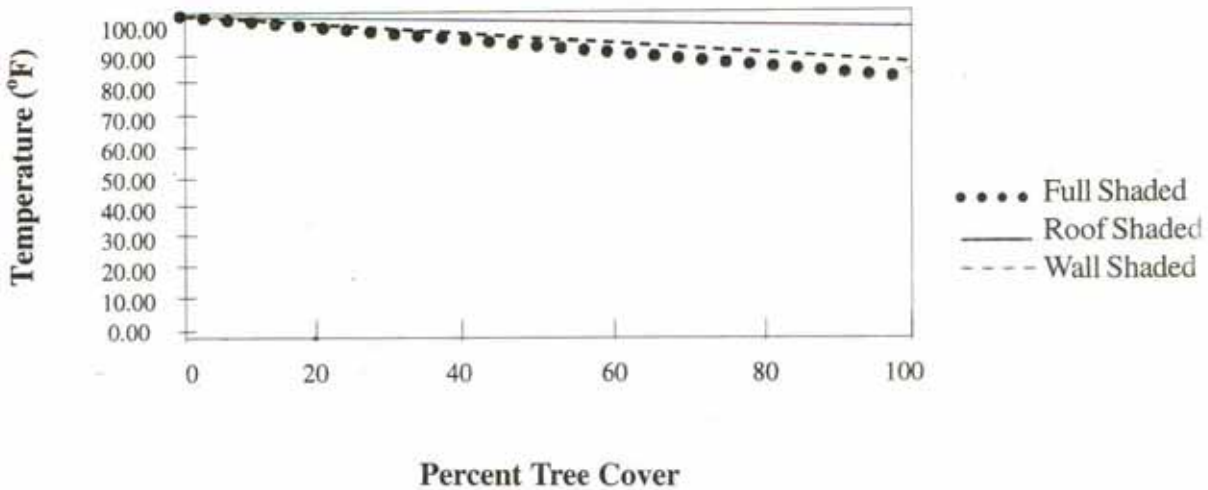
This study also suggests that heat is mainly conducted through the walls. Shading the walls has more impact on the inside temperature of the building as compared to providing shade on the roof. This might be because walls have more surface area exposed to the sun. It was found that with the increase in tree shade on the building internal temperature of the building decreases correspondingly.

Acknowledgement:
The authors wish to thank Professor John H. Enreneich, Department of International Forestry & Range Sciences, University of Idaho, for his help and guidance in conducting research work.

GRAPH-01
SCATTER DIAGRAM SHOWING THE IMPACT OF INCREASE IN PERCENT TREE COVER ON THE INSIDE TEMPERATURE OF A BUILDING IN THREE SHADING CONDITIONS AND TEN SHADING REGIMES IN CLEAR ATMOSPHERIC CONDITION



GRAPH-02
SCATTER DIAGRAM SHOWING THE IMPACT OF INCREASE IN PERCENT TREE COVER ON THE INSIDE TEMPERATURE OF A BUILDING IN THREE SHADING CONDITIONS AND TEN SHADING REGIMES IN HAZY ATMOSPHERIC CONDITION



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RURAL TO URBAN TRANSFORMATION – KARIMABAD, HUNZA

Anila Naeem,
Assistant Professor,
Department of Architecture and Planning,
NED University of Engineering and Technology,
Karachi, Pakistan.

ABSTRACT

Developments of the modern age have resulted in deterioration and destruction of traditional values. This is evident from the rapidly disappearing traditional environments.

The Northern Areas of Pakistan comprise of a region dominated by rugged mountainous terrain. Due to the geographical and physical constraints, the settlements here have developed mostly as isolated units. But in the recent past, development of a road network opened up these areas to the rest of the world, making them vulnerable to foreign influences that are rapidly penetrating into the life and norms of the people.

Change is inevitable in any growing community and it reflects on development of the physical form of built environment. This study aims at understanding the character of existing traditional built-environment, of the historic settlements in the Northern Areas of Pakistan, evaluate and analyze their evolution, identify the forces of change and finally reach to conclusions and propose determinants necessary for the survival of the traditional fabric. Karimabad, the most important and largest town of Hunza valley, is taken here as a case study.

1. INTRODUCTION

The Northern Areas of Pakistan, lying among world's highest mountain peaks, form a geo-physically rugged region. Due to their remoteness and limited accessibility, these regions have developed mostly as isolated units, having very little interaction with the outside world. These independent mountain kingdoms had developed as isolated units, thus the community evolved as an introvert society, cut off from foreign influences due to physical and geographical barriers. The traditional built form of settlements in the region has been molded in accordance with the climatic and geo-physical needs of the area. In the past, this region maintained socio-cultural interrelation with other adjoining mountainous regions that now belong within other political boundaries, forming a larger zone of independent mountain settlements/ kingdoms. The evidence of this overlapping of cultures is today reflected by similar architectural forms, lifestyles and other cultural norms observed in settlements of neighboring areas. The mountainous areas that now come within the borders of Pakistan started an intercourse with regions of this country only a few decades ago.

The regions including Hunza, Gilgit, Chitral, Skardu., etc. forming the 'Northern Areas of Pakistan', do not hold the status of a province but remain as Agencies. With recent developments in communication systems, primarily that of road network, this centuries of isolation came to an end and the area opened up to foreign influences. Tourism also played an important role in this regard. The changes have been accepted by the people willingly and openly - as a result of which they have become vulnerable to a rapid influx of influences that are foreign to them, and they are tempted to unquestioningly adopt them just to become 'modernized'.

The opening up of this area to uncontrolled foreign influences has started to show its impact on the built environment, as well as the social norms of the people. A general awareness, among the people, about modern lifestyle and living standards has led to efforts for improving their living conditions. Some of these are, no doubt necessary and essential for elevating living standards in the region. But in this process of 'change' several things are being adopted, which would bring adverse effects to the existing built environment and may result in an irreversible damage to the fragile ecosystem of the area.

2. KARIMABAD:HUNZA'S LARGEST SETTLEMENT

The settlement of Karimabad is the largest town in Hunza valley, and thus the most developed amongst others. The present town of Karimabad is an accumulation of fourteen clusters of settlements, incorporating the old settlement of Baltit within itself. Karimabad's altitude above sea-level lies between 7,500 ft. and 8.500 ft., covering an area of about 1.5 sq. miles. According to 1990 census its population was 4,600 people living in 616 households (M. Khan, 1996). (According to a report published by AKTC in 1997, the population of Karimabad is 5000 people).

The old settlement of Baltit, in Karimabad, lies on the mouth of Ultar glacier, perched on top of a hill. It was established as a defensive fortification by the rulers of Hunza Kingdom, and gradually expanded into a residential settlement. The hierarchy of houses in the settlement follow the social hierarchical pattern; with the king and nobility at the top and houses of populace concentrating around the forts base.

The fort, being residence of the ruling 'Mir', acted as the center of all activities. The houses of the old settlements of Baltit form three main clusters **(khuns)**, each of which belong to a different clan. The oldest of these clusters are 'Khurukshal Khun' and 'Diramishal Khun', located immediately below the base of Baltit Fort (Figure #1). The new developments and extensions have radiated from these old parts.

2.1 The Settlement Pattern

The traditional settlement pattern, as physically evident from the clusters around Baltit Fort, was extremely compact, with narrow streets and pathways, meant only for pedestrian or animal traffic. The edges of the settlement were clearly demarcated by walls, cultivated fields, orchards and/ or water channels lined with trees.

Entries to the cluster were guarded by watch towers, called 'Shikar' in local language (Gibbs, 1994). The primary determinants of this built form were climate and terrain. On the higher steeper slopes, houses and fort were built, whereas on the lower and gentler slopes and terraces were cut for agriculture and cultivation.

Figure #1: Compact and contained form of the old settlement

The clusters were oriented towards southwest, aligned in rows along the natural contours of the terrain. The longer axis of the settlement ran parallel to the natural contours. The houses were also planned in such a way that their longer axis remained parallel to the contour. The rear or northeast sides of the houses were cut into the hill thus protecting it from cold down slope winds. The whole settlement had a visually unified and repetitive pattern, in terms of color, form, texture and scale, except for the mosques and the fort; the fort being larger in size and scale, whereas the mosques having extensive wood ornamentation.

2.1.1 Streets

The traditional circulation system followed a hierarchical pattern, with major pathways running along the contours at the same level, whereas the secondary minor pathways, lanes and steps going up or down the slopes connecting the major paths at right angles. Special care was taken to have these secondary lanes protected from winds.

All the pathways within the old settlement were meant only for pedestrian and animal circulation, thus not having the capacity for accommodating any type of vehicular movement. The streets were left un-paved and dusty. The stepped lanes had uneven and irregular stone boulders or blocks as steps.

2.1.2 Community Spaces And Public Facilities

The community spaces and public facilities served as the main focal points of the settlement. These include the fort, polo-ground and caravanserai

below the cluster of houses and the graveyard further below and away from the settlement (Figure #2). These were easily identifiable because of their larger scale and proportion as compared to the rest of the fabric of settlement.

2.1.3 Open Spaces

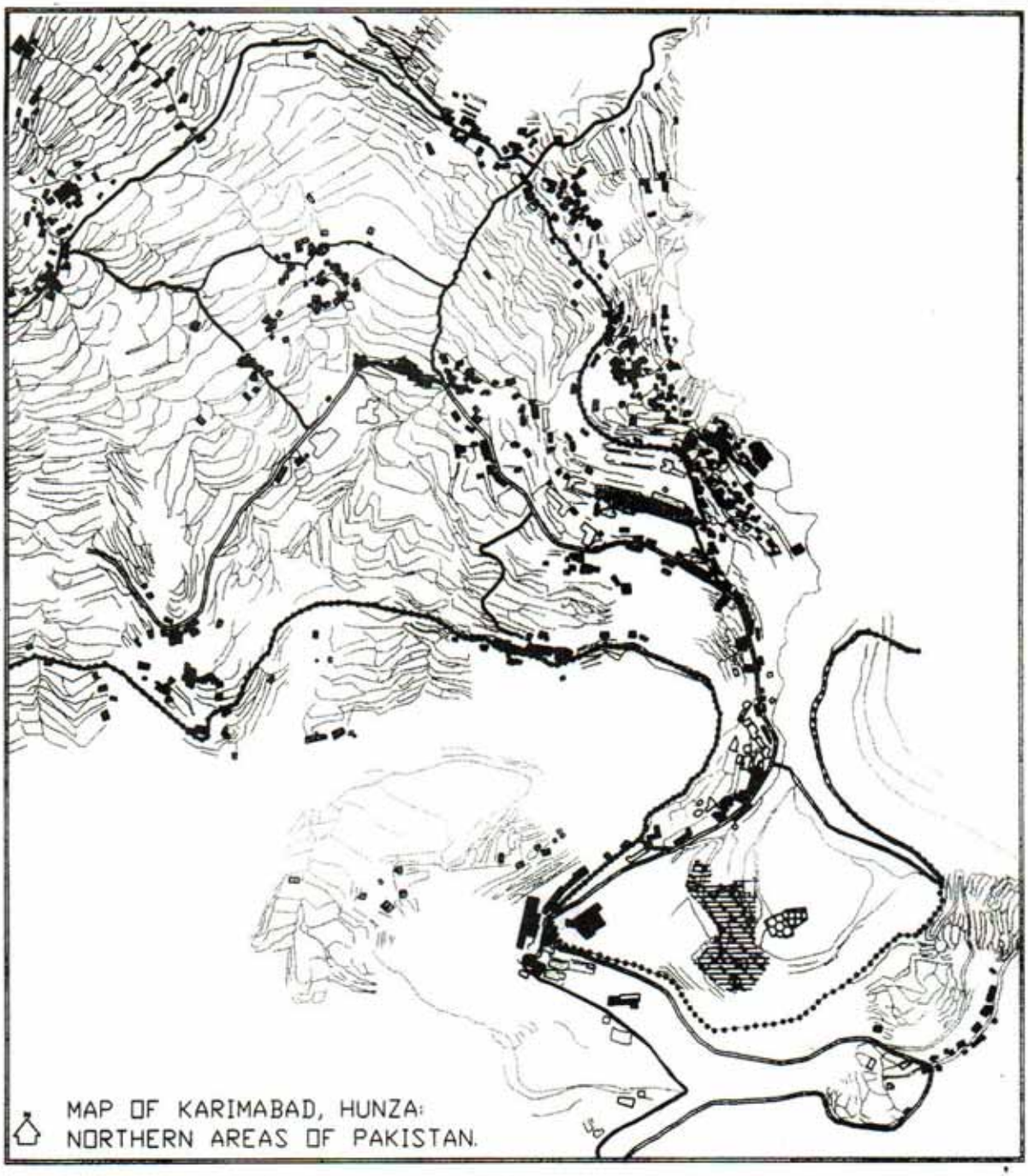
The community areas often had open spaces near or surrounding them. Often the streets/ pathways at their junctions had spaces for sitting and gathering in small groups. Such spaces are an important feature of the settlement as the elders of the community sit here and share their thoughts and experiences with the younger people as well as the touring visitors.

The most important open space for the community, has always been the polo-ground, strategically located near the entrance of the settlement, but outside its boundaries. In present days, although these grounds have lost their original function but they still serve as a major focus for the community as all the public gatherings and meetings take place in this space.

2.1.4 Agricultural Land And Orchards

In the harsh mountain terrain it was necessary for the people to develop a system of agriculture and farming, for survival. The sloping terrain did not allow for large flat spans of agricultural fields, thus small terraces were cut into the slopes for this purpose (Figure #5). These lands started from the outer periphery of the settlement demarcating its boundaries. Through the highly developed system of channeling glacial watershed into the terraced fields, agriculture developed and a self sustained community was founded. The agricultural produce was only sufficient enough to last the community

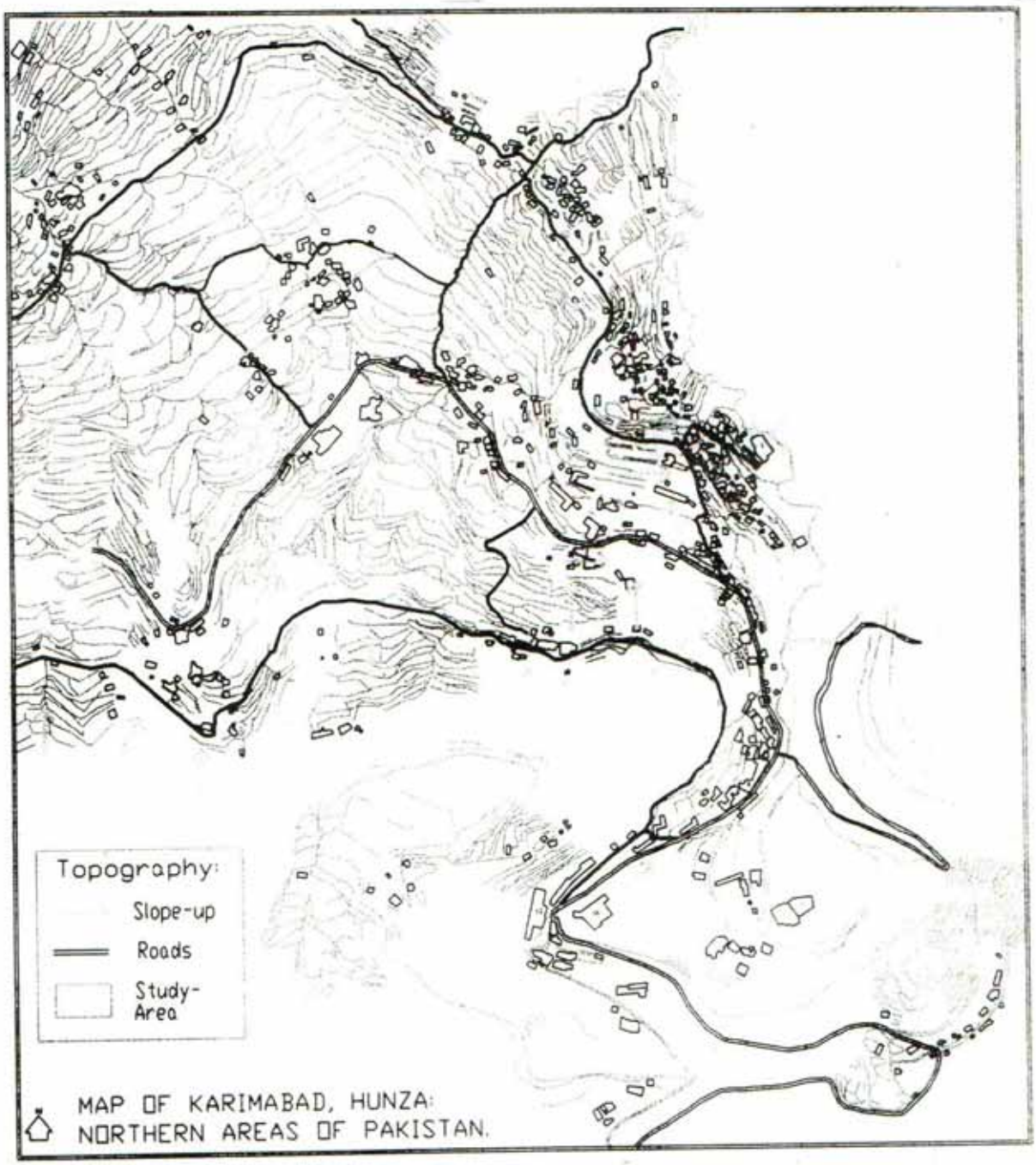
Figure # 2: Small gathering space for the community at street junction



Land-use in Karimabad:

- Residential
- Commercial
- Public/ Administrative Facilities
- Study Area
- Graveyard
- Mir's Palace
- Baltit Fort
- Pologround
- Water Channel
- Underground Water Channel
- Vehicular Roads
- Helipad

Figure #3: Map of Karimabad, showing general Landuse



	LOCATION	ALTITUDE		LOCATION	ALTITUDE
1	Baltit Fort	2615 m	7	Graveyard	2538 m
2	Wazir's House	2595 m	8	Mir's Palace	2510 m
3	Dirimshal Khun	2590 m	9	Hilltop Hotel	2500 m
4	Berber Dala	2580 m	10	Rakaposhi View Hotel	2490 m
5	Khurukshal Khun	2570 m	11	Samarkand Dala	2485 m
6	Pologround	2550 m	12	Serena Lodge	2475 m

Figure #4: Topographical map of Karimabad

for one season, till the next harvest. No surplus was produced which could be exported out.

The fruit orchards contain apricot, apple, grape, mulberry and walnut trees in abundance. The large quantity fruits produced is dried and stored for use in winter. However, due to lack of facilities for processing and drying a substantial quantity of fruit gets wasted. In addition to this the surplus fruit can also not be exported to down country due to difficulty of transportation.

2.2 Characteristic Physical Features

A feature of the landscape is the terraced slopes where agricultural fields are marked by low rubble stone retaining walls. These walls are constructed by placing rounded field stones meticulously graded for size, with large boulders at the bottom and cobbles at the top. As agricultural land was precious, settlements tended to be very compact, tightly built and concise. Due to this fact the distinction between settled area and open farmlands was quite clear.

This environmental quality of Karimabad, is governed by vast green expanses, with small pockets of compact settlements in between. This dominant feature of terraced landscape gives the town its aesthetic appeal, which is a pleasure for the visitor.

3. DEVELOPMENT AND CHANGES

Being the major town of Hunza, development pressures in Karimabad are quite high and changes are rapidly taking place, specially along the KKH and areas which have metalloid roads, linking with the main Highway. As a response to

Figure # 5: Open ended and sprawling agricultural ands

these developments several changes occurred, resulting in a decline and degradation of the natural environment as well as the traditional built form. Today the town is no longer compact and confined within the boundaries of the old fortification but stretches in a suburban pattern from Momenabad to Hyderabad (the two nearby small towns), along three main routes; Berber Channel, Samarkand Channel and the Main Road. Today there is an ever increasing disregard for traditional principles, as a result of which the years old, balanced ecosystem is being badly damaged.

In order to understand the causes of the changes that today mar the traditional pattern of this historic town it is important to evaluate the developments in their historic continuum(Figure #6). These developments have been summarized step-wise as follows (Gibbs, 1994);

- **Cutting down of watch towers** guarding village entry gates on Berber Channel in **1891**.

- **Construction of new palace** by the Mir in **1923** at a location 130m. lower in altitude than the historic village with materials and a style, leading the village away from tradition also had a change in the traditional physical form of social hierarchy, in which the Mir lived at the top above the nobility, who in turn lived above the serfs. This act also represented the expression of Mir's ownership of his own private property.

- In **1940's** the concept of **'wage labor'** was introduced in Karimabad, which was the second step towards capitalism, after private property. This was further popularized in 1960, when the Aga Khan on his visit to Hunza encouraged the men to join the Pakistan Army. Thus they became more acquainted with the ideas of wage labor, private property, technology, communications and institutions. These soldiers when they returned with military pensions, in the 1980's, introduced these new ideas in the region.

- **Abandonment of fort completely** in **1945**, and with it the compact village form and building tradition.

- **Arrival of roads and private automobiles** in Karimabad in **1960**, ending centuries of pedestrian environment, scarring the hillside, trucking in tons of products with waste packaging, and leading to strip development as well as a colossal increase in the land area covered by the village.

- **Installation of first flush toilets** in **1970's**, thereby polluting and wasting water resources, contaminating the soil, and spreading disease from the overflowing soak pits and septic tanks.

- **Completion of Karakorum Highway**, in stages from **1972 - 1979**, leading to the economic penetration of Karimabad followed by a wholesale weakening of local culture, including the loss of traditional ideas of building and urban form. Hunza was now openly vulnerable to complete economic, military and cultural absorption into Pakistan, thus loosing its independent status which it had maintained for thousands of years amidst powerful neighbors, both North and South.

- Proliferation of shoddy hotels, stores and shops in **strip development along the new roads** beginning in **1960** and increasing in pace after **1974.** In 1960 President of Pakistan, General Ayub Khan visited Hunza and a jeep road was extended to Hyderabad. This was later extended by the Mir towards Karimabad, right upto his new palace. Thus the arrival point

changed and got shifted to this area.

- In 1974, Government of Pakistan abolished the kingdoms in Northern Areas, and the serfs were legally freed from their feudal position. For their benefit they were given the small land holding to which they were attached, as their private property. This started the movement of these people from the historic district onto their open lands and fields. Only those stayed back who lacked the capital for construction of new houses on open fields. Thus further class stratification occurred within this group of people.

- **'Suburbanization' of lower agricultural land** which began in **1923** but became a flood in **1980's** as the new middle class emerged, and built one-storey houses on their small farms.

- **Continued construction of road** throughout the larger area of the village in the **1990's**, moving the form of Karimabad closer and closer to that of Gilgit. (Gilgit is the largest town in Gilgit Agency, and the last point which is accessible by air).

The three primary factors that caused the above mentioned changes in Karimabad can be identified as follows:

- Transition from **feudalism to capitalism**

- **Subjugation of the area** militarily, economically and culturally - first by Britain and later by Pakistan

- **Continued disregard for the ecosystem**, that although started hundreds of years ago, but has increased dramatically in the past two decades.

4. IMPACT OF THE CHANGES ON PHYSICAL FORM, ENVIRONMENT AND SOCIAL STRUCTURE

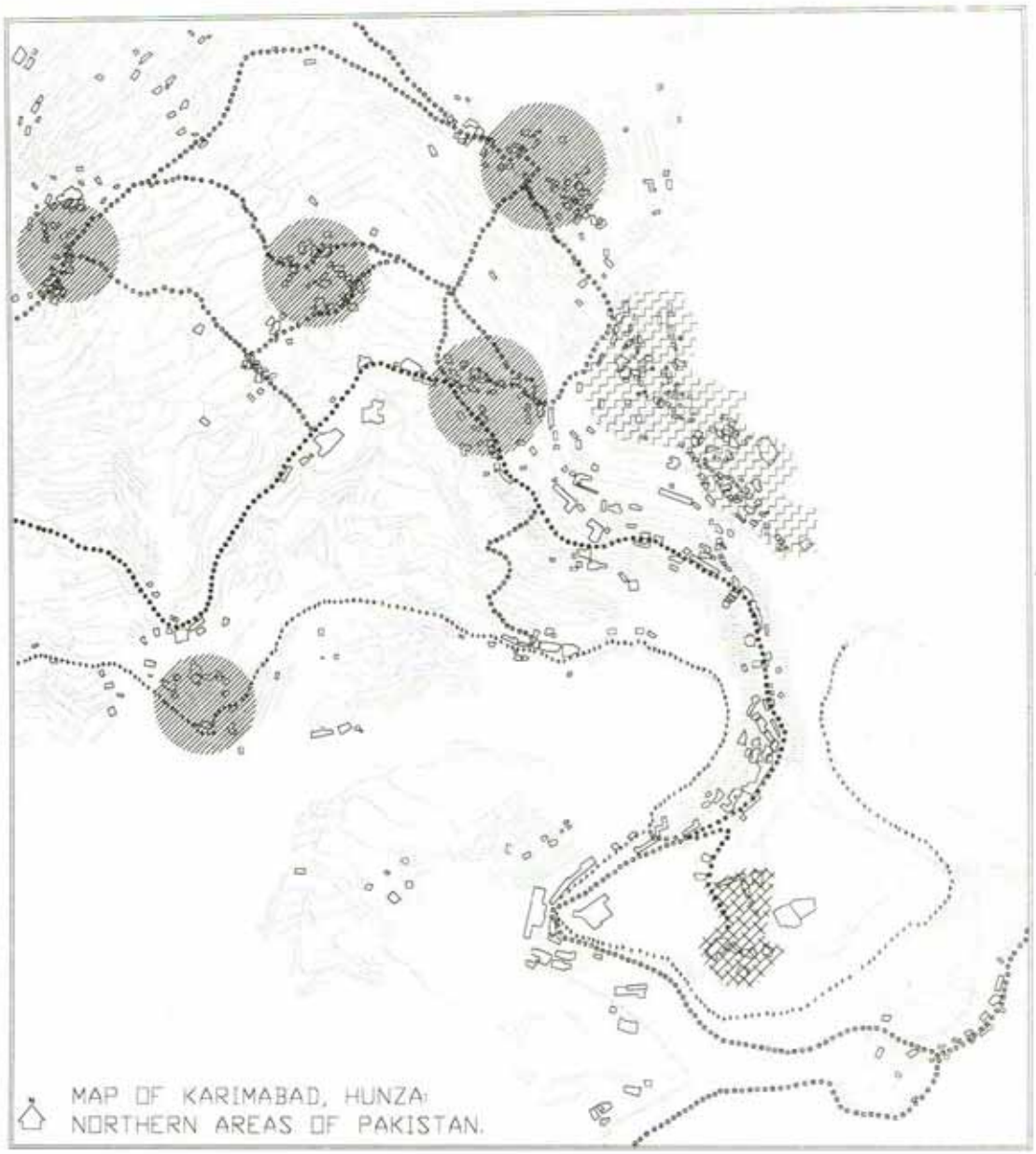
Under the pertaining development pressures, the traditional fabric of Karimabad is constantly being altered. Old houses are being demolished to make room for modern needs. Karimabad's current change from a secluded rural system to a semi-urban agglomeration involves problems of infrastructure, traffic, commercial activities and new construction modes. These have had their impact on the physical form and environment of Karimabad, as well as its social, economic and political structure.

Physical Changes: The scale and character of the built form of Karimabad has changed beyond recognition. The once contained, compact and clustered settlement has now become a sprawling stretch of suburban pattern, expanding up to and even beyond the nearby settlements. The built form of the traditional dwelling has also changed from a single roomed, closed and compact unit to a multi-roomed and open houses built solitary on fields and terraces. The materials and textures have also changed from that of earth and stone to cement and block.

Environmental: Environmentally speaking a visual depletion or degradation has taken place, which is continuously getting worse.

The once pure, clean and peaceful environment is now spoiled by rushing cars, jeeps, buses and trucks, which are a major cause of pollution through engine combustion, oil spills, car horns, headlights, etc.

The increased land value and speculation has resulted in clearing off of land along the new roads,



Development Phases of Karimabad

Prc 1891	Limits of earliest walled settlement (Fort, Khurukshal Khun, Dirimshal Khun)
	Outer limits of inhabitation (Pologround, Graveyard, Water Channels)
1923 - 45	Construction of new Palace
1923 - 80's	Extension of inhabitation as people move out to open land
1960	First road and automobiles
1960 - 74	Strip development along new road
1990's	Continued construction of link roads

Figure #6: Development Stages of Karimabad

thus resulting in cutting of trees and clearing of valuable agricultural land. As a result the panoramic views of the green slopes of the valley are now marred with large out of scale structures (Figure #7, #8).

Social: The traditional hierarchical pattern in which everyone had his own social status according to the position he held, with the consent of the Mir (ruler) has changed. The people are now free to go out to other cities and work as they wish. Education is also available for those who wish to seek it. Thus each person is now responsible for making their own social standing in the society.

With the changing trends in the upbringing of the younger generation, the patterns of family life are also under transformation. The system of a close-knit extended family is gradually breaking down.

The younger generation which has been to the cities for education, work, etc. no longer wants to live in the single spaced traditional houses, but want bigger houses with separate rooms, attached baths, kitchens, etc.

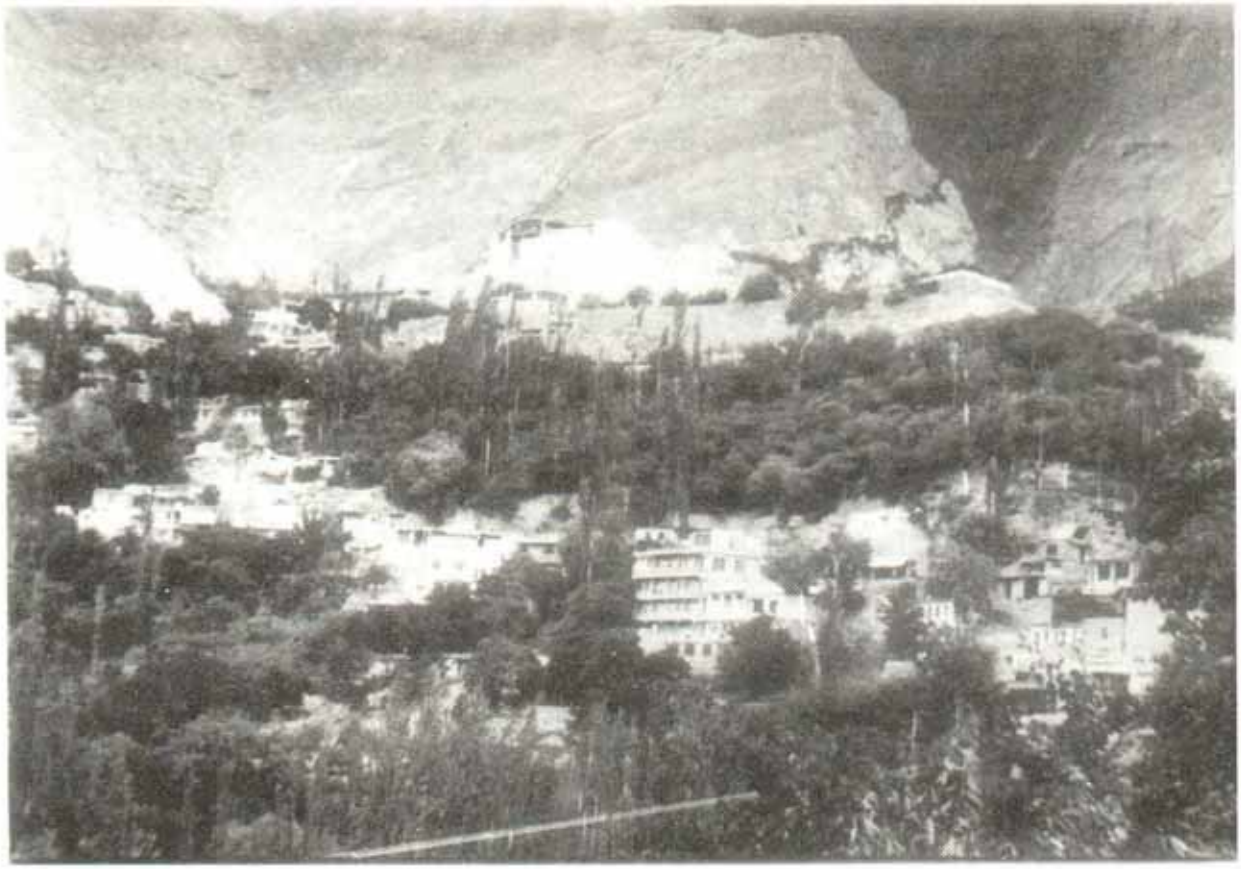


Figure # 7: Panoramic views of the valley marred by multistoreyed concrete structures

Figure # 8: The visually obstructive electric poles today marr the valley

CONCLUSIONS

The town of Karimabad is an accumulation of settlements both old and new. Being the largest as well as amongst the oldest settlements of the region, it holds great historical and cultural significance. In addition to this, Karimabad's natural setting, its subsistence economy and frangible ecosystem, increase its values. But during the last two decades, the town has grown rapidly and increased its extents several-folds. Due to the pressures of modernization the town has become prone to developments, that are rapidly proving to be a hazard to natural environment and ecosystem of the area.

Judging by the pattern of developments taking place in Karimabad it can be said that they are following the same pattern as Gilgit, Sust, and other similar cities which serve as strategic stop-over points for all transportation along the KKH. For Karimabad, however the residents may want it, this can never happen. The two major reasons for this are, firstly it does not lie directly on the Karakorum Highway and is located approximately 1000 ft. above it; and secondly its terrain is extremely sloping and hilly, without any flat spans of land (unlike Gilgit), which does not allow for continuous commercial activities and service areas (Gibbs, 1994). Thus Karimabad's economic viability does not lie in adopting models such as Gilgit, Sust, etc., but in strengthening its own potentials, and developing its economic base as a self-sustained community, using agriculture, tourism and other related sectors as the main income generating resources.

The most valuable assets of the region are its natural resources; its scenic beauty which display a sharp contrast of character, from emerald green belts of terraced fields, to starkly barren slopes of hard rock along with snow covered peaks in their midst. The existence and survival of human settlements in such a difficult terrain and climate, is an evidence of the undying courage and struggles of the people of this region, as well as the delicate balance of the ecosystem that allows for the continuity of life in the area. For centuries this balance between natural and man-made environment has been guarded by careful planning, sensitivity and wisdom of the past generations. The surviving parts of old settlements reflect on these principles which were to be considered while planning a new settlement or constructing a new house. Unfortunately, these principles are no longer reflected in the new developments, as a result of which there has been an accelerated deterioration, both in natural as well as the built environment.

The region has shown great potential as a tourist attraction, and this particular aspect has been and is still being exploited for economic gains. As a result the obvious destruction and deterioration of the environment becomes inevitable. The people, no doubt, show a clear desire for economic stability and improved living conditions. And for fulfilling this desire they have blindly disregarded the protection of resources that give the region its beauty and attraction. They have failed to realize that people do not come here to see high-rise buildings, or watch programs from dish, or see speeding vehicles pass by and pollute the serene and pristine environment that they have come to enjoy. Developing this realization is very important for making the people, willingly accept, any proposals or plans for conservation and protection of the natural and built environment.

Only imposing restrictions is not the solution. There is a need for developing guidelines and incentives that give people the right options to choose from. Options that in addition to fulfilling their dreams of a better and stable living, also protect their built and natural environment. Where life continues, changes are bound to happen. But they can definitely be geared for a better future.

Some guidelines that can be considered are as follows:

- All new developments should be planned as compact, small pockets, following the natural contours and proportions of the traditional settlement. They should have their share of peripheral green zones or belts, so that they are protected from winds as well as concealed from becoming visually unattractive patches in the panoramic views of the valley.

- Rules and regulations at regional as well as town scale must be developed, to ensure the protection and preservation of natural environment. The most important factor for consideration in this regard is the development of a land-use strategy, both for the historic district as well as the entire town, to control the haphazard and rapid growth of the town.

- For construction of new buildings alsocertain rules or by laws must be established so that they do not harm the environment. The most important factor being the mass, magnitude, and proportions of the structure. Such new buildings, no matter for what purpose, should not be constructed as huge masses of several storey height. They should not be more than two or three storeys high, and must be composed as an accumulation of small masses and blocks.

- For open areas and stretches of orchards and agricultural fields, the old rule of inheritance, may be given a legal status. According to this law agriculture land goes to one son, whereas all orchards go to another. In this way land is prevented from being divided into smaller and smaller patches of different ownership.

- Karimabad has traditionally been a pedestrian town. Even today the use of vehicles is limited to services and tourist activities. Forceful insertion of vehicular traffic into its fabric could prove to be an environmental hazard for the area. Thus there is more need for improving pedestrian network, rather than vehicular access to all the areas. Vehicular movement should be kept limited to the existing main roads, and strong pedestrian links, running perpendicular from these at frequent intervals, should be developed to provide easy access for pedestrians into the areas above and below the contours of the main roads. Attempts at connecting all residential areas with link roads, to provide vehicular access into them, should be minimized.

- Natural resources such as hydro-power and solar energy can be utilized as an effective source of energy, to overcome the growing demand for electric power.

- For the town of Karimabad the public facilities have reached a certain substantial standard in the past few years, specially in the field of education and transportation facilities to other towns and villages are also substantial, but for these some service stations and terminals need to be provided. Public facilities for the recreation of the local people need to be taken care of in any master plan that is developed for the town of Karimabad.

- To sustain the community and its environment the traditional occupations and crafts should be revived and developed for achieving economic stability. At present, tourism seems to have the greatest potential for achieving economic uplift in the area. Thus revival of traditional occupations and crafts can only be achieved by gearing them towards tourism.

- Owing to the present trend of developments, the land value along roads has immensely increased. Results of this trend are seen in increasing strip development along main roads. It is essential to discourage any kind of developments that centralize commercial and tourist oriented activities. This can be achieved by first banning any construction immediately adjoining the roads, and by-laws should be made for keeping green belts on both sides of any vehicular road. Commercial and tourist activities must be planned in a more scattered way, taking their concentration away from the main road to other areas, thus giving a larger sphere of people the chance to benefit from tourism and commercialization.

For Karimabad the scars of development are still under controllable limits. Proper and well thought planning interventions can help in preventing the town from turning into a nightmare of development, as has happened to so many beautiful towns all over the world.

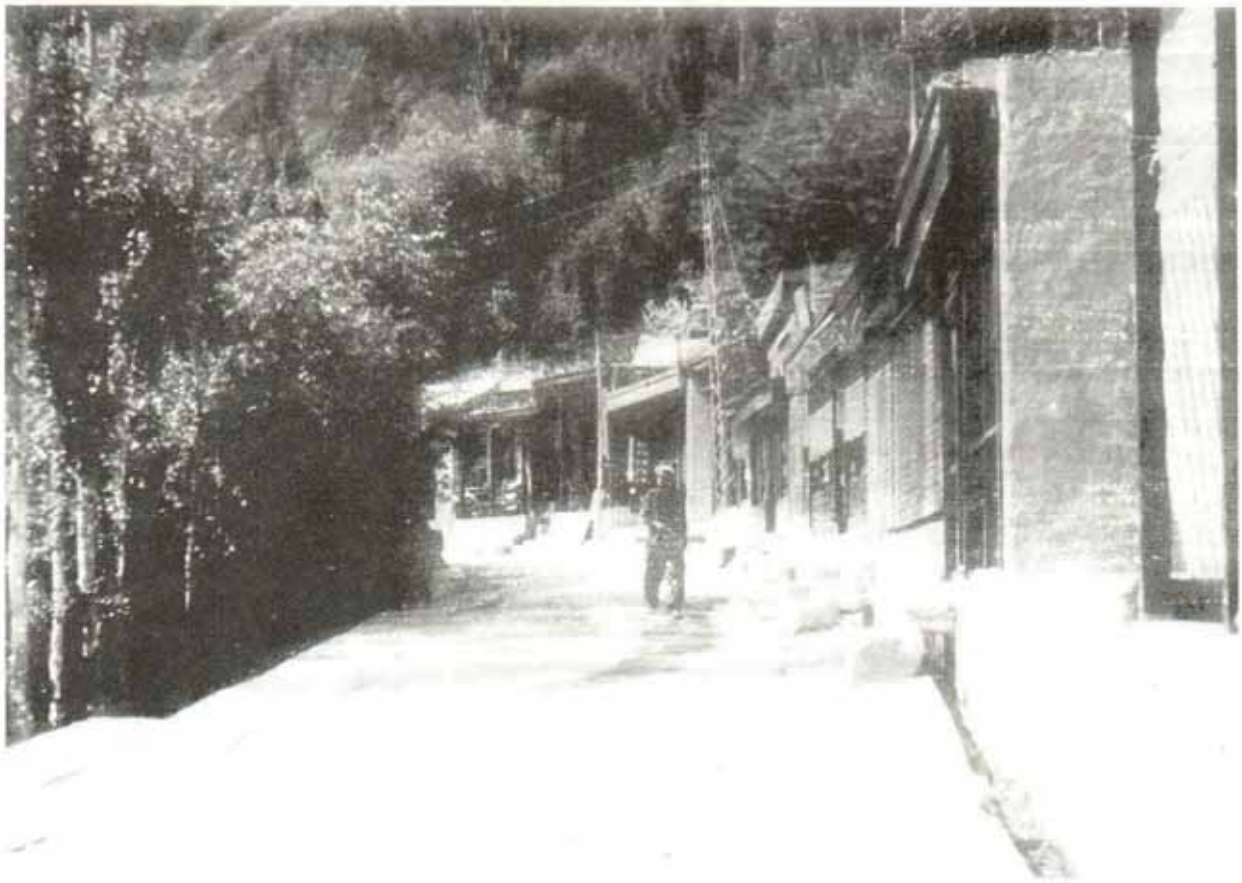


Figure # 9: Commercial development along the main road in Karimabad

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DEFINING THE REGIONAL IDENTITY: CONCEPTUAL PARAMETER OF URBAN MORPHOLOGY

Aykut Karaman, Ph.D.
Professor of Urban Design
Mimar Sinan University Faculty of Architecture
Findikli - 80400 - Istanbul

ABSTRACT

With the beginning of a new century, we are faced with discussions and arguments about the future of our cities. It is being argued that cities have undergone a major transformation process. The morphological aspects of the cities is in the agenda of post modern discourses which debate that morphological patterns of cities are as important as economical, social, political, and cultural factors. It is a lack of understanding for the importance of morphological patterns in establishing the essence and identity of cities, due to which the modernist towns are being questioned.

A growing concern for the new tools, concepts to enhance the methodological issues and to understand the essence of the morphology in urban design is being observed. This paper is concerned with developing a method for analysing the morphological essence of cities in terms of concept of genius loci. The basic premises of the methods consists of the concepts of morphology, topology and typology. With these concepts an analytical framework is established and the town of Mardin is analysed with the help of this model.

1. INTRODUCTION

Cities gain their identity through a complex process in which culture always plays a dominant role. The 'sense of place' that makes each city unique is defined by the culture which attributes different textures, form and meaning to its environment. The city as a cultural artifact reveals how an individual or a group acts of the culture at large has transformed the place they live in, how they responded to the limitations or potentials of their environment and how this is engraved in to the landscape through spaces, blocks and buildings. In cities we can identify these layers of ideas, each with its own story to tell of how the city comes into being, what has been achieved as morphology that still works and as to where the city is going.

What does 'sense of place' connotes in urban identity? Does the identity have anything to do with the cities' morphology? Are they useful as concepts in enhancing the quality of urban design. What are the roles of these concepts in understanding the design process of the cities?

The purpose of this study is to put forward a conceptual model through which the morphological identity of the cities may be explored. The basic premises of the model consists of concepts such as 'sense of place' or 'genius loci', 'topology', 'morphology' and 'typology'. Let us examine each of these concepts thoroughly.

2. THE SENSE OF PLACE - GENIUS LOCI

Cities must have an identifiable essence with the place and the understanding of this essence is important for the discourse and practices of urban design. What is identifiable essence of the place? The identifiable essence of the city with the place for the purpose of this study denotes an active process of man's engagement with the natural condition. Identification with the place pre-supposes that "place" has character and attributes which distinguish it from any other place and "lend to its unique presence or genius loci" (Norberg - Schulz, 1979).

The concept of 'genius loci' here implies an attitude that pays attention to the natural characteristics of the undeveloped site. When applied to the built environment it must be understood as metamorphic design which is regional and pays attention to those valued qualities of the total environment, both natural and built, that evolved over time.

The concept of 'genius loci' as a term is useful in determining and understanding the values and attributes of a place when it is present in the urban design process.

2.1 THE STRUCTURAL COMPONENTS OF 'GENIUS LOCI'

What are the environmental components that help make up the 'genius loci' or better yet latent identity of a place? How this concept can be used as a tool in analyzing cities?

The structural components of the genius loci can be divided into three categories through which one can explore the formal essence of a place.

a. Topology
b. Morphology
c. Typology

a. Topology: Deals with spatial order and its structural components are land forms, space and settlement patterns.

a. 1. Landform, is one of the components that forms image of an area referring to the qualities and characteristics of a place that includes climatic conditions, topography, water elements and flora. These are non-manmade permanent parts of a place that give a background to the image of the environment. They contribute to the identity of that place by having features like flat-land, wide-slopes, desert, forest, mountain and landmarks, all of which influence the urban development, as a reference in making up new images.

a. 2. Space, is one of the key components of the identity or image of an area. It is an integral part of a place's morphological characteristics of the environment made by the distribution of the physical objects on the landscape. This configuration generates a meaning in the place. In other words the spatial quality of a place is perceived as relational to a reference in terms of wide/narrow; open/closed. This dichotomous spatial variables as potential carrier of meaning in a place can be defined as:

- diffused versus dense space
- delineated versus open space
- verticality versus horizontality
  right and left in the horizontal plane
- up and down in the vertical plane

a. 3. Settlement Patterns: Settlements are formed as a result of aggregations of repetitive elements that make up patterns. They are synthesized by their patterns. Row houses in American gridiron blocks, courtyard houses in hot climates or single family houses in the suburbs give the character to the settlements. Urban form is a result of putting together many different elements in a consistent totality which is termed as the 'urban pattern'. "Patterns are the outstanding formal features of urban areas. Patterns are the physical expression of an underlying, continuous formal system. Since patterns are fragments or parts of a continuum and not totalities their visual essence lies in the complexity of a number of interrelated motifs, rather than in the total composition.

Patterns can be conceptualized as model of field designs that can be extended over geographic space. Patterns tend not to reflect the will of a single designer, but rather pluralistic wills that have shaped human habitats. Indeed, patterns are the community forms" (Lozano, 90).

According to Lozano the formal aspects of the patterns can be grasped through a series of dualities:

i. Unbuilt space - built form: In this pattern built forms enclose space for functional purpose to be used together with buildings such as open spaces, squares, streets, etc. In this duality public and private realms are stated for some social connotations.

In the history of urban design two types of 'unbuilt space - built form relations' can be distinguished. In the first type space is defined by its surrounding buildings which enclose the public domains through continuous building interfaces. The second type is the space in which buildings stand freely.

ii. Continuous - discrete patterns: In these patterns, one form is in which the urban fabric is interconnected and extends to the whole settlement in a continuous manner and the other form is discrete which contributes to the whole in parts independently.

iii. Repetitive - unique patterns: In these patterns one form is that in which the same type of elements are repeated to make the clustering where as the other form is isolated where autonomous elements work as land marks in the middle of wholeness (Figure #1a, #1b).

Meaning associated with spatial configuration achieved through intermingling with the land form contributes in making the character of a place. For example it is suggested that 'delineated space' refers to bounded, constricted, constrained, contracted or centripetal space; whereas 'open space' suggests inward and outward movement, spatial penetration, liberty and freedom. It is difficult to describe it separately from the other components of environment since it surrounds and is determined by them. As a result of this relationship, the spatial configuration of the place in terms of settlement patterns can be categorized as follows;

- wide - narrow
- open - closed
- dispersed-compact settlement

These relational associations are based on;

- the spatial separation between buildings and patterns
- the orientation of buildings and patterns within
- a spatial framework

While spaces like squares and streets are defined by their surroundings, there are spaces that are defined by their referential quality, like a tree in a open space or a monument that defines a center.

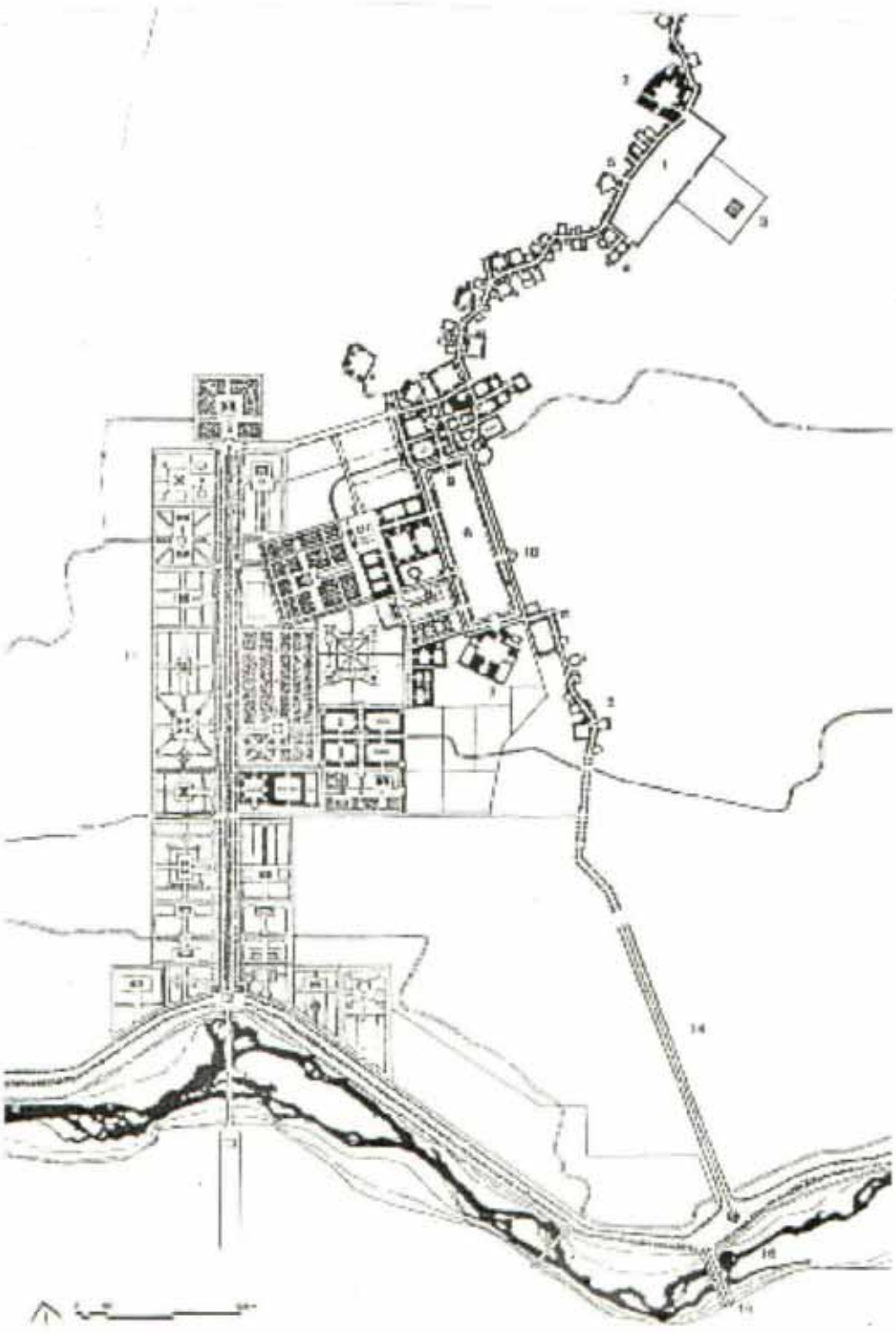
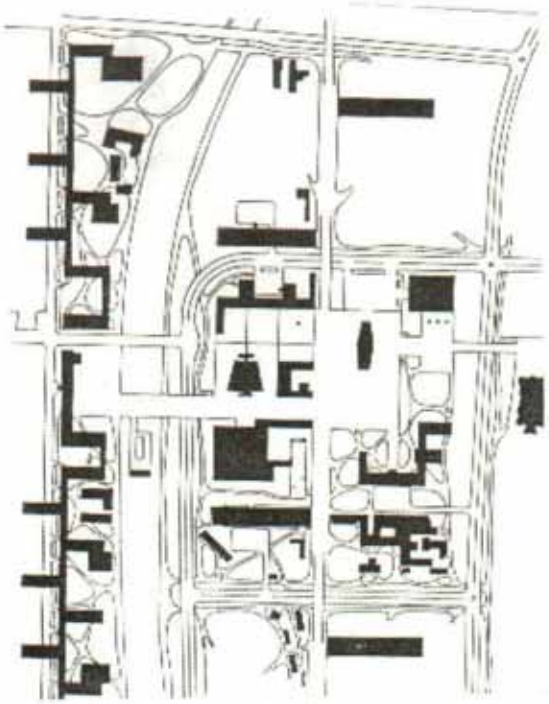


Figure #1(a): Urban Patterns: Isphahan: Repetitive

Parma: Compact



St. Die: discrete

Figure #1(b): Urban Patterns

b. Morphology is inclusive in topology and is also concerned with the articulation of the spatial boundaries in terms of public and private domains as a means to define an environmental character. It comprises the concrete embodiment in terms of built forms. (Figure #2) "Morphology analyses the question, how settlements stand, rise and open. The word 'stand' denotes the relationship of the earth to the sky, and "open" refers to the spatial interaction with the environment - that is the relationship between outside and inside". (Norberg - Schulz, 1979).

Urban forms of traditional settlements springs from the physical characteristic of sites as they interface with the social requirements and environmental factors such as climate, and from the social and psychological demands of the community, to achieve symbolic and expressive values.

The topography of a site is an important factor that effects the morphology of the settlement. The topographical advantages of high grounds paved way to the development of hill settlements. In these settlements while protecting the agricultural land on the plains, buildings built on the slopes of hills and streets run parallel to the topographical contours or ascend via stairs.

The settlements that develop on plain lands also use the privileged positions of the nature. While maintaining the agricultural activities, they choose edges like riversides, forests, valleys, etc., which affect the morphology of the settlements as linear or concentric developments. (Figure #3).

Climate is also one of the natural given that contributes to the modification of the settlement morphology. The aim of using climate in the formation of morphology is to create suitable micro-climates within the settlements and within the buildings. Morphology analyses the relationship between outside and inside. Its components are;

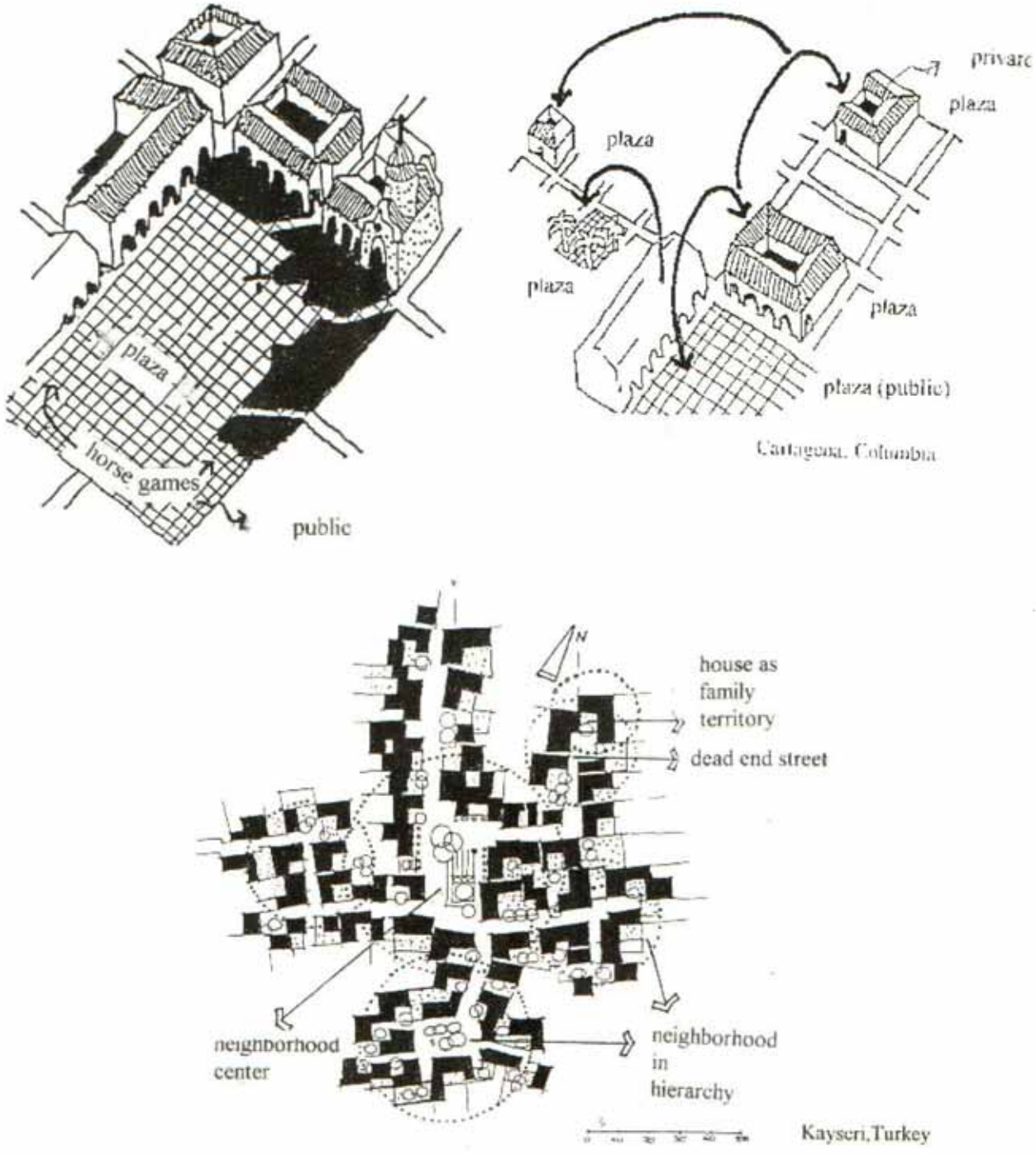
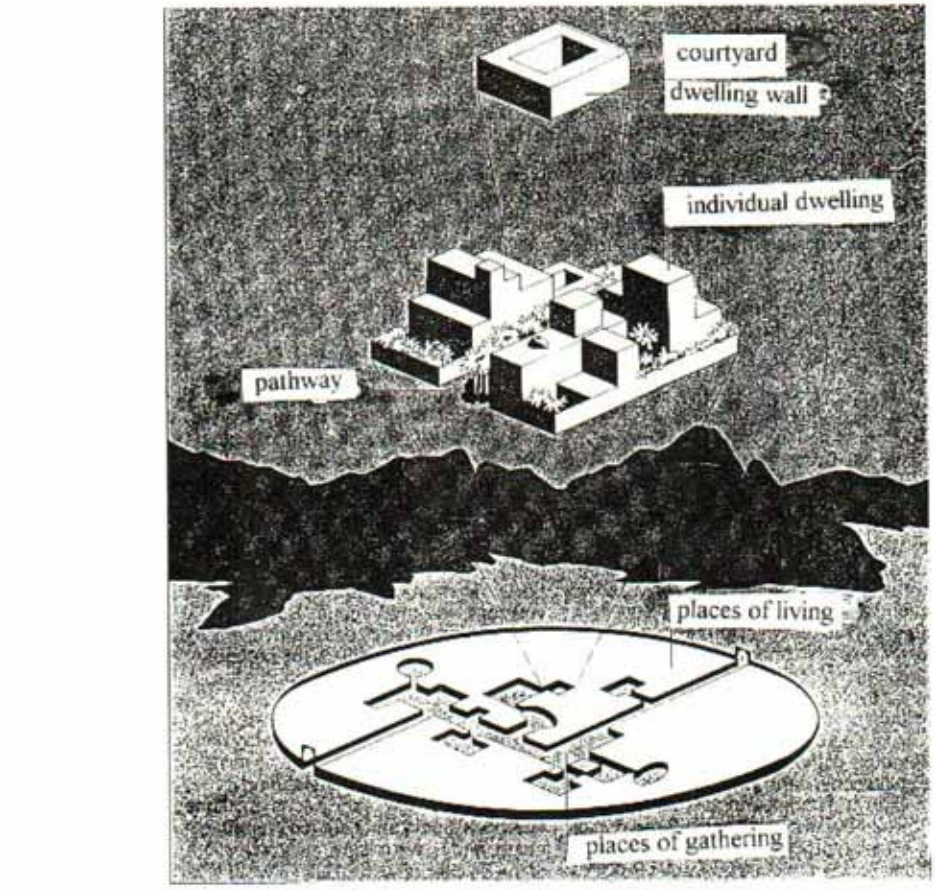


Figure #2: Public and private domains in two cultures



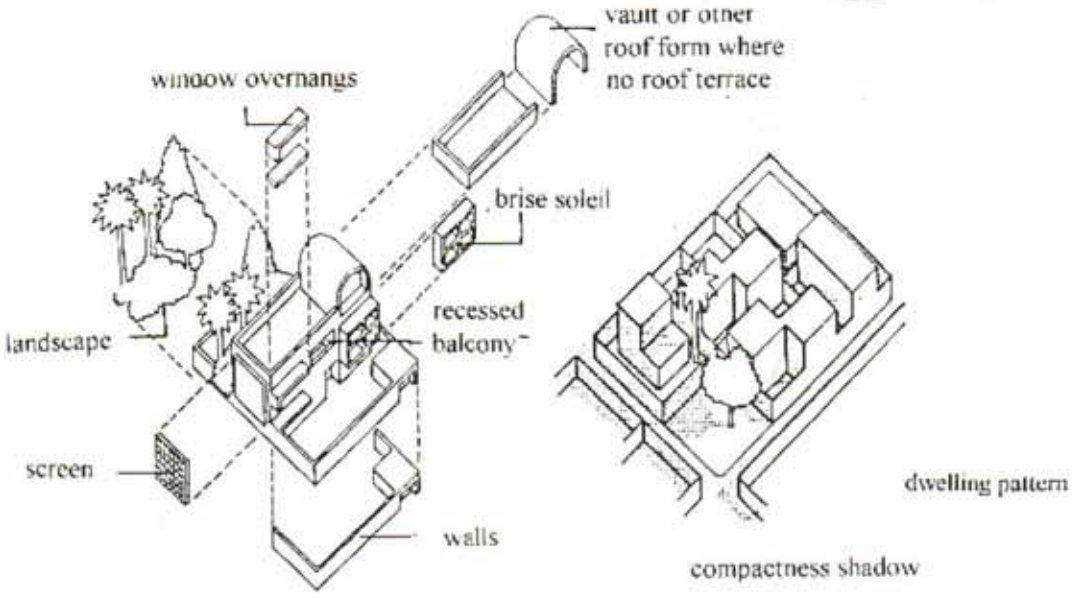


Figure #3: Urban Morphology in hot-and climates [adapted and modified from SOM, 79

b.1 building forms
b.2 materials, color and light
b.3 environmental patterns

b.1. Building forms; the shapes and patterns of built forms are highly visible parts of a region's image and they give an identity, scale and sense of direction to the

environment experience. The building height, width, size and shape such as a circle or an arch, or patterns such as symmetry may have associated meaning within the cultures for which they are designed.

An observer structures a visual image and scheme of the area, through the patterns experienced. The category of building form can range from a street facade or cluster of buildings to building mass characteristics of sections of the city and variations with a city or a region.

b.2. Materials, color and light are most manipulative and flexible elements of a place's identity. They function to elaborate and clarify such qualitative aspects of the environment as texture and decorations ambiance, atmosphere and generate affective meanings.

b.3. Environmental patterns, refer to the accessory part of the environment, such as textures of buildings, fenestration, roof shapes, landscaping and ground-plane-surface characteristics, lighting, works of art and objects in the landscape.

c. Typology; is concerned with the basic structures which are perceived as a strong image. A settlement, a street, a village, a house, a space may become a strong image as a result of spatial totalities. The components of the typology are;

c.1. Type
c.2. Activity patterns
c.3. Circulation patterns.

Urban patterns find their unique presence by the elements that repeat in various forms. The similarities of forms or patterns may be grouped into common features which is called typologies. This grouping may be in the patterns of spaces-squares-buildings, streets-urban blocks types, etc. These types may be universal or culturally defined.

Type is defined as the general form, structure or character distinguishing a particular kind, group, or character distinguishing a particular kind, group or class of being or objects - hence a model after which something is made. Urban typologies connote the forms of spatial organizations in the settlements. Culture is the prime force that develops settlement types by trials in long time periods reaching to solutions which become reference for evaluation of new types.

c.1. Type is concerned with the particular type of room or building which is perceived as a strong image, like a patio house type in Mexico or row houses in Philadelphia. In contrast to topology, typology analyses spatial totalities and functional aspects of the environment including activity patterns.

c.2. Activity patterns: There is reciprocal relationship between function and activities that occur within a place. What happens in the environment in terms of social and cultural activities is of importance in urban design. From behavioral point of view activity types include dwelling, shopping, working, playing, meeting, etc.

The identity of a place in terms of behavioral patterns is dependent upon the question of what goes on where and when?

c.3. Circulation patterns refer to the paths, their location and characteristics which influence the observation of a place.

Apparently there is considerable interdependence among these components. The totalities of

topology, morphology, typology make up the language of a place, 'imageability' of a place. In designing for genius loci an image inventory and analysis which takes into account these components is a necessary pre-requisite for determining the appropriate method to achieve 'the latent identity of a place'.

To summarize the discussion of components of genius loci, a model should read as follows:

Table - 01: Structural Components of Urban

STRUCTURE OF A PLACE	THEMES
Topology	1. land forms 2. space 3. settlements clustering
Morphology	1. building forms 2. material, color and light 3. environmental patterns
Typology	1. type 2. activity patterns 3. circulation

3. MORPHOLOGY OF A HILL TOWN: MARDIN

In this part a hill town in turkey will be discussed in terms of morphology based on the theoretical framework established above.

The city was the center of agriculture and economic activities from the beginning. History of the city goes back to as early as 3000 B.C. Since then the city has been conquered and ruled by many nations. The settlement morphology and the architectural types of the city had gradually developed throughout centuries and changed very little since 12th and 13th centuries. (Turan et al. 1981) Presently the urban pattern of the city is being changed by the introduction of concrete flats.

3.1 TOPOLOGY OF MARDIN

The city of Mardin is located in the south-eastern part of Turkey facing the large plain of Syria. It has been the location for some of the agricultural societies of the fertile Mesopotamian plateau. Its geographical location and unique topography made this town favorable not only for the defense but also for the economic and ecological purposes. (Figure #4).

The hill connects the settlement to another plateau in the north. The hill is located at an altitude 1080m. above sea level, at 37018N.

The hill rises from the plain in the south with a slope of 200 to 250. The top of the hill is surrounded by the ancient citadel (Figure #5).

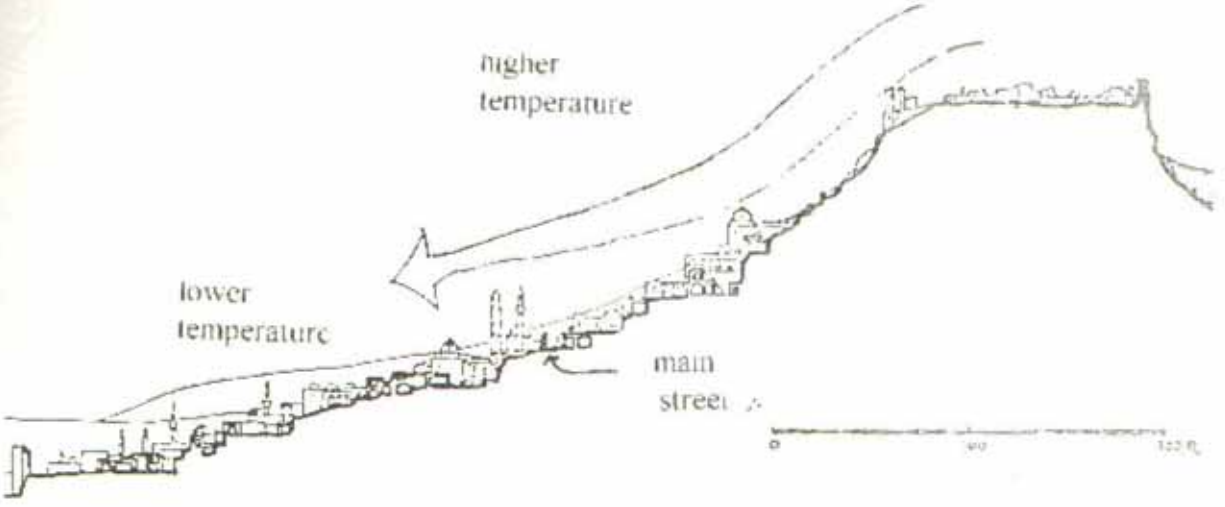


Figure #4: The slope of the city of Mardin creates an advantageous setting for the settlement. The downhill flow of cool air causes cool pools in and around the houses where there is comfortable outdoor sleeping space. [Adapted and modified form Gabriel, 1940].

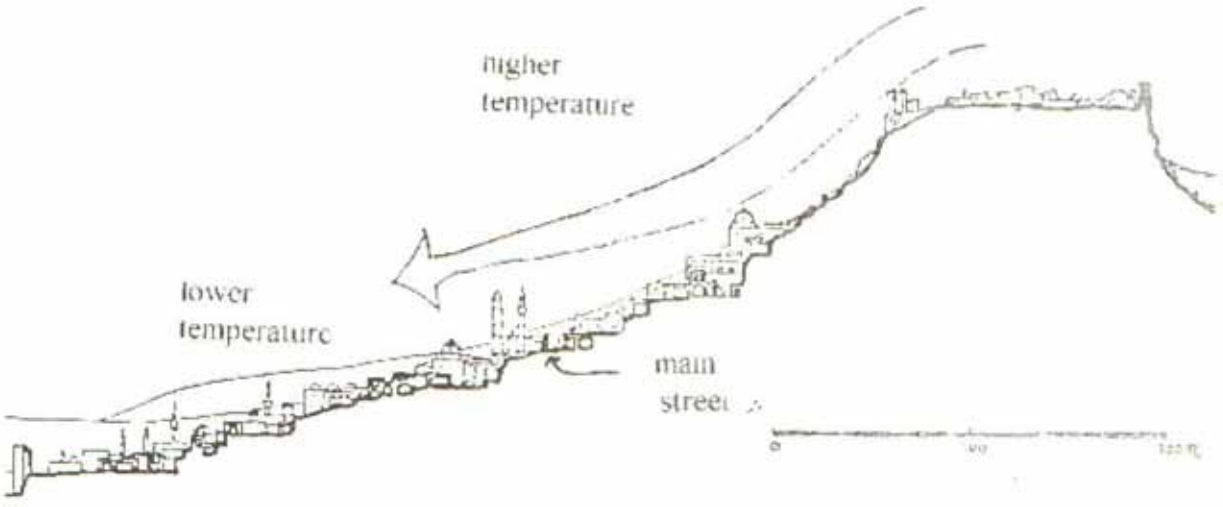


Figure #4: The slope of the city of Mardin creates an advantageous setting for the settlement. The downhill flow of cool air causes cool pools in and around the houses where there is comfortable outdoor sleeping space. [Adapted and modified form Gabriel, 1940].

The topography of the site effects the patterns of the city. Buildings are built on the slopes of the hill on terraced forms. Streets run parallel to the topographical contours and paths ascend via stairs towards the plains. Spatial organizations of the whole settlement conforms to the characteristics of the slope forming a compact, terraced city (Figure #6).

3.2 MORPHOLOGY OF MARDIN

The whole settlement can be considered as the setting for life and the dwellings are more private and enclosed. Public places are long, well defined streets and courtyards of the buildings. The streets are made narrow to keep out the sun and often main market streets are shaded with awnings. The down hill flow of cool air causes cool pools in and around the houses. Southern exposure for the whole settlement is desired because of the cold winter. The location of the city on the south facing slope is not proper in terms of taking advantages of the prevailing wind blowing from the north in summer months. But these conflicts are solved through the building forms, materials and patterns. The building forms in Mardin are mostly courtyard types. Due to the slope of the topography the terraced houses have double courtyards. The rectangular forms of the houses face to the south in order to make use of low altitude of winter sun. Daily life is spent in the shaded areas of courtyards and eyvans. The lower courtyard, having a water basin and tree, makes the life in the house more comfortable. Eyvans, which are closed on three sides and totally open on one side mainly face south and are available for the daily use of the family in summer (Figure #7).

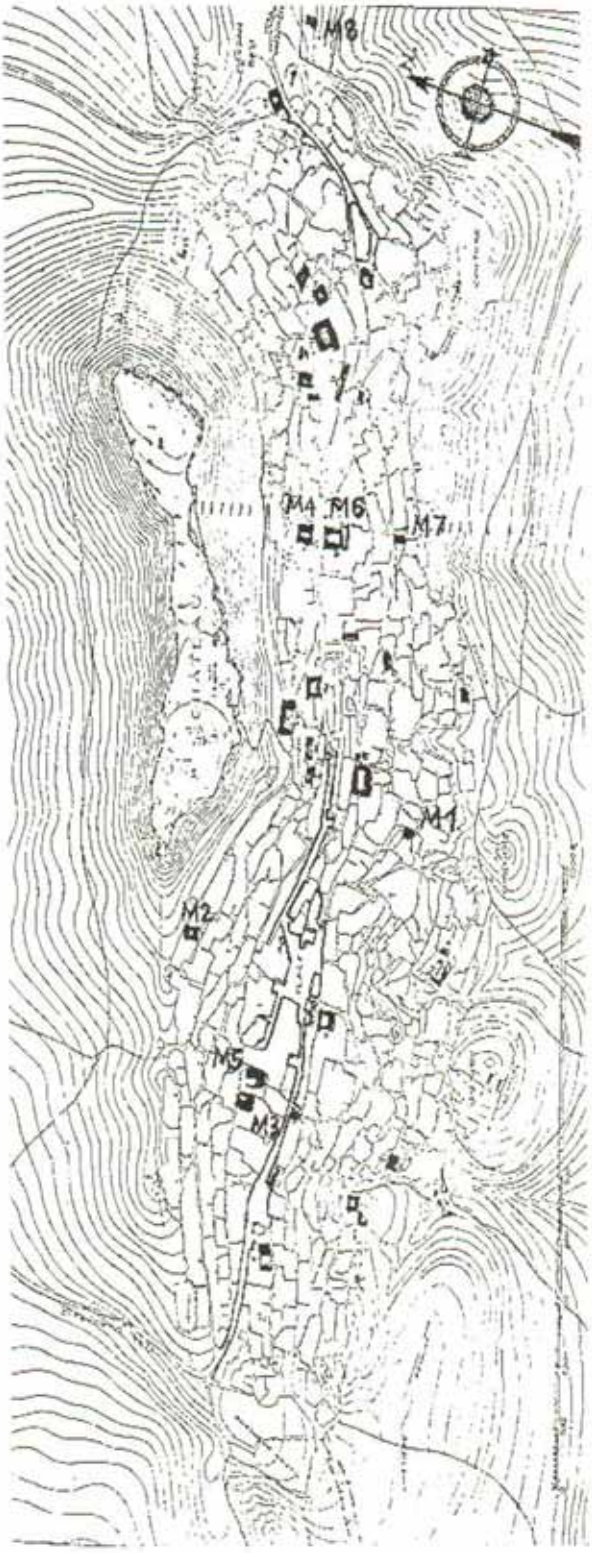


Figure #5: Topology of Mardin

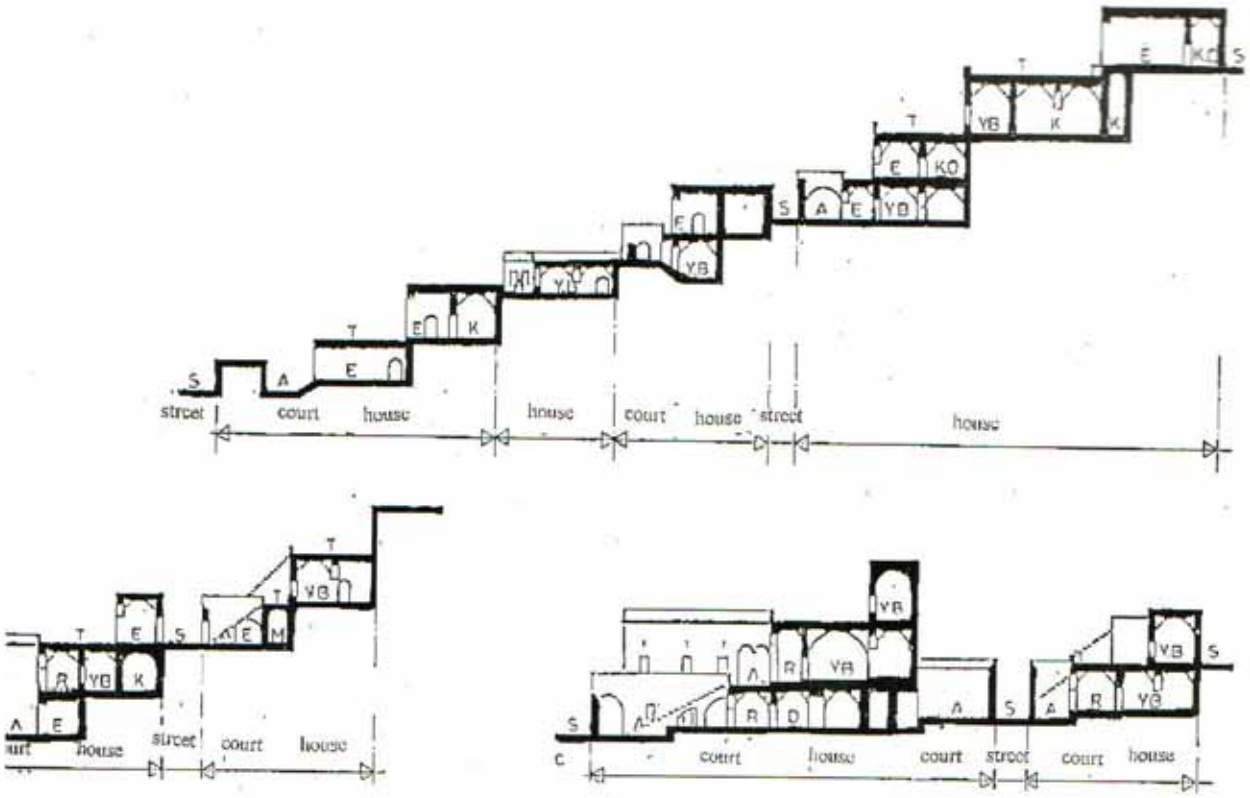
Figure #6: The slope of the city of Mardin creates an advantageous setting for the settlement. The downhill flow of cool air causes cool pools in and around the houses where there is comfortable outdoor sleeping. North-south orientation for the habitable rooms, compact planning, rooms grouped around courtyards.

The way the fenestrations are treated they function for ventilation. The windows for instance have smaller and larger openings on the same surface. The larger openings provide sunlight indoors, while the smaller ones help in ventilating the room. One of their functions working together is to allow for the stack effect when ventilation is needed. When the temperature difference occurs between inside and outside, the air movement starts consequently cooling the interior space. The recessed patterns in the fenestration also create shaded surfaces and ornamentation. (Figure #8).

The massive walls absorb heat during the day, keeping the rooms cool and releasing the heat during the night, warming up the spaces.

3.3 TYPOLOGY IN MARDIN

The unique urban pattern of Mardin comes from the topography and the dwelling types are generated as a result of interfacing of both. The design features of the individual houses in the settlement take advantage of the slope site. Because of the slope the house types are characterized by having double courtyards and



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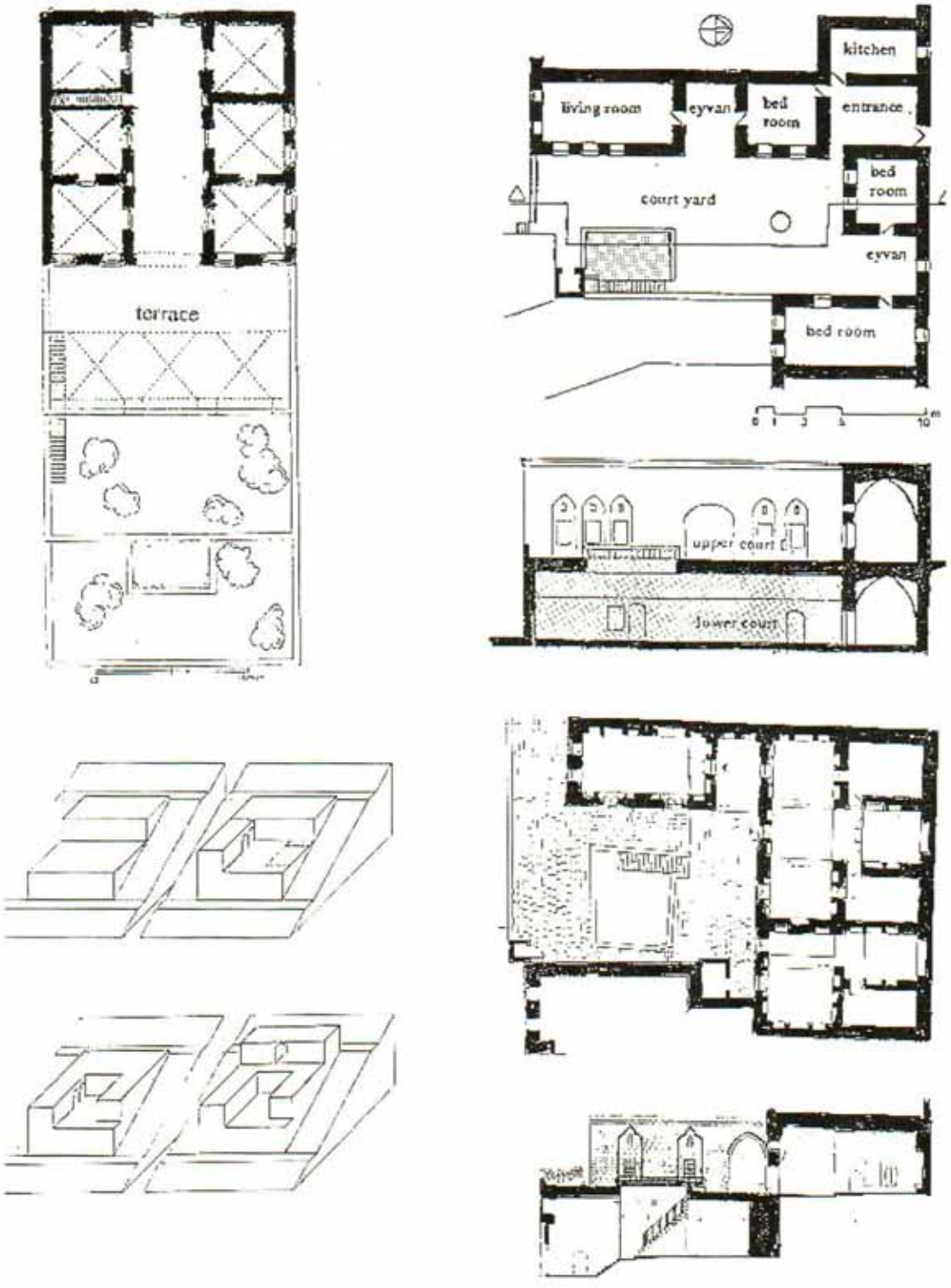
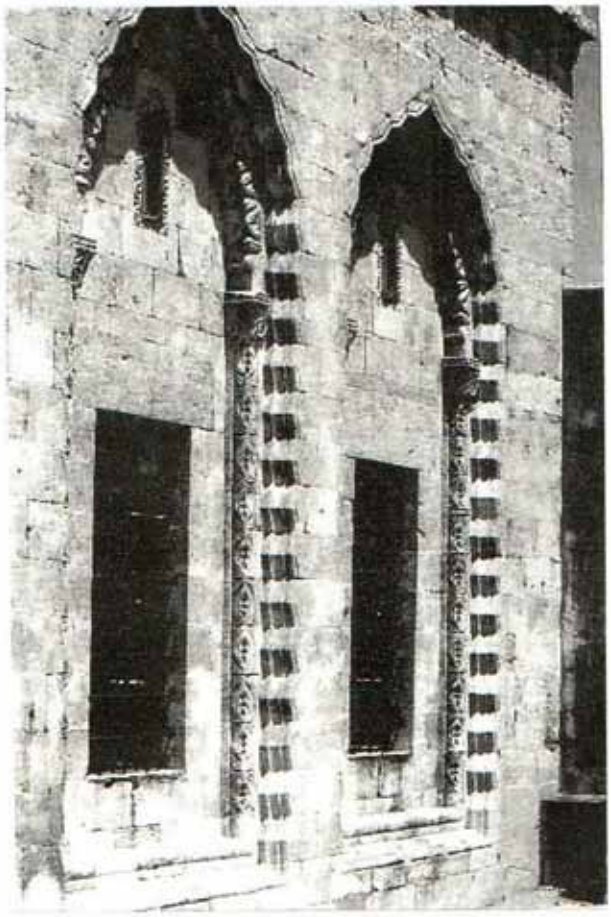
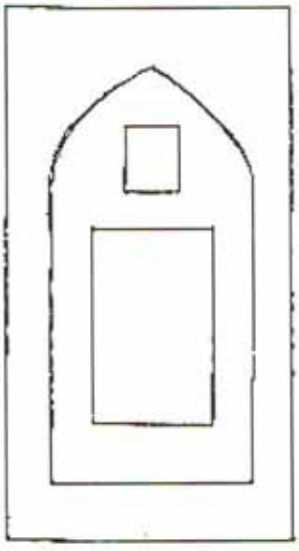


Figure #7: The Houses in Mardin take advantage of the slope. Terraced houses have double courtyards generating micro-climate spaces.





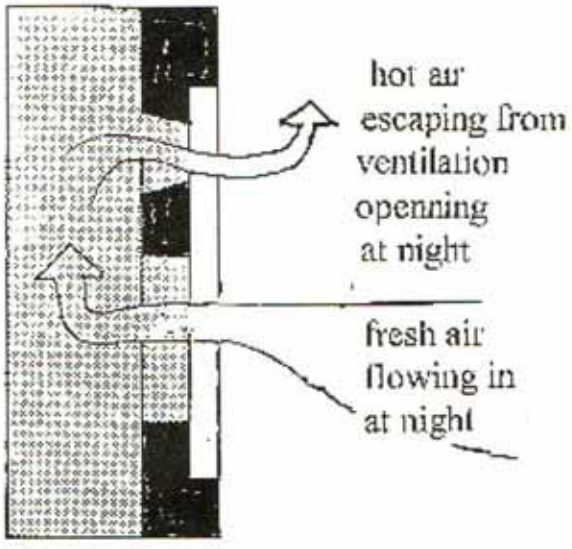


Figure #8: Typical fenestration in the hot arid zone of Turkey, the city of Mardin

large terraces. The grouping of this type in conformity with the potentials of the site makes Mardin a terraced compact hill town. (Figure #9, #10, #11).

The whole settlement acts as a setting for the life activities of the community through its enclosed public or private courtyards or linear shady streets and on the stepped narrow path ways.

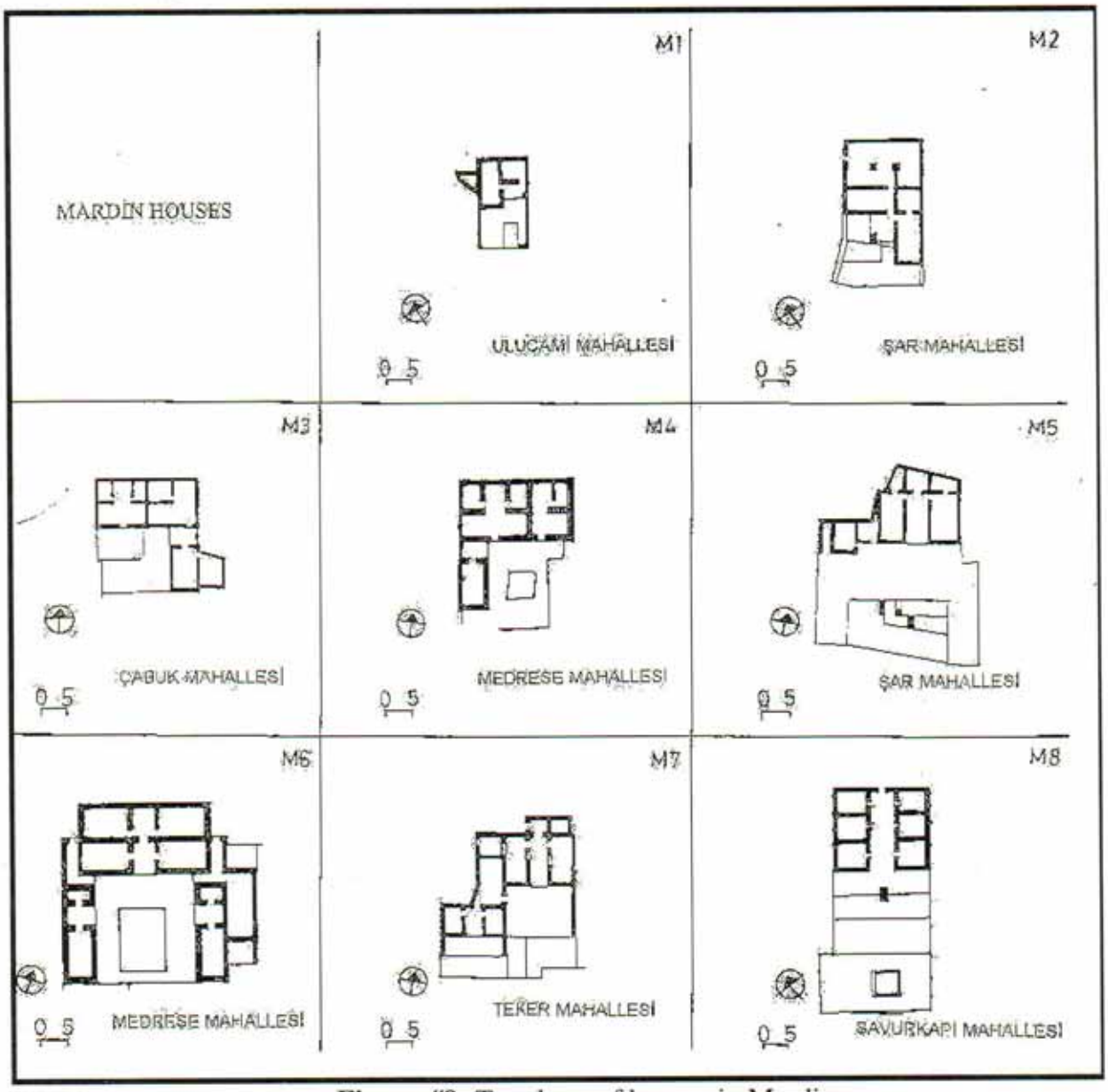
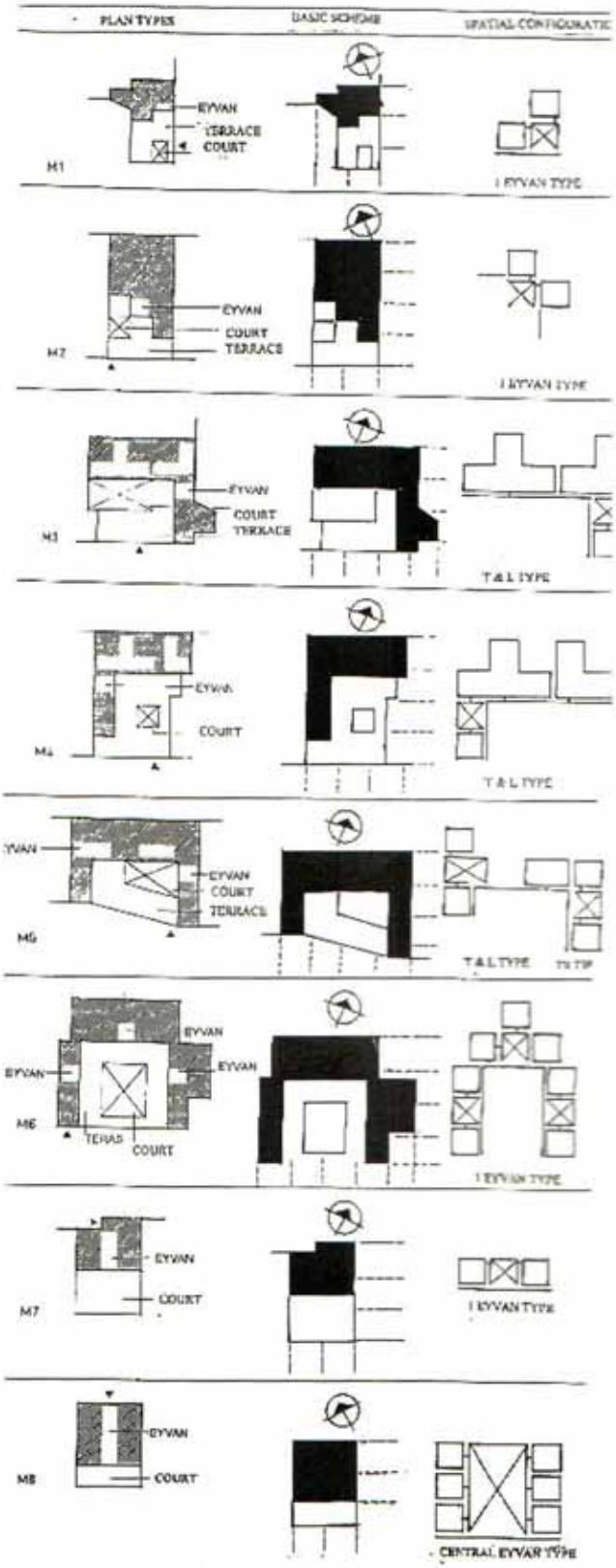


Figure #9: Typology of houses in Mardin



Figure#10: Spatial configuration of the types in Mardin

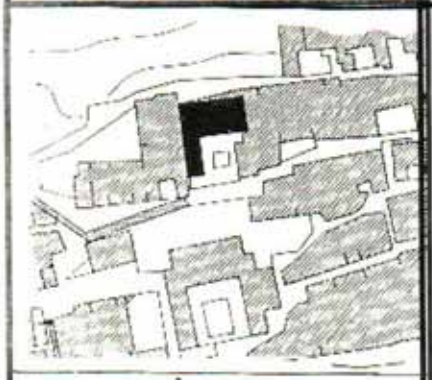
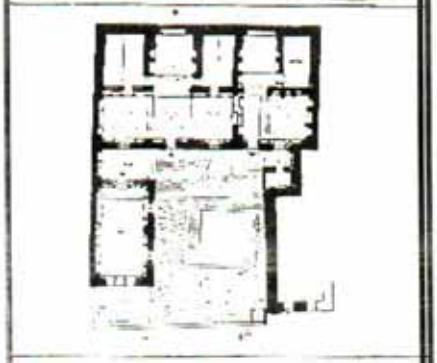
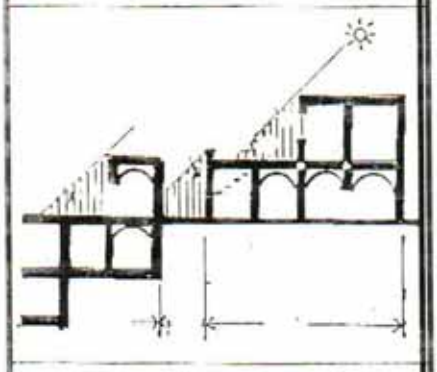
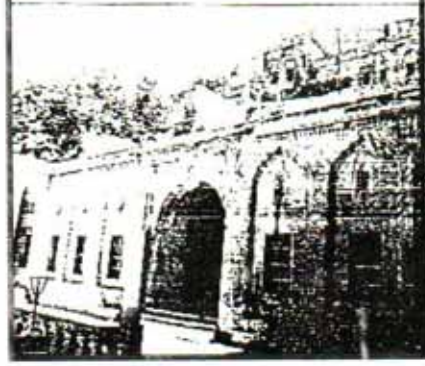
Graphic Presentation	Variable	E.P.L.
	Cluster: Cluster in three dimensions Structural Form: Solid Construction Rise: Single and two storeys Plan Geometry: Simple geometry, rectangular and square units	(Environmental Pattern Language)
	Wall Form: Solid compact, layers of stone Roof Form: Flat roofs, vault Opening Form: Flat horizontal and arched openings Opening Size: Moderate Stair Form: Solid type	
	Wind breaks Plants and water Indoor Outdoor rooms Earth sheltering Solar walls and windows Thermal Envelope Sun Shading Natural Ventilation	
		

Figure #11: Environmental Patterns in Mardin [Karaman, 1997].

CONCLUSIONS

The urban forms of notable cities reflect upon the many wills coming together for a common goal, which is to create a community. The physical forms of the communities reflects values, life style, family types, social structure and attitudes of people towards natural environment. There is always correlation between urban morphology and social structure of the community that creates urban morphology, patterns and types based on its perception of the environment, and its aesthetic values. In other words, a fit achieved between natural confession and urban patterns and fit between typology and cultural preferences are the situations where one can always see a sense of community. The traditional settlements reflect these norms of social structure in their spatial organization as a product of collective act for the common purpose. In every act of environmental making process there is an input from the community and individual reflecting many different values and wills. As a result the form of settlement is rich in patterns and yet consistent with each other.

The conceptual parameters that are discussed above offer us a framework through which the nature of pattern language of the community, the range of urban typology and combinatorial laws as well as elements carrying inherent design codes, can be formulated to guide and develop a consistent whole.

In criticism of modern movement, the arguments focus on the attitude that the city was seen as an abstract whole, low-order visual organization, lack of diversity at every level yielding a monotony, disorientation and lack of community and sensory depreciation.

Complexity and diversity of patterns are the formal dimensions that contribute a great deal to the liveability of the community design.

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