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CONTENTS

EDITORS' NOTE

The current issue of the journal is focused on the theme stated architecture of housing. Generally, housing is studied and researched from various stand points in the domain of built environment. Enabling strategies and options for less privileged communities, options in cost reduction, upgradation and adaptive re-use, mass and social housing ventures, self built initiatives and many a spread out approaches are covered in this broad realm. Due to the primary importance that is assigned to housing in respect to development, the demand of knowledge driven solutions has remained paramount. The theme – architecture of housing – has attempted to interlace the various dimensions that add value to the discourse in this direction.

The paper by Morten Gjerde evaluates the design capabilities of concerned practices pertinent to infill housing in New Zealand. The study examines the key urban design and architectural amenity issues through a well laid down analytical yardstick, findings of which have been logically extrapolated. The results unpinned the need of shoring up the capabilities of design professionals as the complexities related to housing are several and increasing. A lucid review has been done by Mahbubur Rahman in his critical assessment of low income housing in the developing countries. Cardinal developments in policy and practice have been dwelled upon in this discourse. It shall be useful if researchers extrapolate the various arguments highlighted in this paper through empirical research in identified contexts, particularly in the developing countries. An impressive bibliography is also included in the paper. Jon Calame has delved deep into the social and physical labyrinths that remain at the baseline of ghetto formation in Rome. Issues concerning minimum applicable standards, ethnic profiles and preferences are dealt in sufficient detail in the paper. An important recommendation is the identification of need for exclusive byelaws, standards and regulations for this type of shelter format. Predicaments of ordinary shelter along the banks of Padma river in Bangladesh are highlighted by Amreen Shahjahan. The study covers the matters related to thermal comfort and vulnerabilities in the wake of recurring natural hazards. Housing profile and intervention are comparatively studied by Mukhtar Mai and Mahbubur Rahman in connection with Dhaka and Abuja (in Nigeria). With the help of case examples, the paper illustrates the social and physical evolution of respective urban contexts and spatial transformations. The characteristics of old traditional dwellings namely *havelis* by Samra Khan in her paper is a useful addition to knowledge on the subject. The study points out many useful attributes of natural ventilation that have been embedded in dwellings of similar typology. Whereas swift urbanization and demand for new uses is causing enormous pressure on older and traditional housing, the apparent merits that are included in this valuable artifact deserve to be preserved through a logical approach. Trend of gated communities in Pakistani urban centres – particularly Karachi – are rising. The paper by Asiya Sadiq et.al. has tracked down the core reasons behind this model of housing. The study critically examines the trend of gated communities with an objective to formulate recommendations for qualitative improvement. The comprehensive work on density by Arif Hasan et. al. proves that medium to high density standards have been achieved through incremental development upon small plots (80 – 100 m^2). The paper recommends that the planners and policy makers should be sensitized to this key matter. It is also established that if appropriate density standards are maintained, the cost and provision of infrastructure can be greatly rationalized. This volume has attempted to delineate some of the vital areas of research and application in architecture for housing and its allied outreaches. It is hoped that this modest volume on the topic shall be of use to scholars, researchers and practitioners for its knowledge content and diverse perspectives.

Editorial Board

EVALUATING DESIGN CAPABILITIES IN MEDIUM DENSITY INFILL HOUSING IN NEW ZEALAND THROUGH ANALYSIS OF ENTRIES TO A RECENT COMPETITION

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ABSTRACT

The profile of New Zealand housing has for some time been dominated by the standalone suburban house. However, this pattern absorbs considerable land resources and leads to socially stagnant environments that are heavily dependent on private motorcars. For these reasons the largest cities in New Zealand have declared limits to peripheral growth. Such limits, coupled with changes in lifestyle, lead naturally to intensification of existing residential areas. Urban planning and design objectives that underpin residential intensification are sound – greater densities can provide for improved social opportunities, bolster economic circumstances to enable a greater range of services to be offered, and make better use of existing physical infrastructure. However, experience shows that the built outcomes are patchy, and that many infill projects fall short of meeting expectations for on-site amenity, and/or appear to be at odds with the character of the surrounding area.

In late 2005, Housing New Zealand Corporation organised an architectural design competition for comprehensive redevelopment of a large site in the Auckland region. Research was conducted on the basis of this representative cross section of designers, with the aim of evaluating achievement by New Zealand designers in terms of residential amenity and its suitability to the surrounding context.

A review of literature, including the design brief and a number of design guides for infill housing, bring forth the criteria addressing key urban design and architectural amenity issues specific to medium density housing. The criteria were used to assess the entries using a five point scale. The methodology generates data that is used to compare entries, and analyses relative strengths and weaknesses seen across all schemes. The results provide a snapshot of contemporary practice in New Zealand, suggesting where strengths and weaknesses lie with respect to planning and design of medium density housing.

Key words: *Social housing, medium density housing, design competitions, New Zealand*

1. INTRODUCTION

In future years, due to population growth and pressures on available urban land, many people will be living closer together than in the past. At the same time, the floor space of the average dwelling is expected to grow in size. Apartment and townhouse living is part of this trend…..the challenge for central and local government, together with the building industry, is to meet the shortfall with good quality medium density housing.

Throughout its history the predominant type of housing in New Zealand has been the detached, single family dwelling. A house on a quarter acre [1,012 m^2] section came to symbolise all that attracted early settlers to the country – expansive countryside, opportunities for home ownership, and opportunities for self determination. There can, however, be little doubt that New Zealanders will be living closer together in the future, with factors leading to changes in the supply and demand sides of the housing market. On the supply side, medium density housing [MDH] provides developers with economies of scale that are not possible in low density development scenarios. This is particularly relevant in the New Zealand marketplace as government takes a largely hands-off approach to development. As local governments act to curtail endless sprawl, the supply of cheap land in peripheral areas will quickly dry up. To accommodate the higher value of land closer to urban centres and yet try to keep new housing affordable, developers are driven to build more intensively. Experience shows that this often leads to tensions, as intensive infill development puts pressure on urban and on-site amenity levels as well as the ability to fit with the grain and character of the surrounding development. Demand for housing close to established urban centres is increasing despite the aforementioned attraction to the suburbs, as New Zealanders come to realise the benefits of urban living with the wide range of activities and services on offer. Until feeling the effects of the recent economic downturn, demand for inner city apartments had climbed to unprecedented levels.

Pressure to consolidate existing urban areas is also exerted at a societal level through national and local government. Although not unanimous in favouring compact cities [see Vale and Vale for a contrary view], research suggests that living more densely can lead to more sustainable outcomes. Critics of suburban lifestyles have argued for some time that higher densities enable key infrastructure, particularly public transport, to be used more effectively. Higher residential densities also enable valuable rural land to remain productive. While prevailing theories suggest that compact places offer opportunities for people to connect with each other and with key services, other theories have argued that affordability of housing diminishes and places become socially stratified when they are redeveloped to higher densities.

Bunker et al question whether consolidation can meet the needs of an increasingly socially diverse population, given that much of the housing is produced with little understanding of who will eventually occupy it. On balance though, many local authorities within New Zealand have committed to strategies and policies that will see residential uses in their jurisdictions intensify. Residential intensification is a cornerstone of the growth strategy for the Auckland region with medium density housing forming a major platform in that vision.

While central and local governments loathe becoming involved in development and construction activities, there is the expectation that transformation to higher residential densities will be led by private interests on an infill basis. Over the years, the quality of medium density infill development has been mixed and it is clear that the marketplace cannot itself determine acceptable standards of development. Two significant areas of concern are the way the infill development fits with its surroundings and amenity standards for the residents. Indications are that New Zealand society struggles to accept housing at densities over 30 dwellings per hectare, which in this context is the lower threshold for MDH. These matters are representative of the tussle that takes place in private enterprise driven by the [largely financial] interests of the developer and those of local residents as well as those who will eventually come to live there. As most such development is done for the rental market or on a speculative basis, these stakeholders are generally not represented in the process.

This presents a number of challenges to designers and developers, particularly in light of the prevailing planning requirements. Planning instruments are rarely based on aspiration alone, and are generally conceived in a manner that limits adverse effects of development on the receiving environment. To limit developer risk, infill projects tend to be designed within the limits set out in the planning framework, which generally references prevailing forms and densities of detached housing.

The visual character of the built environment derives from many sources, but those relevant in a discussion around infill residential development include the grain and scale of buildings, architectural style, and form and landscaping. Land ownership is widespread in New Zealand and this can often frustrate efforts to amalgamate residential sites in order to allow larger developments. Provision of on-site amenities such as access to ground level outdoor space, privacy and even dwelling floor space is often challenged as developers seek to optimise returns on sites that are often too small to allow for economies of scale. Private outdoor space is most often the casualty when designers are faced with accommodating the interests of developers, planning regulations, and the motorcar. A particular manifestation of this trend can be seen in fig 1, where the ground plane of a recent development is dominated by hard paving and garage doors.

As the vast majority of housing in New Zealand was created after motorcars became common, providing for them has limited the forms of housing available in the marketplace. In their study of medium density housing, Turner and his colleagues identified four different layout types, with

Figure-1: A recent five unit development in a suburban area of Wellington showing the dominance of paving to accommodate the motorcar.

classification determined by the relationship between the dwelling and car storage. Their dwelling types 1, 2 and 4 each assume garaging internal or immediately adjacent to the dwelling and therefore secure. Only type 3 in their study, associated with schemes of higher intensity, is based on car parking located remotely to the house. This form of housing develops aggregated areas of car parking that help to reduce the extent to which car parking impinges on open space within the site. In the end, the study observes that traditional forms of housing are used in compacted versions for medium density schemes, to the extent that most projects are seen as forms of 'compacted suburbia'. They argue that this limits long term viability because these approaches cannot accommodate changing demographics, environments and contemporary lifestyles in society, and go on to argue that other forms of housing, particularly those pitched at medium density levels, are needed.

2. A NATIONAL COMPETITION FOR THE DESIGN OF MEDIUM DENSITY HOUSING

Housing New Zealand Corporation [HNZC] is the largest owner of residential properties in the country and provides housing assistance to a broad range of people. The majority of the housing stock owned by HNZC is in low-density suburban settings. These houses are increasingly unsuited to the cultural and social needs, as well as the family structures, of their client base. Recognising that different housing models are needed, HNZC announced a design competition in 2005 to coincide with the centenary of the first state sponsored house to be built in the country. The competition brief sought innovative solutions to the needs of large, multigenerational families that would also be better suited to the diverse ethnic backgrounds of residents. Competitors would not only need to ensure that their designs were innovative but also demonstrate compliance with general urban design requirements, specifically those triggered by infill medium density housing.

The competition was seen by the author as an opportunity to gain understanding about the capabilities of architects and designers in this area of work. The research addresses two aims, the first of which is to determine the extent to which new MDH typologies are proposed. Secondly, the research aims to identify areas of strength and weakness in the abilities of architects to design medium density housing. The paper describes methods that were used to evaluate the schemes and discusses key findings in relation to the design qualities of the competition entries. Design proposals were evaluated in terms of overall site planning, residential amenity levels provided for within the site, and the relationship of each scheme to its surrounding context.

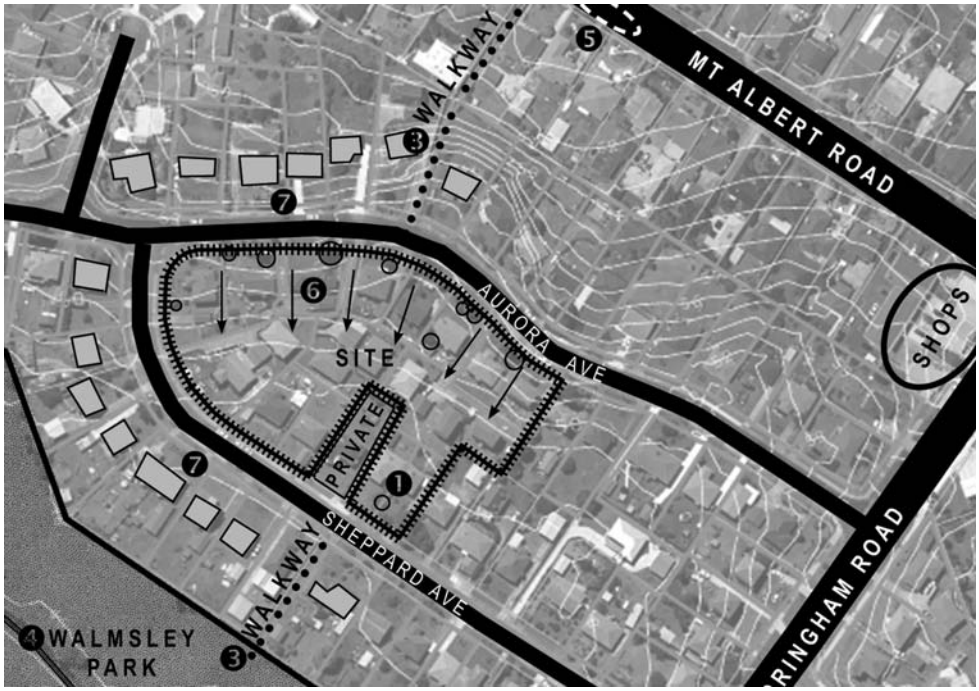

Figure-2: Site plan from the competition brief, showing its relationship with surrounding features.
Key: 1/ Large Trees 3/ Connections between Walmsley Park, the site and Mt Albert Road shops
4/ Open space 5/ Bus stop
6/ Sloping site 7/ Street edge of single storey houses at common setback

Figure 2 shows a plan of the competition site in its context, the Auckland suburb of Sandringham. Although the competition sponsor sought new ideas for social housing, because of their intentions to eventually implement the project the brief was firmly grounded in the pragmatism of local planning controls. Complying with the planning controls may have constrained the extent of 'blue sky' thinking by designers in comparison with opportunities available in more open, ideas based competitions but this has served to enhance the relevance of the proposals to the study reported here. Residential density limits, which envisage 300m^2 of land available to each dwelling unit would see the site able to support up to 30 dwellings. At such a density [33 dwellings per hectare] the project would sit at the lower threshold of medium density housing as defined for the New Zealand context while in many other places it would be seen as low. Although the site was seen as a significant opportunity to develop infill housing, it also contained 19 detached houses in good order that the brief assumed would be removed. The economic and environmental costs/benefits arising from this scenario were not discussed in the brief, nor are they discussed in this paper. The matter is however, relevant in a wider discussion around the sustainability of site redevelopment practices.

Other key design attributes required by the local planning authority included the provision of a minimum area of 35 m^2 private outdoor living space for each dwelling and accommodation on the site of at least one motor vehicle per dwelling plus visitor car parks. Competitors were provided with a document specifying urban design outcomes . This brief was written in very specific terms, discussing mainly matters internal to the site with only a cursory reference to how the project might relate to the wider setting. While this brief may have been useful to designers, its use in this research would have limited evaluation to a simple checklist process. The urban design brief was considered during the process of developing an analytical framework, outlined below.

The organisers received over 100 entries to the competition, with a number of these prepared by students as part of their coursework. 71 entries from practicing architects and designers were then passed on to the author for analysis.

3. EVALUATION FRAMEWORK

Referring back to matters that challenge uptake of medium density housing in New Zealand, the research was conceived to evaluate the effects on the area surrounding the site as well as on the common areas and spaces within the development. Notwithstanding initiatives by the competition sponsor to develop larger dwellings to suit their client profiles, the literature does not raise concerns with standards of accommodation in the dwelling units within medium density schemes. Indeed, Bentley reminds us that during development undue emphasis is placed on the building, as it is the architectural object that becomes the saleable commodity. As a consequence, he and others argue that spaces between buildings are at risk in the development process and particularly in scenarios of residential intensification. Accordingly, the framework was developed to consider factors that affect the quality of spaces between buildings, those that will be used privately as well as those in common usage.

The first of the three strands into which the framework [Table 1] is arranged is that of planning and site layout. To enable residents and visitors to comfortably, and even by chance, enter onto the site from surrounding streets and the walkways linking to schools and parks, the layout of the circulation routes should relate logically to one another. Indeed, urban designers will argue that the spatial network should be considered before all others, with the areas 'left over' being those available for building upon. Benefits that arise through appropriate planning of linkages beyond the site include changes in patterns of local car usage. The second strand in the framework is developed around the architecture. Rather than considering the merits of a design in isolation, evaluation here considers relationships between the built forms and the surrounding environment, as well as the spaces within the development. This line of inquiry is triggered by observations that medium density housing is often seen to fit poorly amongst its surroundings, particularly in areas that exhibit patterns of low residential density. Factors affecting compatibility can be perceived along a continuum of scales from overall massing and articulation of forms to materials and even colour. In addition, the architectural arrangements can influence amenity levels available to residents on site. Not only does the shape and design of buildings affect the quality of common areas, but arrangements determine opportunities for privacy between spaces, as well as opportunities to enjoy the sun or to shelter from the weather.

The final strand of the framework relates to the design of common and private areas within the development and considers mainly the levels of amenity these offer to residents. Clearly there are close links here with the design of buildings, as stated above. Some factors invite measurement, such as the quantity of private outdoor space provided, but as densities increase qualitative factors become more important.

It is also recognised that perceptions of amenity are informed by culture [including factors of age, gender, and ethnicity, among others] as well as circumstances [urban vs. suburban context, family size etc.]. Many design guides in use today can be traced back to the seminal *Housing as if People Mattered*. That text discusses in great detail most of the issues included in this framework and particularly matters relating to residential amenity. Of key importance amongst these are the matters of privacy and spatial quality of the private outdoor spaces associated with individual dwellings. People can often feel trapped within their own homes if sufficient levels of privacy are not available when using their outdoor areas, with overlooking from adjacent buildings offering the most significant compromises. However, for expediency rather than to suggest they no longer apply, many of the more detailed criteria proposed by Cooper Marcus and Sarkissian have not found their way into this assessment framework.

4. FINDINGS

Based on the analytical framework, a pro forma scoring sheet was developed for use by the research team. Each entry was scored using a five point scale for each of 67 individual criteria. The scoring method adopted the scheme developed by Reeve et al. in their analysis of contributions made by heritage projects to townscape quality. That analysis provided for scaled scoring of qualitative attributes by different people on the basis that each one has expertise and experience in the field of inquiry and that calibration of scoring takes place before the exercise commences and proceeds. The benefits of scoring by different people include reduced timeframes and robustness of the scores. In this case the author/principal investigator is an architect and urban designer experienced in assessing medium density housing development proposals. The other two members of the team were final year architecture students. After spending time discussing and agreeing the assessment standards each investigator reviewed the projects independently. The three would re-convene at regular intervals to discuss scores and agree the final mark for each competition entry. It was considered that single scores would provide clearer distinction between entries when analysing the results.

The scores were entered into the database and statistical analysis software package SPSS™. As well as facilitating analysis of scores in individual criteria, use of this tool enabled new variables to be created by aggregating combinations of individual scores. Variables aggregating several scores were considered to supplement analysis of the individual scores by providing a more comprehensive picture of performance in areas that may be affected by more than one criterion. It can also be noted that aggregation of scores was undertaken to stretch the scoring in order to provide greater distinction between projects. Conceptually, the better projects would score well in a number of individual areas so that when combined to create an aggregate variable they would stand apart. This objective was met for the most part at the top and bottom of the aggregate scores. However, there was also a tendency for the majority of projects in the middle to creep towards the median.

4.1 Site Planning

The site is currently subdivided into traditional allotments and is therefore impermeable to movement through it. The brief required a connection through the block, recognising the opportunity for this project to foster links between surrounding recreational spaces, shopping facilities and public transport services along two well established mid block walkways [refer back to fig 2]. In addition, to accommodate motorcars and provide access to dwellings not facing onto the public streets around the site, it was anticipated that a network of roads and walkways would be

Table 01: Design Assessment Criteria

PLANNING & SITE LAYOUT	BUILDING DESIGN	PRIVATE & COMMON AREA DESIGN
Connections, within and beyond site Spatial quality of movement channels Provision for motorcar Relationship to topography Perceived denstiy	Massing Street rhythm Sense of address Materials compatibility Relationship to public space - within and around site Privacy Orientation	Privacy Shelter from elements Orientation [sun and views] Accessibility - Private outdoor space Landscape treatment Availabe area Location of private car parks Robustness [materials & detail] Sigh lines - CPTED

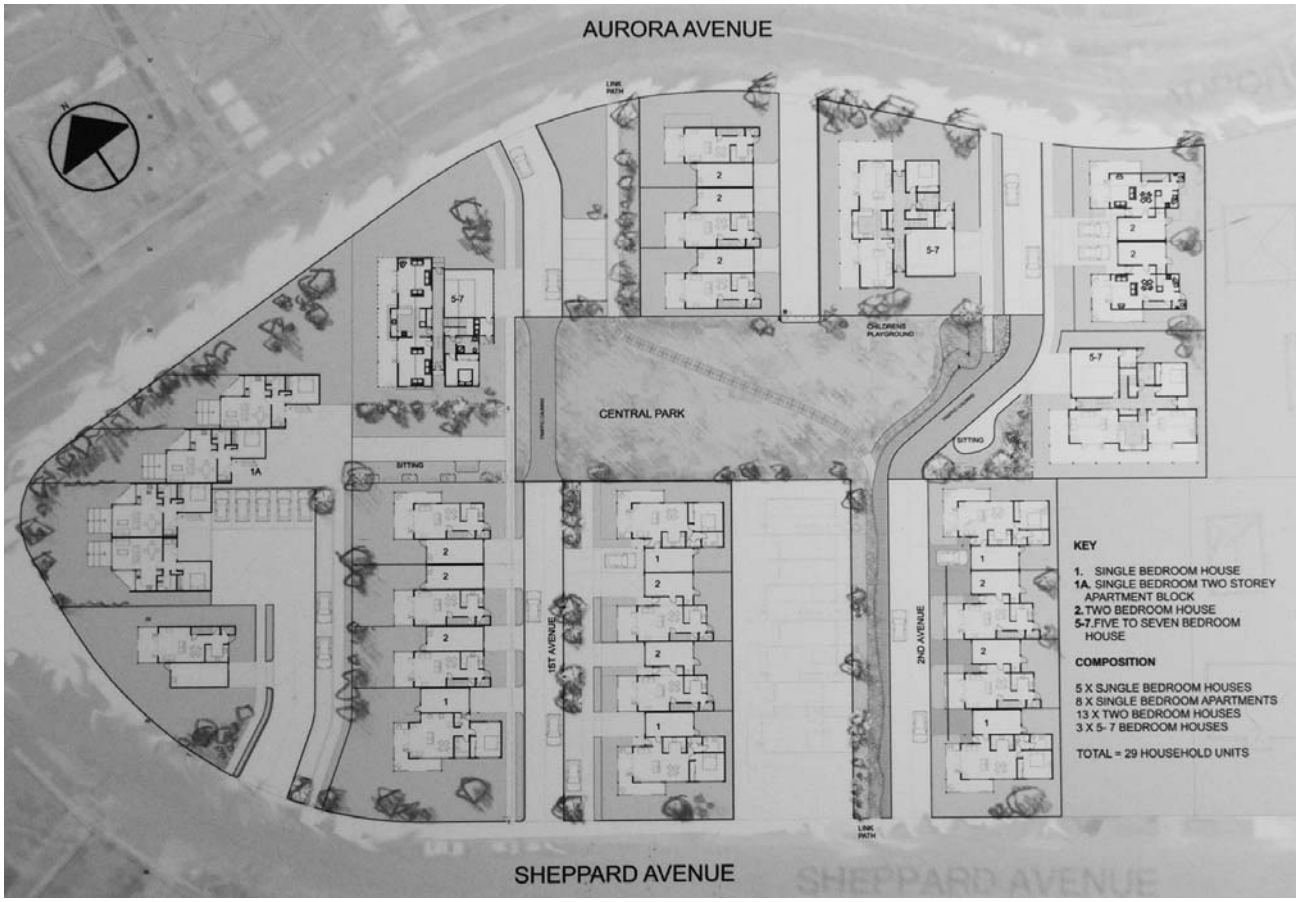

Figure-3: Entry No 70, which scored very well for connectivity through the site. The designers provide for enhanced legibility and choice in routes between Sheppard Avenue and Aurora Avenue. The western pathway is shared between vehicles and pedestrians.

needed within the site. Evaluation considered the layout and legibility of routes and relationships these develop with surrounding features.

Nearly all schemes provided a means by which pedestrians [at least] could find their way between buildings. Surprisingly, two schemes offered no such possibility. Another 13 designs provided poor connectivity through the site, with the main factor leading to this being poor legibility. In these projects there was a sense that visitors would have trouble finding their way to the houses and through the site. It was anticipated that a link across the site would not only benefit residents of the development but serve to welcome the public through. Fully 20% of the entries would make this difficult to achieve. The median score for connectivity was 3 [on a scale of 5] and the results mapped to a classic bell curve. 10% of the entries excelled in this category with the most successful schemes developing at least one shared space driveway as a highly legible connection. Although not based entirely around shared surfaces, entry no 70 [fig 3] offers choice to pedestrians and drivers, and these routes conveniently link the two endpoints of walkways along clearly delineated and unquestionably public pathways. People not familiar with the site would be drawn to the large open space in the centre.

Planning for motorcars often leads to large, paved expanses, and to mitigate poor visual outcomes many schemes adopted shared space designs and attempted to break up the paved surfaces by utilising a variety of materials. The introduction of landscaping to these areas also proved successful. Schemes that separated building entries and the more public side of buildings from driveways stood out positively. The schemes were scored in six areas to determine achievement of planning the site for cars. The criteria considered amenity for drivers and owners of vehicles [connection, parking provisions] as well as the impacts that cars would have on residential amenity generally [separation distances from main living rooms and outdoor spaces]. With 30 marks on offer, the actual scores ranged between 7 and 29. It was somewhat

Figure-4: Site plan proposal by Entry No 3. The central driveway is the only form of common open space in the scheme and is poorly developed for people.

disappointing that the mean score fell to 63% and only 11% of the schemes could be classified as excellent, achieving better that 80%. The schemes at the bottom of the scoring tended to allowed the car to dominate the site and caused immediate curtailing of the individual dwellings.

Spatial qualities of common areas were evaluated in terms of dimension, opportunities for views, orientation to receive sun, extent of landscaping, and robustness of the materials. In all, seven criteria were used to create an aggregate score for a scheme's spatial qualities. The results were generally positive and it reveals that most designers made serious attempts to go beyond simply arranging the buildings onto the site and to create meaningful outdoor spaces. In a somewhat interesting result, Scheme 3 [fig 4, which will be discussed as the eventual winner of the Judges' Award] scored near the bottom 4% of this category. This result can be attributed to poor development of the only common area within the site, a long driveway shared space extending across the site in an east/west direction. Although many of the new houses gain access from the drive, it does not include landscaping of any substance that could help limit perceptions of hard surfaces. In analysing the results, the researchers considered that in a different, more urban context, the scheme might be better suited. This typified the proposals at the bottom end of the spectrum; where driveway areas were not designed to be places for people to use, the quality was revealed to be lower.

Evaluation of overall site planning achievement took in 16 individual scores addressing matters such as the motorcar and connectivity, which have been discussed above, as well as the approach taken to a sloping site and how landscaping was used to define and enhance outdoor spaces. This aggregate variable reinforces the tendency for scores to move toward the average, with only four projects scoring above 80% of the marks available. On further analysis these scores were found to have a strong relationship with the scores achieved for the connection variable. The most successful schemes appear to provide integrated spaces that work well for pedestrians as well as for cars and which can be used informally for recreation purposes, fitting with the notion of shared movement spaces outlined in the *Manual for Streets*. Statistically stronger links were observed between scores for site planning and those for spatial quality. This may reinforce the notion that successful site planning is not simply about making appropriate connections in two dimensions but that it is critical to also develop common areas spatially, by manipulating the built form as well as the landscaping treatment and details/textures.

4.2 Building Design

Turner et al. have described how MDH development in New Zealand tends to result in compacted forms of suburbia. With a dwelling density of less than 33 units per hectare it was unlikely that this competition would explore new building typologies, and this expectation was confirmed in the analysis of schemes. Most adopted variations on suburban two storey dwellings, sometimes attached in plan but rarely in the vertical dimension. One scheme stood out for adopting the typology of the Star Flats, popular housing blocks of the 1950s-60s comprising of four dwellings on each level over three floors, but this approach also landed that entry at the bottom of the character assessment category. The character criterion, a composite of scores for building massing, rhythm and relationship of materials/forms to the surrounding context, considered the schemes in relation to a fairly nondescript, low density of suburban development. Fitting with the neighbourhood is important, as the literature suggests that lack of architectural compatibility is a major barrier to acceptance of medium density housing in the country today.

Several entries were highly placed in the character category with Entry 92 amongst the group. This scheme [fig 5] would introduce vibrant colour into the neighbourhood while the forms, rhythms and spaces between buildings help the project fit well with the neighbourhood without emulating any existing style. This epitomises theories surrounding contextual fit, which promote contemporary expression in a manner that does not grate with the surrounding grain and

texture. While this entry scored particularly well, 24 of the 71 entries scored 10 or more out of 15 points possible. A common thread in all these schemes is the compacted suburbia approach. These results, which rate compacted suburbia positively in this typically suburban context, may also suggest its validity, at least during early periods of transition from low to medium density, to help defuse resistance from neighbours.

Three entries opted to keep some of the existing buildings on the site, a strategy that saw each of these projects score near the top of the character category. One of these stood out in particular, Entry 3 [fig 4], which also won the competition's Judges' Award. This scheme was the only one out of the 71 that developed ideas around time, the fourth dimension. The presentation projected a timeline over which full redevelopment of the site could occur, and provided several snapshots during the process. The premises driving the scheme are those of *flux* and *flexibility* of implementation and use. The designers argued that smaller houses on adjacent sites would suit current demand for one and two bedroom dwellings and in the future these could be combined into larger dwellings, should demand change [as is anticipated]. A key aspect of their strategy was to retain some of the existing buildings, allowing for them to be added to. The scheme proposed intensification by way of strategic replacement, allowing for less disruption in the wider neighbourhood. Interestingly, this entry scored in the middle of a range of amenity related criteria, such as building design and those related to private open space as well as the common spaces around the site. In relation to other schemes this one has worked creatively to allow for a flexible process of implementation and use, working with many of the existing dwellings but perhaps compromising on the potential for residential amenity.

New Zealand designers are renowned for skill in developing domestic scale projects and this programme appeared to be written to foster innovation in housing design. The proposals did not appear to offer innovation in typology as competitors worked with known typologies, manipulating them to fit site constraints and enable their architectural aims. In the formal judging, Entry 13 was the winner of Housing Design Award. This research did not place this scheme above others, indeed it only achieved in the 28th percentile for *architecture* and the 30th percentile for the *building design* categories. This can be explained by the fact this research is developed around criteria for and assessment of the relationship between buildings and the spaces that surround them, these factors influencing public amenity. As such, the issues of relevance are how dwellings relate to the public street, the extent to which habitable rooms overlook public space, and the dominance of garages. Entry 13 provided one of the more stimulating interior living environments and appeared to be deserving of the award; however the layout and captivating three-dimensional configuration did not enable a high score in this research.

Figure-5: Bird's eye sketch of Entry No 92, which proposes a contemporary intervention that that also connects with the surrounding housing stock and site development.

Failure to include criteria for assessing the internal living spaces was seen initially as a shortcoming in this exercise, however on reflection it was not considered to affect the quality of the research. Indeed, design guides and other literature [see Cooper Marcus and Sarkissian for instance] spend a few pages discussing internal room arrangements, sizes or relationships between these spaces. It is the relationships forged between interior spaces and the private and public spaces around them that appear important. Accordingly, the criteria used in assessing the building design proposals have not necessarily acknowledged the matters that extend good urban and amenity planning into the realm of good architecture, and this may help explain where these results vary from other judging outcomes.

4.3 Outdoor Amenity

As residential densities increase and tensions arise in planning the site for buildings of requisite saleable amenity, the motorcar, and outdoor space, it is often the quality of outdoor space that suffers. The scores for overall design of private outdoor space range from 23 to 41 [out of a maximum of 45 points] with one student project outlier at 9. The mean score sits at 72% and all except the outlier achieved passing scores of more than 50%. Analysis of those at the bottom of the range reveals that they were done in by poor scores for *privacy* of the outdoor spaces associated with dwellings. Privacy is a two component aggregate variable that takes

into account the extent to which outdoor spaces can be overlooked from other units as well as how effectively they are screened from adjoining outdoor spaces. A wide range is revealed with the median score sitting at 60% and 30% of all entries failing with scores below 5 [on a 10 point scale]. Another 10% of the entries sat on the barely passing score of 5. Is this simply an oversight by the designers or could poor privacy design be a consequence of a lack of empathy with the way outdoor spaces might be used in denser residential arrangements? While the question cannot be answered in this research, it does suggest that further investigation is warranted.

Scores for *orientation* of the outdoor spaces, taking into account how they are arranged for solar access, outlook, and shelter from prevailing weather, are much more positive. Here, the mean score is approaching 75% and 90% of the schemes scored 10 or better on a 15 point scale. These results suggest that designers are tuned in to the need to arrange buildings and spaces to allow for comfort in relation to known physical influences but find it more difficult to anticipate how amenity may be compromised by other residents. Good design is about finding a suitable balance between a number of influences, and there appears to be a need to provide some guidance on privacy design in medium density housing.

The outdoor space qualities can also be compared to achievement in other areas, to gauge whether one design aspect suffers in relation to others. As noted earlier, the relationship between designing for the motorcar and overall site planning is very closely linked. There is also a significant, if not as strong, relationship between site planning and design of private space that reinforces the notion that good outcomes begin with a solid plan for the site. Private space amenity is not necessarily one that can be added, if the structure is not in place to provide for it. Even though outdoor spaces are not articulated in the initial layout, they should be anticipated so that ability to plan quality private spaces is not limited fundamentally. From this it also follows that good site planning practice considers a range of scales and detail before the plan is finalised.

5. CONCLUSIONS

Responding to a number of factors, there is an increasing need to implement housing more intensively in New Zealand cities than has been done in the past. This is leading into what will be a period of transition in most places, as sites are redeveloped to make better use of the land resource and infrastructure. Barriers to medium density housing in the largely low density residential neighbourhoods of New Zealand cities include difficulty in amassing large sites, onerous requirements for accommodating motorcars on sites, low neighbour tolerance to change and a planning context that appears to have more to do with limiting effects than enabling strategic change. The predominant response has so far been a form of ‘compacted suburbia’.

In 2005, Housing New Zealand Corporation invited entries to a competition to design up to 30 dwellings on a large suburban site. An analysis of the entries was undertaken to firstly identify any new typologies of medium density housing and secondly to understand the capabilities of New Zealand designers in this housing format. The competition did not generate any new housing typologies. The organisers sought innovative designs to meet contemporary needs of social housing tenants. However, the otherwise pragmatic nature of the brief may have limited the extent to which designers could generate radical solutions. By observing the maximum density limits implementation of the winning scheme would be more feasible; however it was always destined to generate only more compacted suburbia.

The entries covered a range of capabilities in site planning. It was unexpected that 15 entries would score poorly in relation to connectivity through the site when the success of any site plan is so strongly dependent on a suitable spatial structure. Designers demonstrated a positive ability to design the common areas within the site three dimensionally and more than 90% of the teams achieved passing scores. The criteria for assessing the quality of the buildings focussed on how they would affect the spaces around them and enable residents to connect with those spaces. This fact was highlighted in consideration of the scheme that won the Housing Design Award. While that project generated innovative interior spaces, the ‘public faces’ of the dwellings provided little opportunity for engagement. The research also uncovered an apparent problem with designing to enable personal privacy, within the dwelling, and, to a greater extent, outside in the private open space. Many schemes achieved low scores and this could be attributed to circumstances of overlooking. There is a clear need to make designers aware of the need for privacy and of tools that can help provide for privacy.

Amongst the entries only one proposed that the scheme be implemented over an extended period. Several potential benefits were discussed, including the ability to take stock and refine the development programme as the scheme is implemented, that by making incremental change the process would be more widely accepted and the cost of development

could be spread out. That scheme was aided by a strategy of working with the existing houses so that ultimately only three would require removal and it was one of the few that pushed at current conventions, something that will be necessary if new typologies of medium density housing are to be generated.

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AN APPROACH TO SUSTAINABLE LOW-INCOME HOUSING

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ABSTRACT

Squatter settlements providing housing to 30-70% of the population in many urban centres in the developing countries have grown due to widespread poverty, and inadequate housing finance and land development systems. Governments assisted by the international agencies have improved environment, tenure security, income and resources in many settlements, but could not eradicate the problems as outcome did not multiply into overall development due to lack in institutional development, policy implementation, governance, participation etc. Because the problem was enormous which the government could not overcome, enablement was advocated to sustain long-term solutions. On the other hand past growing developing world cities are facing environmental problems; coupled with low level of economic and social development, which in turn is threatening sustainable development in cities. This paper argues that the spontaneous settlements in informal sector have more positive attributes in terms of social, economic and environmental sustainability as compared to dominant public housing approach. This paper further discusses the changing approaches to the issues of low-income housing worldwide in the above context, and examines the issues related to sustainable housing.

Keywords: *Housing Policy, Self-Help, Sites-and-Services, Squatter Settlement, Sustainability, World Bank.*

1. INTRODUCTION

The emergence of cities as the unchallenged site of human development and the goal of sustainable development have pushed hundreds to act as levers for strategic change, and facilitate sustainable development (Holden, 2006). Rapid urbanisation taking place in the developing world's cities needs to be critically managed. There has been greater appreciation now of their growing importance in the national economies as development has become dependent on the ability of urban centres to meet the essentials like housing. A rising standard of living and political ideologies have increased the awareness of human needs and social values (UKGP, 1998); the Habitat Conferences put the onus on the government.

The developing world's urban population is going to double by 2030, accompanied by dramatic growth in the number of slums where a sixth of humanity lives today (UNHCS, 2003). Given the social, economic and political situation of these people, most of them can afford only these ill-built and ill-served houses (World Bank, 1993). The global community is falling short of the MDG-target (Millennium Development Goal) which is to significantly improve the lives of at least 100 million slum dwellers by 2020 (UN, 2000).[1] Thus rather than shunning these settlements, governments should attempt to enhance their sustainable qualities.

This paper attempts to infer sustainable housing out of the concepts of sustainable development and compare low-income housing to the changing approaches in the developing world. It particularly examines the role of international bodies in setting the core development themes since 1950s. The paper also highlights housing as a process and the advantages of self-built incremental in situ upgrading, and supports such developments as an affordable and enabling means of providing sustainable housing to the low-income groups in developing countries. In the last section, it tries to draw a relationship between development, poverty and sustainability.

2. SUSTAINABLE HOUSING

According to the WCED (1987, p. 8), sustainable development means meeting "the needs of the present without compromising the ability of future generations to meet their

1 Slums, the 'shelter dimension of urban poverty' (have a broader meaning than inadequate housing. The number of slum dwellers in the world has increased from 715 million in 1991 to 913 million in 2001 and 998 million in 2005, adding another 50 million in 2005-7. UNHCS (2007) projects that there will be 1.4 billion slum dwellers in 2020.

own needs".[2] The idea emerged in the 1980s to bridge the gap between environmental concerns about the ecological consequences of human actions and socio-political concerns about development issues. While the conservation / preservation debate went on, the issues of population growth, pollution, and non-renewable resource depletion got prominence (Robinson, 2004). Government and private bodies adopted the term sustainable development; though sustainability reflected a more managerial and incremental but less radical approach of the Brundtland report. Academics concern was that development was seen synonymous to growth focussed on the role of institutions, governance, and social capital in sustainability (Lehtonen, 2004).

2.1 Three Pillars

Sustainable development is understood as a combination of ecological, economic, and social dimensions. This triple bottom line constitution is generally accepted as its definition (Lehtonen, 2004). The international organisations endorse the hierarchically equal, mutually interacting dimensions. While the importance of each pillar may vary contextually, the model without attributing any priority, place them as independent elements to be analysed separately. Characteristics and logic specific to each of them may conflict with others, with no basis to arbitrate between the conflicting objectives of economic rationality, social justice and ecological equilibrium (Lehtonen, 2004). The model strengthens the idea that the economy can be detached from the social context that embodies all human activities, denying the relations between human societies and their environment (Passet, 1996).

Moreover, though omni-present, these are not qualitatively equal; disagreements over their hierarchy have prevented any model from being widely adopted. However, the social dimension, often difficult to quantify, cannot be analysed through the same framework and tools as the ecological or economic one (Empacher, 2002). Passet (1996) suggested an alternative model where economic activities serve all while also safeguarding the biophysical systems for their existence; the social would be in the command of the economic and the ultimate environmental constraints. Environment is seldom the most important and relevant dimension. In some situations, social or economic aspects may be more relevant as long as their operation does not conflict with the environmental framework (Norgaard, 1994). Until recently, sustainable development was perceived as environmental issue not integrated into economic decision-making. That social dimension, considered the weakest pillar of sustainable development in its analytical and theoretical underpinnings, is seen now as important as environmental and economic dimensions (Forster-Kraus et al., 2009). Norton (1999) defined sustainability as a social imperative, not ecological with social and economic implications. Woolcock (2001, p. 66) attributed this to the fall of communism, ostensible difficulties of creating market institutions in transitional economies, financial crises of 1997, and unemployment and social marginalisation.

While the three-pillar concept has been criticised for legitimising the current goals of the society by perpetuating the economism and productivism, government agencies found favourable objectives to corroborate it. This articulated a new set of checks and balances beyond the basic efficiency-equity and cost-benefit binaries of traditional policy analysis. However, maintaining a positive balance in all three areas directly implies privileging limits and precaution over growth and accumulation.

2.2 Relation to Housing

Sustainability focusses on social and economic conditions in developing countries, their connection to environmental degradation, and coping ability. Sustainable development policies see urban development as promoting economic growth, maintaining social inclusion, and minimising environmental impact. A more directed approaches for building professionals is: “economic growth [that] supports social progress and respects the environment, social policy [that] underpins economic performance, and environmental policy [that] is cost-effective” (Roseland, 2000).

Sustainability is a political act based on human decisions and ways of life, not a scientific concept (Robinson, 2004). According to Greider (1997, p. 448), it “carries revolutionary implications” for urban planning. Against macro economic development focus, sustainability has been applied to housing only recently (Choguill, 1999, p. 133). Given the phenomena of urbanisation and severe housing problems in the cities

2 Rather than a consensus, the Brundtland report presents the term as a language truce about a set of ideas: democracy, freedom, justice (Mebratu, 1998; Guha and Martinez-Alier, 1997). For development scholars and practitioners in environmental sciences and policy, sustainable development has been a universally integrative term, elevating the idea beyond urban planning and policy domains.

that use the greatest resource and generate the most waste products and pollution, the concept has relevance to housing with economic, environmental and social implications.

The concept of sustainable human settlements may remain meaningful within the waste absorptive capacity (Foy and Daly, 1992, p. 298), sustainable use of renewable (Daly, 1992, p. 253) and replenishable (Rees, 1996) resources, minimising the use of non-renewable resources (El Sarafy, 1989), and meeting basic human needs (Hardoy, et.al, 1992). The last criteria distinguished from generalized approaches, guides the housing issues. The economic sector addressing the financial aspects of social justice, accompanying the environmental sustainability, is an important element of it, while the environment constrains economic growth. Social sustainability refers to "policies and institutions that can integrate diverse groups and cultural practices in a just and equitable fashion. As cities develop, the degree of social inequality, cultural conflict and political fragmentation within urban boundaries increases" (Stren and Polese, 2000).

The free-market city attempts to overcome both environmental and social challenges as general wealth of society increases, increasing scope for protecting environment. Target of sustainable housing initiatives must be economically viable, socially acceptable, technically feasible and environmentally compatible. The brown agenda laid down guidelines for sustainable urban development, followed by the UN calling the local governments to mobilise broad-based, participatory, and sustainable environmental improvement. Implementing the agreements reached at the 1992 Rio Summit required a concerted action at the local level (Agyeman and Evans, 1996), focussing on community participation, partnership, accountability, etc.

3. HOUSING POLICY AND PRACTICE

In post-WWII period, public housing became dominant in the developing countries, though resources were spent mostly for the privileged (Keivani and Werna, 2001). Aimed at eliminating the substandard shelters, this could not overcome the escalating urbanisation, overcrowding, poverty, and informal settlement growth (Pugh, 1995, p. 63), and meet the low income populations' demand.[3] Crane (1950) attacked the paternalistic thinking that only architects and allied professionals can deal with housing. Turner (1976a) too condemned architect-designed low-income public housing for being expensive and authoritarian. Back (1962) and Safa (1964) found that regimentation and lack of choice in these were disliked by occupants, whereas variety of social, psychological, and economic advantages in self-help offered a breakthrough in housing problem (Frankenhoff, 1967).

Critics of public housing and modernist urban development grew further. Abrams and Turner influenced the low-income housing theories and policies for decades, drawing attention to the process inherent in informal settlements (Choguill, 1999). They brought the gross housing shortages and huge squatter settlements lacking in basic utilities into the world's notice in the 1950s. Using incremental building in the low-income settlements, in situ upgrading became the main form for improving their conditions (Abbot, 2002). Watts (1997) credited Turner for taking shelter programs out of slum clearance in setting-up policies to assist individuals to solve their own problems.

Turner (1976a) advocated sites-and-services and slum improvement schemes identifying the aspects of self-fulfilment of the slum-dwellers and their commitment expressed in housing (Pugh, 2000). Defining an extended process by 'freedom to build' or 'verb', he supported owner-built homes, however modest, to well-built public housing as those embodied the poor's capability to participate (Harris, 2003) fitting their circumstances (Choguill, 2007). Such autonomy was fundamental to Turner (1968), who argued that squatter settlements improved over time within means more affordable to both the dwellers and the government. Therefore, upgrading and self-help would be more sustainable compared to typically unaffordable public housing schemes that did not reach the target groups (Rahman, 1999, 2004). Advocated by experts and international agencies ever since (Harris, 2003), these not only invested sweat equity, but also provided 'control', and hence were solutions, not problems (Mangin, 1967; Drakakis-Smith, 1981). The World Bank championing urban project assistance in the developing countries adopted self-help upgrading; these were well established, and remained broadly valid since the 1987 International Year of Shelter for the Homeless.

3.1 International Community

The international agencies gave direction to the consulting community, governments, and the UN (Choguill, 2007) trendsetting for development thinking (Huchzermeyer, 1999).

3 Grimes (1976) found that families in Ahmedabad, Bogota, Hong Kong, Madras, Mexico City and Nairobi could not afford to buy a 'cheap' subsidised government house. 90% of the urban population depended on the private and informal sectors (Baross and van der Linden, 1990; Drakakis-Smith, 1981; Kevani and Werna, 2001).

Abbott (2002) identified the shift from public housing, mandating self-help through sites-and-services and in situ slum upgrading, when the housing policies of the developing nations were devoted to complete houses (Peattie and Doebele, 1973). Since this could not solve problems till the 1960s, international bodies and governments started assisting the poor to build their own houses.[4] 1972–82, 1983–93, and post-1993 were the phases when they modified housing development strategies (Pugh, 2000), drifting from a focus on self help to relating to other development sectors (Kessides, 1997). Full cost recovery was essential in these schemes as large-scale subsidies were infeasible (Choguill, 2007). The international credit could also be repaid after making economically and socially responsible uses (Pugh, 2000).

Early planning preferred housing development on vacant plots that had political, professional, funding and management advantages (Abbot, 2002). Still unaffordable to at least 20% of people, it was found that sites-and-services schemes could not be sustained (Kearne and Pariss, 1982); these did not multiply benefits, address the subsidy issues, eradicate poverty, or increase ownership. The 1976 Vancouver Habitat Conference recommended government's intervention to enhance the Poor's access to resources that involve large infrastructure and investment. The 1996 Istanbul Conference further proposed public-private partnership involving the stakeholders to identify and transform priorities into action plans: creating institutions for urban environmental improvement, and building capacities to participate and cooperate. The policy shift accepted informal settlements for a lasting development (World Bank, 1991).

But the same standard of service delivery in settlement upgrading as in formally planned ones was ineffective. Thereafter, leaving low-income infrastructure provisions to the community to plan, build and manage led to the progressive improvement model (Choguill, 1999). Similar to settlement upgrading, utilities could be gradually upgraded, and thus be affordable and sustainable. This sought to match the level to the ability of either the community or the local authority to manage in a sustainable way. Community decision-making and wide ranging interventions made such approach successful in the Sri Lanka million houses program.

Otherwise, costs could be seldom recovered, project sites were remote from employment opportunities and unaffordable, institutional capability and expertise to implement and monitor was often weak, and therefore gentrification compounded the problems, corruption was often rampant, inhibiting accessibility, and the projects did not lead to wider socio-economic development (Pugh, 1990; Nientied and van der Linden, 1985; Skinner et al., 1987; Turner, 1980). Moreover, outputs made no qualitative or quantitative impact (Rahman, 1999).

3.2 Holistic Approach

Sustainability cannot be brought without making the economy, environment and society parts of an overall development (Barbier, 1988). Institutions had to be backed by comprehensive urban policies to sustain programs in the long run (World Bank, 1983). Yet project-oriented self help schemes not translated into overall changes continued due to available funding, and instant benefits (Rahman, 1999). Large-scale upgrading became an essential part of urban planning affecting the informal settlements, e.g. in Karachi (Saleem, 1983) and Indonesia (Silas, 1983).

Thus policies in the 1990s shifted to institutional reform. Gradually withdrawing from direct involvement, funds were generated and channelled to social housing with self-help components through structured finance and purpose-built institutions, NGOs, and CBOs. This allowed faster fund disbursement, better chance to reach target groups, and increased recovery through credit groups.[5] The projects recovered the cost by setting affordable targets; these remained sustainable following the affordability-accessibility-replicability principle (Choguill, 1987),[6] more successful in countries with developed housing finance systems (Rahman, 1999).

4 Assisted self-help, more affordable than public housing but devoid of control, became part of international agencies' wisdom in the 1950s (Harris, 2003). Later sites-and-services aimed to assist and repeat the success of informal sector's incremental building to supply affordable houses to the low-income group. Another type, core housing, could be occupied quickly and extended when the resources were afforded.

5 *Grameen* Bank's housing credit to the poor to transmit social development is supported by international agencies (Rahman, 1999). The World Bank in 1988 in India gave the Housing Development Finance Corporation US$ 250 million to develop housing finance institutions for the low-income group. With Bank loans, Chile introduced vouchers for sites-and-services schemes. In Brazil, *Parana* Market Improvement Project (1983–88) created a municipal fund with Bank's seed fund.

6 Capital costs were to be set by the target group's ability and willingness to pay, not by planning ideals and design standards. The successful projects need to be identified and improved (Abbot, 2002) for replicating in similar situations (Choguill, 1987; Pugh, 2000).

This set to develop finance more, reduce the backlogs, increase infrastructure, reform negative land management and land policy, introduce financial transparency to increase competitiveness of the construction industry, and establish or reform institutions (Pugh, 2000). Social effectiveness was brought by decentralising responsibility of maintenance and cost recovery through the beneficiaries' groups. Against the earlier shelter-oriented approach, the 1980-90s prioritised broader and deeper institutional reforms and development, creating a strong base for reorienting future policies. Since financial markets in many developing countries were weak, funding through the municipalities was appropriate.

Recent thoughts on development policy, instigated by Stiglitz (1998) and Wolfensohn (1999), were followed by many developing countries that opened up the market. The Bank (1999a) emphasised on broader urban issues in the late 1990s to enhance and sustain economic growth and modernisation. Thus improvement of living qualities, poverty reduction, job creation and production, environmental sustainability, and enhancement of agglomeration economies were included as strategies to strengthen a balanced urban development (World Bank, 1999b).

3.3 Housing Process

Informal housing is a necessary part of urban growth in the developing countries (UNCHS, 1996a; Gilbert, 1990; Drakakis-Smith, 1981). Appearing disorganised and inadequate, these can be gradually upgraded as needs are felt and resources are available (Angel and Benjamin, 1976). Low-income people can live in incomplete shelters, and consolidate and improve those over time (Drakakis-Smith, 1981; Turner, 1976b), slowly shaping communities.[7] Formal sector ignores the needs of survival and flexibility of the low and intermittent income of the poor (Smets, 1999); whereas incremental upgrading distributes the affordable consumption and saving over time, increasing sustainability. Low-income dwellers can house themselves at less than the formal sector cost as the occupants would do much work by using unconventional materials and techniques. The process can halve the initial requirements compared to formal construction costs (Benjamin and McCallum, 1985), in exchange for social obligations of the family. Self-management replaces up to a third of the labour cost (Payne, 1983);[8] participatory improvement is a saving too (Pugh, 1994). In reality though most self help projects involve some degrees of paid labour and contract building; 92% sites-and-services households in Lusaka used hired labour (Tipple, 1994).

Despite a humble result, house building is an apocalyptic event for a low-income family, co-opting family members, marshalling all physical and monetary resources, and calling upon the community and the family for for longer commitment to make improvements and additions over time. Self-management with skilled crew and hired labourers works with incremental building process too. Thus informal sector self-help and self-built is providing housing to 30–70% of urbanites in many developing countries (Keivani and Werna, 2001), and more is acceptable and suitable to their socio-economic needs (Turner, 1976b), and are more affordable and sustainable.

Most housing solutions, focussing on price reduction to match the households' ability to pay, ignored their willingness to make extra effort to match financial requirements. With ownership prospect, household can readily devote more of their monetary and commit non-monetary resources like spare time (Ward, 1984a; Rahman, 1999). Though low-income families have little savings, some of them could gather other resources (Keare and Jimenez, 1983), often through sacrifices (Rahman, 2004). They improve affordability by using allocated space (CIVIS, 2003), for example by renting out or using as workshops, often involving more family members (Setshedi, 2006; Mai and Shamsuddin, 2008).

3.4 Expression in Housing

Secure or expected occupancy rights motivate expression of built form in squatter settlements; while extending shelter and occupiers mark own identity on it. This becomes sustainable due to their commitment to place and home (Turner, 1976b) through their ability to participate and express, perceiving the improvements as part of wider resident activities. Such enhancement of aesthetics and cultural amenities is less discussed compared to functional

7 Strong group cohesion and the emergence of political leaders and CBOs that induce investment in housing and influence national leaders for recognition and facilities were the distinguishing features of squatter consolidation (UNCHS, 1996a; Gilbert, 1990).

8 Materials cost is reduced by buying recycled and used items in informal sector. Family labour is usually free; skilled labour can be bartered for. Gerrul (1979) calculated that in lower-income housing, 35% labour is self-help; another 60% is semi-skilled.

dominance; Marcus (1995) focused on the residents attaching meaning and improving their home.

The environmental change, local culture, and design and construction knowledge show colour, adaptation, and ritual and festival spaces; and create specific and varied living environments (Rapoport, 1988). A make-shift shack— the outcome of rational thinking utilising limited available resources, reveals beliefs, aspirations, and the world-view, simultaneously impacting the political, visual, and cultural thought. Professionals could learn from these spontaneous open-ended, multi-sensory, semi-fixed 'architecture adding on elements, like in a 'designed' building, which is about human drive, vision, interest and place identity.

4. DEVELOPMENT, POVERTY AND SUSTAINABILITY

Poverty is about the lack of capability to expand social opportunity in markets, in state policy, and in households. These development requisites focus on the freedom of individuals to choose worthy values and lives (Sen, 1999; Sen and Wolfensohn, 1999). Personal commitments and appropriate human bondage generated in low-income housing through freedom and control over the process can lead to poverty reduction. Fogel (1994) argues that qualities of housing increase health and economic productivity over long-term development transitions.[9] This is evident in the low-income housing requiring social co-operation to improve environmental conditions in a sustainable way.

Environmental regulation combined with market based town planning, can play a part in ameliorating the slum problems if sufficient resources and powers are vested. The market sensitivity to building performance and impact is usually inhibited by price inflation linked to excessive demand for social, economic and other benefits; the scarcity subject low-income housing to exploitation (Tipple, 1994). Integrating poverty alleviation and environmental improvement, Brundtland concluded that "ecological sustainability cannot be achieved if the problem of poverty is not addressed" (Robinson, 2004, p. 372). She linked the issue of environmental deterioration with that of human development, both affected by poverty.

Environment problems in the 1980s were regarded as minor, technical, and politically uncontentious that could be duly solved by economic growth and social progress, as increasing wealth created the resources including technology. The view now is that environmental problems require significant social and economic changes, not merely technical solutions. Sustainable development is the vehicle for this change, addressing the conflict between environmental protection and economic growth. It accepts that the former requires fundamental change towards economic progress and institutional policy. This is compatible with continued economic growth in a capitalist system.

Favouring the human-centred nature of the Brundtland Report, the reformists suggested that the answer to unbalanced consumption, i.e. the environmental concerns, lay in promoting more of sensitive human development that requires improvements in technology and efficiency. Avoiding spiritual values or individual responsibility, it focuses on collective institutional responses and social responsibility, and embodies an anthropocentric approach around human needs.

Combination of sustainability with development, its greatest threat, is paralleled by calls to combat exclusion of the low-income group (Clark, 2001), and restore a broader social and economic purpose of housing equity. The aspiration is not matched by the commitment to provide the resources and powers necessary to change the status quo; politicians and bureaucrats may adopt language and sentiment without the will or means, or empowering the poor (Rahman, 1999). Only a process of political mobilisation and mass education can change assumptions and behaviour. Under ideal conditions acquisition and incorporation of intelligence replaces rhetoric, informs policy, and leads to a measured approach to current anxieties. But we commonly deal in a less scientific or certain way as rhetoric and vision influence priorities and decisions.

4.1 Poverty and Housing

The WCED recognised poverty as a major source of environmental degradation. Yet development agenda revolved around macro-economic stabilisation through relentless export-led growth and market liberalisation of the early-1980s. The 1997-98 financial crises showed that such approaches followed by many developing countries is

9 Apart from the social benefits, housing generates production, income, employment, savings and consumption (Burns and Grebler, 1977). While it leads to labour output and investments in non-housing, that in low-cost housing is not significant. It can make under-utilised labour productive at low cost (Raj and Mitra, 1990). Moreover, investment in low-cost housing attracts low import; incremental investments generate a higher domestic multiplier than import-sensitive investments (UNCHS, 1995).

compounded by absence of a broad-based politics of socio-economic development (Pugh, 2000). Stiglitz (1998) favoured medium-term strategic development policies to alleviate poverty through socio-economic transformation. He advocated holistic societal changes understood as development transitions: improving the environmental and health dimensions, the changing volumes and characteristics of poverty, etc., not isolated development of individual sectors. In an overall context, such development policies could use transitions emphasizing on different sectors, based on the context-based realities and socio-economic opportunities.

The WCED downplayed the extent to which wealth could alleviate poverty and improve environment (Roseland, 2000). Trainer (1990) was dismayed that it chose economic growth and attendant social and environmental impacts (e.g. exploit labour and environment) over a consciously appropriate development strategy for the developing world (e.g. adequate housing and clean water, not industry and export). NTFEE (1987) stated that "sustainable economic development does not require the preservation of the current stock of natural resources or any particular mix of human, physical and natural assets. Nor does it place limits on economic growth, provided that it is socially and environmentally sustainable."

Sen (1987, 1999) criticised the way neoinstitutional and ecological economics direct towards the conventional economic theories, based on individual capabilities and the concept of 'social capital', to address the social dimension of sustainable development. This meant the alternative combinations of functions that a person can achieve set his priorities - from elementary like shelter to complex like community participation (Sen, 1999). Policies should not focus on collective outcomes, e.g. the distribution of income, but rather on building individual capabilities, and ensuring that people have the means and freedom to convert economic wealth into desirable outcome. A key element in Sen's approach, even the poor value it significantly that may be irrational to traditional economy maximising utility. But self-help and identity in housing is more important for sustainability.

Ballet et al. (2003, p. 6) defined socially sustainable development as one that "guarantees an improvement of the capabilities of social, economic or environmental well-being for all, through the aspiration of equity on the one hand, as intragenerational distribution of these capabilities, and their transmission across generations on the other hand". He extended the notion of capabilities from individuals to cover societies too. The structure of capabilities expresses the adaptation of an individual or a society to a number of external constraints.

The capability approach emphasises on the improvement of social conditions from one generation to another, and on the interactions between the three pillars. In designing policies, not only the effects of economic and environmental actions on the social dimension, but also decisions within the social sphere itself are important. This expresses individualistic (capabilities of rational and responsible individuals) and social (capabilities of a society and the roles of its actors) views, not necessarily in harmony with each other, since the improvement of education, health, employment, etc. may even threaten cohesive groups. Social actions like poverty reduction programs may often adversely affect certain capabilities, leading to an increasing vulnerability of individuals and social inequalities as a result. Actors are to decide which capabilities are to be considered.

4.2 Enablement

Crane (1950) viewed self-help as part of a process of community development, requiring and encouraging cooperation. The project-linked participation of the Sri Lanka Million Houses program (Lankatilleke, 1990) had planning, design, implementation and maintenance stages. Hamdi and Goethert (1996, p. 78) identified planning as crucial for the community and the city to jointly take key decisions and define the program. The Recife Declaration on community control over decision-making stressed the importance of the integration of the informal city. However, the support to community participation in the 1980s was lost later (Abbot, 2002).

Reducing the state's involvement in directly providing housing and expanding the role of the private market was accepted by the late-1980s, in most developing countries irrespective of ideology or political structures (Israel, 1990). Governments had played the hopeless role of provider by constructing housing to reduce the shortages. The enablement strategy, responding to the urgency for scaling up supply, aimed to create a congenial economic and social framework to enhance economic efficiency and social effectiveness to grow capability to solve own housing problems. This could be met by expanding the role of the private markets, rather than relying on limited project based approaches.

Given the private sector dominating housing, enablement could expand nationwide production by supporting the formal/informal markets and the self-help of the low-income households. Attention was directed toward devising ways

of providing the financial, legal and institutional support (UNHSP, 2005, p. 25). The international agencies started to encourage the creation of an enabling environment emanating into deregulation and institutional development of the land and housing markets to overcome the external constraints (LaNier, 1987; Kimm, 1987).

The Global Strategy for Shelter to the Year 2000, based on the 1993 World Bank housing sector policy paper, emphasized enablement, the sector's contribution to macroeconomic development, and pro-poor policies involving subsidies targeted only to the deserving poor. It proposed the enablement of private markets for scaling up housing production and developing the sector as a whole. UNCHS in June 1996 founded 'Adequate Shelter for All and Sustainable Human Settlements' in the Habitat II on enabling strategies for private markets (UNCHS, 1996b).

Enablement would bring together technical know-how and capacity of development agencies, use available resources, and recognise and define responsibilities of all stakeholders, through an inclusive participation by residents from all strata. The underlying socio-economic rationale could guide the roles of each partner in the multi-institutional and multi-organisational environment: private enterprises contributing efficiency and entrepreneurship, CBOs mediating between households and government agencies that provide urban management expertise, and the participants providing self-help resources, and localised relevance in the upgrading efforts (Pugh, 2000). Weak institutions, narrow coterie interests, corruption and market manipulation could fail the complex process.

Such enablement framework could work for new housing for other income groups too, where the builders could access competitive finance. Implementation of proper land policies coordinated with the infrastructure and utility agencies could ensure adequate supplies of well-placed ready land at affordable price. The legal system could protect property rights, developed finance institutions could introduce attractive instruments to generate and manage funds. The overall policy and enablement framework could have pro-poor and egalitarian elements for social-relevance and sustainability.

Rather than constraining choices, affordable housing can improve the socially sustainable environment (Forster-Kraus, et. al.; 2009). Enablement brought sustainability in sites-and-services schemes in India, and in the small loan program in Sri Lanka, Singapore, and Chile (Pugh, 1997). Enablement could overcome the effectiveness or the comprehensiveness not achieved due to poor finance sector and institutions.

By the 1990s, it was evident that benefits could not be sustained without good governance (Rahman, 1999). Therefore within institutional reform, enablement focussed on governance in economic, education, health, environment, housing, urban and other sectors The emphasise on state–market–society relations encouraged community-based participation in upgrading the squatter settlements and owning community assets so that people were enabled to improve themselves in a transparent and accountable environment (Rahman, 1999).

5. DISCUSSIONS

Despite efforts by all concerned, squatter settlements remained a dominant form of dwelling.[10] The locales for the life's drama, huge contributions in socio-economic transformations, have shown sustainability amidst squalor and disease. Specific institutional conditions and processes of people living in these settlements influence their housing and social status. These settlements are necessary and important in terms of both product and process, and use in built form and socio-economic (Kellett and Napier, 1995). The intricacy, variety, accomplishment, and resource efficiency in these built forms also have social, cultural, economic, political, and architectural implications (Pugh, 2000). Some of them have also added economic and aesthetic value to urban assets.[11] Varying in theoretical, economic and technical characters, these have dominated literature too. (Ling, 1997).

10 Slum population in India has more than doubled in the past two decades; in 2001, 54.1% of Mumbaians lived there (NIHFW, 2006). A quarter of Sao Paolo population lives in poor conditions. With more slums dwellers, Kolkata has a higher slum density. Based on water and sanitation access, 99% of Afghan and 94% in Central African Republic people live in slum condition; a third of the Argentines experience the same. Nearly 175 mil Chinese, 158 mil in India, 42 mil. in Nigeria and 36 mil. in Pakistan live in slum conditions (UNFPA, 2007).

11 Cross-subsidisation in land pricing and allocation enabled sites-and-services and squatter improvement programs to reach the poor in the 1970s and 1980s in Chennai. Housing investment and wealth of all income groups increased; the contracting between the World Bank, state government, and the project authorities blended state, market, and household self-help roles (Pugh, 1990, 1997). In the *Kampung* Improvement Program, the World Bank provided US$ 439 million in project loans, to improve living conditions, housing investment, incomes, and health. Some of its lessons led to wider participation and deeper reforms (World Bank, 1995).

Assisting self-help programs from 1950s, the funding agencies changed their methods from site-specific projects to programs mediated through formal institutions, and subsequently to developing policies, cooperation and participation. Self help, central in socio-economic, political, environmental and developmental sustainability, goes beyond the construction and management of housing and the environment. The domestic sector is more sustainable as it uses own resources to produce home-based goods and services, depending less on imported materials and technology. Those without proper housing lead socially excluded diminished lives, unable to participate fully in the community. Further human development depends on access to services and a secured, safe and healthy environment; basic housing provides foothold to the poor for accessing other benefits (Peattie, 1987).

Though self help, household economics, affordability, and home sense could describe the roles of individuals and households, the economists ignored non-economic resources, time and energy used for home building, domestic chores, income generation, physical improvements, human capital formation, and personal and community activities (Pugh, 1997; Stretton, 1976). Most of these, e.g. the value of the product and human capital, including time and equivalent market products, and attribution of childrearing in human development, are measurable and thus are significant factors to be considered.

Market forces and official guidance only cannot meet contemporary aspirations, rhetoric, commitment or technical possibilities; environmental justice is also involved as proper housing brings social and economic goods (Clark, 2001). The domestic, commercial, and the public sectors are interdependent in bringing overall socio-economic development of the low-income groups. Thus domestic economics remained important in sustainable development through affordable housing and environmental improvement, supplementing other areas by contributing to the human development.

The state is forced to tolerate some illegal and irregular housing (UNCHS, 1996a; Gilbert, 1990; Drakakis-Smith, 1981); it denies better housing to maintain the status quo. As the legal, professionals and participatory processes may not concur in its modality, squatter upgrading is not readily accepted (Rahman, 2001).[12] While a few accept aesthetic of squatter settlements, the authorities loath them (Peattie, 1987, 1992), which have instigated demolition of shelters and destruction of communities that have rights to improve their settlement. Some politicians, planners, and intellectuals accepted that settlements of the poor were communities and deserved respect. Jacobs (1961) articulated the functional aspects of what planners and politicians label slums; Stokes (1963) called them "slums of hope." Since international policies now favour in situ improvement and regeneration, the self help and the modern technology can cp-exist (Rahman and Mai, 2010).

Recognition of squatters housing rights, income growth, and the development of social capital and empowerment (leadership, organisation, networking, etc.) brings environmental improvements for low-income groups. Thereon, social, ethical, and aesthetic expressions cover the range of living, and encompass environmental, social, economic and political facets, and those that encourage people to value lives. They upgrade low-quality makeshift shacks incrementally into wholesome structures, encouraged by tenure or affordable in situ improvement. Allowing one to participate and express attachment results in more commitments to affordable and sustainable improvements.

Squatter settlement cannot be retained and regenerated by shunning the other development sectors. Social homogeneity, good community leadership, prior social co-operation experience, visible outcome, prospective ownership and the affordability can help to achieve consensus regarding development objectives and means (Rahman, 1999). Despite varying contexts, all settlements require to develop socio-economic, leadership and institutional capabilities. Environmental improvements can be converted into action plans and partnership by distributing responsibilities, attribution of costs and self help, and participatory and transparent management. In essence, both the process and the project need good governance, organisation, and policy (Pugh, 2000).

If legitimised and assisted, the large informal sector in most developing countries providing for the low-income groups can contribute in socio-economic developments (Fernandez and Varley, 1998), in conserving economy, construction,

12 Social groups in Jordan strongly contended priorities and access to political and economic power (Raed, 1998). Public urban renewal attempts in Delhi in the late-1950s were resisted, growing recognition that low-income communities had intrinsic value (Clinard, 1966).

environment, and health, and hence beckon for sustainable improvement. The regeneration schemes are sustainable as these improve living conditions, providing social opportunities for millions to add more socio-economic and environmental values than high-profiled projects. It is essential to enhance these through participatory democracy (UKGP, 1998). Local government, an elected representative, can make accountable planning and development decisions to move toward sustainable communities (Roseland, 2000).

Potentials for retaining and regenerating squatter settlements vary with their characters. Improvement can take place spontaneously in settlements where a form of tenure security is foreseen. Political skills and pressures often influence the selection of improvements and the distribution of costs and benefits. State-assisted regenerations often involve redesigning and re-aligning lay-outs (Potter and Lloyd-Evans, 1998), which disrupts socio-economic network and identity (Rahman, 2001), instead of preserving things of worth for the target group. This should be part of overall housing development and urban macro-spatial planning and stockholders participation.

6. CONCLUSION

Urbanisation of poverty (Whelan, 2004) is increasing number of underprivileged in urban areas. The MDG urged to improve by 2030 the lives of a part of about 2 billion people living under increasing poverty and social inequality accompanying the unprecedented urban growth (UNCHS, 2007). Evictions ignore the socio-economic problems that cause slums; the low income of the majority due to an unavailability of adequate jobs, poor education available for workers, and low productivity due to poor health, and redistribute poverty to less valuable real estate (Rahman, 2001). Economists have been advocating the state's welfare roles to cover institutional reform, social and private property rights, and governance quality. They focus on the way the economic ethics and quality of institutions define norms, property rights, compliance procedures, etc. which influence performance in the long-term development. Institutional reform lies at the heart of governance and is prioritised in current urban development and policy agendas (Pugh, 2000).

Sustainability in housing is meaningless as an end only. Project based policies popular in developing countries cannot meet the requirements of a billion people living in severe housing conditions (Tipple, 1994; UNCHS, 1996b). International agencies want to replace the unsuccessful approach with contextual sustainable housing policies to balance the tensions between economic growth, the environment, and social impacts.

The three-pronged approach has conceptualised urban development and has promoted economic growth, maintained social inclusion and minimised environmental impact. Most of the focus in the literature has been placed on economy and environment, though sustainable housing is more than just that. The economic sector addressing the financial aspects of social justice, accompanying the environmental sustainability, is an important element of housing, while the environmental concerns constrain the economic growth.

Robinson (2004) argued to integrate the social dimensions of sustainability with the biophysical dimensions; as addressing environmental, social or economic concerns only were insufficient. This required a trans-disciplinary thinking that actively creates synergy, not just summation. Although conventional analyses recognise the need for changing the practices, few realise that moving towards a sustainable society requires more than minor adjustments. It must also be integrated across sectors or interests; governments alone have neither the will nor the capability to accomplish sustainability. Hence the private sector must be involved, supplemented by the monitoring, capacity building, and alternative service delivery roles of the NGOs.

Sustainable development implies a shift in the capacity of individuals, companies and nations to use right resources under favourable legal and economic arrangements. Sustainable community development initiatives are not only interventions, but also learning processes to mobilise positive shifts. Changed behaviours like using urban space efficiently, minimising the consumption of essential natural capital, multiplying social capital, mobilising citizens and their governments, can prevent many environmental and social disasters, to create healthy, sustainable more pleasant and satisfying communities.

Sustainability, “an attack on conventional thinking and practice” (Gibson, 2001, p. 6), and a framework for urban futures, provides a hope for solving the urgent environmental and societal problems (Roseland, 2000), like low-income housing. Since in open market, environmental factors affect many, right to affordable secure housing must be freed of property speculation and economic competition. Though, policies for sustainable housing in isolation may not overcome the urban problems, without them no solution can be found.

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Jon Calame
Minerva Partners, New York

Expanded Ethnic Enclaves are Rome's Reply to Its "Nomads Emergency"

The overgrown males now all sally forth from their cells, and disport themselves on the combs; and so crowded does the too prosperous city become that hundreds of belated workers, coming back from the flowers towards evening, will vainly seek shelter within, and will be forced to spend the night on the threshold, where they will be decimated by the cold.

– Maurice Maeterlinck, The Life of the Bee

ABSTRACT

This paper examines the motives, mechanisms and political strategies that underlie the construction of ethnic ghettos for the Roma of Rome, using those observations a point of departure for a fuller understanding of how much ghettos from different times and places have in common. Key comparisons will be made to Italy's Jewish ghettos of the 16th century and native American reservations of the 20th century in the United States. It will be argued, using this broadly comparative approach, that it is more useful to speak of a resonating ghetto system than of separate ghetto narratives – if the mechanisms are to be replaced. For those with a special interest in the origins and evolution of the ethnic enclave as a mechanism of social control, these findings and ruminations may offer some small insight or jumping-off point for more refined exploration.

1. OVERVIEW

To physically enclose and isolate ethnic minority groups at the periphery of demographically diverse cities has been a popular strategy among urban managers for centuries, employed particularly during periods of rapid growth or political transition. The system reached an apex with the Jewish ghettos of the 16th century Italian city-states – stressing the notion that the lifestyle of Jewish citizens posed a persistent threat to the "health and honor" (Siegmund, 2006, p. 205) of the majority. Centuries later, walled ethnic enclaves within strategically important cities still characterized civil conflicts in Cyprus, Lebanon, Bosnia, Israel-Palestine, and Northern Ireland, while ethnicity defined regional partitions in South Africa and post-colonial India, etc.

Despite many important differences, all ethnic ghettos have a strong family resemblance because these support a single fundamental political strategy; they constitute a semi-permanent containment regime for a despised minority of minimal economic value to the host community. Today's ongoing ghetto-building projects are supported by hand-crafted pieces of special legislation that support normally illegal activities, and for this reason – putting aside the purely ethnic concerns implied by this approach –Êdeserve special attention.

Italy's authorized Roma camps of 2010, with familiar gates, fences, and density, show the ghetto system in evolution. The diverse Roma communities of Rome provide a complete illustration of the trend: they generally live in 17 peripheral "camps" (Legge regionale, 1985, art. 2) – some authorized and subsidized, some unauthorized but tolerated – supporting about 7,600 persons. Living conditions in all the camps are inadequate in relation to crowding, sanitation, privacy, and access to markets, workplaces, schools, and hospitals. While the United Nations, EU, and others uphold the human right to adequate housing regardless of legal status, providing standards for space, privacy, security, ventilation, location, plumbing, sanitation, etc., the Italian government has short-circuited or simply ignored these standards in the process of designing a constellation of Roma camps that hover at the periphery of several major cities.

The result is a clearly articulated, painfully felt, second standard for the Roma in relation to living conditions and access to opportunity. Far from hiding its project, the Italian authorities so far have met with significant popular support at the domestic level, have broadcast their intentions to expand the existing program to include mega-camps –

nicknamed "Solidarity Villages" (Excerpts from the Minutes, 2007) – and have effectively disregarded numerous complaints, reprimands and indictments issued by the relevant authorities in Brussels. Physical living conditions in the camps provide a useful barometer for measuring the gap between real conditions and minimum legal standards, though it is understood that a successful outcome would not be merely improved housing but rather a dismantling of the ethnic enclave paradigm as a whole, regardless of the quality of the built environment.

2. A NEW GENERATION OF ETHNIC GHETTOS

A new generation of ethno-racial ghettos has emerged in Europe to cope with the new fluidity of minority communities viewed as unassimilable. At the forefront of this emergence are the Roma ('gypsy') enclaves authorized and engineered by the Italian government beginning around 1985 and intensifying in recent years under the auspices of both liberal and, at present, decidedly right-wing administrations. The Roma enclaves of Rome fall squarely within the long tradition of ethnic ghetto construction in Europe and elsewhere: they are a strategic reply to nameable and predictable political circumstances, they produce a kind of engineered precariousness, and they exert a specific form of juridical violence through bureaucratic statecraft in a concerted effort by authorities to assert self-legitimization of the state during a period of broad-based insecurity. By institutionalizing a permanent double standard for physical living conditions within a democratic social framework, Italian authorities have thrown down a gauntlet which should be taken up by the European Union in defense of adequate housing standards for all marginalized groups.

With this summer's reports from France of the vigorous eviction, detainment, and deportation practices undertaken by Sarkozy and aimed at the Roma community (AFP, 2010), it is not difficult to accept Italian Foreign Minister Roberto Maroni's suggestion that France is "doing nothing more than copying Italy" (Al Jazeera, 2010) with its newly aggressive, and disciplined, expulsion strategies.

While these policy makers compete for author's credit, it is interesting to take a close look at the mechanisms they have employed to contain and marginalize their Roma citizens. The heterogeneous communities of Roma people in Italy have experienced substandard living conditions for centuries, a product of their troubled relationship with the majority culture and a legacy of callous discrimination towards them in Europe. Today approximately 140,000 Roma reside in Italy and about 7,400 reside in Rome. Of these, approximately 60% are Italian citizens, 15% are itinerant, 35% are settled in enclaves built or tolerated by the government, 75% are illiterate, and fewer than 3% will live beyond 60 years.

The example of Roma enclaves on the periphery of Rome – about 17 can be found, half authorized and half unauthorized – may offer a useful case study.

The problem addressed here is the coercive deployment of sanctioned ethnic enclaves – physically isolated and sealed from mainstream urban residents – by the Italian government as the permanent housing strategy for a Roma community viewed as congenitally mischievous and economically valueless. American relatives of these dreary places might be the Japanese internment facilities of the 1940s or contemporary Native American reservations.

3. BACKGROUND AND PRECEDENT

Though the word 'ghetto' seems to stem directly from the Jewish template conceived in Venice conceived around 1516, and while many useful similarities between the medieval prototype and the newly minted ethnic enclaves exist, here the term is used more broadly with reference to Loïc Wacquant's expanded notion of a "a sociospatial contraption" (Wacquant, 2008, p. 4). Wacquant argues convincingly that this device is used to support "specific regimes of racial domination", and "affix blame for unpalatable social facts" (Wacquant, 1997, p. 226) complementing a broad, bureaucratic program of "punitive containment of the poor" (Wacquant, 2000, p. 177). More specifically, Wacquant suggests that a ghetto is an institutionalized mechanism of physical closure and social control that typically provides for the involuntary, permanent, and total residential segregation of prescribed minority groups that are popularly perceived as an occupational threat, an economic burden, or a social menace in relation to the majority. These meanings were foreshadowed by the Jewish ghettos of the 16th century and are implied here with reference to a ghetto system.

Because the history of urban development in the western tradition is littered with ghetto projects, the logic of the ghetto system is not difficult to discern. There is much to be learned, for example, from the unfolding and decay of South African townships, South American favelas, North American Hoovervilles, and the ethnically partitioned cities of the Balkans; through these comparisons we can recognize the political calculus and confirm the prerequisites that led most recently to the conspicuous decrepitude of Italy's enclaves. In most examples, ghetto construction emerges from a climate of broad-based anxiety, economic insecurity,

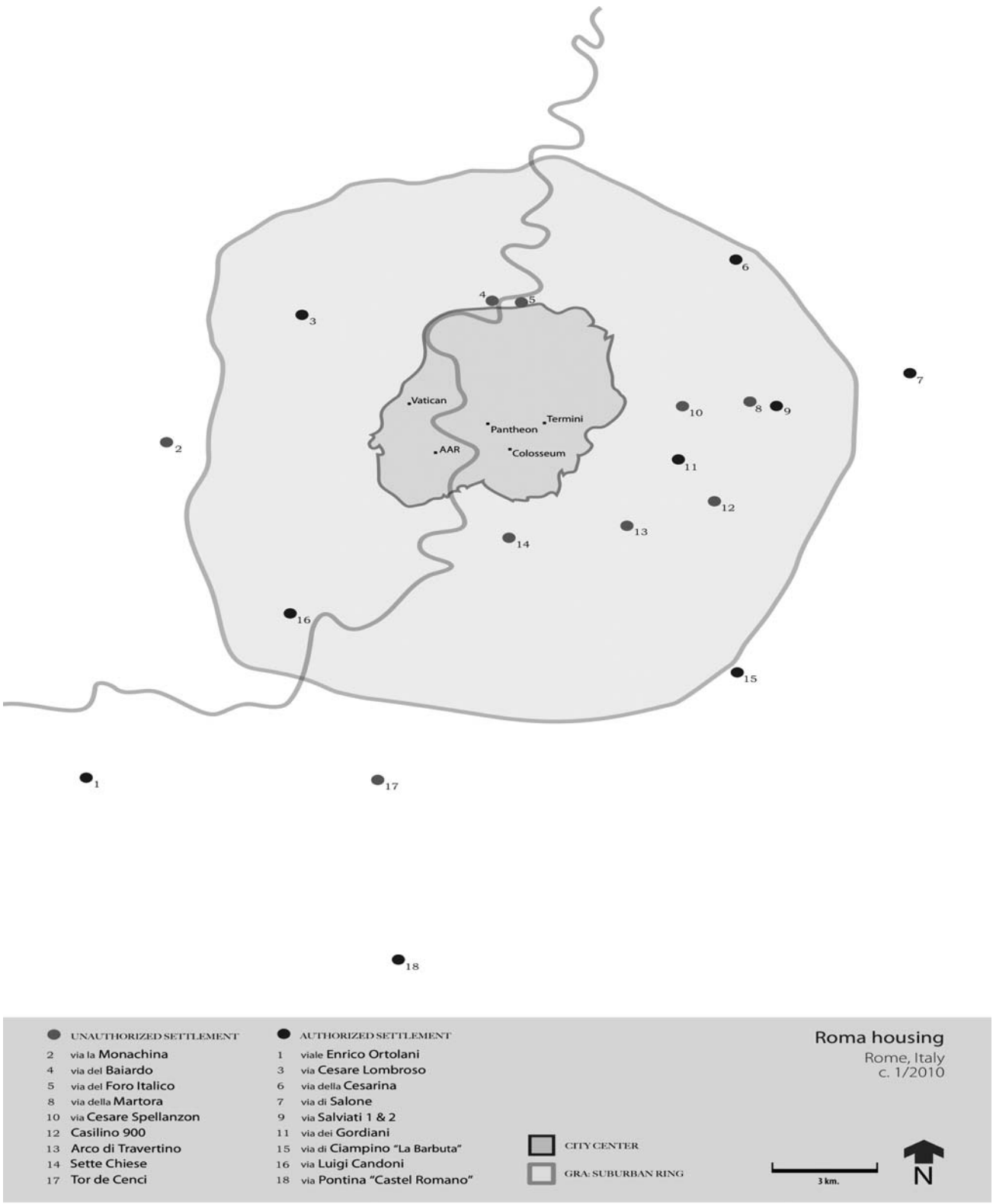


Figure-1: This map shows the approximate locations of 18 Roma "camps" in and around Rome, c. May 2010. The blue dots are authorized enclaves, the red dots are unauthorized enclaves, and the inner ring is the perimeter of touristic Rome. (image: author)

Figure-2: A similarity of living conditions is also found in the Rohwer Japanese internment camp in Arkansas, where official plans generated crowded and haphazard results. (photo: The Bancroft Library. University of California, Berkeley)

Figure-3: The Roma enclaves of Rome are just one variant on an old theme: the ethnic ghetto. Housing on the Pine Ridge native American reservation in South Dakota is similar in style, materials, and general disrepair. (photo: Kristina Barker for the Rapid City Journal)

xenophobia, and racial scapegoating. This climate, usually a result of endemic constraints amplified by political conjuring, generally owes little to the civic performance of the minority group that is ultimately confined to the ghetto.

The Italian Jewish ghettos of the 16th century illuminate many prominent characteristics of the ghetto system. The emergence and dismantling of these urban containers are punctuated clearly in time and space by circumstances that even the most casual student of the period might discern. With a clockwise turn of this chart, it can be easily demonstrated that the ghettos appeared in regional clusters according to timings not corresponding to an apex of anti-Semitic feeling but rather to a convergence of political needs unrelated to the Jewish community and the presence of resources within the Jewish community that were considered vital to the satisfaction of those needs. Put differently, we learn from the example of the Jewish ghettos to associate the construction of such places with a cool-headed appropriation of particular assets in support of particular political projects.

Through this lens in particular, a strong resemblance between this medieval example and today's Italian Roma camps can be seen. In both instances, a reliable rhetoric of racial prejudice was invoked alongside brazenly cynical efforts to validate negative associations with a popularly despised minority.

4. THE ROMAN VARIANT

Structural discrimination and a formidable array of social obstacles that gave shape to "anti-ziganism" in Europe dogged the Roma minority for hundreds of years. While segregation and substandard living conditions have been a constant, fortified enclaves designed, built, and managed by the Italian government are relatively new and can be assessed – as with the Jewish example – as a phenomenon driven forward by forces that are to some degree independent of the narratives of racial prejudice and stigmatization used to rationalize them. That is to say that the phenomenon relies on these narratives but is not a conclusion reached inevitably from them.

As you might expect, the official explanation for the enclaves provided by municipal authorities in Rome varies according to audience. For most outsiders and those generally concerned with humanitarian affairs, the establishment of enclaves is depicted as a sound alternative to the squalor and insecurity of squatter settlements, a gesture of benevolence made towards a troubled minority group showing low appetite and low aptitude for mainstream lifestyles. For Romans and other Italian who share a concern about declining national economic prospects and a reflexive disregard for the civil rights of the Roma, the construction of new enclaves and demolition of obsolete ones offer proof of the government's increasingly commitment to extract unwanted elements from the social domain by any means necessary. In this version of the story, the Roma are portrayed as key actors exerting a disproportionately negative influence on the remainder of

5. ITALIAN SOCIETY, WHETHER OR NOT THIS PORTRAYAL IS IN AGREEMENT WITH THE FACTS

For example, the frequently cited assumption that Roma citizens are responsible for increasing crime does not correlate well with national statistics, which puts crime in Italy on an

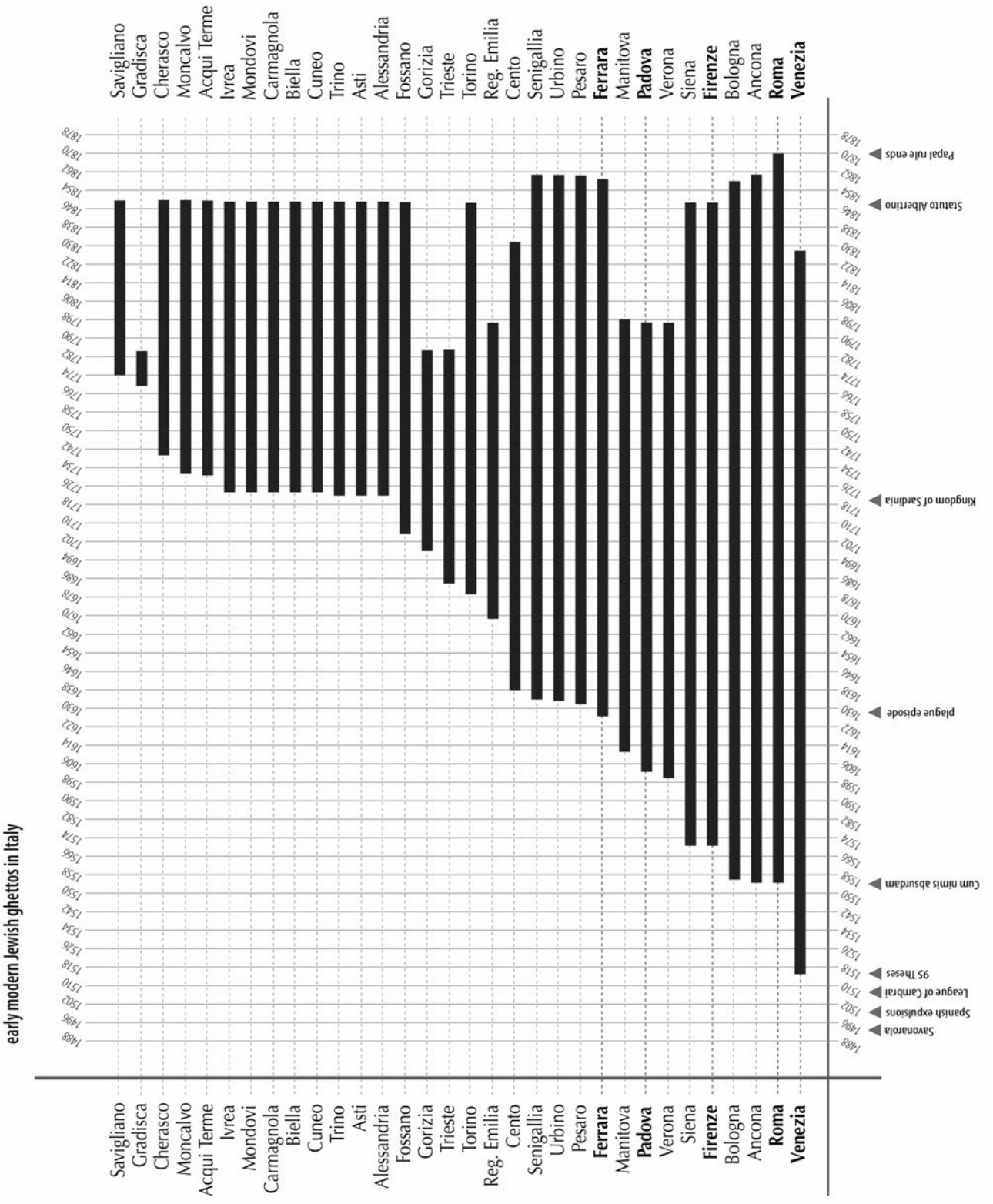


Figure-4: Most of the Jewish ghettos found in the Italian city-states between the early 16th and late 18th centuries are listed here, with some episodes of political and social change indicated to make sense out of their appearances and disappearances. (image: author)

even keel and links Roma convicts mainly to petty, non-violent offenses.

One observer notes that "the estimated effect of immigrants on both total and property crimes [in Italy] is not significantly different than zero" (Bianchi, 2008, p. 3), and in any case the trends above can hardly be taken seriously as the symptoms of a national emergency. Yet in the summer of 2008 the provincial government of Lazio, of which Rome is a part, issued its "Urgent Provisions to Address Civil Protection Status Emergency on Settlements of Community in Nomadic Territory of the Lazio Region (Order No. 3676)" to declare that;

> *"Given the extreme criticality in territory of the Lazio region, with particular reference to areas of the Urban Municipality of Rome and the surrounding areas, and because of the presence of many non-citizens and illegal travelers who have permanently settled in those areas, and given that these settlements, because of their extreme instability, have created a situation of serious public concern, with possible serious consequences for public order and security for local people..."*

So with these questionable premises it placed responsibility for a crisis directly on the bent shoulders of the Roma community, choosing to adopt "extraordinary and exceptional measures aimed at overcoming rapid emergence" of its problem, which boiled down to the continued presence of Roma people within its jurisdiction. Though rife with inconsistencies and insincerity, this gambit has so far brought enormous political dividends and largely negligible public censure.

Here lies a simple and important linkage between the Jewish ghettos of the 16th century Italian city states with the Italian enclaves earmarked for Roma people now: both were designed to produce large amounts of political capital cheaply and upon demand. In the process, the beleaguered members of the target community become residents of a pillory where they are left to accrue negative social capital. The rules of the ghetto system oblige them to live ambiguously, under conditions neither sufficient nor destitute, without functional legal status, within marginal spaces made permanently temporary, reliant on shadow work, relegated to "sociospatial seclusion" (Wacquant, 2008, p. 7) and abandoned by mainstream social institutions.

In most instances of this type of seclusion, it can been seen that ghetto residents come to represent, and seem also to

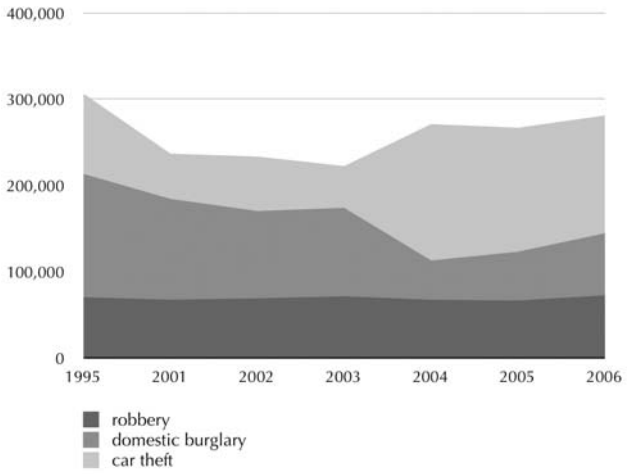


Figure-5: A decade of crime statistics shows no dramatic change during the years when Roma enclaves were conceived and built in the name of public safety and order. (image: author)

embody, the dangers of the unwanted immigrant: contagion, dishonor, dirt, profanity, shiftlessness, lassitude, parasitism. The enclaves in particular ensure that these associations are nurtured in the public consciousness. They are the holding place for a "permanently necessary enemy" (Barrington, 2001, p. 724), a social prison that simultaneously asserts the non-viability and the culpability of its residents, their feebleness and their potency. All the while the fact of the ghetto, its implied necessity in the service of public order, presents an almost irresistible opportunity to invoke Wacquant's "logic of the trial" (Wacquant, 1997, p. 222) as non ghetto-dwellers, seeking an alibi for their collective shortcomings, take up the victim's role in relation ghetto-dwellers as the perennial perpetrators.

6. THE SHAPE OF MANAGED INEQUALITY IN ROME

What is the form and the nature of life inside the Roma enclaves of Rome? The informal, unauthorized enclaves support self-built shelters with minimal sanitation, though some, like Casilino 900 due east of the city's historic core, were tolerated by the municipality for more than 40 years. (Casilino 900 was evacuated and closed in early 2010 as part of an ongoing effort to motivate the Roma population to leave Italy or funnel them into authorized enclaves lying further from the city center and imposing stricter police surveillance upon inhabitants.) In this way, personal volition and free movement are maximized at the expense of personal comfort and hygienic standards for residents of the unauthorized Roma enclaves of Rome.

Most of these units are metal containers designed for short-term and limited human occupancy, and accordingly are unsuited for modification, expansion, or repair. Above all, they are small, incommodious, closely packed together, and isolated from major urban amenities.

These places, when relatively new, present Roma inhabitants – for whom they are expressly and exclusively made – with interior conveniences and sanitation conditions generally superior to those found in the unauthorized enclaves. In exchange, residents experience highly constrained freedom of movement while expending unusual amounts of energy to reach schools, markets, and hospitals. Each of the authorized enclaves in Rome is punctuated by a perimeter fence, an entry gate, and constant police presence. The newest of these also are equipped with flood lights and raised surveillance cameras that peer in all directions. With age, these types of living containers deteriorate quickly. With ten years of use, most of the original advantages of the designed enclave environment erode. Residents are shipwrecked on the urban margin, hemmed in by fences and guards, and confined to living spaces providing, on average, a mere 41% of the floor area required by Rome's standard building code for each inhabitant (Regolamento Generale, 1934, art. 40). These crowded metal boxes, along with the barricades that encircle them, illuminate the double standard sanctioned by the Roman municipality for its Roma residents in an unambiguous way.

The congregation of Roma people into a constellation of isolated enclaves is a welcome development for many mainstream Romans, but has had most unwelcome consequences for enclave residents. For them, hardships multiply under these compounding constraints. Enclave residents are pressed towards downward cycles of destabilization, material want, social exclusion, demoralization, and extralegal activity. For their political wardens, these cycles appear to validate the "resurgent penal fortitude" (Wacquant, 2005, p. 42), "gusting xenophobia" (Wacquant, 2005, p. 45), and "catastrophist discourse" (Wacquant, 2008b, p. 10), which accompany most episodes of ghettoization and which allowed the dubious concept of a Roma enclave system to be considered in the first place. So far, so good, one might say, from the perspective of a government which, "through its structure and policies, patterned actions and inactions" determines the "scope, spread, and intensity of marginality in the city" (Wacquant, 2009, p. 174). But are the enclaves legal?

The United Nations, the EU, and others uphold the human right to adequate housing regardless of legal status, providing increasingly explicit standards for space, privacy, security, ventilation, location, plumbing, design appropriateness, etc. The major legal mechanisms used to enable and defend

Figure-6: This satellite view of the enclave called "via di Salviati 2" shows a dense, gridded plan where living units are arranged orthogonally along a main artery — quite out of keeping with conventional residential arrangements in the Roma tradition. Though crowded, the enclave is adjacent to empty and industrial lots. (photo: Google Earth)

Figure-7: In the unauthorized enclave called "Casilino 900", demolished in February 2010, improvisational shacks were supplied with water running through spigots installed and paid for by municipal authorities, confirming the notion that these unhealthy places were tolerated as long as they remained convenient. (photo: author)

Figure-8: A perspective sketch of the gridded plan at the authorized "via di Salone" Roma enclave, showing a format most readily compared to a barracks or prisoner of war camp. Authorized and publicly-funded enclaves support prefabricated housing units arranged by rank and file upon a raised concrete slab. (image: Stalker Osservatorio Nomade study group)

Figure-9: A typical exterior of a housing unit in the authorized "via Salviati 2" Roma enclave due east of downtown Rome. This dwelling is approximately ten years old. (photo: author)

these rights are: 1.) The Universal Declaration of Human Rights, art. 25 (1948); 2.) The International Covenant on Economic, Social and Cultural Rights, art. 11 (1976); and 3.) The International Convention on the Elimination of All Forms of Racal Discrimination, art. 5.e.iii (1969). In addition, Rome's standard building code, reg. n. 5261 (1934), art. 40 specifies minimum standards for house size, function, and hygiene – regardless of the background or legal status of the inhabitant – as noted earlier.

As a consequence, the authorized Roma enclaves around Rome require special laws and regulations to override routine law. The major legal mechanisms used to enable and defend the ghetto system are: 1) Regional Law n. Lazio 82/85 (May 1985), establishing a protocol for enclave construction to be designed and funded by the province; 2) The Security

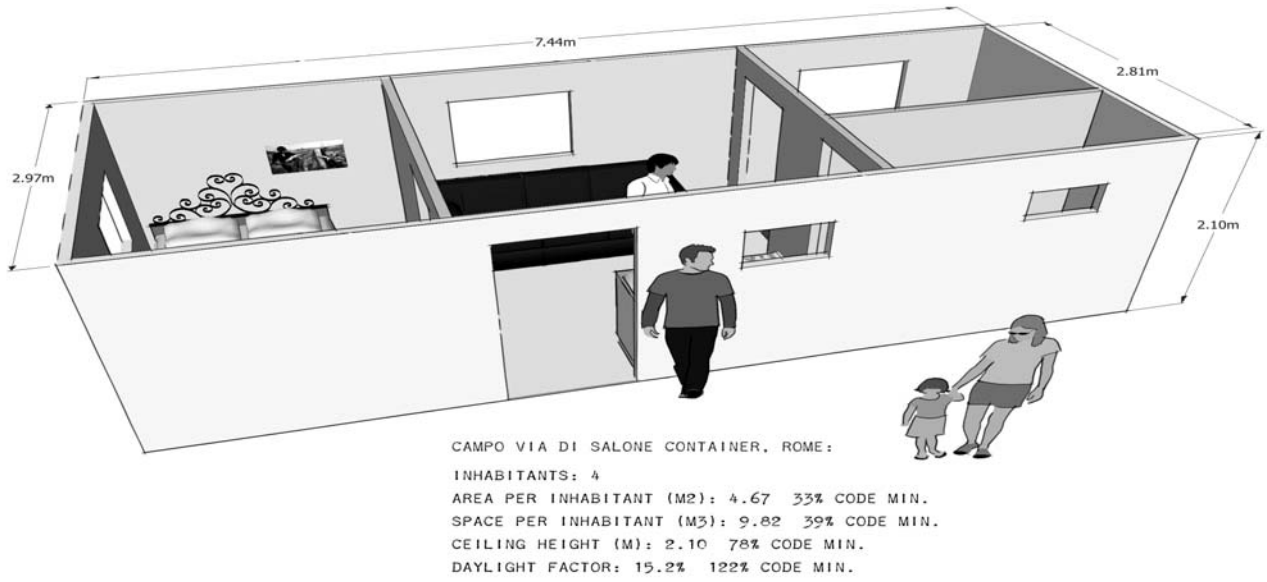
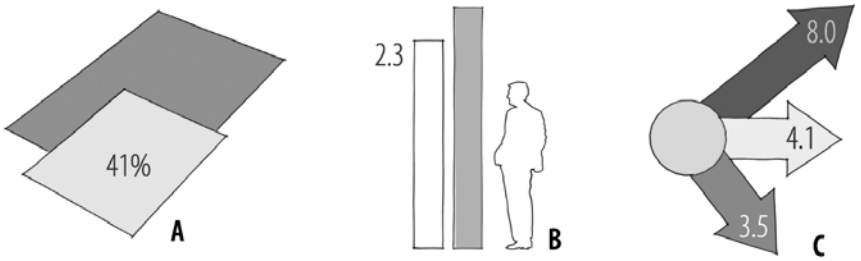


Figure-10: This model of the typical housing unit at the authorized "via di Salone" Roma enclave shows how cramped and poorly allocated interior space is inside. Children commonly have no space to complete homework or read quietly, undermining already poor prospect for success in Italian schools. (image: author)

	inhab.	area per inhabitant (m^2)	code min. %	ceiling height (m)	code min. %	interior length (m)	interior width (m)	non-livable area (m^2)
typical authorized Roma camp container	4	5.69	41%	2.33	86%	8.47	3.21	3.03
building code minimum	4	14.00	100%	2.70	100%	-	-	-



At A, the typical - area per person in an authorized container compared with the minimum allowed by the Roman standard building code. At B, the average ceiling height (m) in an authorized container compared with the minimum allowed. At C, three average walking distances (km) from authorized ramps via de Salini & via salviati to (clodewise from top) nearest hospitals, schools & grocery stores. All designed, contracted and paid for by the municipality of Rome.

Figure-11: A simple analysis of the typical housing unit in the authorized Roma enclaves of Rome compares spatial characteristics to the minimum allowable dimensions allowed by the Roman standard building code, along with typical distances to key destinations from authorized enclaves. (image: author)

Pact for Rome (May 2007), which expanded police powers and Roma enclave surveillance; 3) The Nomad Emergency (May 2008), discussed above and granting a prefect special powers to respond forcefully to the Roma problem, and 4) The Nomad Plan (July 2009), which specified consolidation of Rome's Roma enclaves along with a population ceiling for Roma people within the province.

In this way, for the moment, the political expediency of the Roman enclaves has eclipsed the their questionable legality and leaves open the prospect that other Italian municipalities will follow suit. Meanwhile, despite a chorus of critics and a fattening file of official reprimands, Italian authorities have met with significant popular support at the domestic level. They continue to broadcast, without apology, their purportedly upright intention to develop 'mega-camps' to hold a greater percentage of the province's Roma population and incorporate – inside the perimeter fences – customized medical and educational facilities. These gestures, deeply tied to broader urban planning concerns, are consonant with

Figure-12: At the "via Gordiani" enclave, an entry gate is prominent. All visitors must pass in and out here, watched by police and guards hired by the municipality. Across a busy road a warehouse for non-human goods is visible, creating a regrettable symmetry.
(photo: author)

Figure-13: At the authorized "via di Salone" Roma enclave, the same fencing, flood lights, and cameras can be found all along the perimeter that is a girdle for housing units arranged in gridded plan. Roma residents here pooled their money to purchase and install overhangs to protect entrance doors from oppressive sunlight during the summer months. (photo: author)

other permanently temporary campaigns of ethnic segregation in Israel, the southwestern United States, the Balkans, and elsewhere. With these gestures, Italian politicians have become lead architects of a flexible, low-cost warehousing system designed for Europe's Roma minority.

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MECHANISMS FOR NATURAL VENTILATION IN THE ALLAH BUKSH SETHI HAVELI, Mohallah Sethian, Peshawar, Pakistan

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ABSTRACT

In the 21st century, there has been a rapid degradation of the environment due to emissions of large quantities of CO2 and green house gases, produced by the burning of fossil fuels in order to provide thermal comfort to buildings. This has led to the concept of 'Sustainable Architecture', which works in harmony with nature and natural forces (sun-light, wind etc.) to create buildings that aim at minimizing consumption and preventing the depletion of natural resources. Sustainability requires that human activity exploits nature's resources only at a rate at which they can be replenished naturally. In the context of Pakistan, our current practices in architecture are based on western solutions to requirements of comfort provision, leading to a growing dependence on fossil fuels, and resulting in rapid environmental degradation. Rapoport (1969) states that modern solutions to climatic problems often do not work, and homes are made bearable by mechanical means whose cost sometimes exceeds that of the building shell!

Before western ideals were imported to create architecture within the local context, indigenous architecture made a conscious effort to balance the natural environment with human habitation and lifestyles. Indigenous buildings collaborated with nature to give comfort (Rapoport, 1969).

In this paper the climate responsiveness and appropriateness of the Sethi Haveli, Peshawar, are analyzed in order to understand indigenous responses to the issues of sustainable thermal comfort. The paper focuses on the natural ventilation methods employed in the Allah Buksh Sethi Haveli and in particular the basements of the haveli, in order to understand how natural, renewable sources of energy produce comfortable yet sustainable environments. The design of these basements and their inlet and outlet ducts in particular, together with other mechanisms, promotes natural ventilation, and provides thermal comfort during the hot summer season.

Keywords: *sustainable architecture, Sethi Haveli, indigenous architecture, natural ventilation, thermal comfort*

1. INTRODUCTION

There is a growing demand for space cooling in the hot climate of Pakistan, resulting in an ever-increasing demand for energy. At the same time there has been a steady decline in the production and supply of that much needed energy. The National Energy Conservation Centre (ENERCON) predicted this shortfall as early as 1990, but the rapid pace of urbanization and the resultant energy shortfall has surpassed all estimates. In the heat of Pakistan's long summers, most buildings are dependent on air-conditioning systems which are run on electricity produced by burning fossil fuels. The burning of fossil fuels results in the production of CO2 and greenhouse gases.

The concept of sustainability took shape when the usage of fossil fuels began to adversely affect the environment. In literature, the seminal book 'Silent Spring' (Carson, 1962) was the first attempt to understand man's irreversible damage to the environment. The early ecological movements of the twentieth century had a great impact on formulating today's concept of sustainability (Keeler & Burke, 2009). The 1984 Brundtland conference in Geneva consolidated the concept of 'sustainable development'. The building industry followed this lead with the development of the American Institute of Architects (A.I.A.) Committee on the Environment (COTE), with the understanding that buildings are clearly responsible for an enormous burden placed on the environment. Sustainable architecture builds on the concepts of sustainability to create buildings that work in harmony with nature and natural forces (sunlight, wind, etc.) to minimize consumption of natural resources and their subsequent depletion (World Resources Institute; Dimensions of Sustainable Development, 1992).

Sustainable architecture involves a holistic approach to the design of buildings. All the resources that go into a building (materials, fuels, or the contribution of the users) need to be part of an overall whole. The design of buildings involves resolving many conflicting issues and requirements: issues of ecology, economy and human well-being. Each design

decision has environmental implications, and sustainable architecture is the thoughtful integration of architecture with other building systems to minimise the negative impacts of design. A low energy and sustainable building must begin by designing for load reduction; a design that offers occupant comfort and uses less conventional energy. Environmentally sustainable design is one that minimises its impact on the environment over its life span, by incorporating techniques and technologies for conserving energy and water, and reducing emissions (BREEM, 2001).

Modern buildings in Pakistan are unable to adapt to a climate that is increasingly becoming warmer. In contrast, vernacular architecture is more adaptable to the environment, according to principles evolved over many generations. Rapoport (1969) states that vernacular solutions show a variety of designs related to the conditions that surround it, responding to the nature, culture, symbolic interpretations, and definition of comfort in that area. Traditional and vernacular homes form the basis of environmentally sustainable design (Meir & Roaf, 2006). Many vernacular technologies are energy efficient and sustainable; unfortunately, most of them have been abandoned due to changes in cultural traditions and economic situations. This paper aims to explore the design techniques that promote high thermal comfort via passive ventilation systems in the vernacular *havelis* of the *Sethian Mohalla*, Peshawar.

The seven *Sethi havelis*, located near Gor Khuttree, were constructed without any mechanical means, in such a manner as to create micro-climates inside them to provide high thermal comfort levels. The sustainable architecture of the *havelis* includes multiple climatic modifying strategies like the courtyard, solar orientation, and thermal comfort through stack ventilation and evaporative cooling (Khan, 2010). The study of these *havelis* provides useful insights for designing energy efficient houses that provide thermally comfortable living conditions. The evolutionary passive climatic systems and design strategies of local building culture can be developed further and combined with modern technology for sustainable architecture in today's world (Sorensen, 2008). Hence the study of these buildings in relation to sustainability in today's context is significant.

2. SUSTAINABLE ARCHITECTURE AND THE HAVELI FORM

The *haveli* is a courtyard house, a form predominant in the Indian subcontinent since the Harappan cities of Mohenjo-Daro and Harappa. The courtyard form (*sehn*) developed as a response to climatic conditions of hot environments in regions as widespread as Egypt, Middle East, Iran, Afghanistan, Pakistan and India. The *sehn* is a square or rectangular open space, usually located in the heart of the house, which performs an important function as a modifier of climate.

In the context of the courtyard's environmental performance, studies were carried out at Cambridge University (Martin & Trace, 1972), which focused on comparing the two: the courtyard and the pavilion form of buildings. Results confirmed that courtyards performed better than pavilions in terms of efficiency in built potential as well as day-lighting. This research led to a number of important studies between the relationship of form and environmental responses of a building. Raydan et al (2003) re-evaluated this analysis of building form archetypes from the initial study using the latest computer based techniques. Raydon et al (2003) concluded that, "If best is interpreted in environmental terms, then the answer for hot arid climates is the courtyard form." Hasan Fathay (1986) has continually supported through his work that courtyards are environmentally responsive buildings in hot-dry climates. Bahadori (1978) states that the courtyard introverts space to fulfil several functions, including the creation of an outdoor yet sheltered space, the potential to use indigenous passive cooling techniques, protection against dust storms, and the mitigation of thermal heat from the sun. Sullivan (1996) observes that, "The courtyard integrates a wide variety of passive devices into its design, each creating its own thermal environment". Doell (1989) describes the courtyards as having the ability to modify and adapt to both cold and hot climates. Lobo (1995) carried out a study of housing typologies of the southern part of India; parametric modelling results showed that courtyard houses have a 50% less cooling load requirement compared to other generic building forms used in the same location. The courtyard as an architectural form exemplifies the concept of sustainable architecture: it is designed as a conscious response to the environmental context. Once constructed, these building forms represent an important strategy for creating environmentally friendly homes through minimal use of energy (Jadhav, 2007).

In the *Sethi havelis,* the *sehn* (courtyard) and the *tehkhanas* (basements) helped to harness the forces of nature to bring comfort to the inhabitants. The design of the *haveli* was energy efficient and sustainable through the use of natural and renewable forces of the sun and the wind for heating, cooling and ventilation. Rapoport (1980) writes that vernacular architecture is culture-specific and is adjusted to specific requirements of context and place. The *haveli* thus serves as an example of sustainable architecture, which was

designed as a conscious response to the environmental, aesthetic and social contexts of culture.

3. CLIMATE OF PESHAWAR

An understanding of the attributes of climate in a region is important to the analysis of the performance of vernacular architectural types as different climates have their own reflection on culture and architectural traditions of the region (Nicol, 2001).

The Peshawar district lies between North Latitude 30º 40′ and 32º31′ and East Longitude 71º25′ and 72º47′ (Gazetteer, 1897-98). There are four seasons in the Peshawar valley:

- Spring in February, March and April.
- Summer in May, June and July.
- Autumn in August, September and October.
- Winter in November, December and January.

During the summers, the mean maximum temperature is over 40°C (104°F) and the mean minimum temperature is 25°C (77°F). In winters, the mean minimum temperature is 4°C (39°F) and maximum is 18.35°C (65.03°F).

Wind speeds vary during the year from 5 knots (5.8mph/9.3km/h) in December to 24 knots (28mph/44km/h) in June. The relative humidity varies from 46% in June to 76% in August. Summer winds are strong North and North-Westerly. Winter prevalent wind directions are Southerly and Westerly from October to March. The night breeze is from South and West direction.

4. METHODOLOGY OF THE STUDY

The primary goal of this paper is to identify the passive ventilation strategies used in the *havelis* of *Mohalla Sethian* that contribute to the thermal comfort of their occupants. A case study research method has been adopted for analyzing a representative sample of the *havelis* of *Sethi Mohalla*, Peshawar, in order to understand their ventilation designs and strategies. The research tools include: extensive on-site surveys of the courtyard houses observed; interviews with the residents of the havelis; on-site photography; and analytical sketches. These tools helped to address the research questions on accounts of thermal comfort and ventilation. The research design was divided into the following subparts:

- I. On-site data collection
- II. Data assimilation and analysis

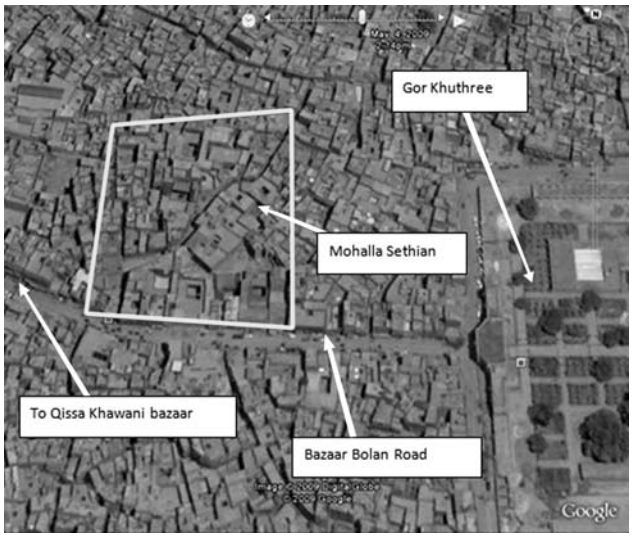

Figure-1: Aerial view of the walled city of Peshawar, showing Gor Khuthree and Sethi Mohalla. Source: Google earth, retrieved on May 4th 2009 from http://www.googlemaps.org

On-site data collection consisted of producing baseline drawings of the case study: the *Allah Buksh Haveli*. This included preparation of measured drawings, analytical drawings, sketches, and explanatory drawings to enable environmental analysis of key aspects.

The *Allah Buksh Sethi Haveli* was chosen as the final choice for the case study based on the following factors:

1. All the *Sethi havelis* are similar in the use of high thermal mass construction on the outside and use of lightweight construction on the inside facade.

2. The size of the *sehn* in relation to the total volume of the *havelis* and their aspect ratios were similar.

3. Ventilation strategies of the *tehkhanas* (basements) and *sehn* are similar.

4. The *haveli* was accessible for data collection and detailed study.

5. The *Allah Buksh Haveli* was part of the largest haveli (*Karim Buksh Sethi haveli*) of the *Mohalla* and as such exhibits the best of the bio-climatic features used in other *Sethi havelis*.

5. CASE STUDY: THE *ALLAH BUKSH SETHI HAVELI*

The *Allah Buksh Sethi Haveli* was part of the larger *Karim Buksh Sethi haveli* built in 1898. This was the largest *haveli*

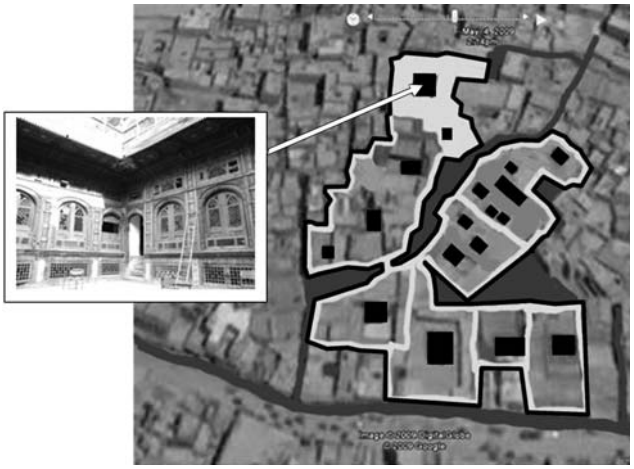

Figure-2: Location of Allah Buksh Sethi Havelis in the Sethi Mohalla. Area map retrieved on May 4th 2009 from; http://www.googlemaps.org

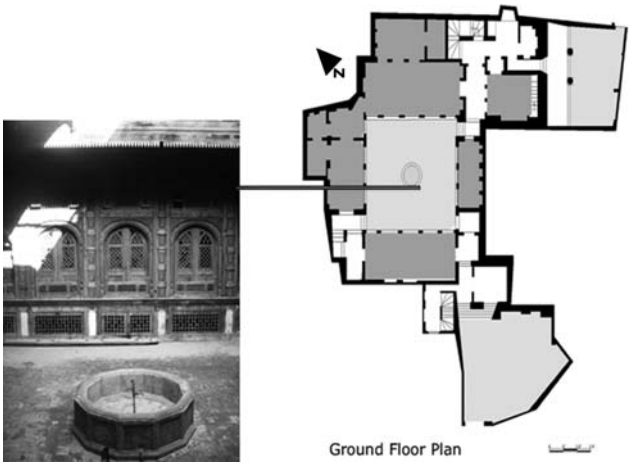

Figure-3: Plan of Allah Buksh Haveli

of the *Mohalla* (and possibly of the area). It consisted of separate *sehn* and spaces for the *mardana* and *zenana* areas (Personal communication with Nisar Sethi on Jan 22nd 2009). The *Mardana* (men) portion, consisted of offices of the business, and the *zenana* (women) area was intended for use of the *Sethi* families and their womenfolk. The *zenana* portion was converted into the current *Allah Buksh haveli* in the 1930s after the larger *haveli* was divided between the two sons of Karim Buksh Sethi (Qizilbash, 1990).

The *haveli* has a large central *sehn* measuring 40´x 40´, which is an important component of the bioclimatic design of the haveli. It plays a major role in reducing the harshness of the summer months by providing a micro climate for the haveli. There is a fountain in the middle of the courtyard, and wooden arcades on all four sides which open to the four main *balakhanas* (reception rooms) on the ground floor. The term *balakhana* is Persian and means an 'elevated room' (Qizilbash, 1990). The *balakhanas* are elevated five feet above the courtyard and three balakhanas have large *tehkhanas* (basements) underneath them. The *balakhanas* and *dalans* on the first floor receive air and ventilation through the courtyard. The courtyard is oriented NW – SE and draws in air from the outside through natural wind flow, as well as through the *tehkhanas* via the stack effect. The three *tehkhanas* are located along SE, SW, and NE directions. The largest *tehkhanas* (SW) is of double height at 22´. There are multiple ventilation shafts on its walls. The other two *tehkhanas* are smaller in size. One is located at the NE side and has ventilation shafts, and may have been used for sleeping purposes. The third *tehkhana* (SE), the smallest of the three, doesn't have any inlet shafts. There is a door which opens onto the street outside, and vents towards the courtyard.

5.1 Passive Ventilation Strategies used in Allah Buksh Sethi Haveli

The placement as well as the size and orientation of the courtyard are important aspects of the design. The Allah Buksh haveli has three courtyards: one at the SW entrance from the street, then the central main *sehn,* and the third on the E corner, leading to the side street. All the three courtyards provide for different functional needs, but they all facilitate the flow of the prevailing wind into the *haveli.* The two smaller courtyards on the periphery of the *haveli* channel the summer breeze into the *haveli*. The central *sehn* with its fountain adds moisture to this incoming air, thereby cooling it, and facilitates the passage of this air into the *balakhanas*. Another method to achieve the flow of air in the *sehn* is through the large fan (hanging from a steel wire across the courtyard), which is moved manually to increase the air flow within the *sehn* and into the *balakhanas*.

5.2 Natural Ventilation

Natural ventilation is the process of supplying and removing air from an indoor space by natural means. In the climatic context of Peshawar, where strategies must be employed to cope with the hot-dry climate, it is equally important to cater for ventilation for the hot-humid climate as well. Generally, cooling strategies used to combat climatic conditions of the hot-dry weather include evaporation, radiation and convection methods. Strategies used in hot-humid conditions like stack ventilation encourage wind flow and movement through the house. The *Sethi Haveli* uses the placement of openings in horizontal and vertical patterns to improve natural ventilation through the building. The natural ventilation strategies

employed at *Sethi haveli* are the following:

1. Wind driven ventilation and
2. Stack ventilation.

These are described in the following sections.

5.2.1 Wind Driven Ventilation

Wind driven ventilation has several significant benefits, like being a natural source and thus readily available. It can be controlled by the size and angles of the aperture to flow as required. In Peshawar, the direction of summer winds is towards North and N-W. This works well with the orientation of the *haveli's* front entrance, and takes wind movement towards the central *sehn* and through the main *balakhanas*. The following factors help in the natural ventilation of the house:

i) Site and building situation to increase exposure to airflow effects:

The front entrance to the *haveli* is located on the SW side to allow the summer breeze to enter the *haveli* (Fig 4). On the first floor, the front has been left open. This allows the wind to flow into the *sehn* and the raised *dalans* on the first floor.

ii) Optimum orientation of the living rooms to the prevailing breeze and the linkage between leeward and windward sides to utilize pressure differences:

The orientation of the *sehn* allows air to flow into the main *balakhana* on the SW side, and the *balakhana* at SE side. The fountain in the middle of the courtyard adds moisture to the dry air and further cools it. The raising of the *balakhanas* 5' above the courtyard floor also facilitates the wind flow in the interiors (Fig.5).

iii) Maximum skin opacity through the number and sizes of openings:

All rooms have windows with multiple operable components. These can be opened horizontally or vertically (Fig. 6). The flow of air can be increased or controlled by choosing which component of the window to open (Fig.7).

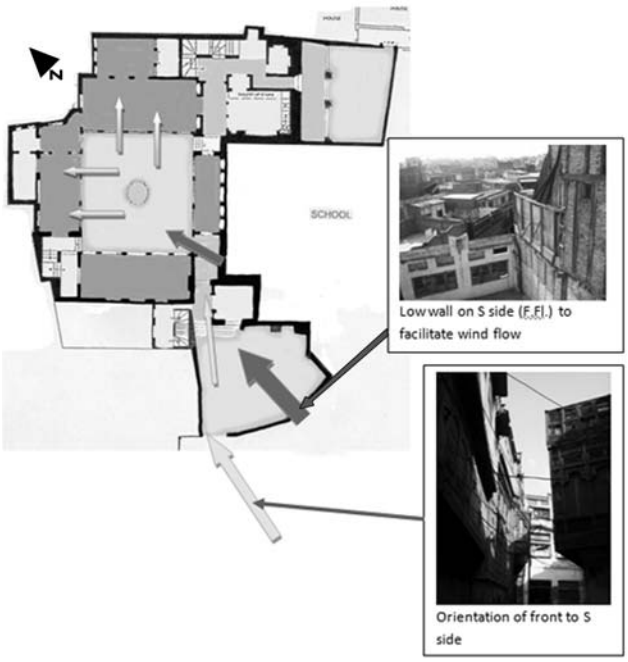

Figure-4: Orientation of Haveli towards the prevailing winds.

Figure-5: Orientation of the rooms to the prevailing breeze, and the exchange of hot and cool air.

Figure-6 & 7: (L) Ground floor SW balakhana. (R) First floor dalan.

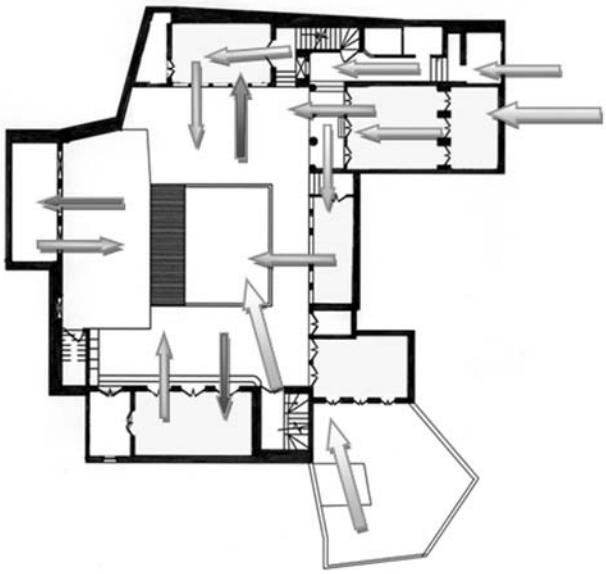

Figure-8: Plan of 1st floor showing the exchage of air in room.

Figure-9 & 10: (L) Rooms open up to one another. (R) Circulation of air through open rooms.

Figure-11: Plan of 1st floor showing the exchage of air in room.

iv) Reduction of internal obstructions, by opening rooms to one another:

All rooms on the ground and first floor open into one another, and there is efficient flow of air between them (Figs 9 & 10). The openings, whether in line or staggered, encourage circulation of air. Multiple openings between rooms and into the courtyard enhance the flow of the wind.

v) Reduced plan depth of rooms and increased openness of side sections to facilitate cross-flow and vertical flow of air throughout the haveli levels:

The rooms of the haveli are longer along the courtyard side and shallower in their depth (Fig.11). This allows better wind flow throughout the haveli. All rooms open into the side rooms and have multiple openings into the courtyard. The internal flow of wind is hence uninterrupted.

The *sehn* acts as a duct and re-entrant space for ventilation. The stairways act as vertical ducts for exhausting hot air from the *haveli* and promoting air movement. The design of the haveli shows that the rooms and spaces are conceived as large ducts that can moderate and direct flow (Hyde, 2000).

5.2.2 Stack Ventilation

Stack ventilation occurs due to differences in temperature. When there is a temperature difference between two adjoining

volumes of air, the warmer air, having a lower density and being more buoyant, will start to rise above the cooler air, creating an upward air stream. In order for a building to be ventilated adequately via the stack effect, the following must be considered: the temperatures on the inside and outside of the building must be different; and the apertures that facilitate air movement must be planned at lower levels of a room for intake of colder, denser air from the exterior, and higher apertures must be provided to allow the warmer indoor air to rise and escape the building. Stack effect increases as the difference in temperature increases, as well as the height between the higher and lower apertures. Stack driven ventilation does not rely on the movement of air, so can take place on hot summer days with negligible air movement, when it is most needed. It offers a stable flow of air, giving greater control over choosing areas of air intake, and is a sustainable method.

This method of ventilation is employed in all the *Sethi havelis* by using double height *tehkhanas*. These *tehkhanas* are up to 30 feet below the courtyard floor (Fig. 12). In the Allah Buksh haveli, three *tehkhanas* open into the courtyard. The largest among them is the two level *tehkhana* on the SW side, where the lower level is used for accommodation (Fig. 13). This was quoted as housing the family, and being very cool, all through the summer months (per comm., Rabia Sethi, Nov. 15th 2008).

The Allah Buksh haveli has a series of inlet ducts designed in the two larger basements. These open on the outer walls in the open spaces of the haveli and outside it, where inlets are designed at a height of about 15 feet higher than ground floor level (Fig.14). The use of solar chimneys attached to these ducts is seen at the roof level.

Internally the apertures open at a height of 5' inside the *tehkhana*. The outlet aperture is on the opposite side of the wall at the height of 22' and opens into the *sehn* (Fig.15). The thermal mass of the external walls (3-4 feet thick) and the level of the *tehkhana* at twenty feet below the ground level maintain a lower temperature inside it. The warm air in the *tehkhana* thus rises to the vent opening into the *sehn*. Here the air from the *tehkhana*, which is still cooler than the hot air inside the *sehn*, pushes the hot air out and replaces it. In case of natural wind flow into the courtyard from the Southern side, the cool air from the *tehkhana* is pushed into the *balakhanas* (Fig.16).

Figure-12: Double basement of Allah Buksh Haveli

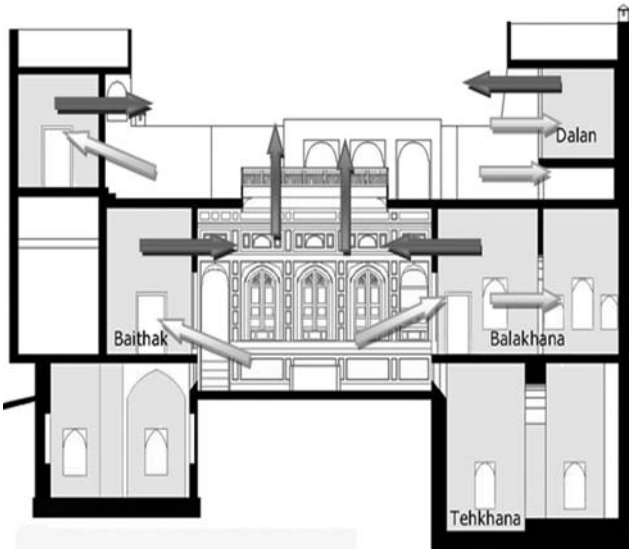

Figure-13: Stack ventilation on the Ground and First floor.

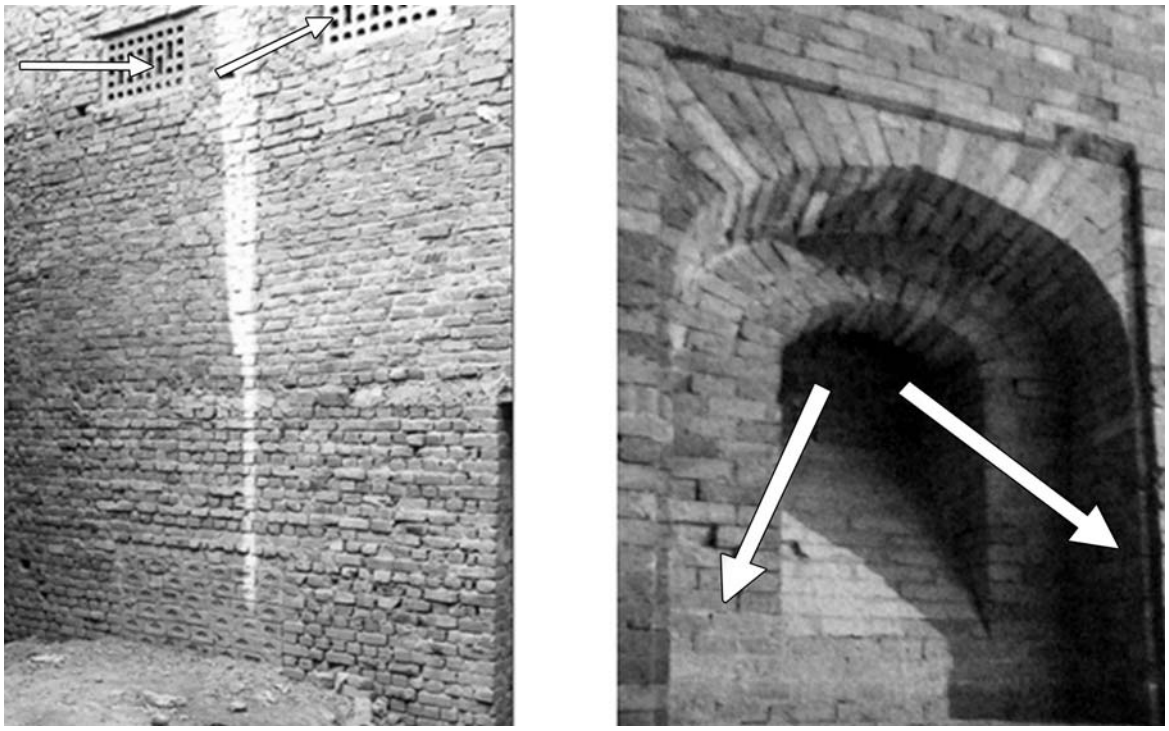

Figure-14 & 15: (L) Intel of basement duct. (R) Duct aperture inside the SW basement.

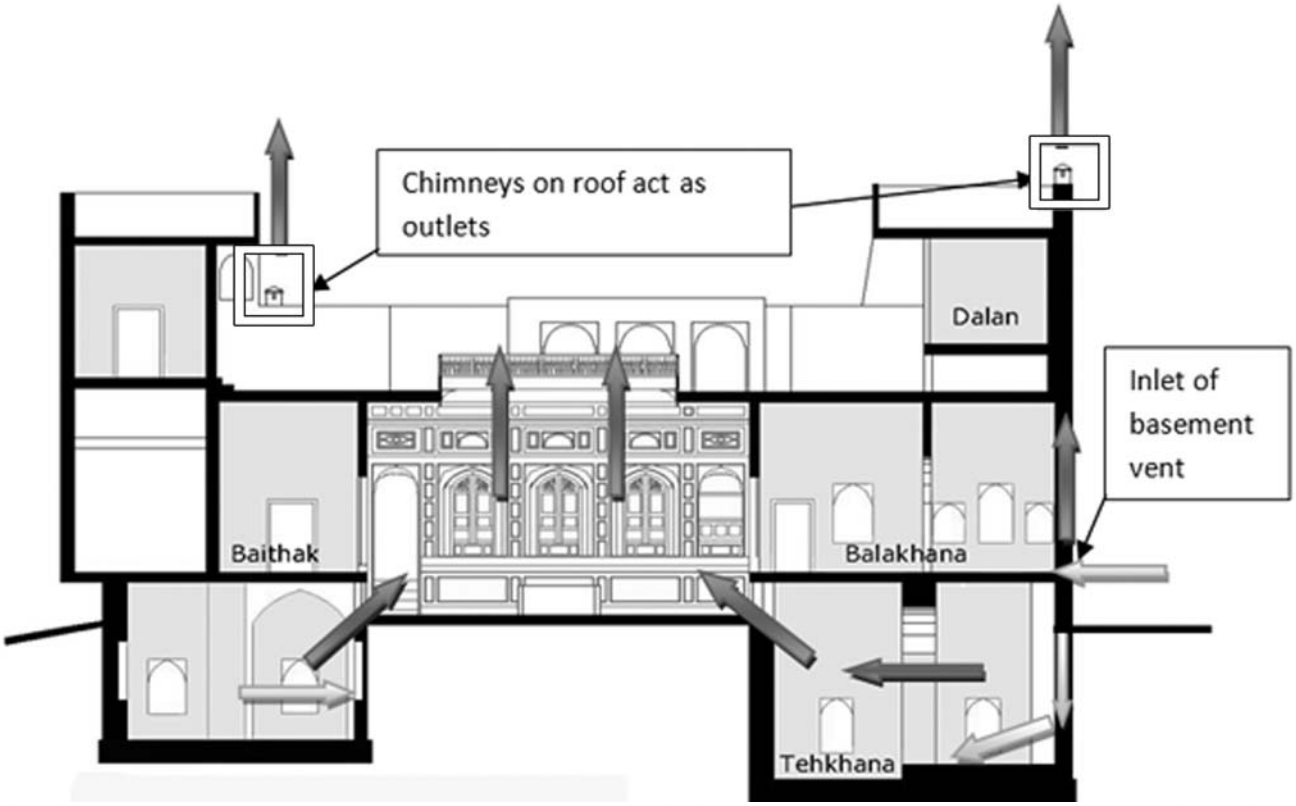

Figure-16: Stack ventilation through *tehkanas*.

Figure-17: The chimney of the ventilation duct on NE side.

The vents of the openings in the *sehn* are covered with *jallis* (wooden lattice screens) which are slanted at a 45° angle towards the basement. This helps to direct the flow of air between the inside and the outside.

The shafts in the SW and NE *tehkhanas* go up to the first and second floor roof levels, and terminate in chimneys. These chimney-like towers are outlet/inlets connected to the ducts from the *tehkhanas.* They have been blocked for many years, and are no longer functional.

This research pursued the objective of studying the traditional *Allah Buksh Sethi haveli* of *Sethi Mohalla* and its context, in order to understand the indigenous sustainable responses to the issues of ventilation and environmental comfort, and to apply these in the current scenario.

Ventilation plays an important role in making buildings healthier by displacing heat from the building. It is required to remove air pollutants, odors and water vapor from a building. The natural air flow, coupled with stack ventilation techniques, continues to replace air throughout the rooms of the *haveli*. Evaporative ventilation helps bring down the temperature of the *sehn* and surrounding *balakhanas* during the evening and the night. The high ceilings of the *balakhanas* and the *dalans* help in temperature stratification. As hot air from the living zone rises upwards, it escapes out of the rooms through the high ventilators and is displaced by relatively cooler air from the *sehn*. The *tehkhana* of the *haveli* continually brings in cool air from the exterior and pushes out this cooler air into the *sehn*, from where it circulates through the surrounding rooms.

The evidence from Oct 22nd 2008 - June 25th 2009 (interviews conducted in field study) suggests that there is

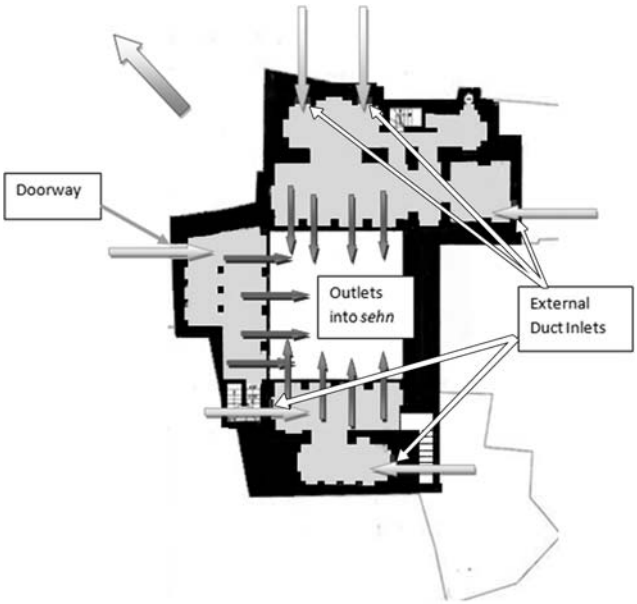

Figure-18: Stack ventilation via inlets and outlets of the *tehkhanas*.

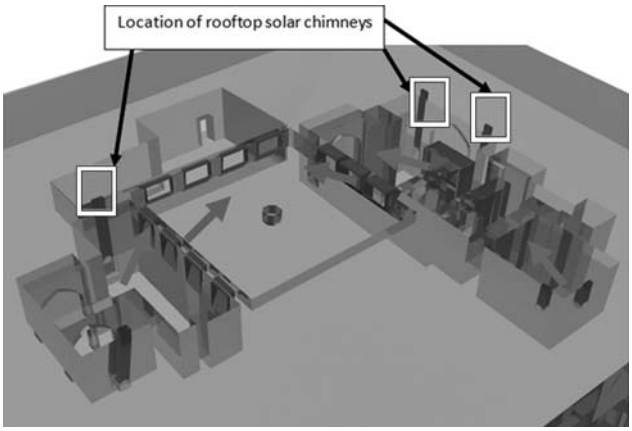

Figure-19: 3D of tehkhanas' stack ventilation; showing inlets (dark gray) and outlets (light gray).

more to vernacular passive cooling methods than meets the eye. Of critical importance is the active participation of the occupant of the house: by spatial migration; in adjusting (shutting or opening) of windows and doors to reduce temperatures by increasing air flow; and wetting the courtyard floor to induce evaporative cooling in the hot dry season. Nicol et al (Nicol, Rijal & Humphreys, 2007) state that the use of windows is a key adaptive opportunity in naturally ventilated buildings, especially in the summers. The opening of windows to increase ventilation or the closing of windows to reduce heat gain in summers are important factors that contribute to maintaining comfort for the occupants. In context of the *Allah Buksh* and other *Sethi Havelis*, there is also a strong tradition of retiring to the *tehkhanas* during summer afternoons (Per. Com. Saleem Sethi, Jan 29th 2009).

The occupants of the various *Sethi havelis* narrated feelings of 'relative thermal comfort' experienced in the *tehkhanas*, and some older members described them as 'ice-cold' and '*hawa-dar'* (breeze running through) in the summers. Reynolds (2002) attributes the feeling of "relative comfort" of occupants to having active control over their environment. The comfort levels regulated by adaptive behaviour include active measures like seasonal spatial migration through the house, and inducing evaporative cooling (through the use of wells in the *tehkhanas* and pots of water on the first floor) to maintain thermal comfort levels. The resultant temperature range will be deemed comfortable, based on culture and the phenomenon of acclimatization.

6. CONCLUSION

Integrated design, where each component is considered part of a greater whole, is critical to successful sustainable architecture. In the context of the *Sethi havelis*, there is a need to look at them not just as remnants of the past but rather as lessons for our future. We observe that these have the ability to provide comfortable living conditions during large parts of the day in the summers, and consequently a major part of the year, thereby reducing annual cooling costs. The combination of the *tehkhanas* with the *sehn* has the ability to create more thermally comfortable conditions inside the house through natural evaporative ventilation. This study shows that in reducing the harsh effects of summer heat, one does not necessarily have to resort to energy-intensive methods, and by reducing the use of mechanical energy for cooling and ventilation, one can save precious energy that could be used elsewhere.

Today buildings are made more comfortable by enclosing them with glass and employing mechanized cooling systems within. The question is whether our modern approach of closing in buildings is a sustainable response to our environmental context. This research investigated just that, and concludes that vernacular houses have the ability to create comfortable conditions for their residents without the use of any mechanical means. Thermal temperatures above the accepted standards of comfort in the context of Pakistan (Nicol et al, 1994) can be mitigated by opening or closing windows of a space and by using ceiling fans. We need to design mix-mode buildings that incorporate thermal mass, night ventilation and operable windows to provide comfort and occupant control during the spring and fall seasons, with air conditioning used only during the hottest months. Such designs not only use less energy, but also offer occupants greater control, thereby reducing the need for mechanised cooling and ventilation through the major part of the year. Producing energy from renewable sources is a widely recognised necessity for a sustainable building, which helps one avoid many negative environmental impacts like the release of green house gases and other pollutants, and the depletion of fossil fuels.

Reinvesting in the mix-mode courtyard house which utilizes traditional ventilation strategies along with modern features and amenities to provide for contemporary needs is the answer to our quest for sustainable architecture. The passive ventilation systems can be used for providing thermal comfort in the months of March, April, May, and June, where air movement would help generate comfort levels. The active systems may be used to transform the energy from the sun or the wind into electricity, to cool the house during July and August, or heat it in December, January and February, when internal climatic conditions become uncomfortable. Future studies are needed to help increase our understanding of the characteristic behaviour of a traditional *haveli* and its passive architectural design features, and how these may be employed to make our current architecture sustainable.

Glossary

Balakhanas	Elevated Room
Dalan	Reception Room
Haveli	Courtyard House
Hawa-Dar	Airy, Well Ventilated
Jalis	Terracotta Trellis
Mardana	Men's Quarters
Mohalla	Neighborhood
Sehn	Courtyard
Tehkhana	Basement
Zenana	Women's Quarters

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GATED LIVING IN THE CONTEXT OF KARACHI

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ABSTRACT

Housing in groups of people with political, ethnic and/or religious commonalities has been a traditional trend. With increase in population and city sizes a later development to this has been restricted access to housing areas and gated security in existing as well as new housing schemes. Today, the concept of gated communities is marketed as ideal housing projects by developers as well as government associations and well received by various communities and income groups in the city of Karachi.

The paper gives an overview of the evolution toward gated living, identifying an evolving morphological typology of (community) housing from the premise of security. Based on the hypothesis that the physical urban form is a manifestation of the social grouping and organization, the two are described for each of the typology. The level of security and controlled access to these housing are also described. Later, the major reasons responsible for increase in gating are identified, marking an evolution in the social mindset. This developing trend of gated living is being supported by the market and the state through policies and planning. The conclusion sums up the social impact of increased physical gating on the city and its people, summing up the challenges for future city planning.

The research methodology employed includes; review of international literature on gated communities, analysis of local city data such as; census data, crime reports and socio-economic profiles and interviews with urban planners and residents of housing schemes. The debate on gated communities in our context was triggered by research on existing housing projects undertaken by the 3rd year architecture students for the course 'Housing and Community Development' taught at the Department of Architecture and Planning, NED UET. Some of the case examples mentioned in the paper are also taken from these student works. The paper seeks to answer some of the following questions: What are the possible reasons for the rising trend of gated housing in the city of Karachi? What are the physical and social implications of gated housing on its context? If this trend continues, what would it imply for the future?

1. INTRODUCTION

International references define typical gated communities to be entirely surrounded by physical walls with gates, and sometimes restricted entry with guards or other means of access control. (Landman et al 2002; Quintal, Thompson: 2007; Low: 2001; Alvarez: 2005; Csefalvay: 2009; Sabatini et al 2007). While the discourse on gated communities mostly refers to posh upper income housing schemes that provide exclusive privatised security and high class amenities, the following paper expands its scope to include community housing patterns with diverse ways of secure, controlled access. Public access to housing here includes physical access as well as access for acquiring living status within (ownership or rental). Community housing in South Asia, centre around cultural norms, the relationship between public and private spaces being a defining factor in the planning and orientation of community and individual housing. Community living as it is, provides for a certain measure of social security where people know one another or follow common cultural rituals while common cultural amenities within allow for interaction and exchange of views on issues and opinions.

In the case of Karachi city which is the subject of this paper, earlier, community housing was bounded by implied edges, surrounded by main roads, circulation alleys and open spaces, and not walls, a relatively recent addition to this has been physical gating of existing communities. Various factors are responsible for a growing need felt for provision of further physical security to community housing besides the traditional walling of individual premises. These are described in later

sections in the paper. If anything, these individual residence boundary walls have gone up even higher, or have been finished with jagged broken glass or barbed wire with the intent of providing greater security.

Besides the extensive gating of existing housing throughout the city, new gated residential schemes are an upcoming fashion. Apartment housing, another type of gated housing has been an increasing trend over the past three decades. Naval, army and air-force housing schemes from the past have set an example of the measure of exclusivity, security and standard of living that can be offered in gated housing. The opening up of some of these schemes for public ownership and living and the rising dominance of builder driven market dynamics in real estate have opened options for the possibility and planning of such housing schemes for all middle to upper income target groups in the city.

2. EVOLUTION OF A MORPHOLOGICAL TYPOLOGY IN COMMUNITY HOUSING WITH RESPECT TO SOCIAL AND PHYSICAL SECURITY

2.1 Traditional community living / Pre-British housing

Traditionally, housing communities in the subcontinent including cities in India and Bangladesh were implied segregated residential zones where homogenous communities sharing ethnic, social, religious, trade and caste related ties resided together. Differences in income and status were not apparent as resource sharing, interdependence on ones clan and caste were supreme concerns. The boundaries of privacy, segregation and spatial planning were intertwined and respected. The street was a shared space amongst the various houses and residents; the market place and public open space the domain of the male population. The mohalla (neighbourhood) thus formed was the planning unit, multiples of which sprang up along; historic traditional routes, market places and production zones. Mixed land use and medium density were the norms which degraded over time as population grew and environmental factors worsened.

The urban morphology of the 18th century fortified Karachi city is an example of such a context where a heterogeneous society resided. (Figure 1: Old City, Karachi). The city within was a mixed land use set up, almost the scale of a neighbourhood today, with the street acting as a public interface. The walled city provided protection to its markets, goods and resident merchant population. The fortification disappeared but the implied boundaries are made obvious due to change in density, extension of certain land use into the immediate surrounding areas. After British conquest in 1839, the native city was largely restricted to housing for the local population, small and medium scale trading activity and other attributes of local land use. Administration and other spaces shifted to the British quarters along Saddar bazaar and adjoining areas.

Figure-1: Fortified Area - Old City, Karachi.
The black shows the previously fortified area of Karachi while the light grey shows the plots and buildings in the British and post British development.
Source: Architectural Heritage Support Programme, Dawood College of Engineering and Technology, Karachi Historical Quarters Revitalization and Rehabilitation Project, 1999.

Homogenous ethnic groupings have also prevailed in the city historically, informally around the main city as well as in the suburban Karachi city, an example of which is the traditional Baloch Compound Housing. Physical proximity allows them to practice their culture and religious vicissitudes freely and independently. Their get togethers, communal activities as well as other aspects important to their public and private way of life are planned for. Naagman Village is a small settlement of Balochis that is over 150 years old. Present in the vicinity of Liaquatabad area in Karachi today, it consists of around 200 houses. Like many other Balochi settlements along Lyari and Malir River, the inhabitants of Naagman Village were farmers and fishermen in the beginning. The settlement has an inorganic layout (Figure 2). People live in compound housing whereby houses of the same family cluster together around an open space, with a single entry/exit point, forming a small *gated* community within. Their religious amenities exist within the village.

Figure-2: Nagmaan Village - Morphology of a traditional community housing type in its context.

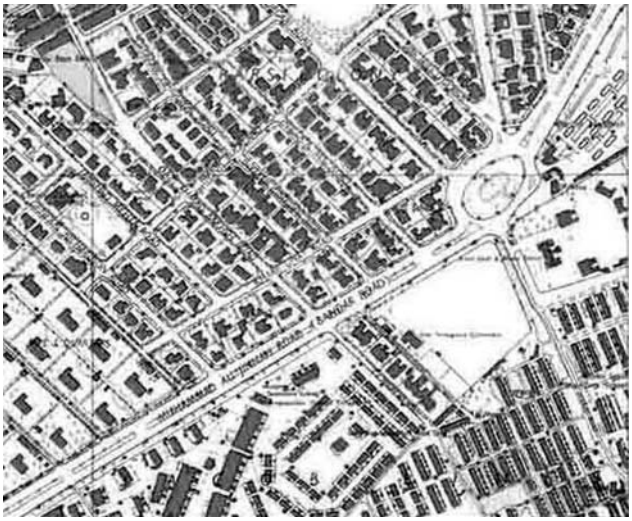


Figure-3: Post British housing morphology showing house surrounded by boundary wall, segregated landuse and use of road as transportation connectors.
Source: Survey of Pakistan, part of Karachi Map 1998.

Moreover, an informal security check exists at entry / exit streets of the area with young men always sitting socializing and playing games at such strategic locations.

After independence the surrounding areas of the village were occupied by Urdu speaking ethnicities. Although there has never been any physical boundary of the area, yet the urban fabric of Naagman Village has remained intact. (Figure 2) Although there is no restriction to sell property to other ethnicities and no restrictions for other ethnicities to come and live in the area, but the ethnic demography has never changed. Besides the physical contrast between the two adjoining areas, there is also a sharp contrast in terms of life style and political affiliation of the social groupings within and outside the village.

The main characteristic of such traditional community housing is that it is clan or ethnicity based and is planned informally by the clan. It is usually high density, yet public and private areas are clearly distinguished. Informal means of security and control exists through fewer exit points, and positioning of public areas at or near exits where there is a visual informal vigilance in place. In a small community where all residents know one another, strangers are clearly identified.

2.2 British planning and its impact on post British housing

The late 19th century saw Karachi's development as a British urban centre. The British developed the city to expand its outreach and utilize its strategic location in South Asia. The British planning aimed to address the larger regional objectives in city planning, improving connectivity and enforcing modern planning principles. The architecture of the city developed to include public monuments and spaces with public commercial and institutional buildings creating a public interface with adjoining urban areas, including streets and squares, giving representation. With colonization came the modernist grid and segregated land use planning. This was not adopted by the native areas and population till after mid 20th century. The mixed land use housing (residential plus commercial) units were replaced by individual housing plots with boundary walls, the vehicle driven road replaced the street and markets and public places were transformed into parks and playgrounds. The boundaries of the *mohallas* stretched to area plans and schemes. This led to low density arrangements with redefined public and private domains, relatively isolated walking spaces (streets) and increased distances.

The local and the British areas hence developed distinctly differently in terms of urban form determined by bigger individual plot sizes, building relation to street, density, mixed versus segregated land use, changing the use of the neighbourhood and the street (Figure 3) The boundary wall around larger plots of land was introduced by the British to offer security from locals and privacy to the semi-public /semi-private living areas of British residences (Lari: 2001). The trend for individual gated plots was carried forward by the elite of the city forming areas which have implied boundaries and public access limits.

After independence, as the population of the city increased by 2 ½ times, the British planning was taken on and expanded further where the boundary wall of the individual residential premises was maintained. In the 1950s, when the city master plans were initiated and formalised housing development started, new cooperatives[1] formed by government employees schemes were formed and given subsidized land and infrastructure support. (Figure 3) These cooperatives were not gated and followed the modernised planning principles of centralised amenities, parks and segregated land use.

With an immense change in demographic status, lack of implementation of a city plan, the shifting of the federal capital from Karachi to Islamabad, instances of gated housing emerged in the 1960s of minorities and defence employees. Ownership and living here was strictly for a restricted group of people. Examples include Cyrus Gate (housing for Parsis) and Ameenabad, housing community of Ismaili Muslims. Ameenabad (1965) is an example of a gated housing community of Ismaili Muslims. Planned on a modernist grid, Ameenabad is a housing of approx. 200 houses. A central belt of common amenities is planned to be at a walking distance from all houses. Besides restricted physical access, buying and selling of real estate is controlled and allowed only to people of the same belief. The residents use markets and facilities from neighbouring areas as well. (Figure 4)

Figure-4: Ameenabad (1965) - Gated community housing planned on a modernist grid, with a central belt of common amenities.

2.3 Apartment housing

The post colonial industrializing societies of the 1970's like Karachi in Pakistan faced immense population increase, coupled with an increased fragmentation caused by globalization and neoliberal policies. This shifted the emphasis on developing commercial zones, shopping malls, parking plazas, apartment housing and new CBDs.

In the late 1970s, flat sites were introduced by the Karachi Development Authority.[2] These were plots of size 5000 sq. yards each where the mid rise (4 – 6 storeys) (walk up) apartment buildings were allowed, with the idea to allow higher density residential areas. Plots were given at subsidized rates to developers to promote apartment housing (Hasan 2002). These were sold off to developers who planned and marketed the apartments to middle to upper income user group. These flat sites developed as gated residential schemes. Maymar Arcade, built in 1985 is an example of this. Designated as a flat site, it was sold to Maymar Builders and Developers to build and sell out the apartments. The vicinity area was planned for similar development and consists largely of apartments of G+4 or less around it. Amenities are planned at an area level by the KDA, providing requisite parking and common infrastructure facilities along with a common central open space within. (Figure 5)

A social change had also begun to take place. The table-1 shows that over the years, there has been an increase in the literate population of the city; the urban married population in the prime age bracket had declined. This along with an increase in the number of nuclear families have led to more than one earning members in the family and a greater number of working women (Hasan 2008a). Apartment living for the middle and upper income bracket, which are also gated, supported this social change. With the ground floor of most apartment buildings being used for parking, circulation and common amenities, the premise becomes feasible only with gated security. Policy support and social change have both played a major role in increasing popularity of the apartment as a housing type.

1 Cooperatives are groups of people who come together to plan and reside in a housing area together.
2 Master planning and development agency in Karachi uptill the last decade.

Figure-5: Maymar Arcade (1979) - Walk up apartments (G+4) on flat site as gated housing, with area planning of amenities done by KDA. The google image shows other such gated apartments built in the surrounding area, the smaller buildings are bungalows that were present in the area before.

Table-1: Social Change, Karachi

	1981	1998	2010 (projected)*
Total population	5,437,984	9,856,530	15,500,000
Urban Married population between 15 and 24 years of age	24.04 %	18.19 %	14.06 %
Total literate population 10 years and above	55.04 %	67.42 %	76.16 %

**** Projected by Author***
Source: Survey of Pakistan, Census Reports. Hasan, Arif. 2006. The Scale and causes of urban chane in Pakistan, Ushba Publishing, Karachi.

3. GATING OF EXISTING COMMUNITY HOUSING AND NEW GATED HOUSING DEVELOPMENTS

The following section describes the prominent social and political factors that have led to increased physical divisioning / gating throughout the city. This includes gating of existing community housing as well as new gated housing developments.

3.1 The changing role of the government from a Provider to a Developer

By 2010, there has been a large shift in the role of the state / government from that of a welfare state provider capacity and perception to a market supporting developer. Some of the first gated housing were built for retired defence (army, airforce and naval) officers housing colonies. These were strictly gated and exclusive in terms of the services and infrastructure provided within. Ownership of property in such areas was initially only for the designated retired officers. In the late 1980s, things started to change. The existing housing colonies started to open up to outsiders, accepting them first for rentals and eventually for ownership. The Defence Housing Authority established itself as an independent real estate developer, the scale of development undertaken by them has today become enormous. This is focused toward an elite clientele, the marketing based on providing exclusivity.

Three cases looked at in this section are Independent Bungalows for Overseas Pakistanis (1979), a low rise gated housing scheme on 541 acres of land; Maymar Arcade (1985), a mid rise housing (G+4) built on about 1.2 acre plot and Askari IV (1997), a combination of low and mid rise housing on 120 acres of land. The three cases span different time periods. It is hence interesting to note the evolution in the role played by the relevant government department in relation to the developer. In the first case, Overseas Pakistani Bungalows was proposed and planned by the Karachi Development Authority as an exclusive housing overseas nationals to ensure certain economic returns from it that were to be utilized in the development and planning of the city. The case of Maymar Arcade has been described in the previous section, whereby the site along with other similar sites in the area, was sold off to developers to build and sell out apartments, by the KDA providing for amenities at an area level. Lastly, Askari Housing schemes (1, II and III) built by the Defence Housing Authority were initially meant only for the retired defence personnel families. However, Askari-IV opened up ownership out to outsiders. The defence authority had by this time established its role as a market developer.

In the first case, the government acted with an established concern and authority for city planning. It planned and executed the project itself. In the second, the role of the private sector developer is determined by the city planning authority with the need felt to increase residential density in a controlled fashion, planning for amenities for all. Now foreseeing the limits of the government planning body, a partnership is determined with the private developer with conditions and plans laid out by KDA. The last case, by contrast is a witness to the changing role of the government toward becoming a market developer itself. Security concerns at Askari IV today described in a later section are a witness to this. The government's support to the developer mindset is today leading to an increase in the number of gated housing schemes in the city.

The prominent stakeholders involved in the demand and supply of gated housing schemes can be summarized as follows:

- Demand: Ethnic communities, cooperatives, Navy/Army/Air Force Personnel, upper income bracket;

Table-2: Three Gated Housing Cases Compared.

Housing	Year	Total Area	Total Number of Housing			Average Unit Size	Population Density	Amenities	Supply Stakeholder
			G+1	Apartments	Total				
Independent Bungalows for Overseas Pakistanis	1979	541 acres	400	--	400	300 square yards	4.44 person / acre	14 parks, 1 playfield, 1 swimming pool, 2 mosques, madrassa, school, community hall, post office	KDA
Maymar Arcade	1985	10000 sq. yards	--	80 (8 blocks)	80	1531 sq. ft.	77.44 preson / acre	Parking, central open space, common infrastructural facilities like underground tank.	Developer + KDA
Askar - IV	1997	120 acres	240	1160	1400	2400 sq.ft (apartmen t), 500 sq.yd (single unit house)	70 person / acre	A market place, mosque, 3 parks, basketball court, parking	DHA as Developer

- Supply: Government departments including Master Planning department, Defence Housing Authority, real estate builders and developers.

The recent master plans of 2000 and 2020 are evidence of the changing role of the government and its policies in planning. The Karachi Master Plan 2000 introduced special sites in the plan. These are larger plots of land that could be developed for multi-family residential uses along with commercial, institutional and public land use. These sites are intended for gated housing.[3] This is also carried on further in Karachi Strategic Development Plan 2020, which allocated areas along the major highways, in particular the Northern Bypass for a stretch of up to 3 km on either side for such development (MPGO: 2008).

3.2 Crime and civic unrest leading to insecurity and social divide

Increasing crime levels in the city has been a major reason for increasing desire and demand for gated housing. As a consequence, over the last decade, large existing residential areas of the city have been gated. Barriers have been put across numerous tertiary lanes, restricting access and implanting security guards at the limited entry/exit points. The community living so characteristic of the city is now allowing the city to turn into controlled gated neighbourhoods. These gated areas range from middle to upper income group residential areas.

Cyrus Gate is an example of a high income Parsi Colony gated over time. Built in the 1980s, the site for the housing was planned to consist of the residential area in half of the site while the other half was left as open space for religious and amenity purpose. With the Afghan war, Afghan refugees came to settle in the adjacent area and started encroaching on the open amenity space. To protect their space, the colony was made gated and more houses were built on the periphery of the other half site, to protect the sanctity of their open space. This case is a classic example of a minority community needing to confine itself to allow practice of their rituals in peace and security offered by the gating. (Figure 6)

The lower income bracket also house in groups. Lack of adequate planning for housing and infrastructure by the state and political will has led to the formation of these groups

Figure-6: Cyrus Gate (1962) - Gated Housing of Parsis. The peripheral housing along the large pen amenity space is apparent from the image. The landuse / planning of the surrounding area has changed since.

3 Interview with Dr. Noman Ahmed, Planner, October 2010

based on representation political, religious or ethnic whereby they are able to lobby and network to acquire related services. This housing is not gated usually, however, there may be other forms of checks and informal security. The case of Nagmaan Village described earlier is an example. The association of political factions with ethnic groupings providing formal and informal housing as a means of gaining vote bank has also added strength to cohesion and introversion of low income neighbourhoods with respect to their physical and social context, these being important characteristics of gated community housing (Hasan: 2010). Although such neighbourhoods do not have physical boundary, however, the edges of where they start can be clearly distinguished in experience of space as well as in an aerial image showing the urban morphology of area.

Due to a lack of accountability of the political process and chaotic unreliable law and order situation, private (formal and informal) security measures are taken up by existing community housing. Year wise crime bar charts from the CPLC[4] show the crime rates in the city (including kidnappings, arson and theft including vehicle thefts and murder/killings) have gone up particularly from 2007-2009 (Figure 7a). Between 2006 and 2007, vehicle thefts, murder / killings and incidents of cell phone thefts have gone up by 47 percent, 24 percent and 83 percent respectively. (CPLC website) In addition, incidents of bomb explosion and terrorist attacks have gone up in the city. 801 persons died as a result of terrorist attacks in 2009 as opposed to 278 in 2006 (CPLC: website; Hasan: 2007). Politically related Civic strife claimed another 95 lives and injured 295 persons in 2007. More than 1,000 vehicles were torched in these conflicts. Although they are recorded, these figures can only be taken as a basic approximation as the actual number of cases that remain unreported are difficult to estimate (CPLC website). These growing crime rate figures are an important factor for the increasing gating and security witnessed in the city.

Spatial crime analysis (Figure 7b) carried out by the CPLC mark the most criminally volatile areas to be the areas under the Defence Housing Authority (DHA), Jamshed Town, PECHS and residential areas along Shahrah e Faisal and Gulshan e Iqbal. These are predominantly high income or high middle income residential areas. This points toward the possibility that crime has a direct relationship to the widening social divisions and the gap between the rich and the poor. (Hasan: 2010) The following section elaborates further on the indicators of inequality among the income based social strata in the city.

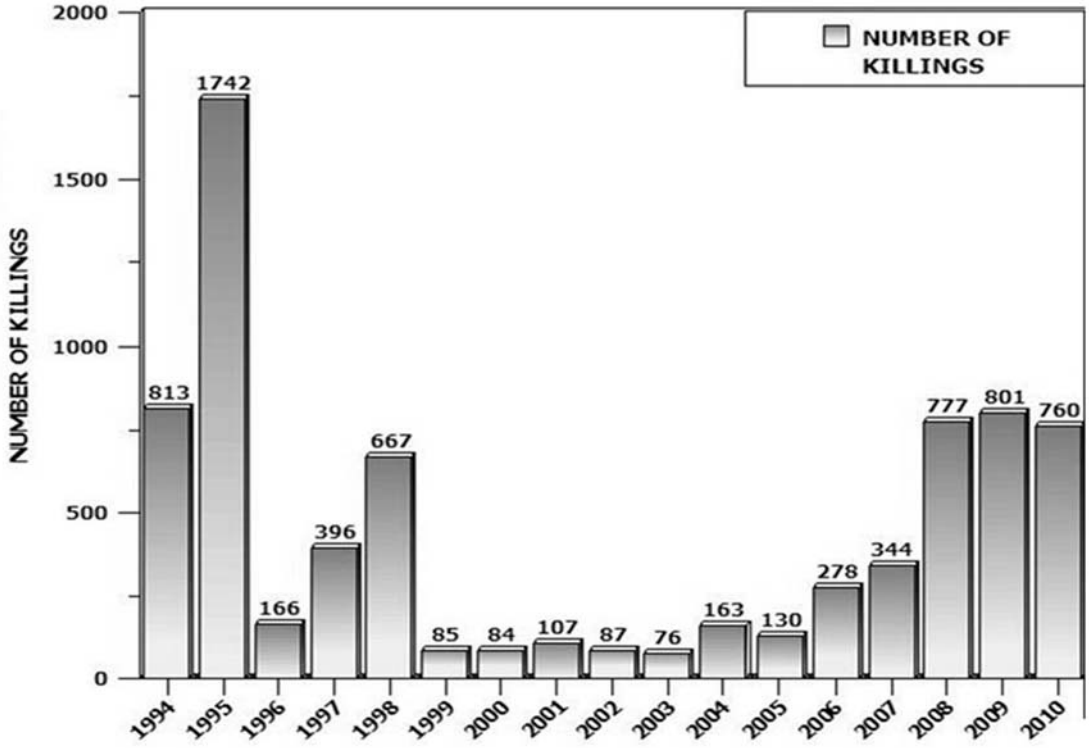
3.3 Inequality status and mindset

Gated communities are characteristic of societies with vast income disparities. (Minton:2002; Hasan: Interview 2010) Examples include Malaysia, Buenos Aires, Rio de Janeiro, Sao Paulo and cities in South Africa. Growing income disparities cause the rich and the poor of the city to share mistrust and fear for each other, manifested in the estranged social relations, increasing levels of insecurity and gated living, reflected in the physical urban elements like higher walls, impermeable gates, deteriorating urban infrastructure, disappearing urban spaces. Besides this, factors like the withdrawal of the state, land being dealt as a commodity in the open market, projects versus planning and the association of political factions with ethnic groupings providing formal and informal housing as a means of gaining vote bank has added strength to gated living (Hasan: 2010). This section summarizes some of the prominent evidences that are an indication of developing disparities in Karachi city.

Marked contrast in physical appearance and state of infrastructure between developed and adjoining less developed residential areas of the city make obvious the existence of parallel urban living and operating systems within. There is a major physical distinction between the upper to middle income areas and the low income areas of the city. This is apparent in the planning of the area, the process of acquiring house, the density of the area including household size, floor space per household, number of persons per room, state of infrastructure, availability and maintenance of water, electricity, gas, sewerage connections as well as level of solid waste management. (Hasan, Sadiq: 1994) There is a clear contrast in the physical housing conditions and access to utilities between the two. Informal processes exist for low income area housing and infrastructure acquisition and up-gradation, enabled only through excessive lobbying and networking. The obvious distinction in the process and physical state of the two income housing is an evidence of marked separation and inequality between the two.

The introduction of market driven projects from 1990 onwards aim to cater to the desires of a small percentage of the rich of the city. Examples of some of these projects

4 The CPLC – Citizens Police Liaison Committee is a non-governmental organization (partially funded by the Sindh Government, but most funds come from the business community) working to assist law enforcement, which maintains crime statistics as well as a criminal database.



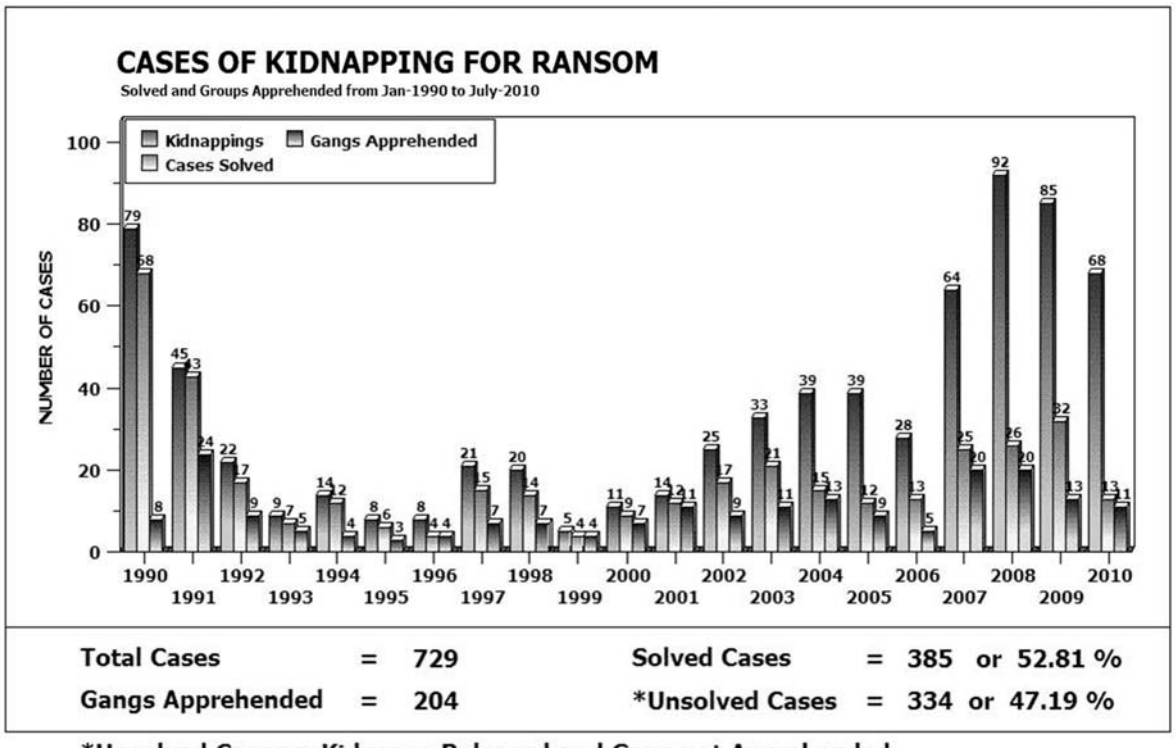


Figure-7a: Barcharts showing crime rates over the years.
Source: Citizens Police Liaison Committee: www.cplc.org.pk

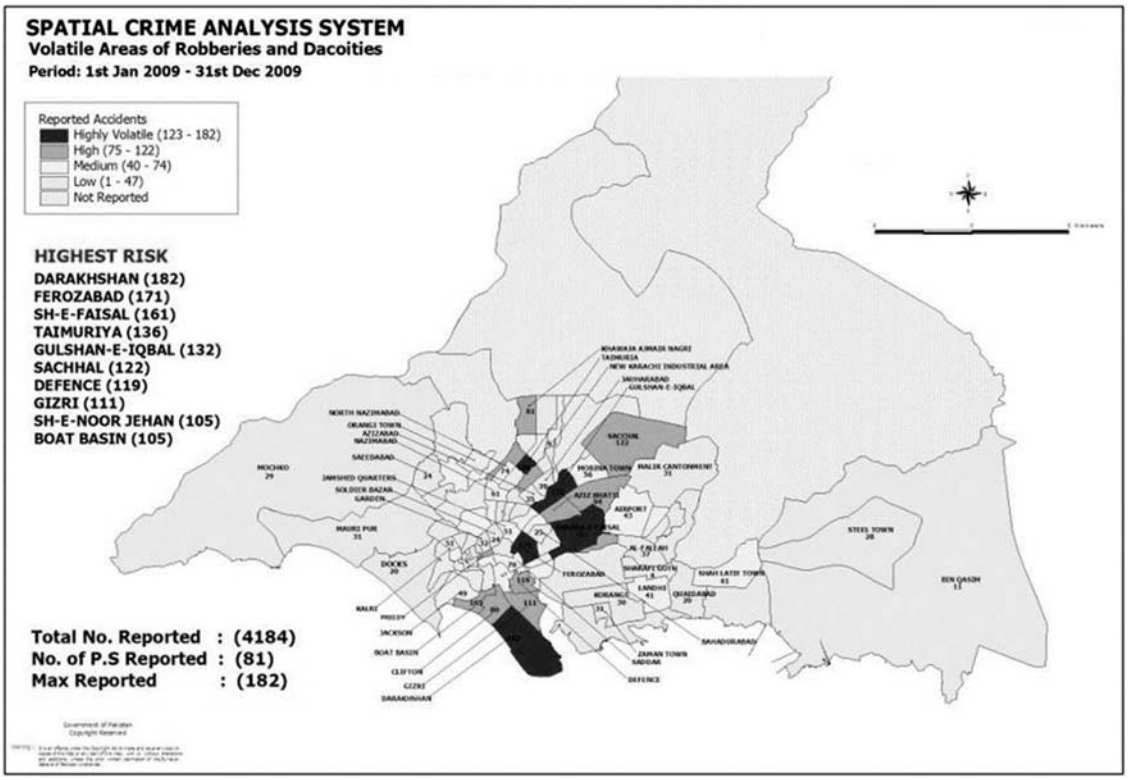


Figure-7b: City mapping of crime - marking volatile areas.
Source: www.cplc.org.pk

introduced over the past years are those in particular along the coastal stretch, many of them aiming to privatize the beach. Some of these were incessantly opposed by various interest groups. Other examples include infrastructure projects supported by real estate developers that induce evictions of low income settlements, both legal and illegal. These are an indicator of growing inequality status and mindset in the city

The presence of a growing informal sector in the city is another important indicator in this respect. The total formally employed population of the city with respect to the total population declined from 48 percent in 1951 to 33.43 percent in 1981 to 27.98 percent in 1998 (Census reports; Hasan: 2006). These figures show a decline in formal employment and its availability in the city. In his publication of *The scale and causes of urban change,* Arif Hasan (2006) concludes, 'Given political and civic conflict, investment (in trade and manufacturing industrial sector) is unlikely to take place, as a result, unemployment will increase and the informal sector will grow further to fill the gap.' The increase in the informal sector, its lack of adaptability in the formal sector and incongruent links with the formal sector, its general acceptability as a norm in the city life all create a lawless environment. All these are indicators of growing social inequality in the city, depicted in the developing physical divisioning in the city.

3.4 Market driven gated housing

Market driven and state supported mechanisms today support real estate ventures for the upper income group offering investment and speculation possibilities. With little investment taking place in the manufacturing and industrial sector, large cash flows are directed toward real estate investment, allowing land prices to hike enormously at potentially important locations. The following section describes a couple of examples of upper income gated housing outlining the market demand and supply factors for these. Recent examples of such housing include Creek City, Creek Marina, DHA Phase 9, Naval colony. Three relatively older cases mentioned in the previous sections were Independent Bungalows for Overseas Pakistanis, Maymar Arcade and Askari IV. These were planned to be gated. The table-2 gives a comparison of the size, density and typology of housing within each of these. The site for the entire residential area

is physically surrounded by walls on all sides with gates and restricted entry with guards. The size of the settlement varies among these only from 2.5 acres to 2750 acres. Housing within may include either or both apartment blocks and the bungalow of size from 200 to 600 sq.yard.

Such projects are marketed on the basis of exclusivity and security. A rosy image of secluded, safe and elite modern housing is created, offering amenities at times to add to this, promoting a mindset of gated living. With security being a prime factor, interviews with residents of gated housing revealed that the measure of satisfaction regarding level of security within was described to be simple things like: it was completely safe for women of the house to go for a walk in the neighbourhood even at a very late hour; or that it was safe for the car to be unlocked outside the house; or it was safe for children to play outside with minimum supervision.

The second important factor catered to in modern gated housing is provision of open spaces where women, children and the elderly can interact, play or socialize, in essence creating a 'safe' neighbourhood.

Independent Bungalows for Overseas Pakistanis is an example successful in achieving this through planning. Blocks of 20 housing plots each surround an open space, the planning thereby creating a hierarchy of semi public and public open spaces and adding to the creation of 'neighbourhoods'; 5 basic design conventions together characterize a good neighbourhood. These include 1) an identifiable center / heart; 2) walkable distances and size; 3) mix of landuse and housing types for greater choices in living; 4) integrated network of walkable streets; 5) special sites for civic purposes. (Farr 2007) (Figure 8). By comparison, Askari IV uses up most of its open spaces for circulation. With large housing sizes, the built up density seems high, open spaces occur mostly as negative spaces and are not well integrated with the housing. New blocks have been added to increase population density of area, however, these are built in the available open spaces, leaving only a few of them. (Figure 9)

The acceptance of outsiders for ownership is a cause of concern for the families of retired defence personnel. Repeated cases of robberies here are testament to the fact that there is no guarantee of complete security even within gated housing. The security factor has been a reason for some families to also move out of Askari-IV. Adhoc planning of newer blocks in amenity areas and planning amenity areas in the periphery or as negative spaces rather than as central elements play a role in negating sense of community in the area.

Like mindedness of people living in a neighbourhood is preferred by most people looking for house. This is offered through commonality of culture, ethnicity or income bracket. The traditional model of community housing still carries provision for a mixed income group residing together. By comparison, in the market driven gated housing, while there may be variation in type and size of housing available, the overall cost range is usually very high, with the addition of privatised security and amenities. Ownership and living status in both cases can be acquired only if one fulfils the criteria for it. In the former, this is based on common culture, belief or ethnicity while in the latter, it is income based. This leads to an inevitable division of the city into the two major groupings.

The following section weighs the pros and cons of gated communities, suggesting the social impact of a large physical increment in gated neighbourhoods, outlining the challenges for future city planning.

4. PHYSICAL URBAN FORM AND SOCIAL CHANGE

Secured, controlled, gated living was an alternative trend for minorities and dignitaries. Today, this has become a popular and developing way of life in Karachi city. As a mega city and an economic hub, Karachi city has witnessed economic and political struggles and social divides, along with increase in crime rates and insecurity. National geo political concerns like the threat of terrorist bomb attacks, chaotic law and order situation and lack of social justice have further added to physical and social insecurities in the city.

There has consequently been an evolution of bounded living in the city. A large proportion of the city housing now consists of controlled (gated) neighbourhoods, which can be broadly classified into two prominent types of social grouping; traditional community grouping on the basis of political, ethnic or religious identity and, a relatively recently formed grouping on the basis of income and status. The social grouping in the city is reinforced through the physical divisioning.

Currently large areas of existing housing (planned at an area level by KDA) have been gated. While barriers and added privatized security aim to check on anybody 'suspicious' from entering the residential territory, nevertheless, the physical planning of existing area remains integrated with

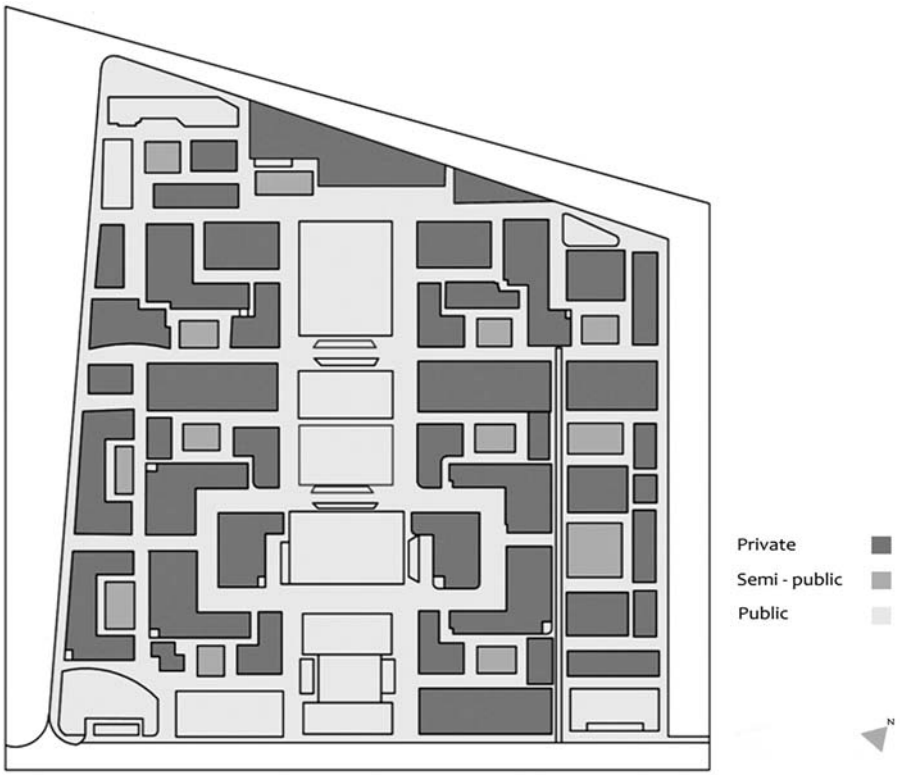


Figure-8: Independent Bungalows for Overseas Pakistanis 1998: An example of good planning of gated housing to create 'neighbourhood'. *Source*: Student research project for Housing and Community Development Course, 3rd Year Architecture and Planning, 2010.

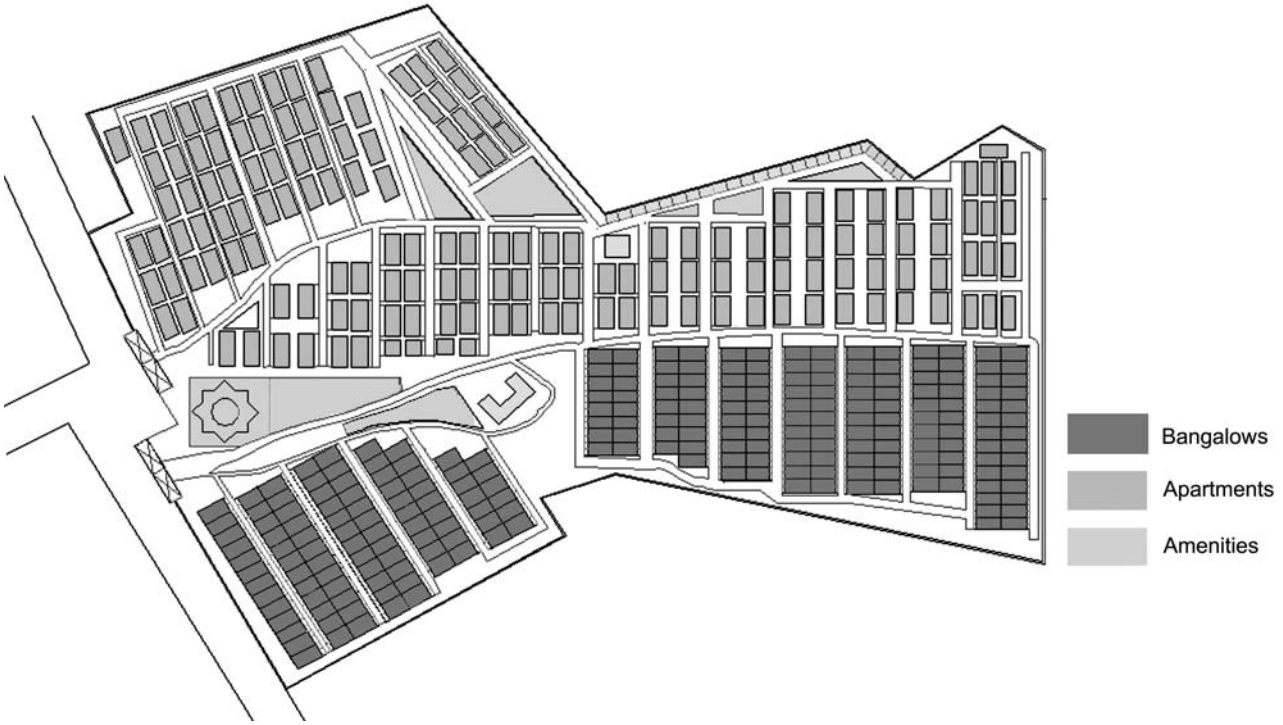


Figure-9: Plan of Askari IV - Gated housing built by DHA, 1997.
Source: Student research project for Housing and Community Development Course, 3rd Year Architecture and Planning, 2010.

its context, unlike in the case of market driven or designed gated housing. Low barriers (3' ft high) allow pedestrians to walk through in and out of the neighbourhood. This keeps the area from complete physical and social isolation from its context.

The trend of gated communities is much more in other cities of the world where the inequality scales are much wider (UNDP:2002, 2005; Landman et al 2002; Alvarez: 2005; Sabatini et al 2007) relative to Karachi (Pakistan). However, growing insecurities contribute to a growing desire felt for its need in Karachi city, subsequently supported by recent policies and plans. Hence, we are heading in a similar direction.

With growing crime rates and insecurity, market driven gated housing (surrounded by walls and restricted entry) will continue to be in demand and grow in numbers as is reflected in latest plans and suburban housing projects along highways. This is because gated communities provide for a secure living environment, keeping up with the desires or vision for living a certain lifestyle following religious and/or cultural rituals, maintaining a sense of community. For such physical separation, this sense of community and ownership remains in a limited domain, that of the housing itself only and not beyond. With the advent of increased mobile networking (accessibility to packages for cheap internet usage, sms and international calling) and consequent accessibility to various networks, in addition to living gated lives, the psychological impact of this entire living is that people live in bubbles. Gated living promotes gated mindedness, where people are just aware of their limited circles of life, when actually there is so much more to the city beyond. The users of gated communities and others who wish to live in them believe that they are a necessity, as feeling secure and insecure affects immensely the life that one lives.

Hence while gated housing addresses the demand of safety, security and segregation from the unknown to some extent at the micro level, but on the macro level, it isolates the community from its surroundings. The streets around gated areas change in character and become less socially interactive spaces. Ownership of the gated residents to these streets becomes less. Gated communities are physically and socially cut off from their context and contribute to spatial fragmentation in urban areas, reflecting social divisions in society. (Landman et al: 2002; Quintal, Thompson: 2007; Low: 2001; Alvarez: 2005; Csefalvay: 2009; Sabatini et al 2007)

In contrast to the original cultural context, where mixed land use gave vitality as well as security to area, keeping it largely a multi class area, there is a marked segregation of rich area and poor area. The interdependence of the rich and the poor is nevertheless inevitable and there exist alongside many elite gated housing areas, colonies of poor that service them in various ways.

While social change can direct change in physical urban form, this physical change requires assessment and evaluation with the intent of developing people friendly, equitable and harmonious cities. This is because imbalanced physical changes can cause social dilemmas unfathomed.

Increasing gated communities promote a social mindset, especially among the younger generations, where the contrast between the exclusive and the deprived is offset, giving shoulder to lack of tolerance and / or respect of *the other,* outside similar gated housing.

> *"Gated communities are paradoxical. They are marketed as close-knit communities while effectively reducing the interaction between neighbours. Internally, they are hotbeds of volunteerism, yet they may reduce civic engagement in the larger community." (Lang and Danielson 1997 in Low 2001)*

Therein lies the major challenge for the future city planning. Whether the crime rates and civic unrest reduce or increase, the important question that arises is how city planning can promote the perception and acceptance (tolerance) of the city as a multi class, multi ethnic city. If gated communities continue to increase, what policies / spatial strategies can nevertheless promote an equitable and just society.

5. CONCLUSION

Gated living as a trend cannot be reversed by the simple identification of its adverse social implications. The state will have to ensure security and crime controls for communities to feel comfortable and choose non gated environments. Multi class economic and social policies will have to be adopted to ensure equality and sharing of resources and space highlighting the mutual benefits the rich and the poor will draw from living in homogenous schemes. Vehicular controls have to be ensured for streets to become safe for residents, especially children, mixed land use which does not surpass and become encroachment has to be encouraged and controlled, medium rise density has to be enforced for effective neighbourhood plans which promote safe , hygienic

and socially controlled living. Literal gated communities are not necessarily safer, therefore, engagement of communities in plan making, execution and operation and maintenance can play a significant role for schemes to be owned and implied neighbourhood boundaries to be safeguarded. As more and more neighbourhoods in large cities will be formed by heterogeneous communities, plans and planners need to address the social planning issues as much as the spatial ones, leading to harmonious cities.

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INDIGENOUS RURAL HOUSING AND ITS INDOOR THERMAL PERFORMANCES BESIDE THE PADMA RIVER BANK AREAS

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ABSTRACT

A unique geographic location, coupled with climate change impacts, has made Bangladesh one of the worst victims of natural disasters. 'Living with disasters' is a cruel reality for the people of Bangladesh, and rural housing is one of the major sectors which is badly affected almost every year. This study focuses on one of the primary problems of traditional vernacular dwellings beside the Padma riverbank areas, which is the overheating of indoor spaces due to changing demand of building materials as well as harsh, barren landscapes. This empirical research was conducted by doing surveys and analyses about the available building materials, housing characteristics, homestead layouts, space-use patterns, and environmental conditions on the northern side of the Padma riverbank areas, at Munshigonj, Dhaka. Again a quantitative method of analysis was carried out for assessing indoor thermal environments of a few randomly selected houses with the help of a pocket weather meter. The surveys reveal that these houses were vulnerable to recurrent natural hazards, and their indoor environment was relatively uncomfortable. But in terms of affordability and availability, they are clearly optimum and sustainable. It may be possible to suggest ways and means of improvement of the physical environment of rural housing in such a way as to improve their indoor thermal performance and reduce vulnerabilities.

Keywords: *rural housing, vernacular dwelling, indoor environment, thermal comfort, natural hazards, riverbank areas, vulnerabilities.*

1. INTRODUCTION

Indigenous rural housing construction and its overall layout in certain localities develop according to the needs of inhabitants under a set of geographic features. Again, climatic variability, economic reasoning, and changing trends of human need have always been a foremost apprehension in any housing technology being practiced, especially among those groups of people who have been living in close association with nature for years. In order to adjust with natural calamities and environmental disasters, these people have generated a traditional paradigm of well-protected, sustainable, and ecologically-sound housing technologies which have been changing due to the presence of several factors. Demographic growth, shifts from rural to urban areas, resource depletion caused by natural as well as man-made reasons, and significant changes in expectations and life styles, all combine in their various ways to erode the viability of traditional approaches to shelter provision and the usage of building materials. However, during the past few decades, due to the advent of a cash economy (Mitchell and Bevan, 1992), industrialization, and population pressure (Alauddin et al. 1995) traditional housing is declining, or changing in form and layout. Thus, inappropriate use of materials and construction methods, fuelled by populist notions of wealth in rural housing, creates unhealthy and uncomfortable indoor environments.

Bangladesh lies in the northern hemisphere, with a composite monsoon climate having a rather long warm-humid season (Ahmed 1994). It is a generally held view that traditional houses in this region are more sympathetic to the prevailing climate, and are well collaborated with local beliefs and traditions as well as local materials, which in turn provides comfortable interiors. Again, the Ganges-Brahmaputra and Meghna river basin make this country one of the most disaster-prone regions in the world. Thus, rural life has always had a slow, steady pace here, broken only by changes of season, celebrations of their life cycle, and by natural calamities. The region already has a very critical geographical location along with poor economic conditions, and the impacts of floods, tropical cyclones, storm surges, and bank erosions are high and heavy on the housing, physical infrastructure and the life and livelihood of the people. However, the advent of frequent natural disasters and the current scarcity of natural resources have greatly affected the traditional rural housing process. Thus in rural Bangladesh, affluent households are shifting to manufactured materials like C.G.I (Corrugated Galvanized Iron) sheeting due to its widespread availability, portability and durability. As a result, the quality of housing, both within the interior and on the exterior, especially beside the riverbank areas,

is declining. In addition, there is an acute shortage of land in this region due to widespread bank erosion. This leads to overcrowding and places further strain on household infrastructure, which has direct and immediately apparent negative consequences on the health and well-being of the rural people beside the Padma riverbank areas. The Padma is a major trans-boundary river in Bangladesh. It is the main distributary of the Ganges, which originates in the Himalyas.

This paper primarily traces the housing typologies and the usage of building materials beside the north bank of the Padma River, examines the indoor thermal performance of these typologies, and suggests improvements to it, especially with regard to building materials. The ultimate aim is to provide guidelines regarding a safe, sound and healthy house, which safeguards its inhabitants from the adverse effects of natural calamities.

2. RESEARCH PROBLEM

Bangladesh, with a population of roughly 150 million people (Central Intelligence Agency, 2009), is a country that is witnessing large-scale natural disasters these days. It is situated on low land, to the east of the Indian Peninsula, and it is crisscrossed by more than 230 rivers and their tributaries (Islam and Islam, S. 2005, p.589). Over the flat, deltaic country of Bangladesh, monsoon-generated flooding covers an estimated 20 per cent of the total land area, and very severe floods may cover as much as half of the country (Rogers et al. 1989, cited in Smith 2001, p.262). In fact, the rivers which cover about 3.4 million hectares of lands are also susceptible to widespread bank erosion. An ever-increasing number of people are living in remote or ecologically fragile parts of the country, such as river islands (*chars*) and cyclone prone coastal belts, which are especially vulnerable to these natural disasters. Due to the severe attack of a natural disaster, the consequent sufferings, and a lack of organized support, people on the riverbank areas have to formulate and undertake various adaptation strategies in their own fashion. It is quite a disappointing fact that the land dislocation and population displacement due to riverbank erosion and flooding attacks have received no specific attention either by social scientists or by the government in Bangladesh (Zaman and Wiest 1985; Abrar and Azad 2004; Chowdhury and Kabir 1991; Halli 1991; Rogge 1991). Traditionally, people have developed different kinds of coping strategies related to their livelihoods. Of the indigenous responses to disasters in Bangladesh, housing techniques are also adapted according to the risk posed by floods and erosion. People use building materials which are easily movable and less susceptible to the damage caused by riverbank erosion and seasonal flooding. This may lead to inappropriate choices in the physical development of homes, such as the use of corrugated iron or that of PVC and plastics showing in Fig.1. Conventional wisdom about building and construction has a tendency to be diverted to inappropriate use of materials and construction methods, fuelled sometimes by populist notions of wealth or durability. Scientific knowledge about the treatment and processing of natural materials is needed to improve permanency, as these materials require less maintenance, provide better overall thermal performance, and do not harm the existing environment (Mallick and Ali 2003; Stulz and Mukerji 1986; Seraj and Ahmed 2004; Ahmed 2005). Again, due to land crises caused by repeated bank erosions, people tend to shift to safer places, like under the shelter of some relative or neighbors'

Figure-1: Inappropriate choice of building materials like C.I sheet & PVC sheeting.

Figure-2: Congested outdoor spaces due to land shortages caused by riverbank erosion.

homesteads, beside the highways, or sometimes even to more vulnerable places like newly emerged islands (*char*) in the rivers. This in turn creates more congested microclimatic situations, shown in Fig.2, where people reuse materials for rebuilding their hut.

Each year disasters repeatedly destroy houses and reduce a family's capital, which in turn increases the family's vulnerability to future hazards. Houses are also getting more vulnerable due to repeatedly being rebuilt with the same building materials. For this reason C.G.I sheets are widely used as a roofing material for durability and to reduce maintenance costs. As a result, the indoor environment gets less appropriate day by day. The roof is the topmost element of rural houses, and is subjected to extensive solar radiation. After that, the vertical wall surfaces increase the internal air temperature. To improve the indoor thermal performance and to understand the impact of vertical walls in heat gain and indoor thermal comfort, analysis was done by elemental breakdown. To understand the impacts of microclimate, the whole study was conducted for two different microclimatic conditions beside the Padma river bank. This study is intended to investigate the effects of suitable bioclimatic design for rural housing beside the Padma riverbank areas, in order to prevent overheating conditions indoors, and to lower the maximum indoor temperatures below the ambient temperature in a tropical or monsoon climate. Finally, the aim is to provide guidelines for indoor thermal comfort for the occupants, as well as to provide high levels of self-sufficiency in energy, by using methods that the locals have created themselves.

3. RESEARCH METHODOLOGY

A survey was conducted to provide a knowledge base for the study and to gather information about related climatic issues and traditional rural housing along with indigenous building materials in the given context. This search helped in getting to know about the parameters for indoor thermal comfort and their necessity in energy efficiency as well as their relation to human wellbeing. This gave a theoretical basis for measurement and data analysis during field surveys. It has also helped in providing design guidelines for creating comfortable indoor environments in traditional rural houses around the Padma riverbank areas, Munshigonj, Dhaka. This research investigated, through an empirical survey, the rural homestead forms beside the Padma riverbank areas, indigenous housing construction technologies and building materials, and the indoor spaces of individual houses. Three homesteads were surveyed through random selection from two distinct microclimatic situations at Hasal-Banuri union in the district of Munshigonj, Dhaka. A fill-out questionnaire survey and observation surveys were the key analytical tools in this study. This analysis was also conducted in a quantitative method for indoor thermal analysis which measured both indoor and outdoor temperatures (DBT, deg Celsius) by using Kestrel 3000 Pocket Weather Meter. Data were collected on two different days of August at regular intervals of one hour, from 9.00 AM to 6.00 PM. Measurements were taken at different positions (**Fig. 19**) within the houses and also at their immediately outdoor environment. Finally, a subjective assessment of thermal comfort in these indoor environments was done based on the obtained data and statistical analysis.

4.TRADITIONAL RURAL HOUSING IN BANGLADESH

About 80% of the people in the country live in rural settlements, and 86% of the dwelling units are located in rural areas (GOB 1993). The present facilities in respect of housing and physical infrastructures are very inadequate in the rural regions of Bangladesh (GOB 1998).

4.1 Indigenous rural housing

In most of the tropics, traditional housing is rural housing, as confirmed in a study made by Koenigberger et al. (1992, p.32). Traditionally, this kind of housing is designed by the user in his spare time, and is based on low investment and the usage of local materials, combined with the assistance of relatives, friends and neighbors. Traditional houses reflect the cultural heritage and the traditional values of the people. Housingin Bangladesh has been changing its forms and

building styles throughout history in response to socio-economic forces as well as the geographic location and consequently the prevalent climatic conditions. Traditional houses are influenced by locally available materials, the climate, and the economical ability of the people. The designs of traditional houses have always maintained comfortable conditions for periods longer than their counterpart contemporary houses. But vernacular building forms are undergoing rapid changes because of industrialized building materials. The use of corrugated iron sheets has become quite popular and widespread, and the production and use of traditional building materials is consequently diminishing (Islam and Islam, S. 2005, p.589).

4.2 Climatic zone and traditional house design

Bangladesh is located in the subtropical monsoon region. There are widespread differences in the intensity of the seasons at different places around the country. On the basis of overall climatic conditions, Bangladesh can be divided into the following seven distinct climatic regions shown in Fig. 03 (Rashid 2007; BBS, 2003). According to these climatic regions, a variety of traditional houses have been developed in each of the different zones.

Rural houses are extensively protected from the effects of solar radiation by trees, which produce their own microclimate. Traditional built forms of the rural area often include sound solutions for climatic problems.

4.3 Rural homesteads beside the riverbank areas

'Homesteads' traditionally refer to dwelling units with adequate open spaces that are effectively used for productive and restorative purposes, and are typically constructed by the users who live there. Rural homesteads in predominantly floodplain landscape represent similar morphological characteristics, i.e. all the household activities are arranged around an introverted central courtyard (Hassan 1885). These are vernacular by nature, i.e. people build their homesteads on comparatively higher ground or levee, as shown in Fig.04.

In terms of space use pattern, a homestead is an amalgamation of indoor and outdoor spaces as depicted in Fig. 05 (Kabir 2004). In a typical rural homestead indoor spaces and vegetation spaces are arranged around a central outdoor space, which is termed as the *uthan* i.e. courtyard. Between the detached indoor spaces, i.e. building units, relatively smaller outdoor spaces serve as secondary yards, which connect other, larger open spaces and/or vegetation spaces. Indoor (rooms, animal sheds, storage, granary, etc) and semi-outdoor spaces (verandah, sometimes kitchen, etc) are more

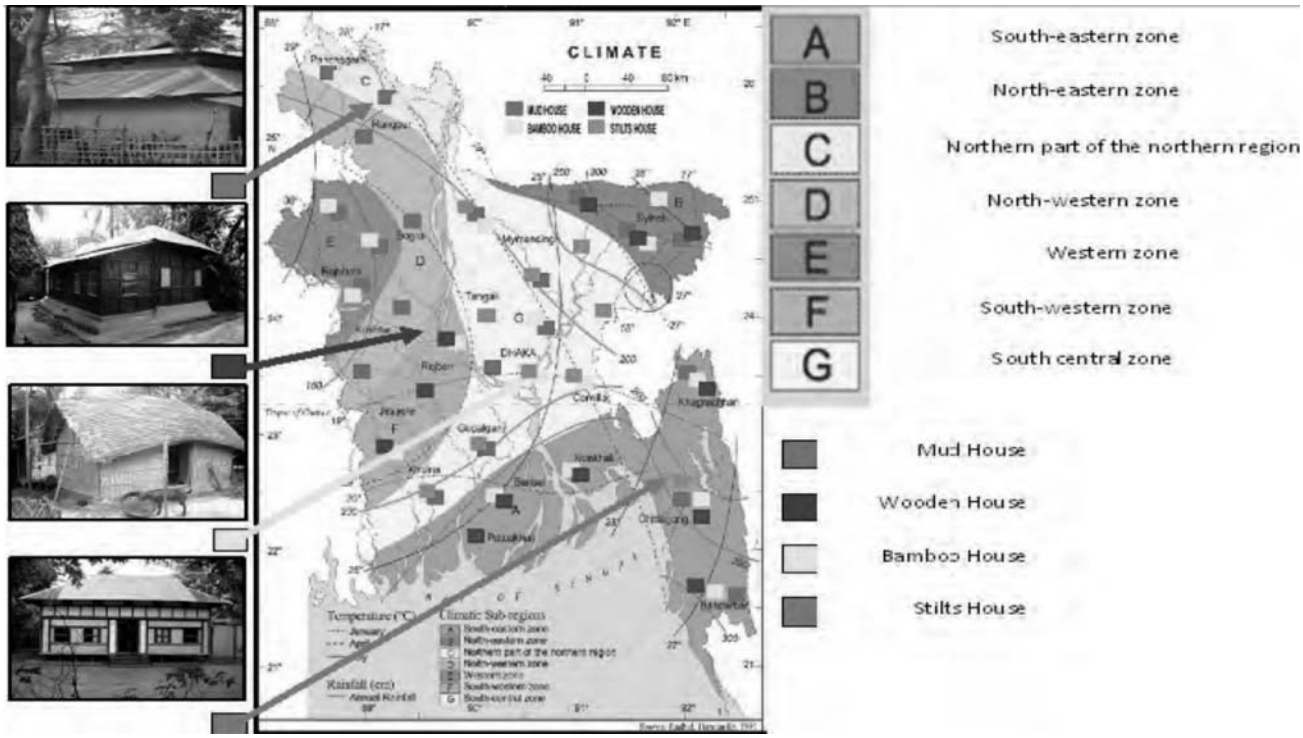


Figure-3: Different type of traditional houses in different region.

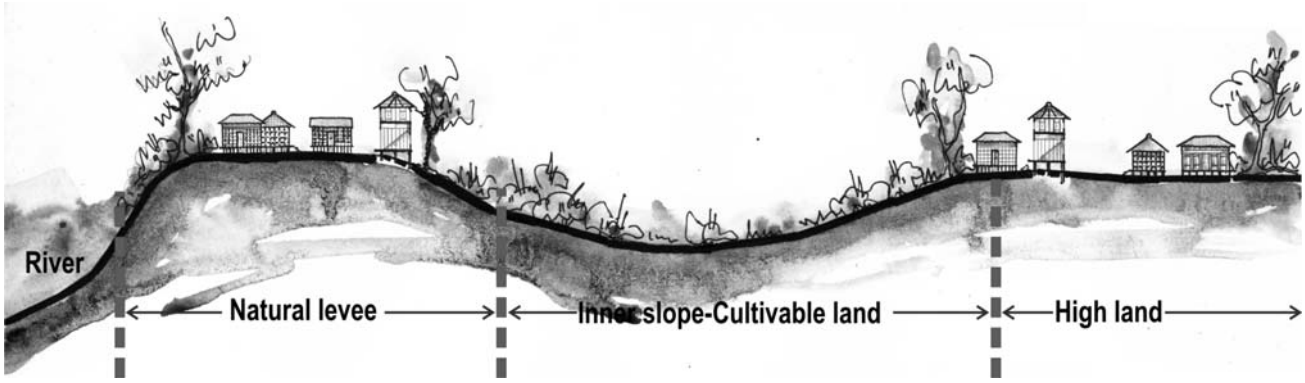


Figure-4: Section showing the settlement beside the riverbank areas.

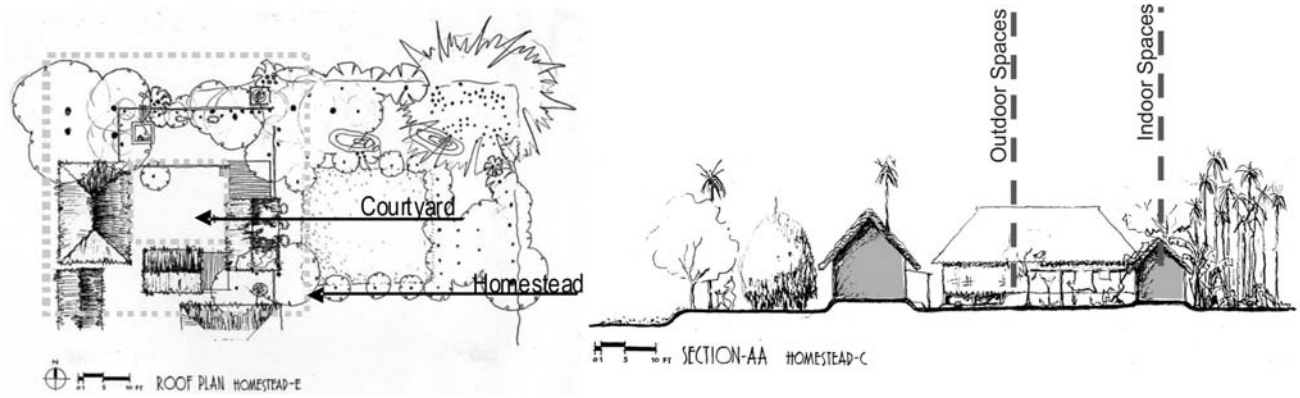


Figure-5: Plan & section of typical rural homestead.

conspicuous than outdoor spaces except the obvious one – the courtyard. Space could be defined as the three-dimensional extension of the world which is around us – the intervals, the relationships and the distances between people and people, people and things and things and things (Rapoport 1977). As a working definition for this study, space can be considered as an area of land that is enclosed, defined or adapted by people for purposes of human use (Dee 2003).

4.4 Housing form and its layout

The traditional house form of rural Bangladesh is the open courtyard type as shown in Fig. 05 (Kabir 2004) where single room units (with or without a verandah) are placed around a courtyard, with gaps between the units to allow airflow in the hot humid climate. Materials may vary depending on where the houses are situated. In the northern bank of the Padma Rivers, bamboo or dried jute stalks are using as walling material. Typically, houses in this region are raised on bamboo or timber stilts and have a floor made of split bamboo sections or timber planks. The roof is traditionally thatch but there is strong preference for corrugated iron, because of its lower maintenance and permanency in spite of high heat gain and the resultant discomfort indoors (Mallick and Ali 2003).

Houses in villages and rural settings are usually not completely built all at once, but over an appreciable period of time. Construction is phased, as rooms are built to meet the additional requirements of the growing family and as finance permits. This development process is thus an organic one: as the family grows so does the house.

The house is the symbol of the position and status of rural inhabitants. Thus the layout of housing design varies according to the socio-economic status of the household. A house in rural Bangladesh may constitute of rooms/huts around a courtyard which is the most common layout. But this courtyard gets ignored when the owners give rent to their relatives after they lost their homesteads at subsequent bank erosion allow them to build their houses on existing homesteads. The courtyard is intimately linked to the household activities; each depends on the other both in spatial terms as well as functionally. A lot of activities take

place in the open in this interdependent relationship e.g. cooking, washing, drying grain, etc. Sometimes social interactions between the family members also take place here.

4.5 Housing types according to building materials

Under warm humid conditions, like those found in Bangladesh for much of the year as temperatures are not extreme, thermal mass is not sufficient enough for maintaining comfortable conditions. Thus, the walls of a building in such climates need not be thick or massive to contain the heat. Rather, they may be perforated to allow the breeze to penetrate indoors and allow convective cooling and the removal of humid indoor air. Woven bamboo walls or wooden slatted walls and perforated jali bricks are ideal for these conditions.Again, vegetation spaces in rural homesteads are host to rich biodiversity with locally native plant communities (Kabir 2004) ranging from wet to dry and sun to shade habitat conditions. According to locally available materials, the traditional houses in Bangladesh are grouped into two categories:

4.5.1 Kutcha house

A house that is made totally of organic materials such as bamboo house, mud house, jute stick and catkin grass house etc.

Walls: Organic materials like jute stick, catkin grass, straw, bamboo mats, bamboo framing. In some areas the walls are made of earth.

Foundation: Raised wooden plinth with bamboo or timber posts.

Roof: Thatch-rice or wheat or maize straw, catkin grass, with split bamboo framing.

4.5.2 Semi-Pucca House

A house that is made of traditional materials mixed with some organic and inorganic materials such as steel house, wooden house etc is referred to as semi-pucca house.

Walls: Bamboo mats, CI sheet, Timber or bamboo framing. In some areas the walls are made of earth.

Foundation: Earthen plinth; Brick perimeter wall with earth infill; Brick and concrete also used.

Roof: CI sheet with timber or bamboo framing.

4.6 Housing and seasonal disasters

One of the main characteristics of vernacular houses is that they are designed with a deep understanding and respect for nature. A comprehensive knowledge of nature's ways and the ecological balance was prevalent in traditional societies as the villagers relied heavily on nature for most of their resources. Effects of seasonal disasters on architecture are severe, especially on houses that have been built out of organic materials. Sometimes the scenario gets worse due to improper planning organizations, like in Fig. 06. The decay of organic thatch or bamboo mat used in the walls of typical kutcha houses or semi-pucca houses can accelerate during floods. The damage begins in the lower part of the walls, weakening the walls and eventually resulting in complete damage. Even C.G.I sheet get corroded when they come in contact with water, especially the lower parts of walls.

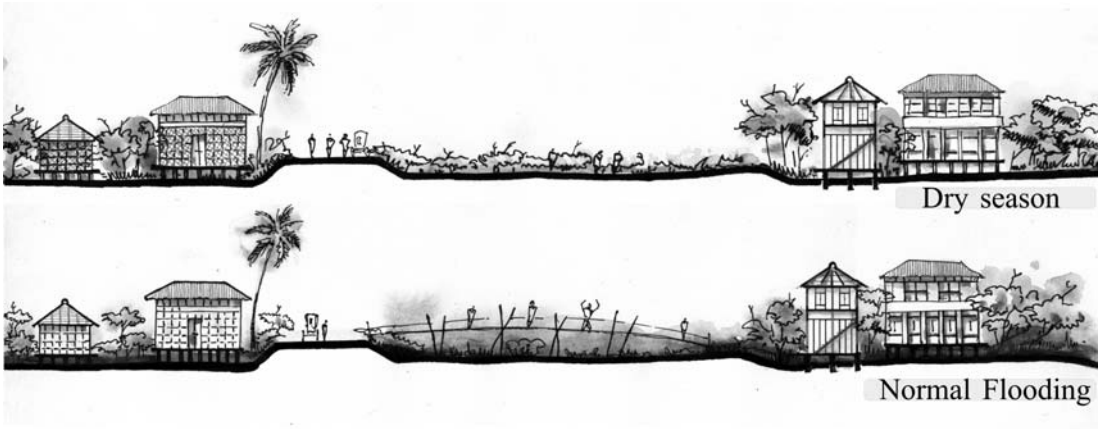


Figure-6: Detached highlands have got disconnected during seasonal flood.

5. THEORETICAL PERSPECTIVE ON RURAL HOUSING & INDOOR THERMAL COMFORT

5.1 Climate as a design generator for rural housing in bangladesh

According to the climate risk index 2009, Bangladesh tops the list as being the country most affected by climate change. Climate change affects the environment we live in, producing severe weather impacts like cyclones and floods. On a less noticeable scale, it is also gradually giving way to uncomfortable living conditions (Ahmed 2009). This again means that economically disadvantaged people in rural Bangladesh seem to survive in basic shelters and the spaces around them. In terms of space use patterns a homestead is an amalgamation of indoor and outdoor spaces. These have evolved from a deeper understanding over centuries. A closer look however reveals that these spaces do not only satisfy just their needs but can also accommodate their aspirations. But this shelter functions like a filter of the external environment. The penetration of solar radiation indoors can be favorable and healthy, or extremely unfavorable, depending on the climate, season, and building materials. Housing is a complex phenomenon, where safety and comfort are the primary requirements. A housing environment is the index of the social health and happiness, social justice, and the dignity of inhabitants (Hasan et al. 2000, p.51). Environmental factors have significantly regulated the evolving technologies of human shelter in the form of housing practice (Maguire 1996). The tropics are regarded as a region where humans evolved and comfort has often been taken for granted, but built environments are increasingly becoming issues for public concern. Comfortable outdoor spaces have a significant bearing on the perception of comfort of the indoor ambience. The demand for comfortable living conditions inside dwellings significantly increases as a result of exposure to the uncomfortable outdoors (Ahmed 2002). In the context of the Padma riverbank areas, overheated outdoor environments due to harsh barren ground have contributed to a growing preference for a lower temperature indoors. From the point of view of thermal comfort it requires reducing indoor daytime temperature below the outdoor temperature using building elements, as well as by using passive systems. Techniques for such thermal modification have been widely addressed (Givoni 1994). From a point of view of thermal comfort, climatic and physical factors other than air temperature are also important. Among various factors, the built environment acts as a mechanism of control for the climatic variables, through the building envelope (walls, floor, roof and openings) and the nearby elements (presence of masses of water, vegetation, constructions around, soil type, and others) – that is the microclimate.

The main causes of the climatic stress within rural Bangladesh are high temperatures, solar radiation, humidity and glare. To achieve climatic comfort in these riverbank areas, these factors must be controlled, besides controlling rain, floods and strong seasonal winds. Direct solar radiation is the primary source of heat gain, while the rest are secondary sources. The other major source of heat gain lies in the type of building materials used. The impact of solar radiation affects the thermal behavior of a roof more than any other part of the house, especially in tropical countries (Mallick 1993). Vertical walls are also subjected to direct solar radiation. These participate to raise the indoor air temperature above the local indoor comfort level in summer seasons. On the other hand, traditional houses of rural Bangladesh are hot during the daytime, but become comfortable within a short time after sunset due to the usage of materials with low thermal capacity.

Therefore, the question arises whether varied walling materials have any impact on the indoor temperature of traditional rural houses. For proper analysis, other identical building materials are taken for roofing, structures, etc to observe the impact of these variables on the expected findings.

The thermal performance analysis to achieve indoor comfort studied in this research involved the use of field measurement using a pocket weather meter. Data was collected from selected traditional houses in Padma riverbank areas at two different microclimatic conditions by recording the air temperature, air velocity and humidity of the indoor and outdoor spaces. According to the meteorological data of Dhaka division in 2009 (Fig. 7), data collection process was carried out in the month of August which has both a high temperature and a high relative humidity level. It is expected that the results of this project can contribute towards the accomplishment of a demonstrative example to generate a favorable effect in these areas, to improve the comfort conditions of these types of dwellings and to ultimately improve the quality of living. So the practitioners, decision-makers and researchers, through the results and experiences of this project, may have a useful source of information about the appropriate selection of walling materials from the available market sources based on their thermal performance. Significant reduction of the indoor air temperature below the outdoor level is a practical strategy in hot to warm humid summers, because of the need for daytime ventilation of the houses during the significant daily temperature range (swing). This situation suggests

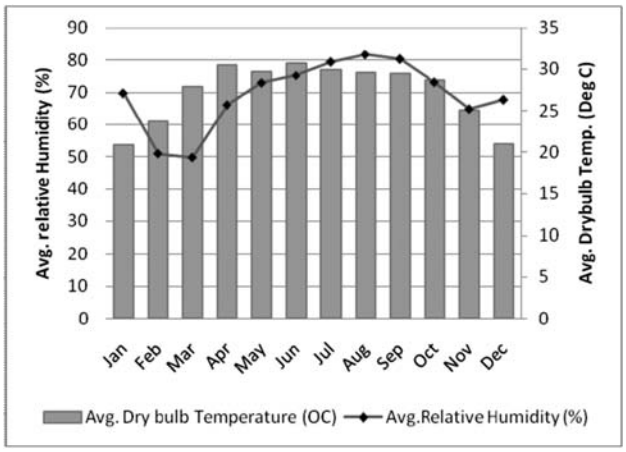


Figure-7: Mean air temperature of Dhaka division from Meteorological Data 2009.

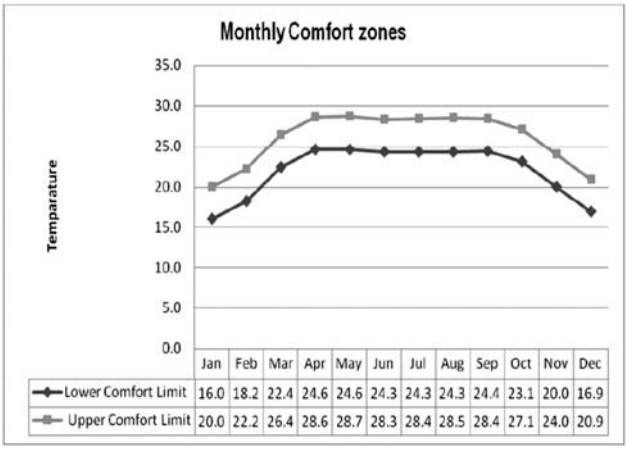


Figure-8: Monthly comfort zones in Dhaka, Bangladesh.

low thermal resistance of the envelope in proportion to the expected impact of solar radiation on the walls and, largely, at the roof surface (Givoni 1998).

5.2 Thermal comfort zone for Dhaka, Bangladesh

Thermal comfort has been considered by many as the major influencing factor in the indoor comfort level. The International Standards such as ASHRAE ISO 7730 Standard 55 (ISO 1984) is often used to determine the thermal comfort condition in a building by professionals. Unfortunately, current researches have obtained evidence that the standards are irrelevant in predicting the comfort level in tropical countries, especially in the countries with hot and humid climate (Ahmed et al. 1990; Mallick and Kabir 2006). Due to this discrepancy, many upcoming researches about thermal comfort in this region have been conducted aiming to establish a more relevant index or range of comfortable temperature for the tropics.

Many of the International standards produced are found to be inadequate for describing the comfort condition in the tropical climate. The majority of the field studies conducted discovered that the international set up either overestimates or underestimates the comfort condition in this climate (Nicol 2004). To predict the comfort zone in the climate of Bangladesh, Ahmed (1987, p.78) proposed Humphreys and Nicol's (1970, p.181) neutral temperature model which was found to be better fitted for our context, especially the Dhaka division (Fig. 8) (Ahmed 1987).

5.3 Housing design factors that contribute to thermal effects

The exchange of heat between the indoor and the outdoor environment is through building elements i.e. the building form. The amount of heat transmitted depends upon the characteristics of the materials forming the roof, walls and windows. Careful selection of these materials helps in creating a comfortable indoor climate. According to Gut et al. (1993, p.324) the main points to take into consideration when designing building for tropical composite climate are:

- Minimize internal heat gain during daytime and maximize heat loss at night in hot seasons,
- Select the site according to microclimatic criteria,
- Optimize the building structure and material (especially regarding thermal storage and time lag),
- Control solar radiation and regulate air circulation.
- Building orientation can affect the amount of solar energy impendent on critical surfaces of the building.

5.3.1 Building materials and thermal comfort

The effect of materials in indoor climate is its ability to transmit heat and also its thermal capacity. Light materials are desirable for hot and humid climate. Due to the problem of high temperature and humidity, cooling is important for this climate.

5.3.2 Building thermal mass

The building thermal mass is related to the exposed surface area of the material, its heat capacity and its thickness. In hot and humid climates the building should easily be able to give out the heat absorbed during the day. The use of lightweight materials during construction is therefore recommended. These materials have little residual heat when the source is removed, and hence cool down quickly.

6. STUDY AREA and ITS CONTEXT

The study area is located at Tongibari Upazila in the district of Munshigonj shown in Fig. 9 (Banglapedia, 2006) and Fig. 10. An important growth center, Hasail, is located on the left bank of the Padma River. This area is 45 km south of Dhaka district. Due to recurrent riverbank erosion, the majority of dwelling units in this region is in a very poor condition. These do not provide adequate protection from wind, rain and flood. Even the indoor living environment is seriously deteriorated and a majority of them are in unsatisfactory condition in terms of thermal comfort. The threats of riverbank erosion and recurrent flooding attacks have impelled the users to use movable housing materials. It is observed that the displacees formulated and undertook the strategy of using movable housing materials, to a large extent incidentally and to quite a considerable extent purposefully as well.

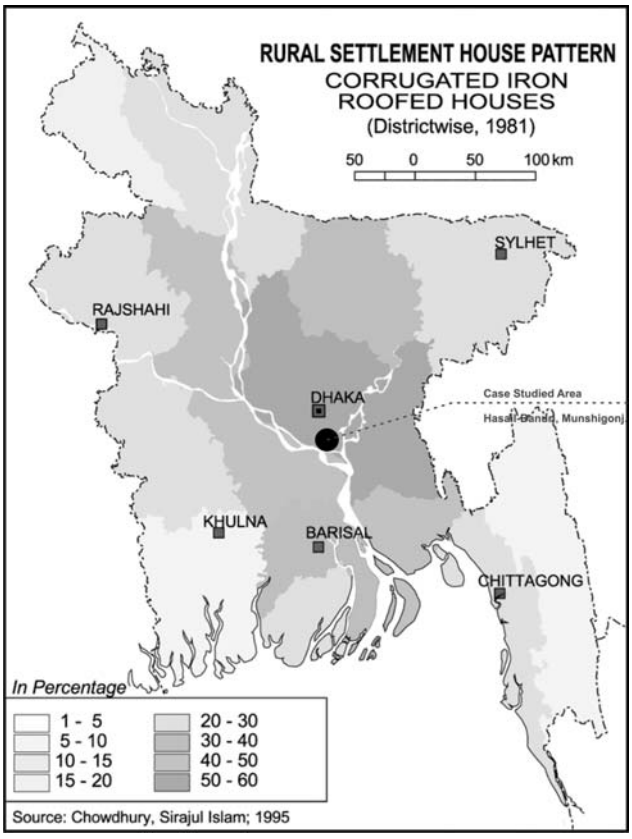


Figure-9: Study area showing in map. Hasail, munshigonj, Dhaka.Study area showing in map. Hasail, munshigonj, Dhaka.

At present (August, 2010), about 68% families of this Union live beside the rural main road (government owned) and mortgaged or rented homesteads (Fig. 10). They have lost their lands either this year or the previous year due to riverbank erosion. For this reason, there is not only an increase in the shortage of housing, but the physical condition of these houses has also deteriorated seriously.

6.1 Microclimatic situations

To analyze the thermal performance of the elevated (stilt) house of the Padma River bank areas, two homesteads have been identified based on their distinct difference in land formation (fig.10 & 11). This in turn has had an impact on the surrounding microclimate. For achieving the objectives highlighted in the research as accurately as possible, the selected homesteads have similarities regarding the typology of houses, layout, orientation, and building materials (fig. 12). The orientations are same for each pair of comparable houses, and similar roofing materials are employed, and there are no ceiling or attic spaces. Microclimatic situation-01 has been selected, as the land formation of homestead-01 is clayish soil with lots of vegetation (fig. 13). Microclimatic situation-02 has been selected due to sandy soil formation with barren landscapes of homestead-02 (fig. 14).

6.2 Housing characteristics

The houses in the northern bank of the Padma River are non-engineered or 'Kutcha' housing. There are fewer variations in the architecture and the methodologies used in this area. **Fig. 15 (**Bangladesh population census, 1997 & field survey) shows the building materials used for the walling and roofing of typical housing in this region.

In planning layout, most of the houses are single roomed and their length:breadth ratio is about 3.3:1 (Fig. 16). Multiple roomed houses are rare in this region. Sometimes addition to the older part of the house is visible, but it is usually small in percentage. Almost all houses are arranged around a courtyard, but due to land shortages, this tradition is gradually dying out.

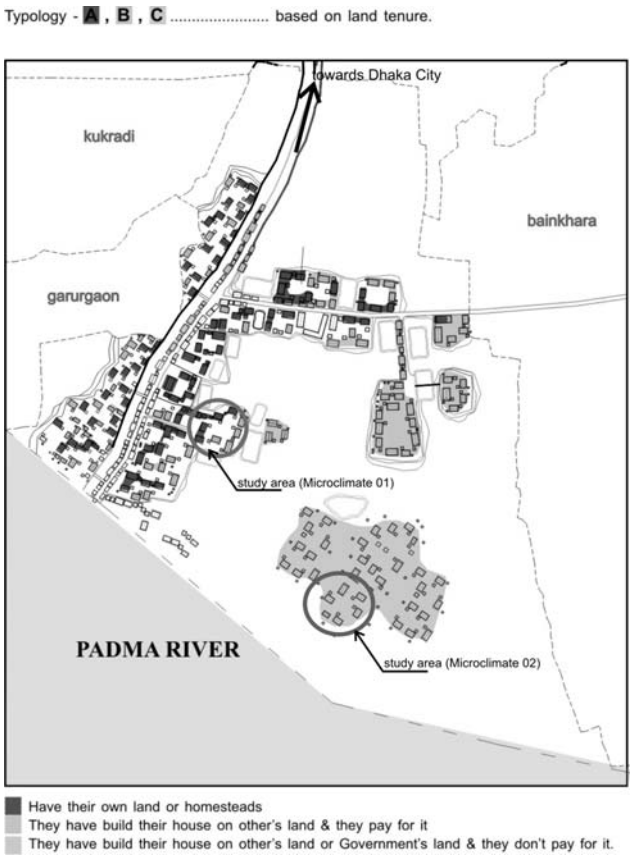


Figure-10: Housing typology based on land ownership (showing study area).

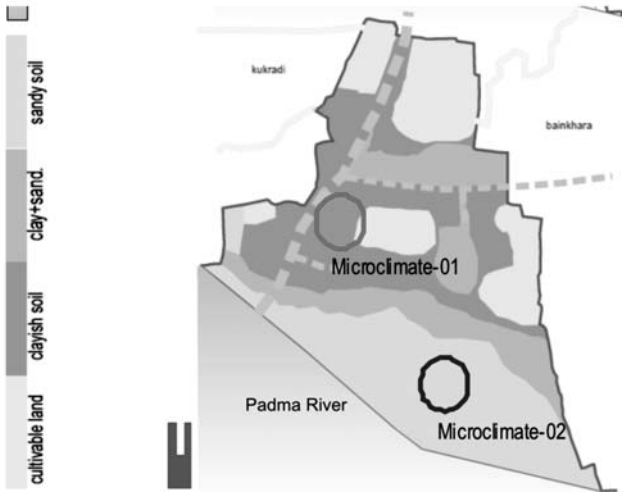


Figure-11: Showing the different type land formations.

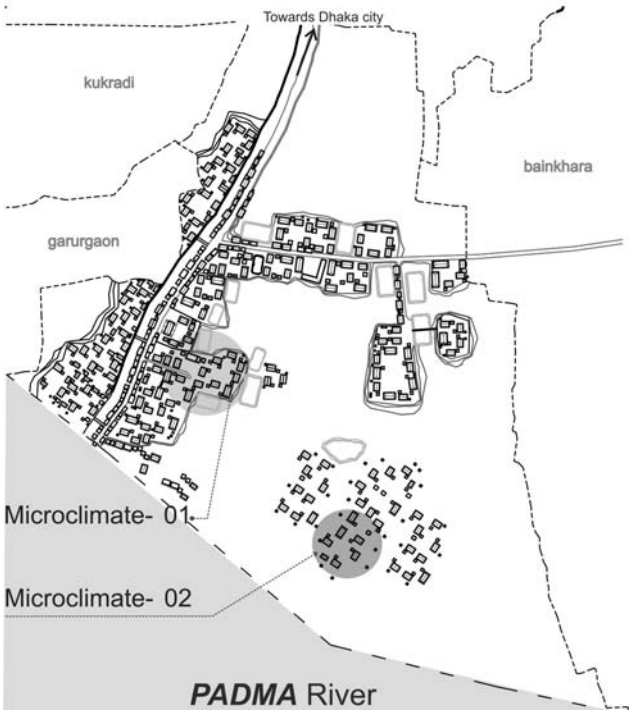


Figure-12: Showing existing built forms.

The materials used for housing in the Dhaka division indicate that the percentage of materials used for roofing are: straw/jute sticks 13%, C.I. (corrugated iron) sheet 60% and cement/flat roof 27% (Bangladesh population census, 1997). Again, the percentage of the stilt house is higher than other types of traditional houses in these areas, especially in the Padma riverbank areas. Houses in these regions are on stilts, to prevent damage from frequent seasonal flooding. As C.I sheets are the only roofing material that is used predominantly in these areas, thermal performance will be investigated based on available walling materials. It is also evident from the field survey and Fig. 15 that there are two to three types of materials that are widely used for walls in this area.

7. ANALYSIS

Fig. 17 shows a typical house of this area. Three houses were selected from homestead 01 based on similar roofing materials, and they all had a single undivided rectangular internal space with an area of approximately 360 sft (33.46 sqm). But they all had different walling materials, namely split bamboo mat, jute sticks or straw, and C.I sheet, as shown in Fig. 18. Similarly three houses were selected from homestead 02 that had the same orientation and building materials, as stated in Table 1. All house types of both microclimatic condition '01' and '02' were North and South oriented with better incidence of solar radiation. Each studied house has one window at its north side and an entrance door at the south side.

Figure-13: Outdoor spaces of Homestead-01.

Figure-14: Outdoor spaces of Homestead-02.

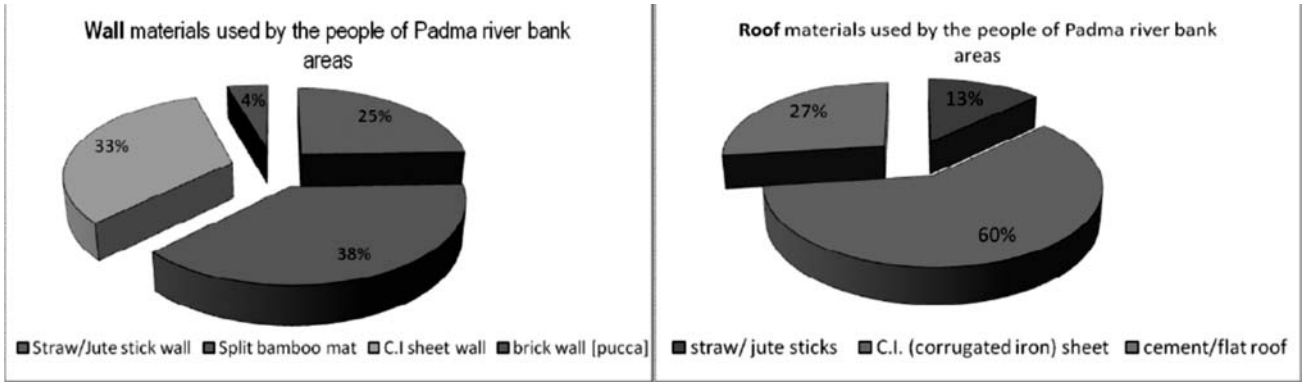
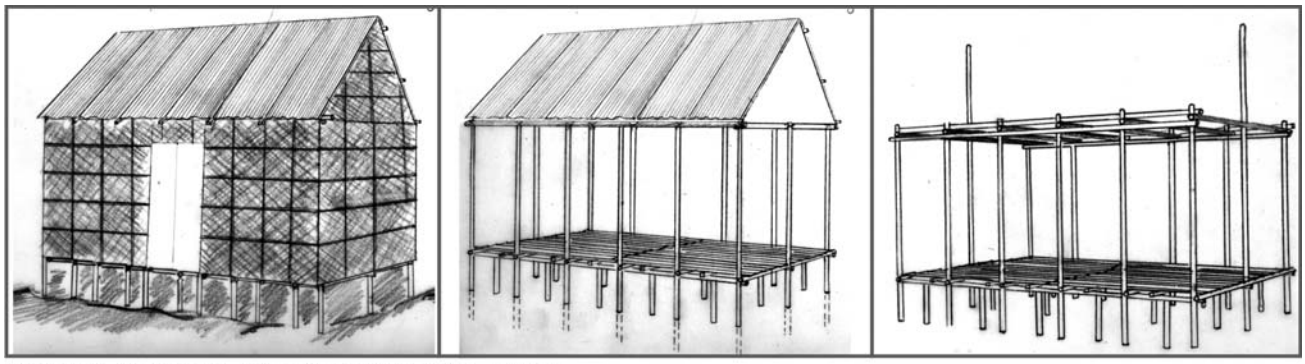


Figure-15: Percentage of building materials for roofing & walling at Padma riverbank areas, Munshigonj, Dhaka.



15'x4.5' home made of split bamboo mat

Figure-16: Typical stilt housing layout of 15'x4.5' & its internal frame.

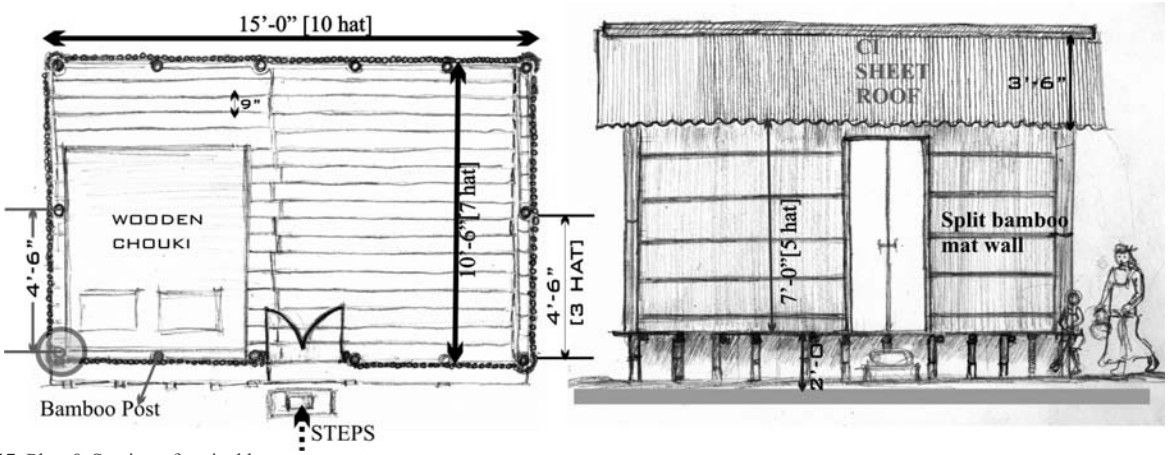


Figure-17: Plan & Section of typical house.

Figure-18: Three types of houses with their different walling material at homestead-01.

Table 01: Dwelling components and parameter settings for the case study

Item	Description					
	Homestead: **01**			Homestead: **02**		
	House Type: A	Type: B	Type: C	House Type: A'	Type: B'	Type: C'
Orientation						
Wall	Split bamboo mat	Jute stick or straw	C.I sheet	Split bamboo mat	Jute stick or straw	C.I sheet
Roof	C.I sheet	C.I sheet	C.I sheet	C.I sheet	C.I sheet	C.I sheet
Ceiling	no	no	no	no	no	no
Floor	Wood plank	Wood plank	Wood plank	Wood plank	Wood plank	Wood plank
Opening/s	1 window	1 window	1 window	1 window	1 window	1 window
Opening orientation	North	North	North	North	North	North
Entrance Door	01 at South	01 at South	01 at South	01 at South	01 at South	01 at South

7.1 Data collection processes

In order to see the thermal performance of different walling materials an investigation was carried out on six strategically selected dwelling units in two different microclimatic conditions exposed to solar radiation between the times of 09.00-18.00.

According to the objective of this research, data collection processes were conducted in one of the most overheated months of the year, August (Ahmed 1987). For data collection, two indoor points and one outdoor point were selected for each house at both microclimate 01 and 02 as shown in Fig. 19. As data was collected for only day time, the interval was one hour. According to this, 30 readings were taken in one day for each house type at each microclimate. This process was conducted on the 19th and 26th of August, 2010.

For the ease in data tabulation and analysis some annotations have been used (Table 2).

7.2 Measurements and data analysis

With the help of a pocket weather meter, temperature readings were taken at one hour intervals at previously selected data collection points (Figure: 18). The whole process was conducted for three different houses at two different microclimatic conditions (Figure: 18)

Preliminary readings from Table 03 revealed that the maximum outdoor and indoor air-temperature are recorded between 13.00 to 16.00 hrs. This temperature data also coincided with previous field surveys during the selection of two different microclimates. From the chart at Fig. 20,

Table 02: Tabular output method of Climatic data collection for three houses at two different microclimates (1 & 2)

Annotation & Description							
	Microclimate 01			Microclimate 02			Measured Variables
Outdoor Temp.	T_o (1)			T_o (2)			Temparature (^{0}C)
Indoor Temp	type- A	type- B	type- C	type- A'	type- B'	type- C'	
	Ti (1A)	Ti (1B)	Ti (1C)	Ti (2A')	Ti (2B')	Ti (2C')	
	V (1A)	V (1B)	V (1C)	V (2A')	V(2B')	V(2C')	

Table 03: Temperature readings at different locations [average data of two days at each hour has tabulated]

Time	Microclimate 01				Microclimate 02			
	To (1)	Ti (1A)	Ti (1B)	Ti (1C)	To (2)	Ti (2A')	Ti (2B')	Ti (2C')
9.00	31	26	27	28.5	32	27	27	29
10.00	31	27	27.5	29	32.5	27	27	29
11.00	32	27	28	29.5	33	28	28	30
12.00	32	28	28	30	33	28	29	31.5
13.00	33	29	29.5	30	34	29	30	32
14.00	32	29	30	31	34	30	31	33
15.00	32	30	31	32	34.5	32	32	33.5
16.00	30	28.5	30	32.5	33	32.5	31	34
17.00	29	27	29.5	31	31	31	30	33
18.00	28	27	28	30	30	30	29	32

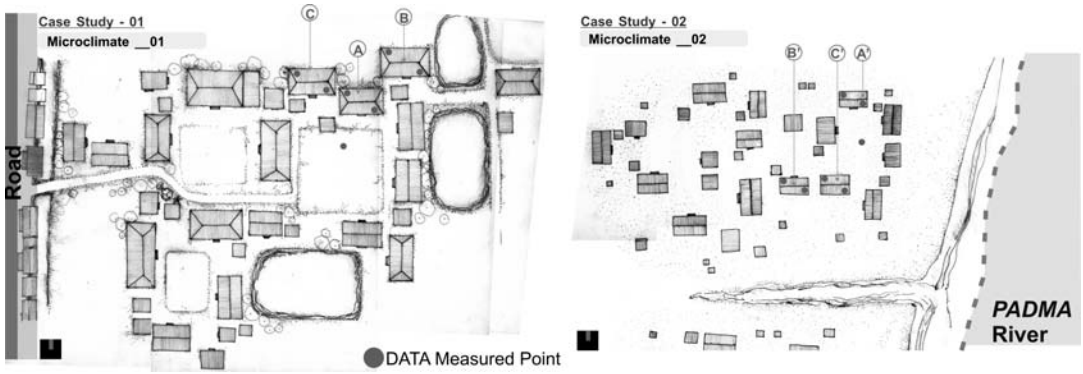


Figure-19: Data collection positions (red dots) at two different microclimates.

it is revealed that microclimatic situation 02 is hotter than microclimatic situation 01.

Surveyed data was plotted with identified comfort zone for this area as is shown in Fig. 21. For the month of August this range is 24.3-28.3 0C (Ahmed 1987).

It is evident from both charts in Fig. 21 that the indoor temperatures of house types 'A' and 'B' are comfortable only during the morning and afternoon periods. But house type 'C' which has both walling and roofing made of C.I sheet remains out of the comfort zone throughout the day. This statement is also made clear by the profile of indoor comfort hours (Fig. 22 & 23). From the chart shown in Fig. 23, it is visible that at both microclimates, the least hours of comfort are found in the house made of C.I sheet walls and C.I sheet roof – especially at microclimatic zone 02, which has barren sandy soil formation.

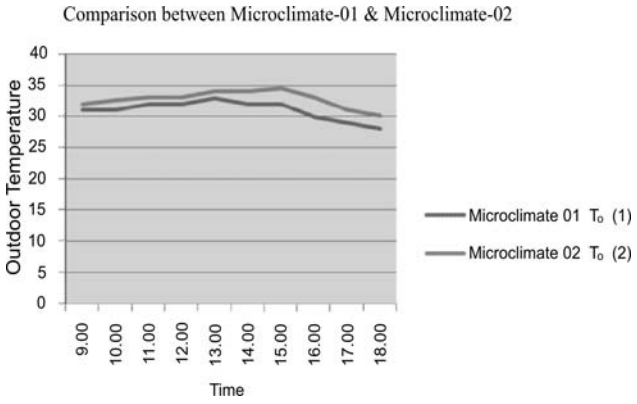


Figure-20: Comparison of outdoor air temperature between Microclimate-01 and Microclimate-02.

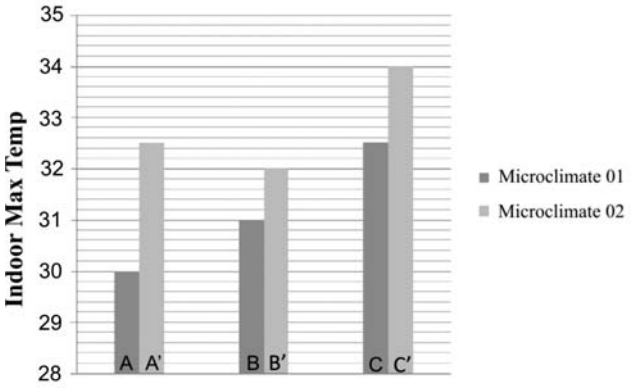


Figure-22: Comparison of indoor maximum air temperature of three types of houses at both microclimates.

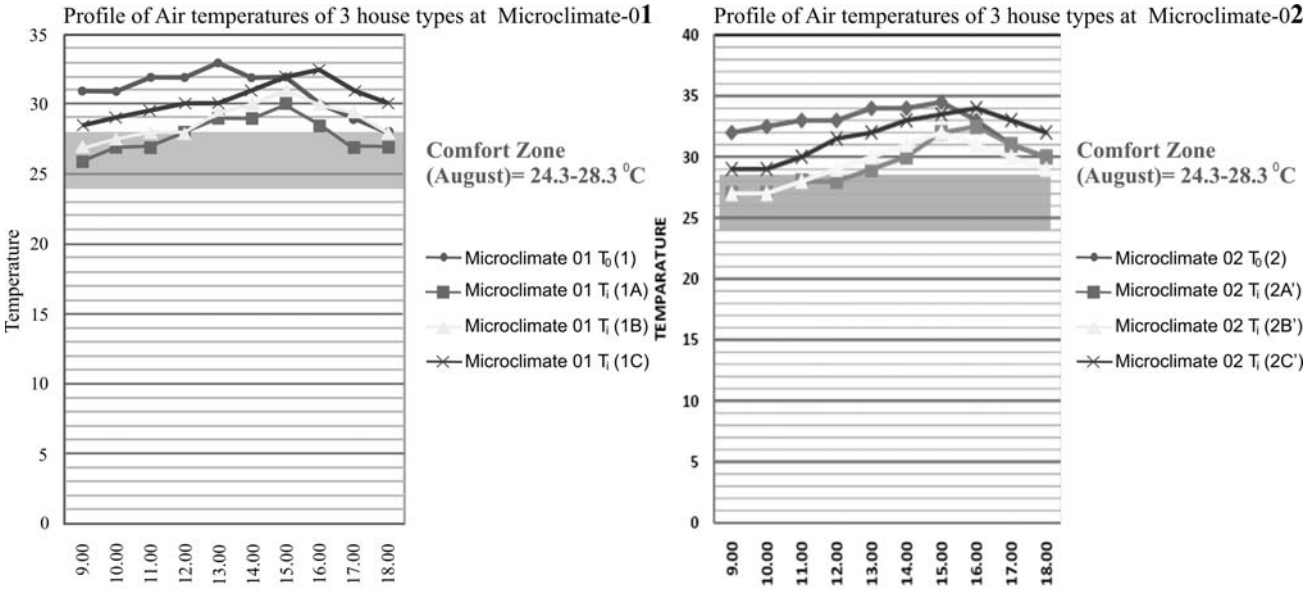


Figure-21: Comparison of outdoor air temperature and indoor air temperature with comfort zone at Microclimate-01 and Microclimate-02.

7.3 Findings

From the preceding explanation of the indoor thermal environment of three commonly built rural houses beside riverbank areas, it is obvious that these houses remain mostly out of the comfort zone, especially during summer days, due to the choice of building material, that is largely C.G.I sheeting. Situations have gone even worse due to the presence of sandy soil and the absence of adequate natural vegetation in the surroundings.

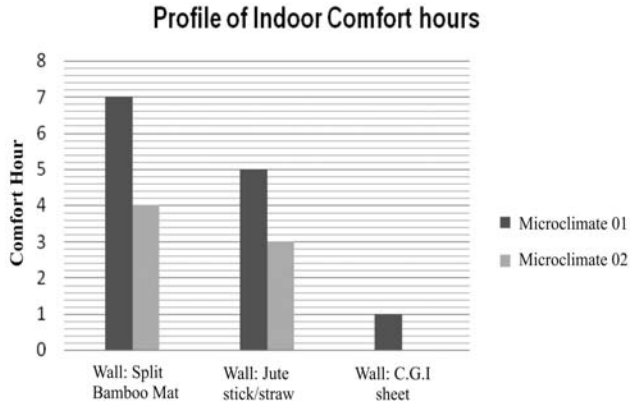


Figure-23: Profile of indoor comfort hours at day time in three house types at both microclimates.

8. CONCLUSION AND RECOMMENDATIONS

8.1 Conclusion

The envelope of the building includes walls, roof, floors and windows, among others, that is, all the building components directly in contact with the external ambient conditions. The envelope of the houses plays a very important role for achieving comfort conditions for the occupants in a dwelling. In this research, it was revealed that an envelope made of C.I sheet is not comfortable during summer days especially for those houses which are naturally ventilated. Minimizing energy use and promoting energy efficiency in hot and humid seasons requires that roof and walls are lightweight and have low emissivity of long wave radiation. Ceilings are highly desirable for protecting the interior from heat from the roof. A larger portion of walling material should be one that is locally available, and at the same time provides for a cool interior, with sufficient openings for cross ventilation. Although materials alone cannot be concluded to be the only way of attaining thermal comfort, light colored roofing materials, light colored walls and lightweight building form are primarily the potential ways of better thermal performance in indoor spaces.

8.2 Recommendations

Traditional planning and building methods were often good examples of sustainable architecture in their time, and represented good uses of local resources paired with local skills. Combined, they produced a built environment which met people's needs. But factors such as frequent natural disasters, demographic growth, abundant availability of C.I (Corrugated Iron) sheet, and significant changes in expectations, life styles, and socio-economic structures, all in combination erode the viability of traditional approaches to shelter provision. Thus these environmental problems in rural areas are not always due to a lack of resources or lack of knowledge base but for inappropriate focus on unsustainable issues (Ghosh 2003). This statement has also been proved true through this comparative analysis which provides some evidence to support the proposition that traditional building materials in house design are superior to the widespread C.I sheet. So the type A and B houses are indeed well adapted to the natural climate of region. It also provides us with a useful indicator of appropriate architectural design in response to climate. So walling with split bamboo mat and roofing with light colored reflective materials with double ceiling, supported by a wood or bamboo structure may be considered as a low to medium thermal mass. For appropriate planning solution, the central part of the courtyard should be its highest point, sloping gently (1% minimum slope) to the edges to allow drainage. Traditional building materials like wooden/bamboo structures and other walling and roofing materials should be properly treated to protect them from seasonal flooding. Finally, a house made of C.I sheet without any ceiling should be highly avoidable. From the above discussion, it is clear that to achieve thermal comfort in the composite or monsoon climate with an extensive warm humid season, solar heat gain by the building and the human body must be minimized, while heat dissipation from the body must be maximized by methods of ventilation and evaporative cooling.

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CONTRASTING HOUSING TRANSFORMATION IN CORE DHAKA AND PERI-URBAN ABUJA

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ABSTRACT

Informal settlements constitute the bulk of urban housing stock. Culture specific dwelling units in the developing countries are transforming fast to commercial style housing due to drastic urbanization, globalization and their attendant acculturation. This paper focuses on establishing commonalities and disparities of the situations in Abuja, Nigeria, and Dhaka, Bangladesh, in terms of the transformation process, the predicating denominator, and the driving force. It will make comparative analysis of the changing residential patterns in these two developing world cities in Africa and Asia over a period of several decades. This research qualitatively contrast physical, social and psychological adjustments observed in traditional family compounds typical of Abuja; and the commercial subdivision of old Dhaka houses.

In line with the post positivists' epistemology, an emergent-grounded theory triangulates with quantitative evidence and field observation. The findings suggest a fusion of isolated Gbagyi housing units into hollowed-out structure physically; and fission of the tribal group socially. Individualism replaces communal responsibility, with Islam and Christianity as moderators in Abuja, while the core Dhaka housing transformation pattern emphasizes on spatial economization through subdivision, addition-subtraction, conversion and reconstruction, motivated by convenient fraternity of respective socio-economic classes that are united in housing themselves. These findings give evidence of economic precedence over cultural sustainability in the process of housing transformation. However, the capitalist tendency of the twenty first century for income first, jeopardizes local identity, rhythm and modernity. This could have a global implication on cultural sustainability of vernacular housing in the urban environment.

Key words: *Informal settlements, cultural sustainability, housing transformation, informal delivery.*

1. INTRODUCTION

Transformation of housing, a physical manifestation of society's culture that is dynamic, is an inevitable response to changing needs brought by socio-economics of survival. As is universally observed, families require satisfactory dwelling environment throughout their respective life cycles. Housing transformation, whether by moving, improving or a combination of both seeks to obtain satisfactory habitat. Transformation also takes place due to changing needs and aspirations, some with priorities. Family requirements, need for comfort, duration of living, and tenure type and security also vary over time. These are important causes, particularly in the developing countries, that see changes in its infrastructure, services, density, economy and the society as a whole.

Shifts in population distribution and mobility and economic and political forces have changed societies and the urban environments in Abuja and Dhaka— cities of developing countries. Today, in large cities with high demographic and social mobility, neighbours have become strangers, individual identity is lost, and the feeling of community and pride in ones own place are gone (Rahman & Islam, 2004). Socially accepted unwritten controls on the environment and people no longer exist. The internal dynamics and the external stimuli bringing about changes are too intense and too fast for the transformed society to absorb and assimilate, without altering and damaging the context beyond recognition. The dynamics of change has divested the community of the socially accepted framework; there is no mechanism to manage it without losing the essential character.

The paper mainly contains four sections. Following this introduction are outlines of core Dhaka and Peri-urban Abuja settlements. The second section deals in a comparison of the two transformation profiles. The third section is on apparent spatial transformation profile. The fourth section concludes the paper with recommendations.

1.1 Core Dhaka Settlements

Dhaka, a city older than the time when it was first recognized as the capital of Mughal province of Bengal in 1608, has gone through Mughal, Colonial and Pakistani rule before becoming the capital of independent Bangladesh in 1971. With around 14 million people increasing at 4%+ rate, it is destined to be the 4th largest in the world by 2020. Like typical developing world's mega cities, Dhaka is plagued with poverty, migration, unplanned growth, poor services, pollution and ill governance. The old core in the south on the river is one of the densest areas in the world, with narrow alleys, crumbling infrastructure, and thousands of neglected traditional buildings that provide refuge to low-income families. The society, predominantly Muslim with about 15% Hindu, is culturally homogenous, though there is a wide disparity in income and education.

Dhaka's warm-humid climate has four distinct seasons with long monsoon and temperature variation of 10-400C making climate an important factor for the house form. Considerations like south wind, cross ventilation, adequate rain protection and shade etc. are essential in architecture. Introverted rooms around courtyards, a replica of rural form, creates a pleasant microclimate, and ensures necessary light and ventilation in traditional urban houses by acting as a cool sink (Mallick & Huda, 1996). Most parts of these houses are thus single room depth with a veranda (Rahman & Haque, 2001).

1.2 Abuja Peri-urban Settlements

Abuja, planned in the late 1970s and developed throughout the 1980s, became the Federal Capital Territory (FCT) of Nigeria on December 12, 1991. Endowed with fertile land for agriculture and a uniformly moderate climate, it has two distinct seasons: the rainy (March-October) and the dry (October-March). The high temperatures and the relative humidity in the Niger-Benue trough warm it up, but the increasing elevation to the north-east reduces the heat in Abuja. Rainfall intensifies during July-September.

Brand (1994) categorized transformation physically into two types: add-In and add-On. Add-In type means the changes done within the existing building increasing horizontally, whereas add-On type represents the additional construction and the vertical expansion of an old building to obtain more floor areas. Al-Naim (1998), Shukri (2002) and Winterhalter (1981) preferred categorization like slight adjustment, addition and division, total conversion, and reconstruction based on degree of changes. (Tab. 1 & 2)

Table-1: Four different categories of transformation as a tool for evaluation in Dhaka and Abuja

A. By Slight Adjustment	B. By Addition & Division	C. By Total Conversion	D. Total Transformation by Reconstruction
Functional change rather than physical change, especially in the interiors. Most old houses adjusted to become like new houses, using electricity and modern facilities. In Dhaka, drawing rooms or stores are transformed into bedrooms. In Abuja, kitchens are turned into bed rooms, shops, etc.	Enables to increase the number of rooms to meet the needs of the sublet & owner. Additional spaces & services are to suit modern lifestyle. Bath rooms and kitchens added within the premises as new units are created only in Dhaka. Rooftop rooms commonly added in Dhaka, but not in Abuja. Division of space to maximize privacy while the space is shared by more than one family in Dhaka and Abuja fringes.	Physically converts wholly into another use, introduce new services, or subdivide for more rental units, difficult and costly. Changing life style made animal or servant areas redundant, hence, converted to new uses, often commercial. The courtyard is easier to convert if there is more than one.	Demolition and reconstruction of old houses shows how the new housing type, materials, and technology influence decisions. Commercial conversion increased the land value, encouraged by new streets and urban clearance in the old areas. Location influences a property's ability and propensity to undergo reconstruction; the more close to the main street, more is likely to be transformed, and used commercially.

Table-2: Differences between Dhaka and Abuja Housing Transformation Pattern

Attribute	Abuja	Dhaka
Physical	Filling-in-the-gap externally; Lateral expansion; Easy to expand; Minimum slight adjustment; Moderate addition & Subdivision; High conversion & reconstruction; Attention to services provision; Lost of kitchens, toilets, & animal pens to habitable spaces; Single storey structures; No building recycling Incremental housing system	Filling-in-the-gap internally Minimum lateral expansion, Difficult to expand; Maximum slight adjustment High addition & subdivision No conversion & reconstruction Attention to services provision Replacement of lost kitchens, toilets Multi-storey structure – mostly; Adaptive reuse of old buildings; Complete house construction from start
Social	21st century occupancy type – owner occupier, owner tenant & rental only; Original - Gbagyi peasants, 21st century occupiers are middle or lower-middle class tenants;	21st century occupancy type – owner tenant & rental only; Original owners – Hindu merchants; 21st century occupiers - middle or lower-middle class Muslim tenants;
Psychological	Informal (indigenous) housing; Urbanization due to national political economics; Shrine - outside the compound, but within neighbourhood; Original settlement assumed rural norms 21st century tends towards urban norms Value of building conservation; Cosmic beliefs by Gyagyi pagans;	Formal housing; Urbanization due to international political economics; *Puja Ghar* (prayer room) adjacent to the courtyard and a sacred tree, within the house; Value of building conservation No cosmic beliefs by Hindu;

Figure-1: Types of trnasformation in Old Dhaka (L-R) - Courtyard, a space for further addition and subdivision; vrenadas converted to storage or additional bed room; convresion to shop-houses.

2. CONTRASTING THE PAIR OF TRANSFORMATION PROFILES

In old Dhaka, transformation of the houses took place in two levels, in two different phases, through the change of ownership and occupation from the Hindu to the Muslim families. Initially, the Hindu landlords (who originally built the houses) undertook those adjustments. Subsequently, the Muslim families who procured those houses subdivided and/or rented them out. The ownership changed following two major exoduses after 1947 and 1971. After 1947 many Hindu families migrated to India; they sold their properties, often to incoming Muslim refugees from India. Similarly, in 1971 during the Liberation War, some Hindu families made the second exodus. The Muslims taking over these houses changed them to fit new needs. There were sporadic cases of similar ownership changes in the interim. Through economic, social and cultural changes, some old areas retained their characters and old buildings, despite pressures to change and an overall deterioration of the urban environment and infrastructure.

Three phases of transformation manifested within urban fringes of Abuja. Its planning and development as a model capital city was Abuja's incipient period (1976-1986). The first leg movement of federal government activities from Lagos (the port city) to Abuja, the hinterland, located at the geographic centre of country took place in 1987; thus marking the intermediate period (1987-1991). Since 1992 after the final transfer all federal functions to FCT-Abuja, this new capital city witnessed the mass influx of corporate activities during its consolidation period (1992-2006).

2.1 Transformation in the Core Dhaka through reuse of old buildings

Adaptive reuse of old dwellings and historic preservation fall within the purview of 'conservation'. According to Cantacuzino (1990), this is a planning issue that deals with policies and needs to be evaluated in the context of a given cultural tradition in a society; no policy succeeds without effective implementation strategies by the local authority. For Dhaka, the most important and difficult task would be to convince the owners to keep the old buildings, not destroy or reconstruct them for apartments or markets. Different incentives and monetary compensations, grants, subsidies and tax relief etc. can discourage demolition (Rahman, 2009). In Dhaka, generally policies are formulated but not implemented due to lack of accountability and transparency that enables unethical practices often involving government employees. There are strict rules and penalties for violating building rules, which are hardly imposed. In order to save valuable old buildings, it is necessary to make people aware of the value and develop consciousness for preserving old buildings (Rahman, 2009).

In Dhaka unlike Peri-urban Abuja, many cultural properties are succumbing to high-rise high-density developments under the pressure of urbanization and speculative market– a process that became vigorous in last 50 years. While some of this heritage at risk may be saved at moderate cost, land compensation cost alone will gradually make any such effort prohibitive (Imam & Mamoon, 1994). This has been further aggravated by the action of the real-estate developers and scarcity of build-able land in right location (Rahman, 1994).

Table-3: Similarities between Dhaka and Abuja Housing Transformation Patterns

Attribute	Similarities
Physical	Courtyard housing style Considerable reconstruction of core Dhaka in the 1950s, following the Muslim occupation is reminiscent to Abuja's consolidated era (1996-2006);
Social	Housing transformers in both cases are of middle and lower income group;
Psychological	Concerns for family privacy (seclusion of women) as an Islamic tenet; Provision of prayer room in both the typical original Hindu and Gbagyi houses; Retention of core housing characters and loss of peripheral values to urbanization;

A striking similarity between the Abuja and Dhaka cases is the non-enforcement of development control rules. The Abuja case study could be argued to be an apparently formal settlement, but labelled informal due to inconsistent urban development policies on Gbagyi Settlements (Jibrin, 2006).

2.2 Dhaka Transformation Actors

A good part of the traditional houses in old Dhaka, like the ones selected as case studies, were mainly built by Hindu families (Rahman & Haque, 2001), who started to amass wealth and climbed up the social ranks being in government service, business, and law practice before the Muslims. To express their status accompanying wealth, they used to build these gorgeous and intricately decorated mansions during the late-19th and early 20th centuries by mixing European and local styles (Rahman, 2001, 2009). Most of the 2-3 storied houses had three portions distinguished by separate courtyards facilitating various activities, other than guiding the spatial composition (Rahman & Haque, 2001). The front portion or the outhouse belonged to the male incomers, which would be adjusted to accommodate offices or other business enterprises of the owners, and often to allow the clients or guests to stay overnight.

Major changes occurred after the marriage of the sons of the family in a joint or extended family, which needed a more private area and separate convenience within the same premises. The resulting conversion/adjustment would mainly occur in the middle part of the house with most of the habitable rooms (Rahman & Haque, 2001). Some of the animal areas, servant quarters, kitchens, etc. in course of time were changed to bed rooms to augment scarcity of space as original need was not there.

2.3 Dhaka Transformation Model

Old buildings in Dhaka despite carrying mixed architectural features on the façade, usually followed indigenous spatial composition— habitable rooms around a multi-purpose courtyard (Rahman & Haque, 2001). The ways Hindu urban families live, and their social behavior pattern, have no marked difference from that of the Muslim families, except some religion-specific spaces due to differing rituals and role of women. Thus organization of domestic spaces of both Muslim and Hindu families in Dhaka is defined by the common inherent notion of privacy in local culture based on domain separation (Imamuddin, 1982; Rahman & Haque, 2001).

As mentioned above most houses were divided into three portions to facilitate various activities, and define and compose the spaces: the front for the business talks, strangers and male guests, the middle with bed rooms facing the courtyard, and the back used for the kitchen, toilets, storage and animals. The female dominated middle and end parts were farther from the front entry. Female onlookers use the front balconies and upper veranda around the courtyard— an essential space for various domestic, social and productive activities. Extra bathrooms and kitchens built in the courtyards while subdividing the house into rental units drastically reduced the courts in size, no more able to play the conventional roles (Fig. 2).

The orientation and location of the kitchen, and the *Puja Ghar* (prayer room) adjacent to the courtyard and a sacred tree, were unique features of the Hindu houses. The incoming Muslim families converted the no-more-needed Puja Ghar for other functions. Though taking bath in the courtyard near the well is common for the Hindus, the Muslim families introduced separate closets, mainly for the females. The Hindus would take food usually on the kitchen floor or on a platform in the veranda or the semi-open space adjacent to the kitchen; the Muslims introduced a separate dining room and table for the purpose. However, these were more culturally influenced habits than religious, developed over time.

In Dhaka all four types of transformations (Tab. 4a) occurred in old buildings with no particular pattern (Tab. 4b). Amount of changes during occupation by Muslims was considerably higher as compared to that earlier, as the original Hindu owners were making smaller horizontal extensions to accommodate more of the extended family members, Muslim owners were converting the houses into smaller units for renting out, often extending vertically. This reflects the socio-economic situation of the related periods, and the fact that vertical extensions were done after horizontal changes.

Figure-2: L-R Transformation of the Old houses in the 3 neighbourhoods in Dhaka, Dalpatti, Sutrapur & Bangla Bazaar. Source: Authors fieldwork.

Table-4a: First Phase of Transformation (Hindu Owners) in Dhaka

Case	Adjust	(%)	Add / Subtract	(%)	Conversion	(%)	Reconstruct	(%)	Total
Case-1: Gupta Bari (Dalpotti)	- bed & study room to law office	4	- bathroom and toilet in courtyard	2	-animal area into toilet	1			
	- 1st floor bed room to family sitting	4	- tube well, water point in 1st floor bathroom	1	-kitchen into study room for children	2			
	- bedroom into Puja ghar	2	- 2nd floor flat	1					
	- animal area at the open backyard	3	-store, kitchen and servant's room at the back	5					
			-remove animal house at back	5					
		13		**23**		**3**			**39**
Case-2: Sen Bari (Sutrapur)	- Dining room into bedroom	4	- Kitchen and servant room at the back	6	- Part of bed rooms to WC	4			
	- Garden in the roof top space in the 1st floor	5	- Extended kit. to dining	3	- Kitchen to servants qrt.	3			
			+ Pujaghar in the courtyard &	2	- 2nd floor bed room to kit & bath	1			
			+ 1st fl'r Br WC	4					
		9		**15**		**8**			**32**
Case-3: Lahiri Bari (Banglabazar)	- Bedroom into puja ghar	2	- Servants quarter and WC in the courtyard	3	- Add bath to bedrm.	2			
	- Bedroom into family sitting in the 1st floor	3			- Veranda into storage	4			
					- Converting part of drwg room to office/lib	2			
		5		**3**		**8**			**16**

Table-4b: Second Phase of Transformation (Muslim Owners) in Dhaka

Case	Adjust	(%)	Add / Subtract	(%)	Conversion	(%)	Reconstruct	(%)	Total
Case-1: Gupta Bari (Dalpotti)	5 rental units - Study into printing press office - Veranda for book binding - Guest room in the 2nd floor	 3 4 3	- Tube well in the courtyard - 2nd floor bed room and bath - Guestroom in the 1st floor	1 3 3	- Drawing room, bedroom to printing press - Puja ghar to kitchen - WC with drawing room	9 3 5	- Demolishing the back part and reconstructing the 2-storied dwelling unit	16	
		10		**7**		**17**		**16**	**50**
Case-2: Sen Bari (Sutrapur)	2 rental units kit, servant room, dining into guest rm veranda to patient waiting	 4 2	- Drawing and bed room in the 1st floor	5	- Guest room into clinic & chamber - Bed room to kitchen, store puja ghar into kit	5 3 3			
		6		**5**		**11**			**22**
Case-3: Lahiri Bari (Banglabazar)	Adjustment of 3 rental units - Rental parking at the enhance - New side entry	 10 1	- One storied bachelor house at the back unused space	12	- Bed rooms into grocery shops - Puja ghar into bath room, veranda into store & living	7 3 5	- 1 storied separate sublet unit at the back	12	
		11		**12**		**15**		**12**	**50**

2.4 Abuja Transformation Model

Evaluation of spatial order of Abuja peri-urban squatter settlements enhances the appreciation of the structures and processes embedded in its urbanization (Gilliland & Pierre, 2006). Abuja is now a heterogeneous society where economy submerged in social relations. Therefore, the evaluation of spatial order is relevant to housing design and development socially, economically and physically. Reuse of building materials is an economical approach to housing reconstruction and adjustment in peri-urban Abuja.

2.4.1 Incipient stage (1976-1986)

At the settlement level, the typical Gbagyi perceived houses on neighborhood domestic center, myth and ancestor worship, religion, and development control. At the compound level were courtyards, building shapes, access to toilets, home granaries, fencing of compound premises, multiple open spaces, kitchens, and boknu (guest reception hall). Others are self-help housing delivery and core housing provision. These could be grouped into three general categories: physical (nature of original compound, layout, location, plot demarcation), social (occupancy, typology) and psychological (self-help delivery, core provision). This era was characterized by the retention of rural norms.

Physically, nature of original compound was expressed in the concepts of courtyard housing; building shape and plot demarcation or residential boundaries. Based on dwelling history of the sampled compounds, building shapes, toilet, granaries, kitchen, reception and other features pointed to the rural housing norms. Survey shows that more compounds combined rectilinear and curvilinear structures, few were only rectangular. That mixed form was prevalent in the incipient era supported Balogun's (2001:100) assertion (rectangular 'West Coast' type and the round 'Sudanese' type).

Unlike in core Dhaka, Bangladesh, the provision of a kitchen and toilet was not a priority. Consequently, toilet provision in many compounds was scanty; like in rural environments; backyards, community or refuse fields were used for convenience. Similarly, outdoor kitchen attached to the granary was mostly used; seldom indoor kitchen would be located next to the woman's bedroom. Figure 3 shows conceptual and actual residential layouts.

2.4.2 Intermediate stage (1987-91)

To establish a transformation pattern in the second decade of Abuja, the study focused on retained, lost and emergent housing features in comparison to the previous period. This is further examined for dominant pattern, animated model, and talking typology (Richards, 2005:132-145) to establish a pattern by constructing: the big picture (pattern), pathway (stages), x-ray view (explanation), and process. The big picture indicates modification of physical housing features, socialization of migrant tenants with their hosts, and gradual decline in communal responsibility among indigenes at both extended family and community levels. Survey shows massive extensions and new construction, along with internal alterations and fencing. Figure 4 is an illustration of the housing environment in Peri-urban Abuja.

2.4.3 Consolidation stage (1992-2006)

Housing transformation patterns of the preceding periods could be viewed in terms of rural and urban norms respectively. Population shift into Abuja diluted the rural economy and affected the cultural values. Consequently, cash economy gains eroded the sense of ethnic communality and collective family survival. Socially, the emerging housing concept was occupancy-specific. The early typology of predominantly owner-occupier extended family compound was gradually converted to owner/tenants and rental housing types. Figure 5 shows layouts typical of the consolidated era. The spatial ties between compound and settlement layouts are illustrated in figure 6 below.

2.5 Transformation of Abuja House Form

In Gbagyi traditional housing unit, the compound follows the courtyard as in other societies. It has undergone changes in construction method, materials, and spatial organization in three decades, with a decline in traditional patterns. Consequently, the mix round and rectangular housing layouts of the incipient stage was gradually regularized to a rectilinear

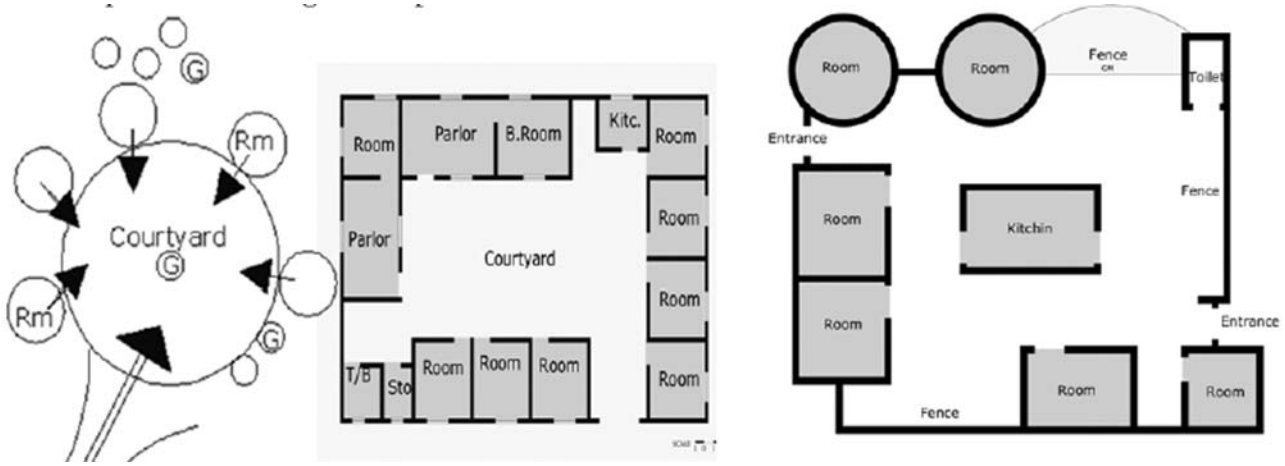

Figure-3: Left to Right - Courtyard housing Concept; A modern manifestation of Gbagyi courtyard housing in Karu Peshe; Courtyard Compound in Karu Zhimi, Abuja. Source: Authors Field Survey 2006.

Figure-4: Samples of Karu-Abuja situation. Approach facade showing the entrance sandwiched between the shops and the main lounge in Karu-Abuja; a shop curved out of the family block; multiple functions of courtyard regardless of size.

form - a process described as "loss of multiplicity of building shapes and forms" (Mai, 2008).These compounds are true to the Christian doctrine of a bungalow to every nuclear family, as shown in Figure 7 of retained individualized bungalows. However, inhabitants share toilets and kitchens.

Gbagyi housing transformation was predicated on socio-culture, acculturation, development control, rental income, nature of existing building and retained core values. Figure 8 illustrates physical transformation pattern manifested in the three periods.

3. APPARENT SPATIAL TRANSFORMATION PROFILE

In both Peri-urban Abuja and Old Dhaka, courtyards remain essential spaces for regular domestic uses, social uses and varieties of production and income generating activities, in addition to being the climate modifier in a house. The findings show a number of additional bathrooms and kitchens in the courtyard, constructed when the main houses were subdivided into rental units. Thus reduced courtyards were unable to perform socio-economic and physical-climatic roles, as illustrated in Fig. 8.

3.1 Motivation for transformation

Identified Core Dhaka and Peri-urban Abuja housing characters, transformation and motivation could be linked to each other on the basis of a priori themes or components of behavioural, cultural, socio-economic and spatial (Turgut, 2001:17-25). Behavioural components relate to privacy, territoriality and personal space. Cultural components involve norms, lifestyle,

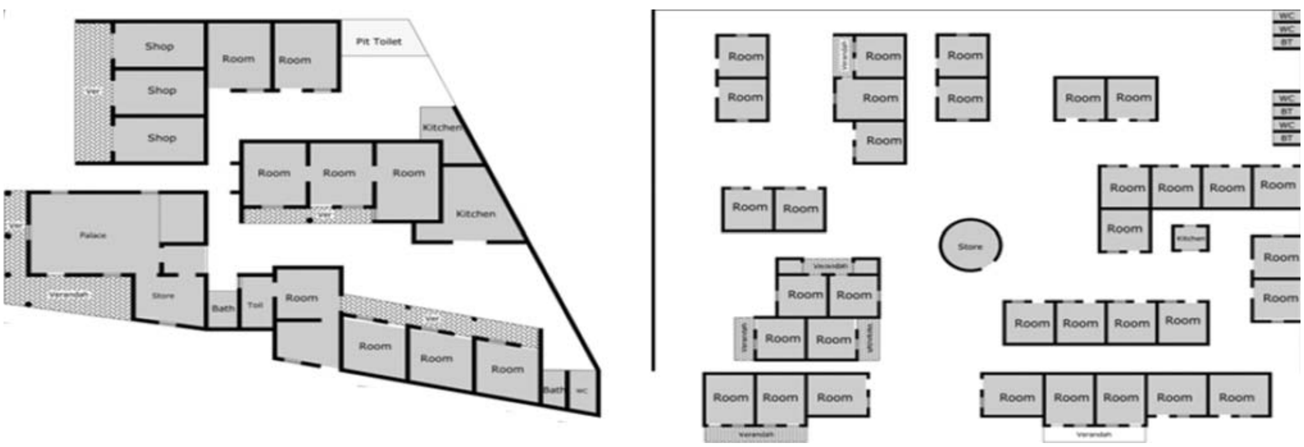

Figure-5: L-R - Owner/Tenant Compound with Hierarchy of Spaces; Typical Face-to-Face Rental both in Karu Hausa, Abuja. Source: Fieldwork, Mai (2008).

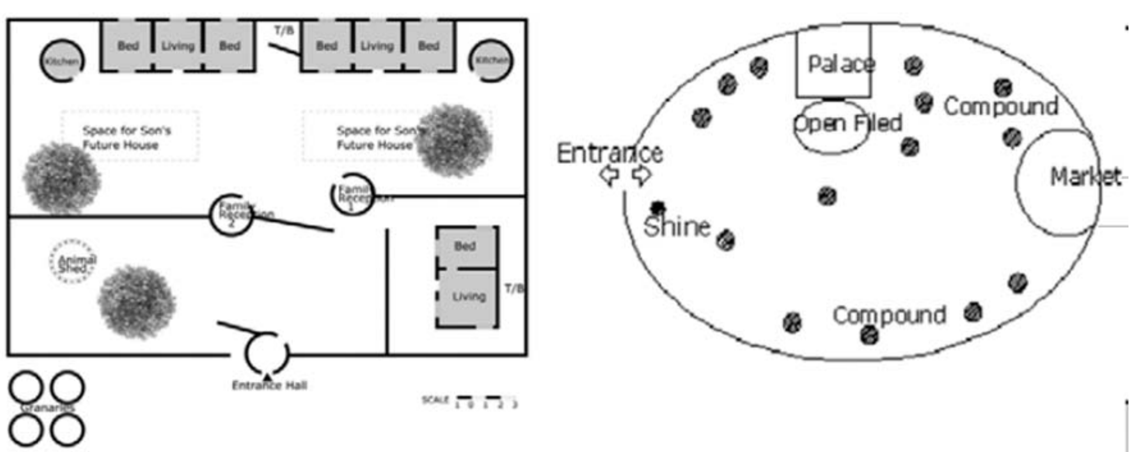

Figure-6: L-R - Typical Gbagyi Muslim Ubrna Compound; Typical Gbagyi Settlement Layout.
Source: Fieldwork, Mai (2008).

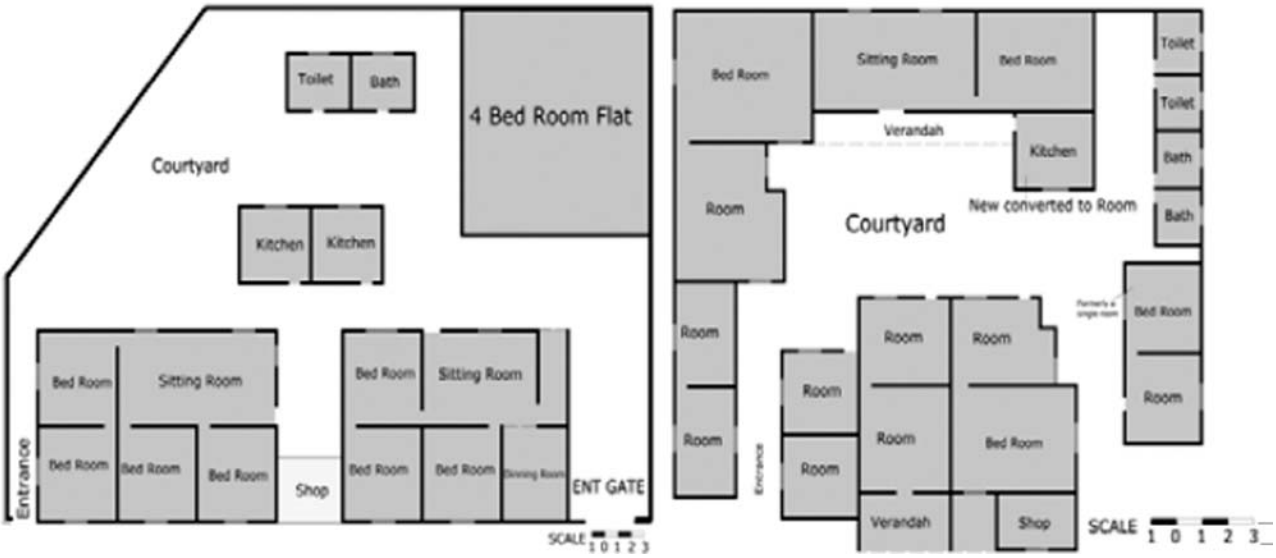

Figure-7: L-R - Owner/Tenant Compound with Hierarchy of Spaces; Typical Face-to-Face Rental both in Karu Hausa, Abuja. Source: Fieldwork, Mai (2008).

and family and kinship structure. Socio-economic components are made up of income, occupation and education. Spatial components are concerned with the physical features of a dwelling such as its dimension, location and form (Turgut, 2001:17-15).

Unlike the Hindus who construct their dwellings around the hearth in a kitchen, Peri-urban Abuja traditional compounds focus on the family granary, which integrates with the kitchen. As such, circulation within such compound is influenced by the centrally placed family granary, with other facilities radiating from it, which has parallels in other societies (Al-Naim & Mahmud, 2004). Moreover, Peri-urban Abuja Muslims avoid straight axis for residential entrances to achieve visual privacy. Peri-urban Abuja pagans belief in deity, ancestral gods, and symbolic gods from nature, as well as in witchcraft, has influenced the nature and size of small windows (Jarumi in Je'adayibe, 2005: 48-59).

4. CONCLUSION

Conservation of the old buildings by saving them from the developers would not be possible without intervention by the public authorities enforcing strong rules. Building public consciousness regarding the preservation of architectural and cultural heritage would be crucial here. This paper showed an alternative way to continue the traditional use of old buildings and enhance their income in the process to the owners with emotional attachments. Thus subdividing of the existing building and renting those out to middle income people could defer the aggression of the developers in Old Dhaka and Peri-urban Abuja. However, many alternations and changes done in the interiors in the process may not have followed proper method so that intricate details could be preserved (Rahman, 2009). Conserving old buildings is an urban design issue that deals with not a single building, but a particular neighbourhood or an area. However, it is not possible for the public authority to handle this alone, private sectors also should come forward and take initiatives especially for cities like Dhaka and Abuja.

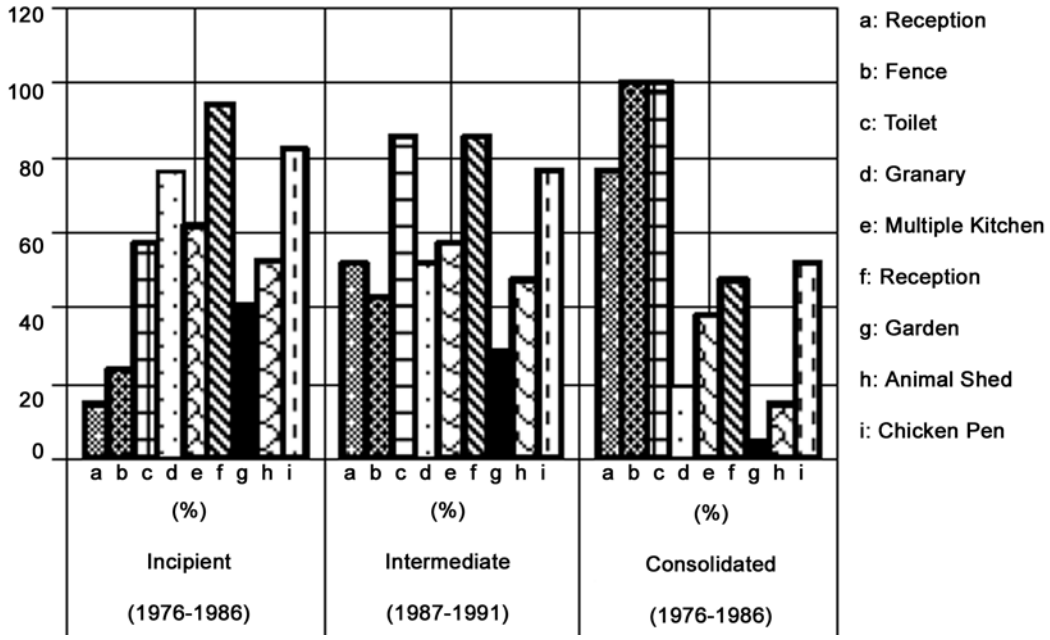

Figure-8: Transformation Pattern of Housing Features.
Source: Mai (2008).

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OF

OUTSTANDING SIGNIFICANCE

PLANNING FOR HIGH DENSITY IN LOW-INCOME SETTLEMENTS FOUR CASE STUDIES FROM KARACHI

Under the International Institute of Education & Development (IIED), UK

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1. INTRODUCTION

With the rise of globalisation, most major cities in Asia have begun seeking direct foreign investment to build their social, physical and economic infrastructures. To attract such investment, they are casting themselves as 'world-class cities', a version of urban prosperity and aspiration consisting of communication networks, investment friendly infrastructure, iconic architecture, international events and catering to tourism. This image has been aggressively promoted since the 1990s by international financial institutions, national and international corporate sectors and a number of UN agencies.

In these cities, globalisation and the pursuit of a world-class image have created an expanding industrial and agricultural corporate sector and an increasingly affluent middle class. Both these entities require land for their growth and consolidation. Often the ideal locations are occupied by existing inner-city informal settlements, many of which were marked for regularization and upgrading in the 1980s. Upgraded informal settlements are not in keeping with the image of the world-class city, however. Hence, the settlements are being removed and their residents relocated in high-rise apartments, often on the peripheries of cities. (Hasan, 2009b)

Evidence suggests that (i) low-income groups (with the exception of some white-collar workers and some of the better-off among the poor) are unhappy with high-rise housing because of social problems there; (ii) the units are expensive to maintain, service charges can be high (and unavoidable) and installments for lease or ownership are usually unaffordable for the poor residents; (iii) residents cannot run informal businesses in the apartments, apart from service businesses such as tutoring or beauty parlors; and (iv) the residents become poorer and some of them grow destitute. As a result, the majority sell their possessions informally at throw-away prices, if they can, and move back as renters to informal settlements in city centers. (Verchure, 2006), (UN'S Advisory Group on Forced Evictions, 2009)

Governments justify the construction of high-rise apartments on the grounds that it promotes the image of a modern city and that it is the only way to achieve high densities, while conforming to the building bylaws in most Asian cities. Image is a matter of perception and can be debated. By contrast, the density of low- and lower-middle-income settlements can be objectively ascertained.

Here we show that planners, NGOs and formal and informal developers in Karachi, Pakistan, could achieve — and in some cases considerably exceed — the densities prescribed in the bylaws of the Karachi Building Control Authority (KBCA) by building houses on small plots, as opposed to apartments, without compromising on concerns about the social and physical environment. We further examine the social and economic benefits from providing plots or houses rather than apartments.

2. INITIAL INTERVIEWS AND DESIGN OF CASE STUDIES

This study was initiated by Arif Hasan, working in association with IIED. First, interviews with residents of six randomly chosen low-and lower-middle-income settlements and apartment complexes in Karachi were carried out at meetings within the settlements. Usually a crowd of six or seven persons gathered to give opinions about their experiences of living in the settlements or apartment complexes.

These interviews revealed that the majority of residents preferred 'homes' (by which they meant access to land) rather than apartments. Comments from residents of apartment complexes were critical of this living arrangement. One resident said, 'This is not a home — it is a coffin.' A female resident complained, 'There is no neighborhood

feeling. You cannot watch your children play without coming down yourself, and this is not always possible, so children misbehave and get involved in bad things.' Another complaint was that there is no privacy in apartment living, and as such, 'it promotes promiscuity in adolescents and this leads to conflicts between families'. Complaints regarding promiscuity and privacy were also made by residents of exceptionally high-density informally planned settlements consisting of individual houses. A senior apartment-complex resident said, 'A house has to grow with time. An apartment cannot grow, so either grandparents must go or the children must go. If neither can afford to go then you die of congestion and suffocation'.[1]

These views are not unanimous. One study of an apartment block, undertaken separately (see below), found that a majority of residents had no such concerns and were happy living there. Some residents said that the apartments provided security and that they were the only affordable option because the developers who sold the apartments offered loans. There was general agreement, however, that apartment complexes were badly maintained, that garbage was not collected and that there were serious plumbing-related problems. Residents also pointed out that it was difficult to carry out economic activity in the apartments and this denied them access to funds badly needed for survival.

The complaints of plot owners in low- and lower-middle-income settlements were different. In newer settlements, they were related to the bad state of infrastructure; in older settlements, they concerned congestion and lack of open space. Except in one settlement that was part of an inner-city regularised informal settlement, social issues did not surface, nor did the issue of being able to use the home as a place of economic activity.[2]

After the interviews and an exploratory study of a few houses, a larger local research and teaching team was brought in, coordinated by Urban Research and Design Cell at the Department of Architecture and Planning, NED University of Engineering and Technology, Karachi. The goals of the study expanded to include feeding into the teaching of architecture and planning, and engaging with government agencies involved in land use planning.

On the basis of the initial interviews and site visits, as well as a review of secondary sources, we chose four sites for more detailed study. Questionnaires were administered to about 10 per cent of the households in each settlement, and the settlements were further documented as described below.

- Khuda Ki Basti 3 (KKB-3) is a 10-year-old suburban, incrementally developed lower- to lower-middle-income settlement designed according to the bylaws of the KBCA, comprising 1,237 housing units. Twenty residents were interviewed in-depth, and a questionnaire was given to 100 households selected to represent different locations across the settlement. We physically documented four houses, using plans, sections and elevations to understand spatial relations, scale and the process of incremental growth. In addition, the settlement was physically documented. The results were analysed and tabulated.

  KKB-3 was chosen as a case study of a comparatively new and low-density settlement. It served as a baseline for exploring the extent to which densities for new plot townships can be increased with regard to residents' preferences and maintaining the quality of environmental and socioeconomic conditions.

- Nawalane, comprising 769 housing units, is one of the oldest settlements of Karachi, part of the 250-year-old Lyari Town. It is an ethnically uniform, clan-based lower- to lower-middle-income settlement located in the dense inner city. Documentation and analysis, including detailed interviews with residents and municipal councilors as well as physical documentation of four houses, were similar to those for KKB-3. A questionnaire was given to 75 selected households spatially distributed across the apartment buildings and floors.

  Nawalane was chosen as a case study to examine whether settlements of houses on small plots can reach the high densities that exist in this settlement (though they are in complete violation of KBCA bylaws and zoning regulations) without adversely affecting social and environmental conditions.

- Paposh Nagar, with 714 housing units, is a 55-year-old lower-middle- to middle-income government plot scheme near the city centre of Karachi, which has densified incrementally over time. As for Khuda Ki

1 These interviews were carried out in August and September 2008 at Al Azam Square, Karimabad; Labour Square -I, Orangi Town; and Falaknuma Apartments, New Karachi.

2 These interviews were carried out in August 2008 at Khuda Ki Basti 3, Nawalane, Lyari and Chashma Goth.

Basti 3 and Nawalane, we carried out physical documentation and detailed interviews with residents and municipal councillors. A questionnaire was given to 75 randomly selected households.

Paposh Nagar was chosen so that we could study the conversion over time of a planned low-density settlement into a medium-rise high-density area and understand the environmental and socioeconomic repercussions of this change. This could help in developing new approaches to planning and management of incremental growth.

- Fahad Square is a 10-year-old apartment complex with 248 housing units for low- and lower-middle-income residents, located near the city centre. A site-specific questionnaire highlighting issues and trends of high-rise living for low-income communities was given to 25 respondents. A physical survey was also carried out.

  Fahad Square was chosen so that we could determine whether apartments can be replaced by small houses without compromising on density, while fulfilling the security and image requirements of the residents and meeting the profit requirements of commercial formal-sector developers.

- An additional apartment complex, the 36-year-old Labour Square, was included as a comparison to Fahad Square to reveal how apartment complexes develop physically and socioeconomically over time and link these changes to density-related issues. For this purpose non-structured interviews were carried out at gatherings in three locations.

For the four main sites (not including Labour Square), we prepared matrices comparing environmental, housing and socioeconomic conditions and compiled maps and documentation including a satellite image of each site, site dimensions, land use, built-up densities, solid-void relationships, sewage and water lines, sections through sites and house plans.

After analyzing our findings from the case studies (Sections 3 and 4), we hypothetically redesigned the four sites to explore the possibilities for high-density housing on plot settlements (Section 5).

This research generated information related to a number of socioeconomic, sociopolitical, urban design, and physical planning and management issues. Only the results relevant to the planning of high-density low- and lower-middle-income settlements are described here.

3. CASE STUDY RESULTS

3.1 Khuda Ki Basti 3

Khuda Ki Basti 3 is located 25 kilometres from the city centre; spread over 40.8 acres (16.5 hectares). It is planned according to KBCA regulations for the planning of townships (see Box 1). Residential plots, 80 square yards (67 square metres) each, make up 49 per cent of the site; 1.9 per cent is allocated for commercial plots, 6.5 per cent for amenities (including schools), 7.2 per cent for open spaces and parks, and 35 per cent for streets and roads. The total number of plots is 1,237. The land was provided at subsidized rates to the NGO Saiban,[3] who had the settlement planned as a plot scheme and developed a process through which only low-income families could purchase a plot and they would be forced to live on it immediately. Repayment for the plot is in affordable installments spread over seven years.

The settlement is designed as a set of neighbourhoods, each with 100 houses surrounding around a small open community space, with space for one primary school for every two neighbourhoods. A central circulation and amenity spine containing parks and community buildings runs through the settlement. The maximum permissible density, as per KBCA regulations for the township, is 500 persons per acre (1,250 persons per hectare). For KKB-3 this works out to about 15 persons per residential unit. Currently the average number of persons per plot is 6.7 and the density is 203 persons per acre (555 persons per hectare). According to the Karachi bylaws, construction is limited to ground plus two floors. The settlement is completely occupied except for the commercial plots along the main road, but the density is low since only 10 per cent of the houses are ground plus one floors and 6 per cent are ground plus two floors (see figures 01-04).

3 Saiban provides unserviced land to low-income families for affordable down payments and monthly instalments. They acquire infrastructure over time on the Orangi Pilot Project (OPP) model. Saiban provides support through other NGOs for education and health programmes and advice on infrastructure development.

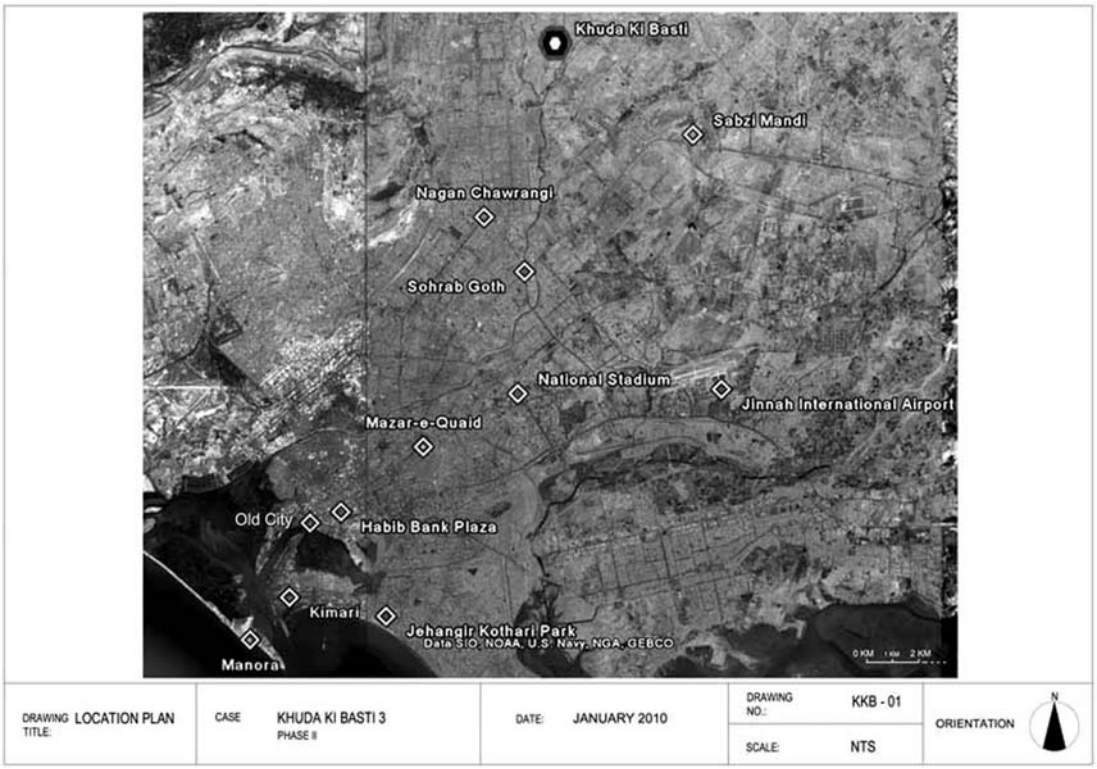


Figure-1: Location of Khuda Ki Basti in Karachi

Figure-2: Immediate vicinity of Khuda Ki Basti in Karachi

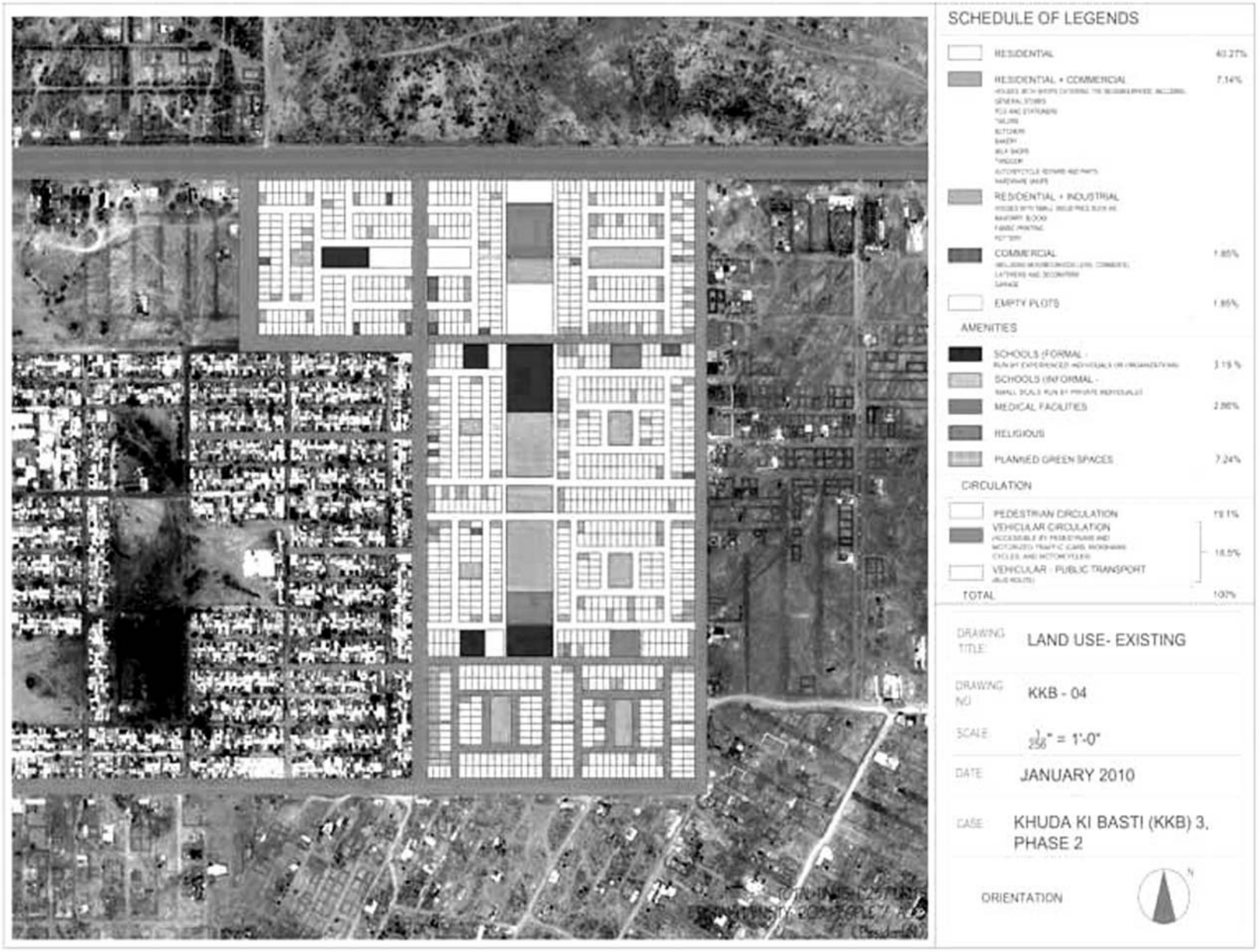


Figure-3: Existing Land use of Khuda Ki Basti in Karachi

Figure-4: An aerial view of Khuda Ki Basti in Karachi

Figure-5: Typical Layout Plan of a house

The following issues emerge from the KKB study:

- Circulation and community spaces can be combined so as to increase space for residential plots.
- The accommodation requirements of residents can be fulfilled in plots of 56yd^2 (47m^2) instead of the current 80yd^2 (67m^2), provided that residents are allowed to build houses of ground plus three floors. This would reduce the cost of the plot, infrastructure and construction (see figure 5)
- Respondents wanted at least two of their children, after marriage, and to be able to live in a semi-independent unit within their plot. To be semi-independent the new nuclear family must have a separate kitchen so that the mother-in-law and daughter-in-law do not have conflicts.
- School teachers at the site felt not only that the areas allocated for the schools are appropriate, but that with the use of neighbourhood open spaces for playing the number of students can be increased by over 50 per cent. For higher-density settlements, however, the area allocated for education purposes should be appropriately increased.

3.2 Nawalane

Nawalane is situated in an area of Karachi known as Lyari Town, which is over 250 years old. It is an informal settlement that was regularized in 1976, spread over 20.9 acres (8.4 ha), with 769 plots and a density of 1,356 persons per acre (3,376 persons per hectare). Until 1976, most of the houses had one or two storeys. Today, the majority are ground plus two to ground plus four and even ground plus five floors, and they continue to rise vertically. Parks and playgrounds are almost nonexistent, though there are parks near Nawalane. The settlement consists of houses on plots of 38 to 300yd^2 (31 to 100m^2) and is served by 24 lanes. The maximum width of road (a paved area accessible to vehicular traffic) is 15ft (4.5m), and the minimum width of lane (a pedestrian pathway not accessible to vehicular traffic) is 2 feet 6 inches (0.76m; see figures 6-9).

The settlement is ethnically homogeneous. The ancestors of the 75 residents surveyed migrated from Balochistan. All the respondents were born in Nawalane except for four women who had come to the settlement as a result of marriage. The average family size of the respondents was 13.6, and an average of two families live on one plot. There are 6.4 children per nuclear family, so space is required for playgrounds. Among respondents, 34 per cent of males and 55 per cent of females were between the ages of 20 and 29. There will therefore be substantial growth in the population in the coming decade. Some 24 per cent of males were over 60 years old and needed a peaceful space for sitting, gossiping, and playing chess and board games. Only 19 per cent of the respondents use their homes for economic activity; the area is working class and does not have a tradition of entrepreneurship. The area is 71 per cent residential, 20 per cent streets and only 0.1 per cent parks and open spaces.

Nawalane can be divided spatially into two almost equal zones, which we termed A and B. The majority of houses in Zone A, in the southeast, are ground plus three to ground plus four floors. Zone A's density is around 4,480 persons per hectare, more than two and a half times the maximum government-prescribed density of 650 persons per acre (1,625 persons per hectare) for low-income apartment complexes (see Box 1).

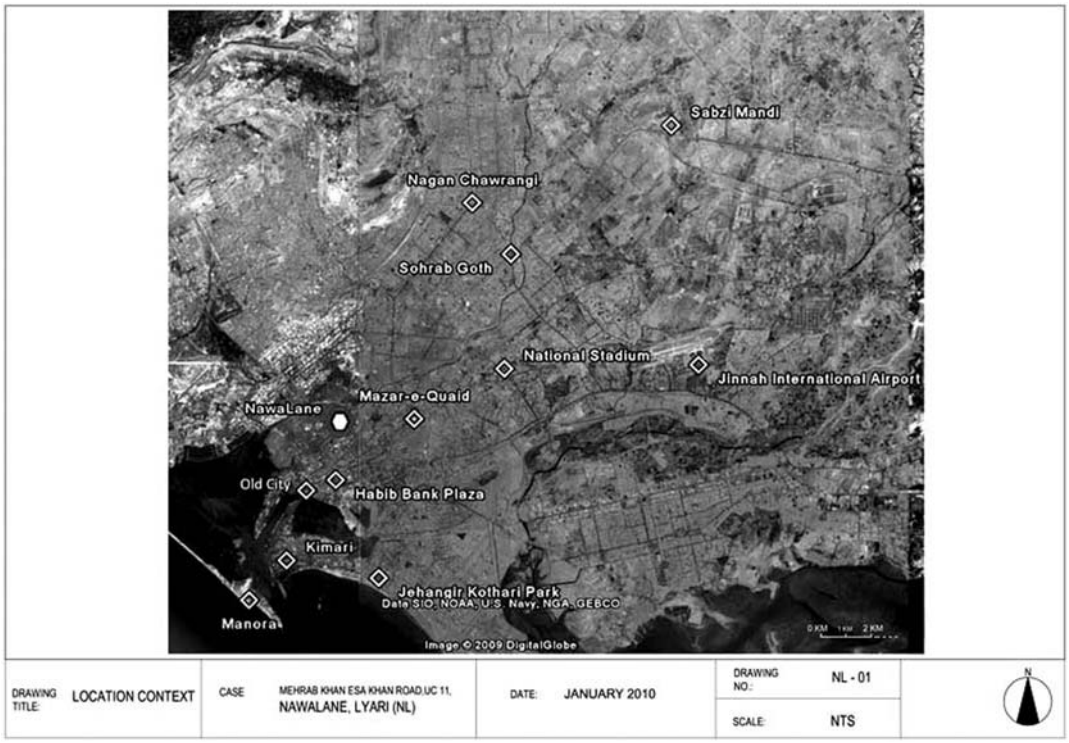


Figure-6: Location of Nawalane in Karachi

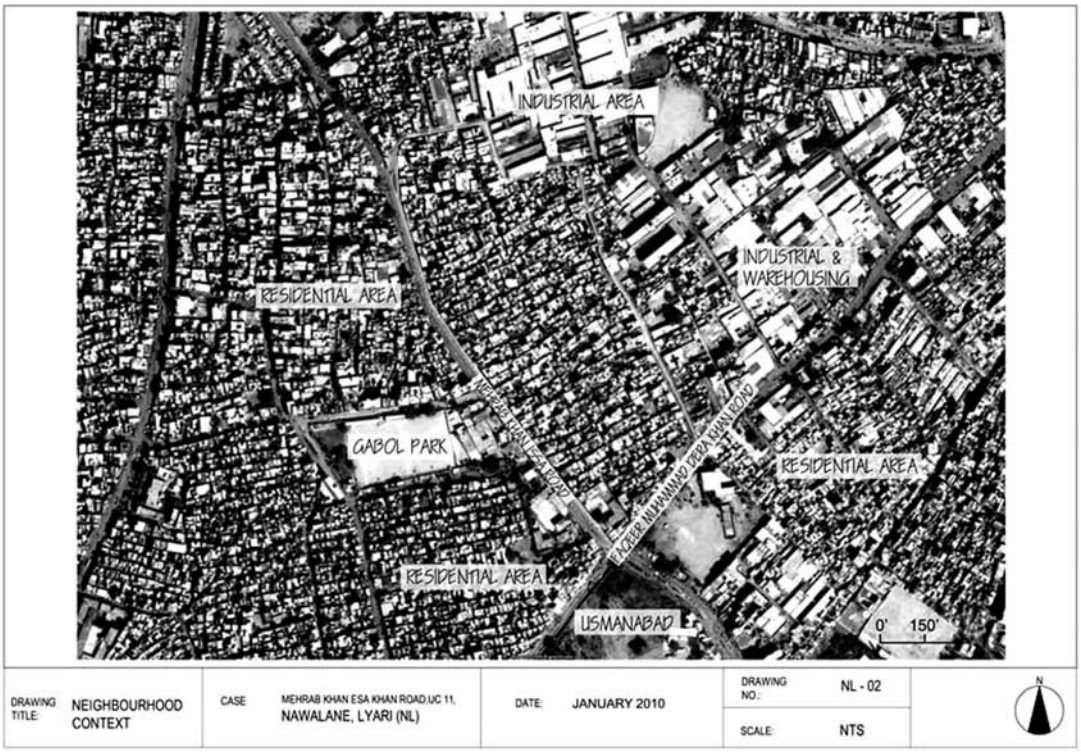


Figure-7: Immediate vicinity of Nawalane in Karachi

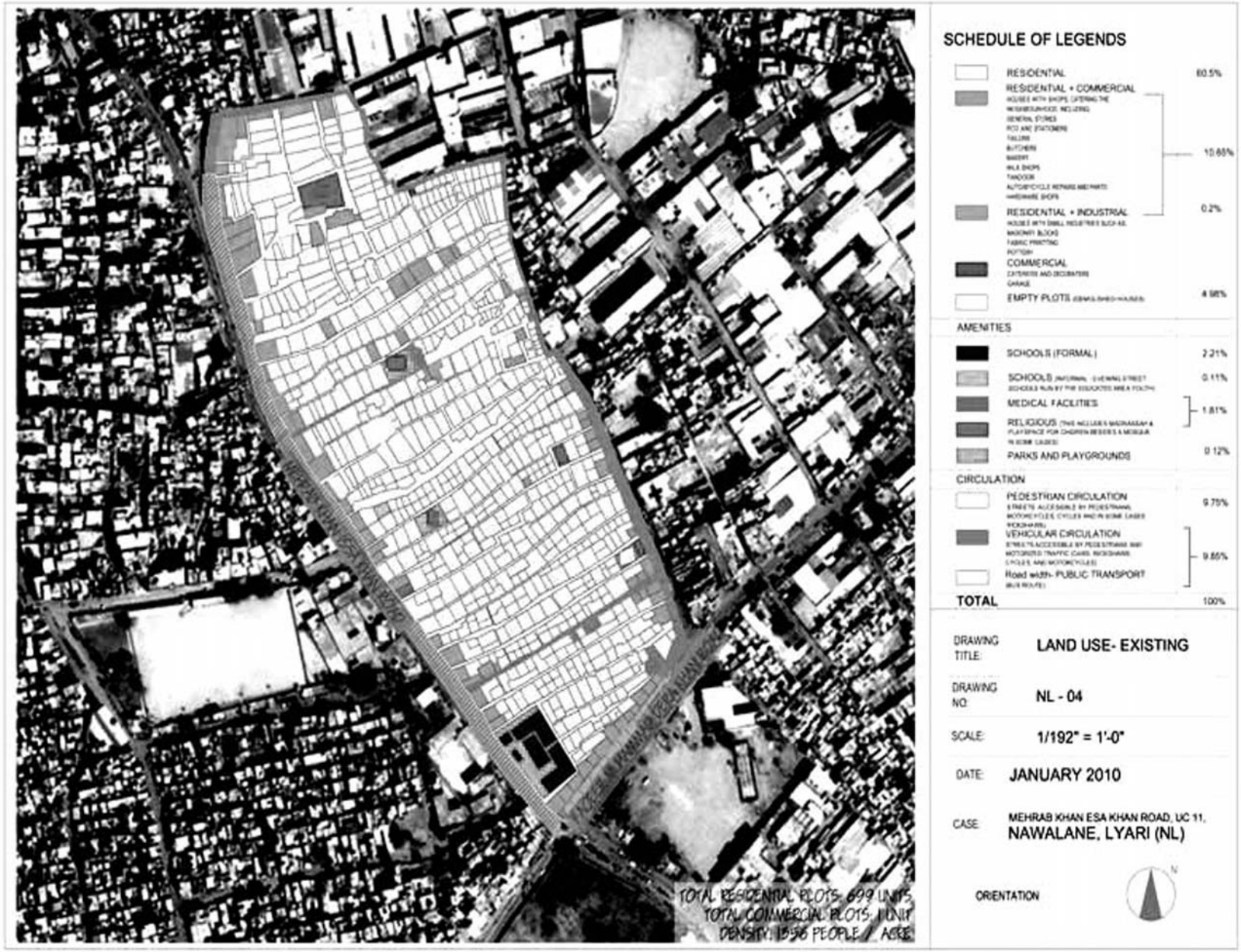


Figure-8: Existing landuse of Nawalane

Figure-9: Main street of Nawalane

The following issues emerge from the Nawalane study:

- Densities over 3,500 persons per hectare create congestion that planners may find difficult to manage. Congestion and lack of space for social interaction is also responsible for discomfort in social relations (figure 10).

- If circulation and community spaces can be combined, densities of up to 3,000 persons per hectare can be achieved without compromising on environmental conditions.

BOX - 01: KBCA Density-Related Bylaws, 2006

Land Allocation for New Residential Development

Land Use	Maximum % of the Total Area
Residential	55%
Commercial	5%
Amenities	--
Roads / Streets	22%
Parks	5%
Playgrounds	5%
Public Usage Including Religious Buildings	5%
Educational	3%

Plot Areas

- Residential plor at least 80 yd^2, (66.89 m^2) no more than 60 yd^2 (501.67 m^2).
- Apartment site at least 2420 yd^2 (2023.4 m^2).
- Commercial plot at least 60 yd^2 (50.42 m^2).

Plot Shapes

- Plot shapes should generally be rectangular.
- The ratio of frontage to depth of residential plots should be at least 1:1 and not more than 1:3.
- Residential or commercial plots should be at least 20ft (8 m) wide.

Plot Size	Acceptable Maximum Density	
	Persons Per Acres	Persons Per Hectares
80 sq yds (65.89 sq.m)	500	1250
> 80 sq.yds (66.89 sq.m) < 120 sq. yds (100 sq.m)	400	1000
> 120 sq.yds (100 sq.m) < 240 sq. yds (200.67 sq.m)	300	750
> 240 sq.yds (200.67 sq.m) < 400 sq. yds (334.45.67 sq.m)	200	500
> 400 sq.yds (334.45 sq.m) < 600 sq. yds (501.67 sq.m)	150	375

Apartment Typology	Acceptable Maximum Density	
	Persons Per Acres	Persons Per Hectares
Low Income	650	1625
Middle Income	500	1250
High Income	325	812.5

Source: Karachi Building and Town Planning Regulations, 2006

- Plots of 56.3yd^2 (47m^2) can accommodate three families provided permission is granted to build ground plus three floors and provided there is sufficient accessible open space in the form of a courtyard or in front of or adjacent to the house. The additional cost to the foundation of a two room ground floor house to build three more floors will be about 15 per cent which means Rs 48,000 (600 US$).

- For densities of between 2,000 and 3,000 persons per hectare, at least 4 per cent of the area (as opposed to the present 2.3) percent should be allocated for primary schools given the present demographic balance in Karachi. As the population ages, this can be used for colleges and other public services.

- Road width should be a minimum of 15ft (4.5m) so as to permit access by service and emergency vehicles.

- Women should be provided space for recreation and related activities. Half of the area for amenities should be allocated for this function.

- The settlement would have been very different if there had been an organisation that could have provided the residents with design advice, managed the expansion of their homes and prevented encroachments.

3.3 Paposh Nagar

Aurangabad, a neighborhood in Paposh Nagar, was created as a settlement scheme in 1954 for migrants from India. At that time it was on the fringe of Karachi, about 7km from the city centre. Today it is adjacent to Karachi's industrial area and important health and education institutions are accessible. It was designed as 417 plots of 45yd^2 (38.5m^2) each. The houses consisting of two rooms, a kitchen and a bathroom, then had only one floor, but over time they have grown, and many are now ground-plus-one-floor to ground-plus-three-floor structures. Residents have also increased the sizes of their plots by encroaching on the roads. For example, the tertiary roads were planned as 12-14ft (3.6-4.2m) wide, but many are now only 4ft (1.2m) wide. Secondary roads were 24ft (7.3m) wide and are now 12ft (3.6m) wide. The primary road, however, has not been encroached upon and remains 48ft (14.6m) wide. As a result of these expansions, the average plot size is now 81.6yd^2 (68.2m^2). On average, household size is 6.7 persons and there are 1.5 households (10.1 persons) per house, yielding a density of 478 persons per acre (1,195 persons per hectare). The settlement contains private health clinics, two mosques and six schools. There is a park southwest of the settlement that is used by the residents (see figures 11-14).

Figure-10: Congested Streets of Nawalane

The following issues emerge from the Paposh Nagar study:

- Paposh Nagar was initially a well-planned settlement with sufficient amenities. Because of population pressure and a lack of alternatives, however, the settlement densified and residents encroached on roads and public spaces, thus increasing plot sizes. This densification and growth could have been managed if there had been an institution to give design and technical guidance. With a ground-plus-three-floor option for the original 45yd^2 plots, families' accommodation requirements could have been fulfilled (see figure 15).

- Given the current density of the settlement, at least 4 per cent of the area should be utilised for amenities and

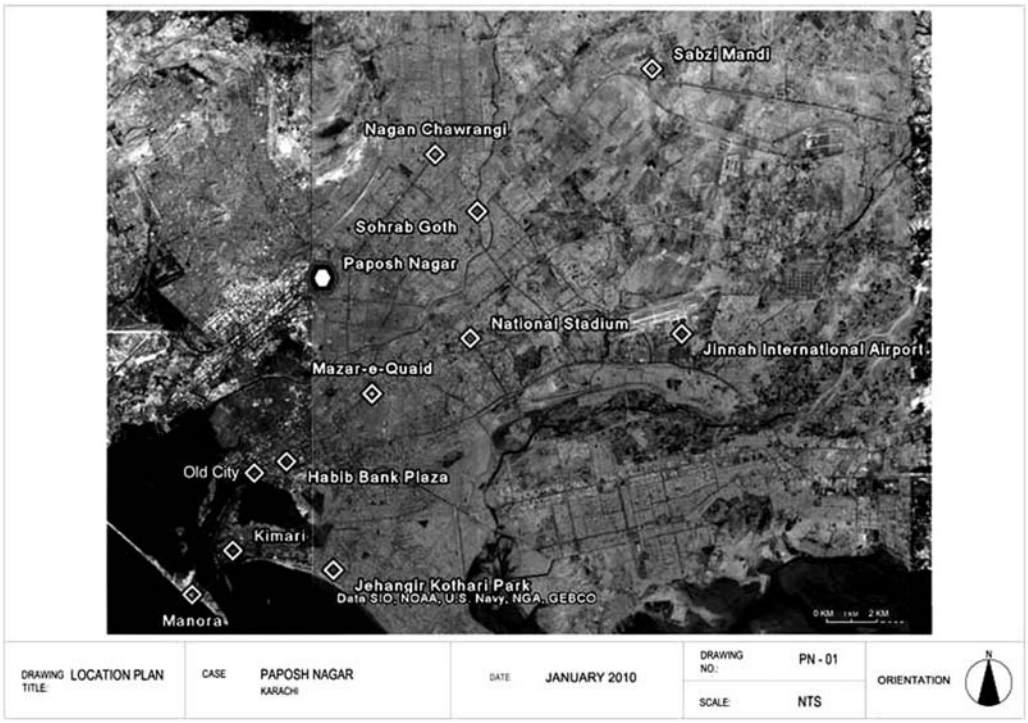


Figure-11: Location of Paposh Nagar in Karachi.

Figure-12: Paposh Nagar: Immediate vicinity.

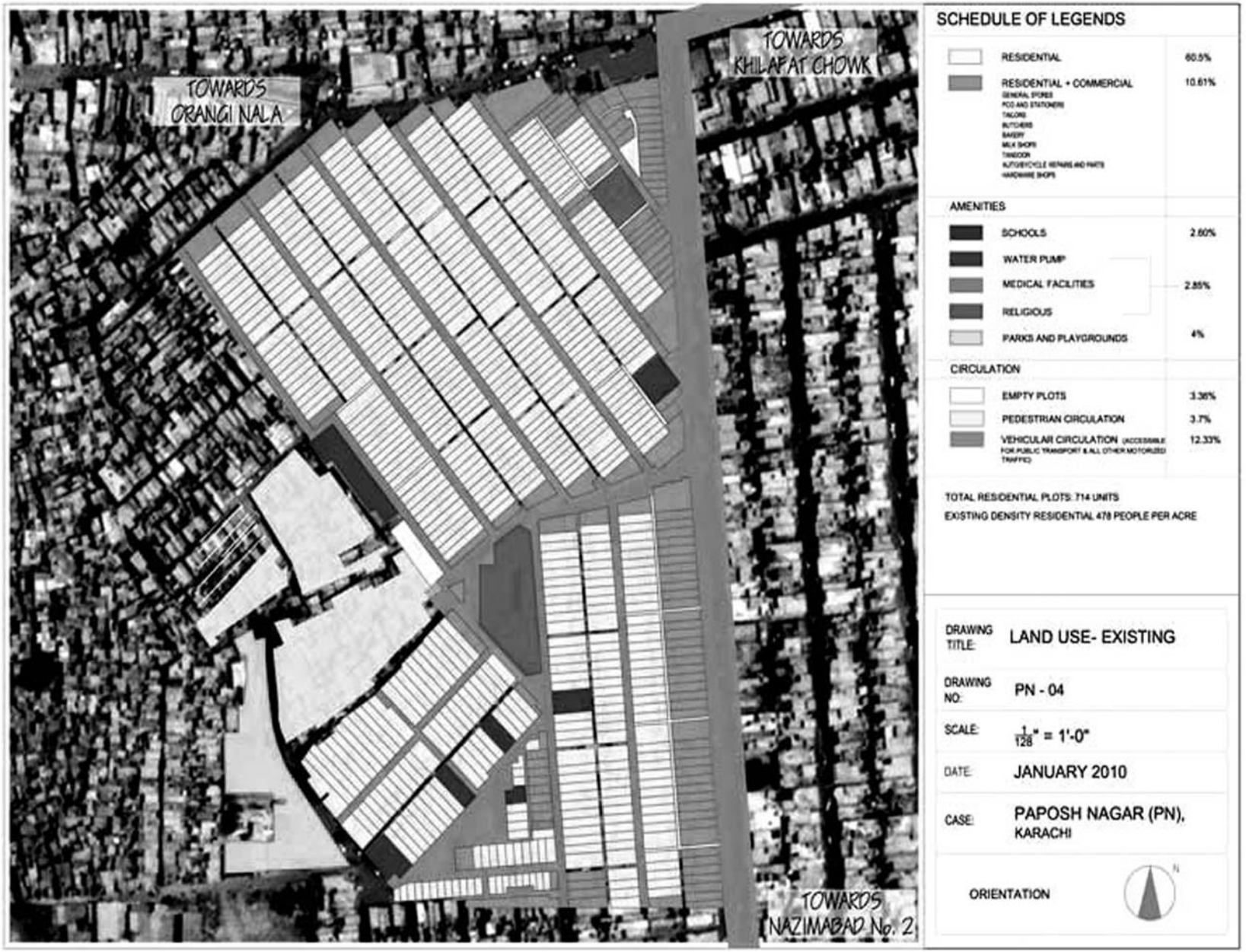


Figure-13: Existing landuse of Paposh Nagar

Figure-14: View of Paposh Nagar

another 4 per cent for education, rather than the present 2.6 and 2.9 per cent, respectively.

- If public and street space were combined, Paposh Nagar could be redesigned to accommodate higher densities without adverse effects on the physical and social environment.

- As for KKB and Nawalane, a 56.3yd^2 (47m^2) plot is adequate for the needs of the residents.

3.4 Fahad Square and Labour Square

Fahad Square differs from the other three case study sites, as it is not a settlement consisting of houses on individual plots but a developer-built apartment complex. Located within a much larger urban-development project in suburban Karachi, of 26000 acres designed by the Karachi Development Authority (KDA) on 26,000 acres (65,000ha), the apartment complex itself is built on 1.5 acres (0.60ha) and consists of 248 apartments and 56 shops. Each apartment has three rooms and a covered area of 81.6yd^2 (68.2m^2). The original price was Rs 320,000 (US$ 4,000). The current price is about Rs 800,000 (10,000 US$). The entire complex is a walk-up affair of ground plus four floors. The average household size is 5.72 persons per apartment, yielding a density of 942 persons per acre (2,329 per hectare). This far exceeds the maximum density of 650 persons per acre (1,625 per hectare) allowed by KBCA regulations for low-income apartment complexes. Obviously, the developer of Fahad Square has violated the rules. (See figures 16-20)

The housing units in the apartments are also different from those in the other case studies. They have balconies, attached bathrooms with glazed tiles, and 'American kitchens'. They project a different culture and way of life. This is imposed by the developer. Many of the residents would be living differently if they had built their own homes. The extent to which this has determined their lifestyles could be a subject of further study.

Figure-15: Congested streets of Paposh Nagar.

The other major difference between Fahad Square and the other case study sites is that amenities and health and educational institutions in the neighbourhood are arranged according to a plan. The residents of Fahad Square have, however, added a mosque in the open space provided within the complex. Unlike Nawalane and Paposh Nagar, Fahad Square is not ethnically homogeneous, as the apartments were offered for sale on the formal market, where, in addition to ethnicity, cost, location and the availability of loans determine who applies to acquire an apartment. The owners and renters have formed a union that maintains shared spaces and infrastructure. A small office for the union has been built in the open spaces provided by the developer. The complex has been occupied for the last 10 years.

The following issues emerge from the Fahad Square study:

- KDA zoning regulations for plot townships do not apply to Fahad Square. Nonetheless, it would be interesting to see what densities could be achieved if Fahad Square was developed as a self-contained complex with all amenities and facilities, as per these regulations.

- In settlements with plots instead of apartments and with incremental additions to the first two floors, it is possible to achieve densities as high as those prescribed by KBCA rules.Developers would make less profits from such settlements than from apartments, however, as catering to incremental growth means that initially there is less square footage of construction for sale.

- Apartments are suitable for white-collar workers and initially lend an upwardly mobile image to their owners. With time, however, congestion and poor maintenance destroy that image.

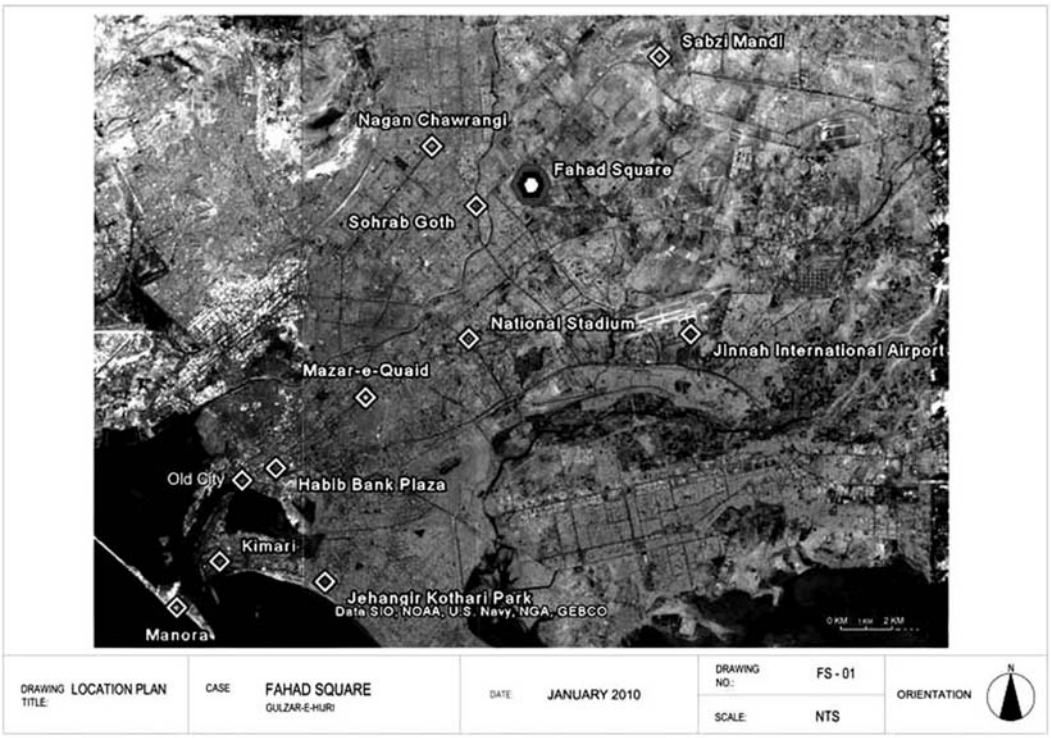


Figure-16: Location of Fahad Square in Karachi

Figure-17: Immediate vicinity of Fahad Square in Karachi

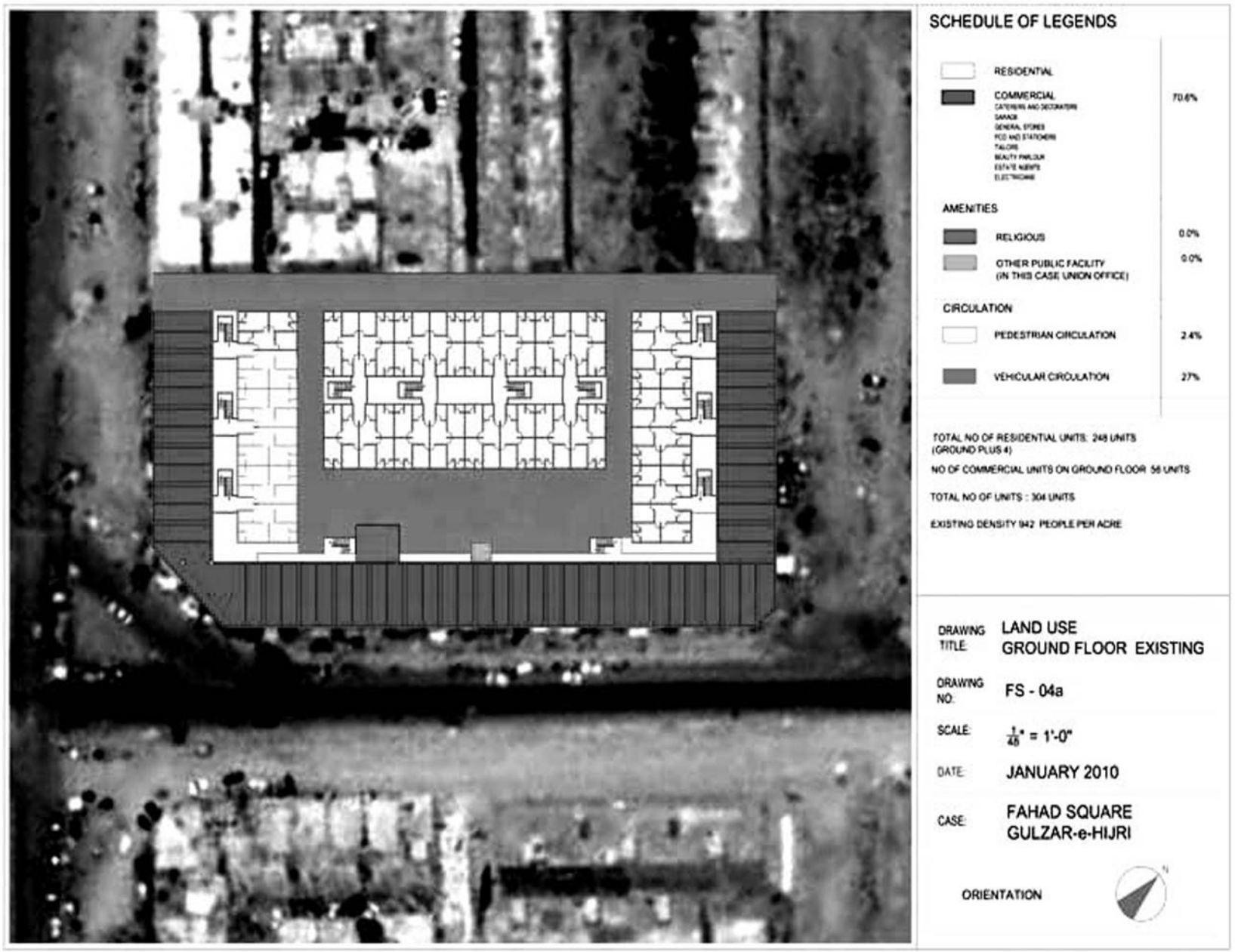


Figure-18: Existing landuse of Fahad Square in Karachi.

Figure-19: A view of Fahad Square from across the road.

Figure-20: Fahad Square's internal compound.

It is interesting to compare Fahad Square with Labour Square, which the provincial government built in 1974 next to the Sindh Industrial and Trading Estate, a major industrial area, as housing for factory workers. Labour Square consists of 28 blocks of three-room apartments. The blocks have ground plus two and ground plus four floors. Residents have, over time, become owners of their apartments by paying rental instalments. The important findings related to Labour Square are as follows.

- Unlike in Fahad Square, residents we interviewed estimated that there are 10 to 15 persons per apartment. When they moved there in 1974, many were young married couples with one or two children. Now the children have grown up, married and had children of their own. Because of cash constraints and a lack of affordable loans, they cannot purchase apartments or plots of land as additional accommodation for the children. Rentals and even land in katchi abadis — settlements created through the informal subdivision of state land — are unaffordable, apart from the outer fringe of the city, where there is no infrastructure.

- Maintenance of the apartment complexes is poor. There are problems related to sewage, scarcity of water and poor garbage collection. In addition, a number of informal businesses have cropped up in the open spaces, as it is not possible to operate businesses from within the apartments. This, it was claimed, adversely affects the social environment.

- Since this is a formally planned area, schools and colleges are available within 2km of the neighbourhood, and health facilities in the form of private clinics are also available.

4. CASE STUDY CONCLUSIONS

Taken together, the four case studies yield a number of conclusions that could inform the planning of liveable high-density housing in low- to lower-middle-income areas.

- All respondents and interviewees in the four settlements wanted to own a place to live. The distance from their place of work influenced where they chose to live, but it was a secondary issue.

- The vast majority of respondents wanted the possibility of some income-generating activity within their home. This was an important consideration in their choice of where to live.

- Respondents preferred homes that could grow incrementally to house some of their married children, as finding separate accommodation was not an affordable option.

- When they first built their homes, residents in the plot settlements did not consider the additions that they would make incrementally as their needs increased. As a result, the houses are badly planned and ventilated; in Nawalane and Paposh Nagar, the neighbourhoods are congested, and in certain areas of Nawalane there are also social problems. Planning in advance for the incremental growth of houses is a must.

- The existence of a controlling authority or organisation that gives advice on development would help settlements to grow in an organised manner. A controlling authority or organisation can prevent encroachments on streets and public space, and help create education and health facilities; Saiban plays this role in KKB-3 but does not

provide design advice on house construction. Design and technical support for house construction is essential, nevertheless, if an improved physical and social environment is to be created and sustained.

- Except for KKB-3, all the settlements had densities in excess of the KBCA requirements for apartment complexes.

- There is a limit to the density that can be reached without compromising on residents' needs. Houses higher than ground plus three floors are uncomfortable, and their living spaces on lower floors lack light and ventilation; decreasing spaces for amenities and social facilities adversely affects social and environmental conditions. In our re-planning exercises (Section 5), we avoided increasing house heights above ground plus three floors or cutting back on amenities and social facilities, and we found that it was not possible to achieve ultimate densities higher than 3,500 persons per hectare. We have always kept a courtyard in the centre for providing light, air and an open family get-together space.

- Apartment living imposes a different lifestyle and culture on residents. The majority of families in Fahad Square are less poor than those in the other three settlements, which may be the reason they have opted for this lifestyle.

- Streets in low-income plot settlements are planned for vehicular traffic but are not used by vehicles. They can be integrated into parks and open spaces, considerably increasing space for residential areas without adversely affecting access and safety.

- The portions of each site allocated by the KBCA for different activities are rational and do produce a liveable physical and social environment. For higher densities than proposed by the KBCA, however, a higher percentage has to be set aside for the purposes of education and amenities.

- In the case of plot townships of 15 acres (6.07 ha) or more, core houses that can be added to or plots of land on which people can build are normally provided. Such land is on the periphery of the city, and developers accept these conditions. Spaces for facilities and amenities are set aside as per KBCA regulations and are built upon by the government, by the developer or by NGOs inducted into the planning process.

- Plots for apartment blocks and complexes are usually part of a larger sector plan by the KDA. The sector and its different neighbourhoods have spaces allocated for social amenities such as commercial, educational, health and recreational activities. The developer therefore does not have to provide for these in the plan of the apartment complex. In addition, land is expensive in these locations, and developers would lose financially if they planned for incremental growth. We discussed this with developers and estate agents, and we considered their proposals in our replanning of Fahad Square (Section 5.4).

- The orientation and width of roads, the ultimate heights of buildings and the relationship of buildings to each other are important factors in efforts to provide a climatically comfortable environment in the heat and humidity of a Karachi summer.

- The dimensions of plots are important in developing rational and affordable layouts. A geometrical relationship between width and depth is advisable. The narrower the width, the cheaper are infrastructure and construction costs. A variety of options for plot sizes an house plans that can grow incrementally are given in Appendix 5. Table-1 lists recommended plot dimensions.

5. CONCEPTUAL REMODELING OF THE SETTLEMENTS

The above findings suggest that the settlements we studied could be redesigned to provide densities equal to or higher than those prescribed by the KBCA while improving environmental and social conditions. To demonstrate this, we created revised plans for each settlement. This remodeling exercise also examined several more specific questions for each site: (i) whether KBCA-prescribed densities could be increased, and to what extent, while meeting the KBCA's land use requirements, including a residential area occupying not more than 55 per cent of the site as well as the required areas for social and recreational functions (Refer to Box-1); (ii) the minimum size of plot

Table- 01: Recommended Plot Dimensions

Plot size (m^2)	Dimensions (m)	Width to depth ratio
47	4.0 x 11.8	1:3
47.6	4.9 x 9.8	1:2
46.5	6.1 x 7.6	1:1.25

that would fulfill the space requirements of a low- to lower-middle-income family in a ground-plus-two-floor house built around an open courtyard or space; (iii) the plot dimensions most suitable for reducing infrastructure costs and promoting better spatial relations within and between houses; and (iv) the effect that the redesigns would have on density-related and environmental issues in settlements.

The redesigned density figures given below for each settlement are for residential units only. The commercial areas will add an additional 2 to 4 per cent as shopkeepers and workshop owners tend to live with their families above their businesses.

5.1 Khuda Ki Basti 3

We remodelled Khuda Ki Basti 3 to increase its density to 702 persons per acre (1,732 per hectare), well above the maximum of 500 persons per acre (1,250 per hectare) prescribed by KBCA regulations (see figure 21).

The changes and their results were as follows:

- The plot size was decreased from 80yd2 (67m^2) to 56yd^2 (47m^2) because residents' requirements can be fulfilled on a smaller plot. We also changed plot dimensions to 13ft x 39ft (3.96m x 11.8m) to accommodate more plots. The number of plots increased from 1,237 to 1,910.

- Residential area was increased from 40 per cent to 55 per cent, in keeping with the maximum prescribed by KBCA regulations.

- By combining roads and open spaces, we reduced circulation areas from 36 per cent to 24 per cent of the settlement (KBCA minimum is 22 per cent). As a result, we were able to substantially improve the physical environment by increasing the spaces for commercial areas, parks, amenities and educational facilities from 1.9, 7.2, 2.9 and 3.2 per cent to 5, 8, 4 and 4.5 per cent, respectively.

- The increase in the number of plots and the new plot dimensions also reduce the cost of a plot considerably,

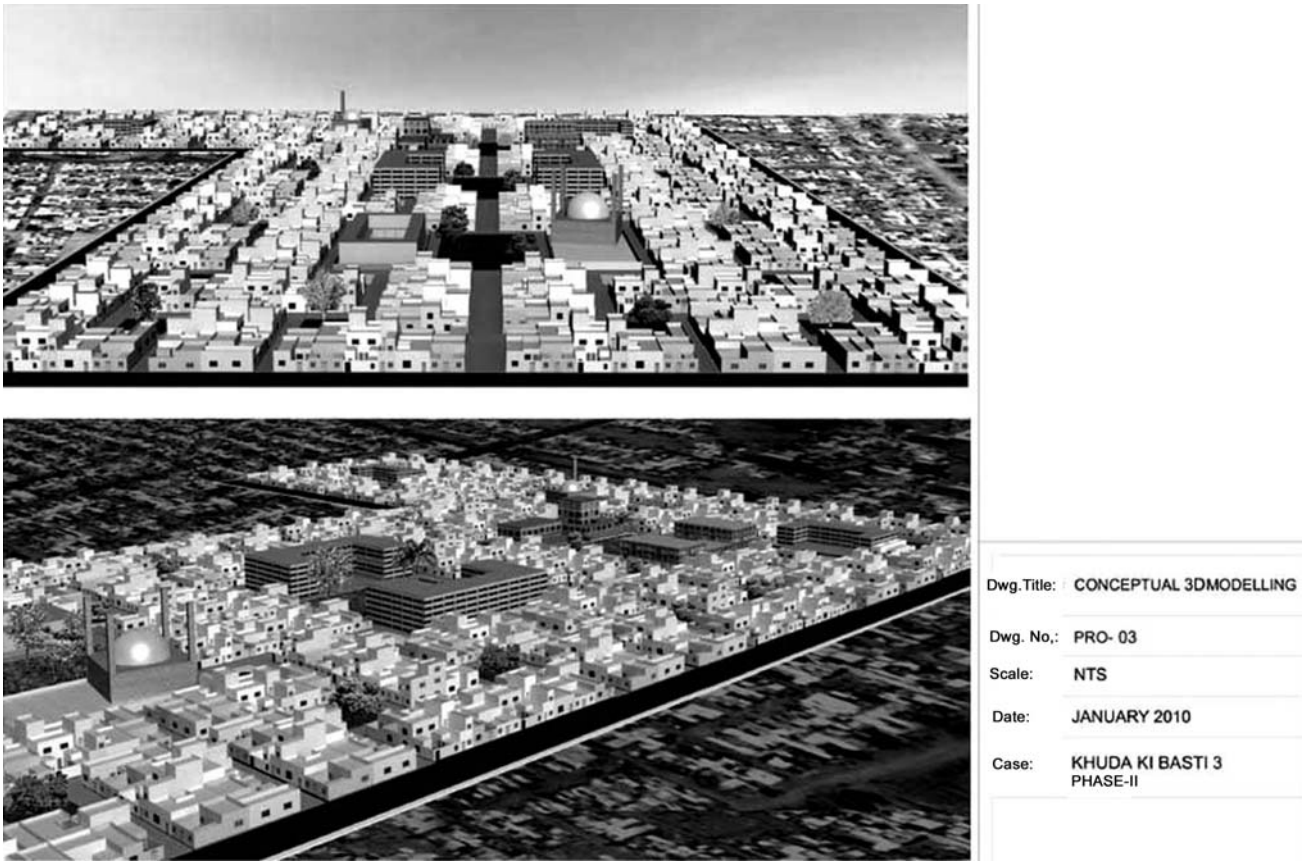


Figure-21: Conceptual remodeling of Khuda ki Basti.

making KKB far more affordable. The cost of a plot from Saiban was Rs 42,000 (US$525). After remodeling, the cost drops to Rs 24,600 (US$308). In addition, costs of infrastructure development (water, sewage and road) are reduced by Rs 5,965 (US$74) per plot, a 44 per cent savings.

5.2 Nawalane

Nawalane currently has a density of 1,356 persons per acre (3,390 persons per hectare). We were not able to keep the same density while providing a better physical and social environment; we therefore reduced the density to 1,262 persons per acre (3,157 persons per hectare), about 2 times higher than the KBCA-prescribed maximum density. The remodeling improved physical conditions may be successful in eliminating many of the social problems faced by residents with regard to recreation, entertainment, education, public space, gender issues and privacy. (see figure 22)

The changes and their results were as follows:

- Nawalane currently has 769 plots, averaging 125yd^2 (100m^2) and varying from 38 to 300yd^2 (25 to 251m^2). These were replaced by 982 plots of 56.33yd2 (47m2) each.

- Currently, there are an average of 2.7 families (36.8 persons) living on each plot. Remodeling placed two families, or 27 persons, on each plot. Housing plans for the remodeled settlement are ground plus three floors, with eight rooms.

- Residential space was reduced from 61 to 55 per cent of the settlement, as prescribed by the KBCA regulations, while spaces for commercial areas, parks, amenities and educational institutions were increased from 0.02. 0.1, 1.8 and 2.3 per cent to 5, 8, 4.5 and 4.5 per cent, respectively.

Figure-22: Conceptual remodeling of Nawalane.

- Nawalane's existing circulation area is 19.6 per cent of the settlement and consists of narrow, congested lanes. This was increased to 22 per cent, and wherever possible roads and open spaces were combined to give the settlement a feeling of openness.

- Amenities were grouped together around large open spaces. They were remodeled with one to two stories, in contrast to the ground-plus-three-floor houses, increasing the feeling of openness at these nodes.

- Commercial plots were added on the road at the periphery of the settlement, each one 56yd^2 (47m^2) with up to three floors of apartments above it (see figure 23)

- Sections through the site indicate that the ground-plus-four-floor heights of the houses will not create a feeling of congestion.

5.3 Paposh Nagar

The Paposh Nagar site is 15 acres (6.07 hectares). Currently it has a density of 478 persons per acre (1,195 per hectare). The average plot size is 81.6yd^2 (67.8m^2) and the average number of persons per plot is 10.5. By remodelling the settlement as described above for Nawalane, we increased the number of plots from 714 to 749 and the density to 13.4 persons per house and 661 persons per acre (1,653 per hectare).

The remodelling of Paposh Nagar created a pleasant, non-congested settlement. The residential area was reduced from 61 per cent to the KBCA-prescribed 55 per cent. The spaces for commercial areas, parks, amenities and educational institutions were increased from 4, 4, 2.9 and 2.6 per cent to 5, 10, 4 and 4 per cent, respectively. Road space was also increased from 16 to 22 per cent (for details see figure 24). Sections through the site indicate that the ground-plus-four-floor heights of the houses do not cause a feeling of congestion.

5.4 Fahad Square

Apartment complexes are planned by developers with loan facilities, who aim to maximize profits. We therefore considered it difficult to apply the concept of incrementally expanding houses to a developer-built scheme. We held discussions with developers and estate agents in which they proposed a number of interesting alternatives. We modeled two of these alternative proposals, (See figures 25-26). Briefly, the two options were as follows:

Figure-23: Conceptual changes result in a congestion free environment.

5.4.1 Proposal 1

The developers felt that if they were given the ground floors in larger areas alongside the main roads for commercial purposes, they would be willing to build double-storey row houses above them, on lots of 56.88yd^2 (47.6m^2). The residents could then expand these houses incrementally, adding two more floors. The developers also proposed that in areas not facing the main roads, single-storey units with the same footprint should be built and row houses constructed above them. The single-storey units would not be able to grow, though the row houses above would. The results of this redesign would be as follows:

- Forty-two ground-floor commercial units
- Forty-two ground-floor residential units (cannot grow)
- Eighty-four residential row houses built above ground floor (can grow)

At 6 persons per unit in 168 units, the population would be 1,008. Given the area of Fahad Square, this yields a density of 672 persons per acre (1,680 per hectare), higher than the KBCA-prescribed maximum density for low-income apartment blocks. If residents of the double-storey row houses added a floor to their homes and allowed for the expansion in their household sizes accordingly, the density would be considerably increased.

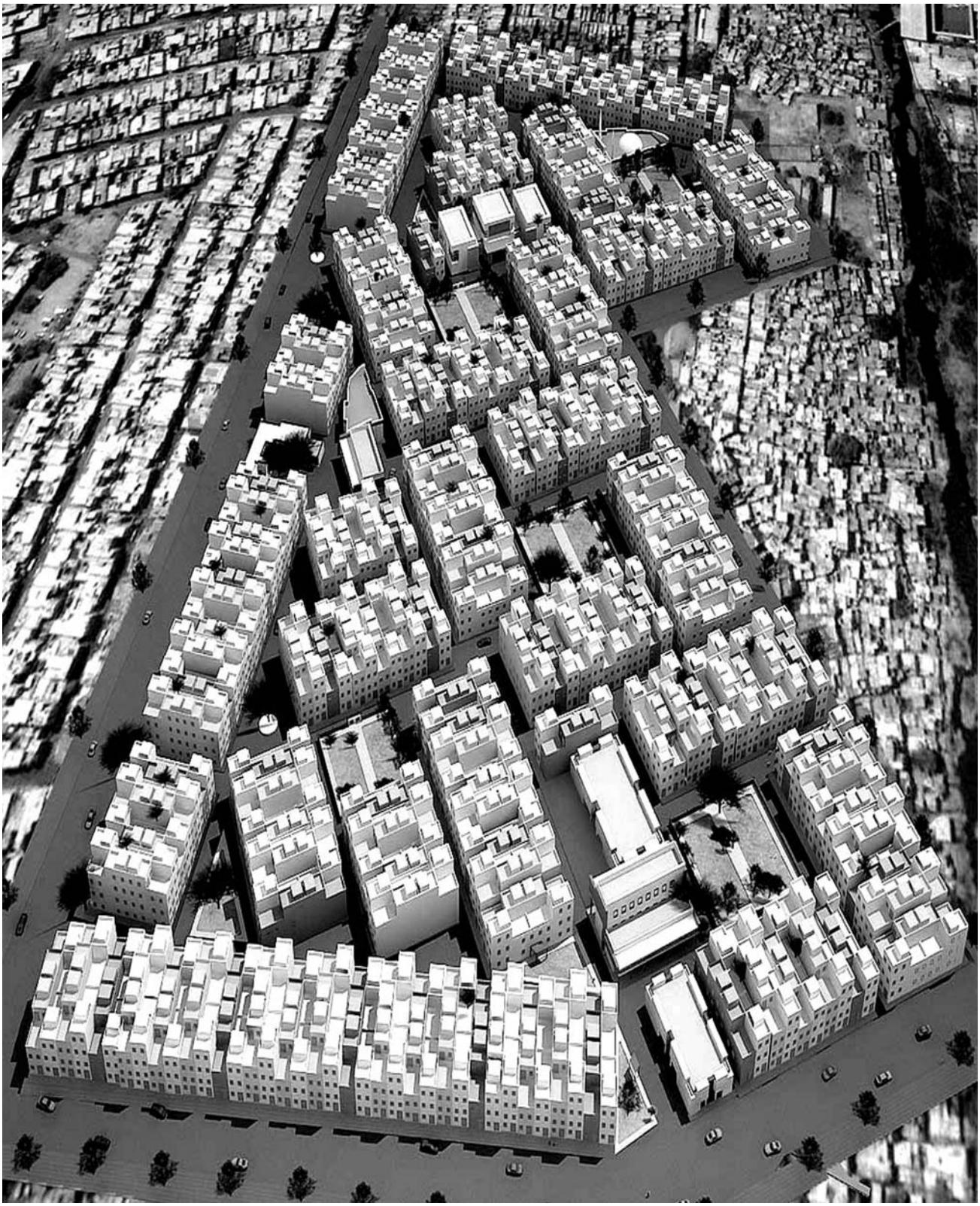
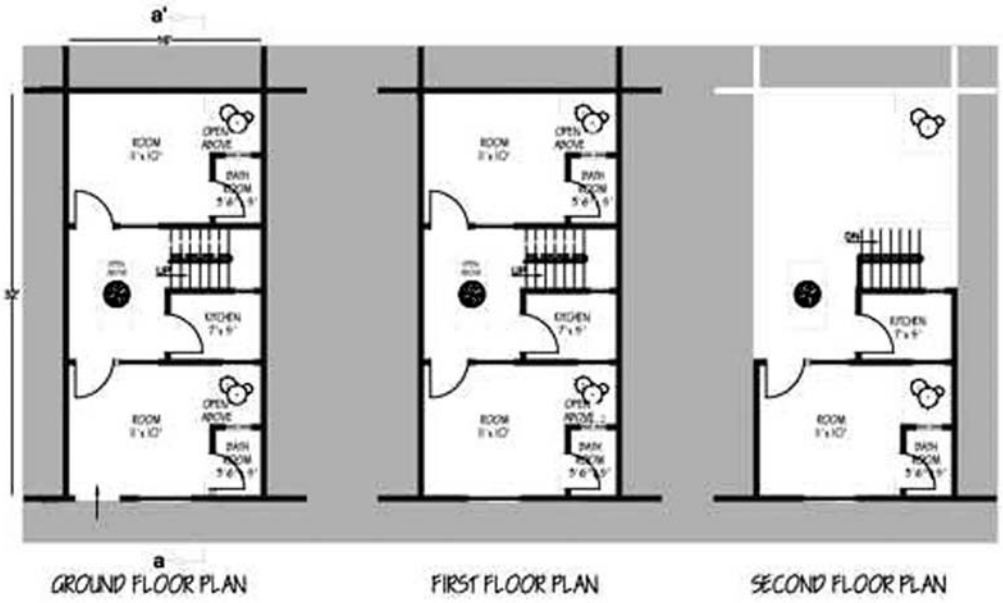
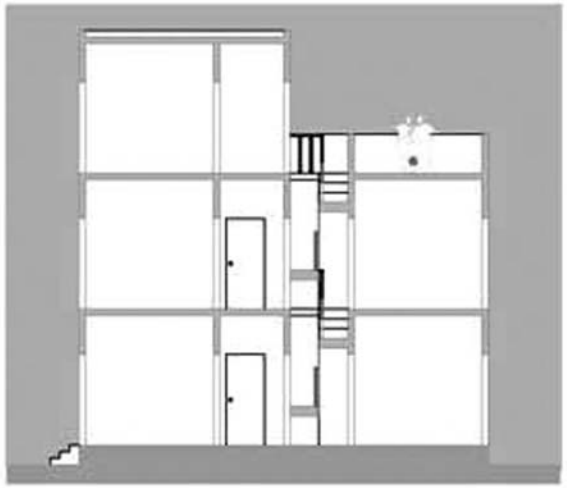
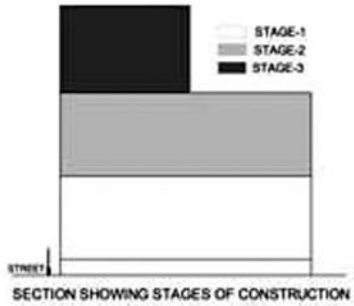


Figure-24: Conceptual remodeling of Paposh Nagar.







HOUSE TYPE : 56.88 sq. yds
(47.55 sq.m)

POSSIBILITY ONE
$2\frac{1}{2}$ Units per plot

Pro-17: HOUSE TYPE PROPOSAL
(OPTION -ONE)

DATE: JANUARY 2010

CASE: FAHAD SQUARE,
KARACHI (Changed plot dimensions)

Figure-25: Remodeled layout of an apartment in Fahad Square; Option One.

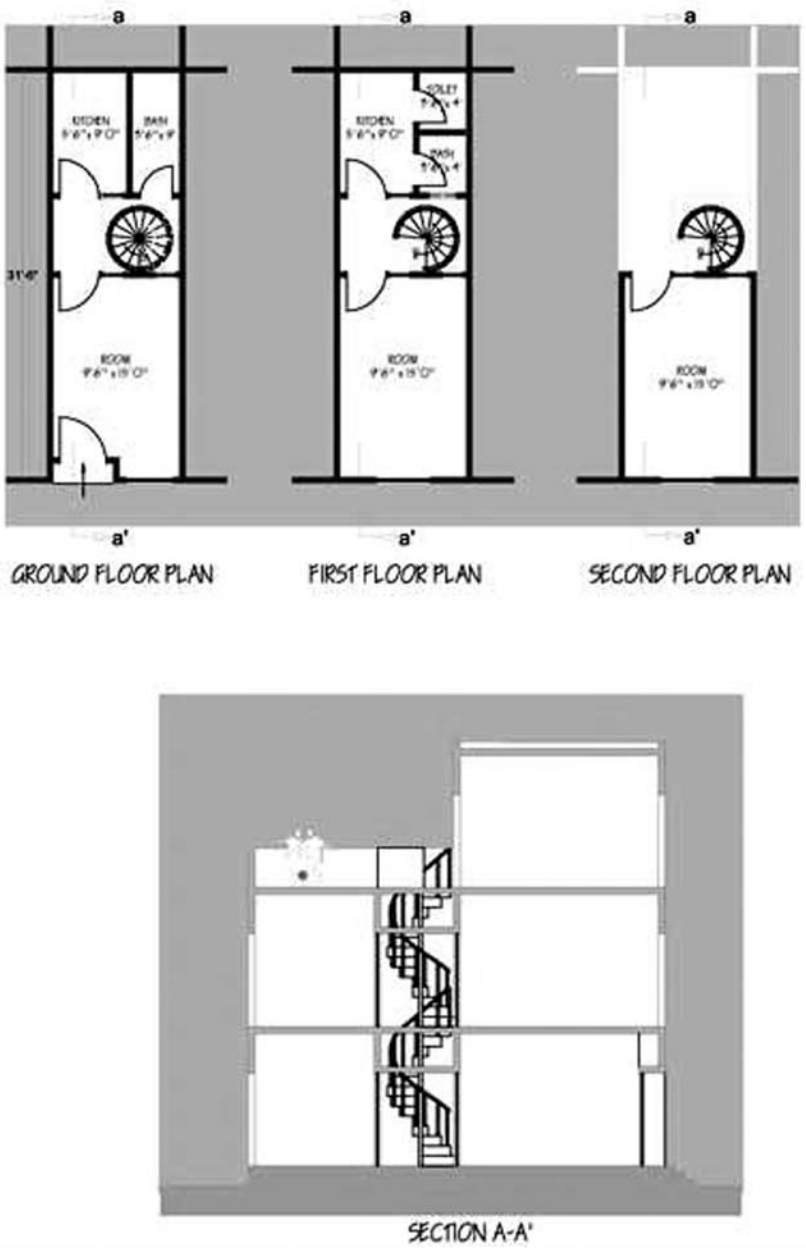


Figure-26: Remodeled layout of an apartment in Fahad Square; Option Two.

5.4.2 Proposal 2

Another developer-proposed option consists of dividing each plot into lots of 36.75yd^2 (30.75m^2). In an area the size of Fahad Square, 152 plots would be developed, leaving considerable space for social activities. Built-up area would be 77 per cent of the site. The developer would construct row housing, with each unit consisting of ground plus one and a half floors. The owners could add an additional one and a half floors later on.

At 6 persons per unit, the developer-built accommodation of 152 units would have a density of 608 persons per acre (1,520 per hectare), lower than the maximum density of 650 persons per acre (1625 persons per hectare) permitted by KBCA regulations for apartment complexes. If the additional floors were built, the density, by a modest estimate, would increase to 9 persons per unit and 912 persons per acre (2,280 per hectare).

The developer who made the proposal preferred this model to building apartments. He felt that it would attract a more affluent clientele and construction would be faster and considerably cheaper.

6. RECOMMENDATIONS

Our research shows conclusively that through deliberate planning much higher densities than those prescribed by the KBCA for apartment blocks can be achieved by building small houses on plots of land. We have also demonstrated that accommodations in these houses can be incrementally expanded, provided that owners receive design and technical advice. All this can be done without adversely affecting the physical and social environment as envisaged by the KBCA regulations.

This study explores the spatial dynamics of low-income settlements and their relationship to social, economic and real estate development issues. Reaching conclusions that apply universally will require further work, but the following recommendations based on our findings should guide planning and research elsewhere.

- The model of high-density, incrementally growing - individual houses is suitable for new settlements and townships. Additional work is needed on the planning of individual units, land use, governance systems and financial requirements for the model.

- There are groups among the better-off poor who may prefer apartments. Planners need a better understanding of who they are and what they can afford.

- With incremental growth, it would be expected to take 20 years for settlements to reach their planned densities (faster consolidation is possible if appropriate means for densification are made available). The pros and cons of such lengthy development should be investigated.

- Although our research deals with developers' concerns about applying the incremental housing model to apartment sites, it probably does not offer a commercially viable solution. Financial and commercial concerns still need to be addressed.

- A study comparing Karachi and the KBCA regulations with other cities and regulations in Asia should be initiated.

- Study of further options and plot sizes in addition to those proposed here should be carried out, leading to the development of new zoning and density regulations.

- The results described here should be presented to the communities at the four study sites, and their feedback should be used for modifications if required.

- Academics should draw lessons on housing and urban design from these data and incorporate them into teaching material.

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THE ARCHITECTURE OF HABIB FIDA ALI

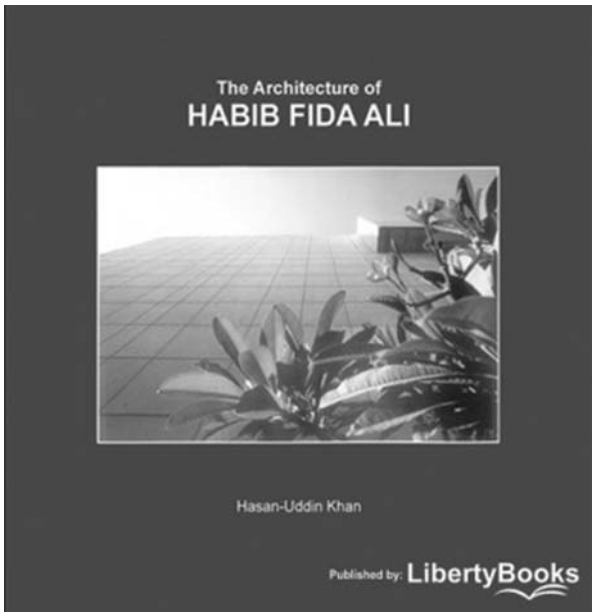
Hasan-Uddin Khan
Liberty Books, Karachi
ISBN: 978-969-8729-04-2
214 Pages

Reviewed by
Dr Noman Ahmed

Karachi has been fortunate to have received creative inputs to embellish its built environment from many an outstanding architects and designers. From the talented and efficient James Strachen of the bygone British era to the young practitioners of today, there are many names that stand out prominent. But the name of Habib Fida Ali deserves a special place for many reasons. His works can be truly regarded as an emblem of simplicity enveloped in a powerful aesthetic flavor and purity of forms. Whether the erstwhile Kohsar restaurant or the more contemporary head office of Sui Southern Gas Company, the message stays loud and clear! The exhaustive monograph on the legendary architect by Prof. Hasan Uddin Khan has come as a real treat for those admirers of his work who intend to learn more about it and wish to preserve the laboriously produced compendium for ready reference.

The book defines its audience in a very clear manner. It is for every one – architects, artists, media folks, students, corporate hips, gallery managers, ordinary citizens and many others can benefit from the book with ease of absorbing each and every detail of it. In an extremely reader friendly manner, the chapters are outlined around architectural typologies practiced by HFA. The book opens up with a foreword by well known Anjalendran of Sri Lanka. In a near conversational narrative, he unveils his association with Habib Fida Ali and illustrates the finer points about his works. The long but extremely interesting narrative by Hasan Uddin Khan sheds light on various labyrinths of HFA and his works. From making of the architect to the conscious choice of practicing an uncomplicated genre of modernism, the narrative extends information and analysis in a very simple manner. Flints of facts have been collected through an open methodology. Opinions of HFA's staff and friends, small anecdotes and reflections of the architect are interlaced in an all absorbing diction that does not leave the reader before completing the book. High quality photographs, illustrations and captions have made the images of architecture come to life.

The book has created a threshold for further and deeper



exploration into the legacy of HFA. There are many dimensions which invite researchers to delve deep and derive hypotheses leading to expounded analysis. For instance, each architectural typology - which makes a separate chapter – can be considered for interpretation, focused examination or simply linking up with the three dimensional chronology of the built environment. Parallels of his work can also be drawn from followers and practitioners in the times and space where HFA dwelled. Such questions can also become moot points to be addressed by scholars, academics and critics in the form of original contribution to knowledge. Perhaps young budding academics can pick up a theme and turn it into a comprehensive academic study, as was done by Professor Norma Evenson of University of California – Berkeley in her dissertation on Chandigarh as realization of dreams by Le Corbusier some four decades ago.

Pakistani architects and their architecture is quite inadequately documented and published. In such a scenario, the book under review can be truly regarded as an invaluable addition. This will certainly not be the last book on HFA!

INVITATION FOR CONTRIBUTIONS - 2011

Journal of Research in Architecture and Planning is an initiative taken by the Department of Architecture and Planning, NED University of Engineering and Technology, to provide a medium for communicating the research and the critique in the broader domain of architecture and planning in Pakistan and beyond. From 2011, the Journal of Research in Architecture & Planning is going to be a biannual publication; one of these will cover general topics related to architecture and planning, while the other shall focus on a specific theme.

For our forthcoming issues of the Journal, the editorial board invites contributions from researchers, scholars, architects and planners. The papers can be based on ongoing researches or analytical and hypothetical concepts related to relevant fields. Interested authors should download and read the Instructions to Authors Manual (www.neduet.edu.pk/arch-journal/index.htm) for all details of requirements, procedures, paper mechanics, referencing style and the technical review process for submitted papers.

Format of Contribution

- The length of the article should not exceed 5000 words.
- Text should be typed and printed on A-4 sized sheets. It should be in the format of Microsoft Word document. The paper can either be sent on a floppy disk or CD or it can be e-mailed to the address given below.
- Photographs should be original and preferably black and white. Do not embed graphics, tables, figures or photographs in the text but supply them in seperate file along with captions. Scanned images will only be accepted in *jpg* or *tiff* formats with 300 resolution.
- Drawings and maps should also be on A-4 format. If drawings are on AutoCAD they can be sent on a floppy disk or CD or e-mailed to the address given below.
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March 1	Full Paper
April 1	Final Paper (After Review)

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Towards Sustainable Built Environment

Deadline:

August 1	Abstract
September 1	Full Paper
November 1	Final Paper (After Review)

Contributions for our 'Book Review' section are welcome in the form of a brief summary and a sample of the publication related to the field of architecture, planning and development.

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