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Editorial

Hugh Pearman, on page 75 of the new September RIBA Journal, (In part 3 CULTURE ) Pearman 2013, explains the changes he has brought about in terms of content, design and physical feel. This is to his credit to have been able to do this. The RIBA journal is now a very pleasant read, very sensitively laid out with quality colour images. Now that the editor Hugh Pearman has got this far I think it will be well maintained and carry itself through any difficult times.

In the December 2013 edition the title Pearman used in the 3: Culture section on page 41 was Adapt and Survive. A subject very close to my thinking and philosophy as it embraces the whole theory of sustainability and enables structures to be filled in and modified whereby they remain up to date and keep in line with the development of technology and fashion. Adaptation can overcome the mainstream of peoples dreams and ideas of the present and future realms.

Without trying to out-point the new RIBA Journal Open House International has turned forward into a new phase and has gone into colour from Vol.38 No.4 2013. Our approach is also to adapt and survive by incremental change. First we have full colour plates then image size will change and from there to text arrangement. With these in hand our the design and physical feel will be evident.

In this open issue there are a number of interesting of subjects ranging from attitudes to urban open spaces to Sustainable Urbanism and Landscape design and Sustainable Development. Sustainability comes to the front in a number of manuscripts relating to urban and rural contexts. Lofts deal essentially with interiors but one manuscript shows a great deal of what can be done in confined spaces. A study of courtyard housing with Feng Shui creates a contrast around several different countries on the Cyprus China axis. An interesting topic of Demolition versus Deconstruction and Collaborative Design Processes almost completes the issue with the exception of an exceptional manuscript on Housing Co-ops.

Adaptability and survival goes close hand in hand with each other. This is a long way from the sixties rigid concept where there was no adaptability especially in the government housing sector. Now we have all this reversed into a close and synchronised relationship between users and the owners. This is something we should care for and do our best to maintain and develop it.

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January 2014
SUSTAINABLE URBANISM: MOVING PAST NEO-MODERNIST & NEO-TRADITIONALIST HOUSING STRATEGIES

Alazar G Ejigu & Tigran Haas*

Abstract
The growing alienation of modernist public housing estates and their ethnically and socially excluded residents, as well as the neglected human potential they symbolize (not social burden), is a grotesque expression of the failure of a system driven by the profit motive and failed housing, planning and social policy, rather than by the requirement to satisfy sustainable urbanism and dignified and just housing for all. The modernist concept of architecture & urban planning, which emerged in response to a very particular set of regional circumstances, spread throughout the world in the 20th century. The result, where the idea was simplistically accepted, had disastrous consequences. The postmodernist approach on the other hand has given up altogether on the social agenda of architecture and housing. Paying particular attention to housing, this paper discusses the contrasting results of modernist and –or post modernist planning approaches in housing and its consequences. It also looks at the rather recent Sustainable Urbanism paradigm and the possibility that it might offer as an alternative or a new complement to housing planning and design; this in contrast to the modernist satellite-suburban generic type of living in most major European cities as well as in the developing countries. The study is based on multiple methods which include, descriptive and exploratory qualitative approach (observation, introspection, analysis and deduction), as well as Futurescape Method of selected cases in the American Housing Program HOPE VI, and from ethnographic survey of an ongoing large scale housing program in Ethiopia known as Integrated Housing Development Program (IHDP).

Keywords: Sustainable Urbanism, Modernism, Hope VI, Integrated Housing Development Program, IHDP.

INTRODUCTION
Urbanization is the defining phenomenon and process of this century. The impact of rapid-hybridist urbanization coupled with the population growth will be felt most acutely in developing countries, where the built up area is expected to increase threefold while the urban population doubles by 2030. From this troubling perspective, both city sustainability and the resilience of cities become the main issues at hand, where housing and “adequate shelter for all” become paramount subjects.

The search for a more conventional and livable lifestyle in the city or in the countryside continues unabated for middle class citizens and consumers globally, regardless of the realization and predictions of the peak oil and ‘dark ages’ ahead; while millions of dwellers stand the test of time and continue dwelling in the minimum of housing conditions worldwide. The time and age of walking in Avalon has been replaced by one where walking in complexity and in the convergence of emerging crisis of the 21st century is a cruel reality. A time for unprecedented need for controlling and reshaping modernization on human grounds basis becomes warranted. In urbanism and architecture alike, we need to reevaluate and rethink critically the Avant Garde’s pursuit of novelty with iconic-flagship architecture manifested in Transurbanism and City Branding schemes (As Professor Dana Cuff, 2011 calls it ‘architecture without urbanism’) where the new ‘architectural masterpieces’ generate more media buzz than really creating humane models for urban life, not least leaving the social agenda of architecture and urbanism in the waste basket of ignorance and unmemorable times. Their blind belief that new technology and innovation should sweep away the past, at the expense of humanistic design borders on madness. We have seen once before the results of that similar approach, during the age of modernism where, human aspects of urban form, environmental design, and ergonomics of everyday life paid a horrific price for the sake of architecture, function, and style. Nonetheless, the intentions were at least there and good as for example the housing that addresses the Modernist pledge to deliver improved living conditions did make a brake with the poor housing conditions and health hazards environments, but at what cost? The dream that modernism could somehow ameliorate...
living conditions for all residents did not really come true. On the other hand, Christopher Alexander has laid the groundwork with his theory that there are common patterns underlying traditional architecture and urbanism, which modernists have abandoned but which we should revisit and return to in order to build on a more human scale and sustainable basis. In this regard, New Urbanist planners in the US and worldwide have attempted to lead the way by building human scale neighborhoods, returning to the traditional principles of town making. That notwithstanding, their idea is not all that entirely different from the times of the moderne, where architecture and urbanism could also aid and lead our (their) society toward a better social order and behavior. But just as modernist architecture helped to promote faith in technology and progress during the 20th century, a humanistic architecture coupled with sustainable urbanism can now (and is doing so) help promote the focus on human values that we need in the 21st century. Modernist architecture symbolized the triumph of technology and innovation over culture and context, with decisions made on technical engineering grounds and the blind faith in the future and complete mistrust of the past. Today, with all the challenges posed to us we again need an architecture and urbanism vision and solutions that symbolize the triumph of culture and context over technology, with decisions made on human grounds and smart growth principles, those that are capable of being sustainable and resilient and in the long run (Duany, Speck, and Lydon, 2009 and Haas, 2009).

This paper attempts to bring two strands of linked-post-modernism housing planning & design, one in the USA resulting as a reaction against modernist high-rise public housing program and the other in Ethiopia growing out of the desire to provide a package solution to interrelated urban problems of shelter, employment, and urban development through transformed modernist housing solutions. Both examples are a ‘progressive’ attempt to deal with the most complex issue of planning, that of providing adequate and good housing, but lack in the long-term vision of sustainable dwelling and adaptation to energy crisis, climate change and risk and uncertainty in general, as well as a long term holistic and systemic approach to home building. The assertion is that in both cases the application of ‘sustainable urbanism’ principles could be beneficial and sustainable on the long run.

The methodology applied in both cases is a qualitative one. Four cases from HOPE VI were studied: San Francisco North Beach Place, Orchard Gardens in Boston, The Broadway Overlook in Baltimore, and Capitol Hill - Ellen Wilson Homes in Washington D.C. (Figures 1-4) while the projects in Addis Ababa were Tsion, Mechere, Gulele II, and Mikyleyland (Figures 5-8). The research described the phenomena under study using observational urbanism, introspection, deduction, analysis and synthesis as elements of exploratory research. The methods were used to identify and obtain information on particular problems or issues in the study cases (Stebbins, 2001). Also focusing on specific groups of tenants the research partly relied on social and interpersonal phenomena under study, i.e. ethnographical survey. The data was then further analyzed and synthesized and recommendations were generated using Futurescape™. FutureScape is a tool for combining insight of the present and foresight of the future - two skills needed for planning in the midst of complexity and change (Sanders, 1998 and 2008).

HOPE VI - JUST THE BEGINNING OF BROADER TRANSFORMATION

The HOPE VI (Housing Opportunities for Everyone) Program, which was in many respects the brain child of New Urbanism, has over the past twenty years endeavored to catalyze the transformation of the US most distressed projects into well-designed, mixed-income neighborhoods (See: Popkin et. al. 2004). HOPE VI began in 1992, with formal recognition in law in 1998. As of 2005, the program had distributed $5.8 billion through 446 federal block grants to cities for the developments. HOPE VI has included a variety of grant programs including: Revitalization, Demolition, Main Street, and Planning grant programs. As of June 1, 2010 there have been 254 HOPE VI Revitalization grants awarded to 132 housing authorities since 1993 – totaling more than $6.1 billion. Hope VI programs concentrated on diversity of ages, races and incomes; safety and civic engagement by providing “eyes on the street” (Jane Jacobs legacy); compact, mixed-use neighborhood design ideas; local architectural character; streets and public open space.

One of HOPE VI’s principal accomplishments was to shift the emphasis of housing policy from output (units built and managed) to outcomes — housing quality, safety, resident outcomes, economic opportunity, social mixity, and the vitality of the surrounding neighborhood. Turabov and Piper (2005) demonstrate that the main catalyst for this shift was the creation of the mixed-financing, mixed-income model, which permitted private and other affordable units and financing of public housing. This approach helped build economically integrated communities consisting of both public housing and market-rate units (Turabov and Piper, 2005). Studies (Popkin, et. al.2004;
Buron, et. al. 2002; Cisneros, et. al. 2009, Haas T. 2011) have shown that HOPE VI has helped deconcentrating poverty and improving some resident outcomes while also being an important catalyst in community cohesion and strengthening the local organizations as well as keeping ‘they eye on the street’s momentum in focus. However, HOPE VI has ‘not yet been able to solve the questions of justice, equity and fair housing for all,’ as displacement and relocation of a large number of ‘old modernism residents’ continues.

An idea behind the new approach, or a new version and ‘super-plug-in’ called the Choice Neighborhoods, is recently proposed to expand the HOPE VI strategy continuing the principles by adding sustainable and long-term holistic vision initiative. It deals very much with economic sustainability by making funding available to a wider range of stakeholders, including nonprofits, private firms, local governments, and public housing authorities, the initiative encourages greater community investment in redevelopment projects and increases available resources (Zielenbach and Voith 2010). Just as important, the program widens the range of activities to include the acquisition of properties to create mixed-income housing in strategic locations. The $250 million proposal is a planning experiment and one of the most progressive proposals under consideration for the next budget year, building upon the Hope VI program, which over the past 17 years has torn down nearly 100,000 of the worst public housing projects in the country. HOPE VI and Choice Neighborhoods are both premised on the idea that mixed-income, economically integrated neighborhoods improve the lives of residents and aid the surrounding community. In studying mixed-income developments,
Turbov and Piper (2005) found that such projects were instrumental in both revitalizing the market and improving residents’ quality of life, where the median household income of neighborhood residents grew significantly faster than elsewhere in the city or region and likewise, unemployment levels fell, workforce participation rates improved, and residential markets strengthened.

**IHDP-TRANSFORMATIVE GLOBALIZING EFFECTS OF MODERNISM**

The “low-cost” condominium housing program of Ethiopia (officially known as the Integrated Housing Development Program, or IHDP) was primarily introduced with a stated plan to address the overwhelming housing backlog which in 2004 was estimated at about 300,000 housing units but also to replace 50% of the total 136,330 dilapidated, low-rent, public houses (locally known as ‘kebele’ houses) which constituting as much as 70% of the housing stock in the central parts of the city. The ambitious plan also included ideas for densification and ‘integrated’ strategies to address multiple problems of the city such as high unemployment and low skill levels in the construction sector. Targeting low income and middle income households, the city government, in 2004 set itself the goal of constructing between 40,000 – 50,000 low-cost houses per year over five years (AAHDPO, 2007). By 2007, the national government has scaled-up the program to cover 36 cities and the figure has grown to 59 cities in 2008 (MWUD, 2008). By Feb 2011, over 100,000 housing units have been built in Addis Ababa alone and of which over 60,000 were transferred to beneficiaries (AAHDPO, 2012).

The success of the program in terms of quantity of housing it produced and the tens of 1000’s of jobs it created were evident. The result in terms of meeting the social and other urban objec-
tives of the city, however, were shown to be very questionable (Ejigu, 2012). In just less than five years the city was filled with mono-functional clusters of freestanding condominium blocks that in the words of Herbel & Kifle (2009) ‘neglect the importance of public space as a social and economic base’. Instead, the authors show, traditional, mixed-use neighborhoods are replaced by high-end developments and publicly funded large-scale condominium clusters and ‘social ties’ and unique combinations of different income groups within a neighborhood are jeopardized by uniform planning concepts, leading to social and spatial separation...’(p.112). Although the overall conception and planning of condominium housing of Addis Ababa follow ‘modernist’ planning principles, the designing of the blocks demonstrate attempt to modify the ‘foreign’ design concept of large apartment blocks to make it local. For example, condominium blocks are low and mid-rise blocks; they are largely inner city phenomenon; they are for intended for private ownership with some legitimacy to modify internal organization of the housing units; they are made with increased density as one central goal and hence are relatively denser; there were some cultural considerations in the designing for example, by proposing communal blocks to accommodate traditional activities. By so doing, they meet most of the physical form qualities early critics of modernist planning argued for. Despite this courageous attempt to make the architectural twist away from highly criticized monolithic, flat roofed, massive modernist building form (which more or less became an ‘international style’), a closer look at life in condominium housing reveals that all this was not sufficient to create a livable housing environment neither for low nor middle income residents of the city.

SUSTAINABLE URBANISM: APPLYING ELEMENTS OF FUTURESCAPE ANALYSIS

Sustainable Urbanism, a phrase that is used widely and in combination with ecological and green connotations, a rather new and complete framework for interdisciplinary planning and design of contemporary cities, neighborhoods and settlements. It explores, in a more holistic manner sustainability and urban design in a rapidly urbanizing world, by focusing on the processes that shape the form and function of our built environment in its full complexity – infrastructures, land developments, built landscapes, social networks, systems of governance and economic and facilities – that all collectively make up metropolitan regions (Farr, 2007; Haas, 2008; Newman, Beatley and Boyer, 2009).

Applied, sustainable urbanism focuses on identifying small-scale catalytic interventions that can be applied to urbanized locations, which in aggregate, lead to an overall shift towards sustainable neighborhoods, districts, and regions (Newman and Jennings, 2008). Doug Farr, in his Sustainable Urbanism: Urban Design with Nature (2007), sums this up in five points:

- Increasing sustainability through density and compactness.
- Integrating transportation means, patterns, and land use.
- Creating sustainable neighborhoods, including housing, car-free areas, locally-owned stores, walkable neighborhoods, and universal accessibility.
- The health and environmental benefits of linking humans to nature, including walk-to open spaces, neighborhood storm water systems, waste treatment, and food production (permaculture).
- High performance buildings and district energy systems.

All of these are ought to put the focus on the key element of the community – the neighborhood and housing as being a main node for the carrying capacity of sustainable transformations and consolidation, one founded around the human aspects of form and traditional, timeless practices of good city building.

Analyzing different cases of HOPE VI (median) and Addis Ababa Condominium Estates by using the methods employed in explorative research and applying FutureScape (mapping and visioning planning process, an innovative new approach to visualizing the future as it is beginning to take shape), Five Main Features/Aspects were recognized which in turn created 10 recommendations or strategies. These have been generated in Table 1 and Table 2 respectively. The approach and method of FutureScape supports the process of visual thinking by helping us link our intuitive sense of events in the larger environment with what we already know and what the data indicate (Sanders, 2008). This visual synthesis promotes insight about the present and forecast about the future. For the purpose of this paper, it blended appropriately with the explorative methods we used to generate data on sites and off site we offer a condensed and simplified version of some of the possible strategies that can be suggested by using the FutureScape and Exploratory Research. It is important to emphasize here and mention clearly that the suggested recommendations below are not meant to be complete and ultimate solutions to the problem at hand, which deals with systemic build up of sus-
### Table 1. Comparative table of five main features and/or aspects generated through exploratory research and the application of the Futurescape method of analysis.

<table>
<thead>
<tr>
<th>Features/Aspects</th>
<th>IHDP’s condominium estates of Ethiopia</th>
<th>HOPE VI estates in United States (median)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical</strong></td>
<td>Base, boxed building form with quite few typologies each of which are duplicated several hundred times across the city.</td>
<td>Buildings and layout reflect the local building and architecture adapting itself to the context with mostly neo-traditional styles.</td>
</tr>
<tr>
<td><strong>Scale</strong></td>
<td>While inner-city estates are relatively high-density, small scale comprising low-rise apartment buildings, a growing number of the new estates are constructed as large suburban neighborhoods of between 20 and 300 condominium buildings in each.</td>
<td>Traditional high-density, low-scale (except for some cases), mix of row homes, town homes, individual homes, apartment buildings varying in scale but always compact &amp; dense.</td>
</tr>
<tr>
<td><strong>Location of the estates</strong></td>
<td>The earliest condos were inner-city estates but growing number of them are being built on the peripheries of the city.</td>
<td>Mostly inner-city neighborhood developments that replaced demolished public housing estates plus some suburban projects.</td>
</tr>
<tr>
<td><strong>Spatial organization</strong></td>
<td>Cluster of building blocks (often ranging 4-6) organized to form a common courtyard space. However, spaces are often left unused or used for purposes they were not intended for.</td>
<td>Based mostly on New Urbanism principles and crime prevention strategies, and traditional neighborhood concept of development (TND).</td>
</tr>
<tr>
<td><strong>Relation to the surrounding neighborhood</strong></td>
<td>Usually exist as freestanding islands fenced and gated thus physically and socially segregated from surrounding. Uniform planning concept is seen to reconnect the social and spatial separation.</td>
<td>Often perceived as “Islands of Hope in Sea of Despair” the estates relate to the neighborhoods in architectural character but linkages are often poor, i.e., hard to connect to other neighborhoods if they are in worse shape.</td>
</tr>
<tr>
<td><strong>Functional</strong></td>
<td>Largely mono-functional — i.e., about 93% residential; some commercial spaces on the ground floors of some condo buildings.</td>
<td>In most cases purely housing units with certain additions of schools, community buildings, etc.</td>
</tr>
<tr>
<td><strong>Social mixing of classes, activities, and income levels &amp; geocentrification</strong></td>
<td>The design idea is based on greater identification of beneficiaries as “low” and “middle” income household thus uniform planning concept is emulated on “standard” block housing. The result as seen in the studied condominium estates in a growing geocentrification and systematic exclusion of the poor.</td>
<td>Poverty deconcentrating and income mixing were the main targets of HOPE VI. The results are verified when it comes to mixing income groups. On the other hand, the biggest problem has been in terms of relocation and retaining the old residents in new developments. Geocentrification followed as a natural process.</td>
</tr>
<tr>
<td><strong>Property entitlement and rights, Financing</strong></td>
<td>Beneficiaries receive temporary ownership entitlement with limited rights which is then upgraded first after five years in order to allow more rights including those of selling the property and secondly, once the loan is fully paid out after which time owners will be granted and receives full rights.</td>
<td>To ensure a greater mix of tenants, HUD encouraged developers to leverage HOPE VI funds with private-sector debt, private-sector equity (raised through the federal housing low-income housing tax credit), other federal grants, local capital sources, and infusions of philanthropic resources.</td>
</tr>
<tr>
<td><strong>Management of the estates</strong></td>
<td>Association of owners is supposed to manage the estates. The association and its board are entirely formed by condominium owners although over half of the units in the housing estates are owned by second-hand tenants. Poor participation is reported in most of the housing estates.</td>
<td>HUD deregulated public housing and promoted a more entrepreneurial, market-driven culture in housing management. Substantial emphasis was put on developing public/private partnerships among housing authorities, private-sector developers, and management firms. New forms of asset management approaches and work with private firms.</td>
</tr>
<tr>
<td><strong>User participation in the planning and after</strong></td>
<td>There was no public consultation of any kind on the design of condominium. Except for the number of rooms beneficiaries have no say on what kind of unit and which location they prefer. The blind lottery system of distribution has determined existing social networks and employment situations due to increased transit costs.</td>
<td>HOPE VI development was based on public participation and citizen input within the principles of new urbanism planning &amp; design. This was done with the residents and community groups and where the input was high before and after construction, projects were successful. Charrette process was also used in preparatory planning stages when first designs were developed.</td>
</tr>
<tr>
<td><strong>Economic</strong></td>
<td>Insufficient in housing associations for HBE’s by law and the few shops on ground floors of some condominiums are leased to rather well-off business people from other parts of the city. Condominium architecture is of a kind that promotes consumption rather than production, for example, by depriving homes of enough kitchen spaces and spaces for processing daily household items.</td>
<td>Income mixing has become a hallmark at HOPE VI sites across the country with several mixed-income developments that were operating successfully, attracting a mix of market-rate, affordable, and low-income tenants. Mix of Rental and Home Ownership (60% market-rate units and 40% public housing units/this varies from project to project) with flexible financing, loans, vouchers, tax credits, equity, mortgages, etc.</td>
</tr>
<tr>
<td><strong>Climate Change, Energy Efficiency, new forms and materials</strong></td>
<td>Favorable weather conditions in Ethiopia meant that not much environmental considerations were needed to be taken into account. Yet it could be seen that no attention is paid in the design towards maximizing energy efficiency, that, for example, dwellers have to entirely rely on expensive energy options such as electricity and gas for cooking and even to heating during cold nights and winters. Condominiums are also criticized for their poor regard to seismic risks particularly due to the “low-cost” technology employed for a kind of ribbed-slab construction.</td>
<td>Even though as one HOPE VI program objective was to build sustainable communities Section 24 of the United States Housing Act of 1937 as amended by Section 535 of the Quality Housing and Work Responsibility Act of 1998 (P.L. 105-276), there is little real consideration to energy efficiency, special building materials, renewable technologies and other. With new approach of Choice Neighborhoods and more sensitivity towards climate change and energy, upcoming projects will take these issues into consideration with no need for retrofit.</td>
</tr>
</tbody>
</table>
tainable housing for all citizen of society. Although they are largely focused on the physical restructuring of the built environment (as it is clear from both cases studied), other aspects such as (social restructuring and management, property rights and financing, public participation and citizen input, private-public-partnerships) should be considered as vital components of the whole process of holistic revitalization for urban housing development (Bean, 2009). The important thing is that a system, such as housing system, is always bigger than first imagined, especially when you consider the larger context with all outside factors influencing it (Sanders, 1998 and 2008).

Table 2: Futurescape and Exploratory Research Findings: 10 Strategies

| Strategy 1: | By changing the physical shape of public housing so that it fits with the surrounding communities instead of becoming an island of isolation. A belief that the aesthetically bland architecture and single-use nature of the housing projects was not simply anti-urban but destructive of community in ways that bred poverty and dependency. |
| Strategy 2: | By establishing positive incentives for resident self-sufficiency (opening of small businesses and creating the self-sufficient economic prosperity districts that have an ethnic hallmark) and by setting expectations through strict occupancy rules (breaking the culture of dependency and non-involvement is crucial. In the case of mixed-income housing developments, effective management is essential. |
| Strategy 3: | By lessening the concentration of poverty and heightening the de-concentrating instead. Concentrating of very poor residents in a neighborhood or public housing projects create, through a variety of factors, an un-improvable black hole of unemployment and poverty, crime and drug abuse, low educational performance, and other communityills. Designing/planning for households of the same economic class is thus ethically problematic and socially unsustainable. |
| Strategy 4: | New social housing developments should not be done as 'islands of hope in the sea of despair', instead a full integration into the existing fabric of the adjacent neighborhoods and the rest of the city should be achieved by mix use developments, urban infill public transportation, schools and other amenities and overall urban pattern solidification. |
| Strategy 5: | All new retail and commercial urban development should provide space for the public realm, for public use and to the extent feasible should facilitate the livelihood of independent and cooperatively owned businesses, where ethnic and home grown businesses can thrive and support the social capital and community cohesion. |
| Strategy 6: | By creating and renewing the fundamental infrastructures of the community and neighborhoods, services, communications, transportation, facilities, schools and agencies. This will also be achieved by creating partnerships of ample opportunity between public and private entities, developers and investors. |
| Strategy 7: | By generating (in the cases when it brings positive effects to the community) or restoring and upgrading the deteriorated urban property by middle-class or affluent people, but at the same time being careful not to eliminate or displace the poor and lower-income people (by having a viable anti-strategy for displacement of the affected residents - the unemployed, the excluded and the very poor). |
| Strategy 8: | Plans and further ideas about social housing should be developed in consultation with the target population and community neighborhood organizations if the area is already developed. The existing population, however, should not be the sole author of the future of an area. Citywide considerations must also apply, but principles of equity, gender, diversity, justice and democracy must be embedded in the process at all times. |
| Strategy 9: | Physical design only partially accounted for public housing problems, that social factors might also be implicated. Safety and Crime prevention are still one of the dominating elements where the negative aspects such as lack of social organization, social cohesion, social service programs and lack of employment opportunities for residents, must be worked against. |
| Strategy 10: | Understanding the development patterns, close connection of the community in the planning and building process, capacity building and utilization of local materials, crafts and skills as well as an identification of the needs, not just of a particular neighborhood or settlement, but also the whole city and even a region (holistic approach) is paramount keys to success of any project. |

**self-sufficiency strategies**
**social mixtr strategies**
**social services and support systems strategies**
**user participation strategies**

**CONCLUSIONS**

This paper has looked into two very different but yet kindred housing attempts and projects. The American program HOPE VI, a strong social housing project, turned back to the past and started to excavate the legacy of good urbanism and human aspects of form and function, while breaking and distancing itself from the false promises & failures of modernist architecture and planning. The program in Addis Ababa has worked from similar premises that a viable and good housing solution had to be created but neither breaking with the past nor embracing the future, it has gone down a uncertain road when it comes to urban planning & design, i.e. the culture, context and spirit of the place of
new housing schemes have a long way to go. What both programs have not been able to balance nor integrate, is the issues of energy efficiency, climate change resilience and maybe the most important aspect – an integrated holistic housing scheme that would complement the other bits & pieces of city and town building, instead of just being ‘islands of hope in sea of despair’. Both programs have a long way to go but they still have made the first, very important and crucial leap, maybe a quantum one in strengthening the third pillar of sustainability – the social one. The strategy generated by using Futurescape method and Explorative Research (Observation, Introspection, Analysis, Synthesis), has generated recommendations that can be further developed by more dense analysis and extended temporal research into new urban & housing policies; this return might enable a more fertile ground for creating livable environments, which would provide sense of place and belonging, inclusion and participation; coupled with creation of jobs, and improvement of often atrocious housing conditions, bad transportation links and means - all of that would be a way forward to: a diverse population and range of activities, a rich array of public spaces and institutions; and human scale in its buildings, streets and neighborhoods. The larger questions and issues remain though, ones that this paper did not work directly with: to what extent should we promote ownership? What kind of social housing model should we have, a generalized one or specific context-culture one and is the model jeopardized today and will it survive at all? How can urban and housing policies help control property prices and rents? To what extent deconcentration of poverty is needed for housing policies? Does housing diversity and tenants’ satisfaction enable a proper social mix and integration? Can gentrification be viewed as a positive process and not just as a negative one, if adapted to the systemic development and change in the community? Could diversity be better than mixity? What about the social and physical mobility and the issues of social and ecological determinism? If we are going to built great places for people and humane neighborhoods for generations to come we need to start, as Jane Jacobs observed 50 years ago, asking the right questions first. Finally, policymakers, professionals, and practitioners working with these issues need to explicitly recognize and address the challenges distressed, poor and excluded citizens’ face in the housing market. Economic disparities, racial and ethnic segregation, prejudice, and all form of discrimination limit options for them and even for middle and lower-income public housing residents. As Henry Cisneros observes that “the public housing mission can be carried out with respect to the residents, with appreciation for the dynamic potential of our cities, and with confidence that wise public investments can support the values of our society” (Cisneros et.al., 2009, p.13)

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Abstract

Traditional architectural forms and structures develop under the influence of such physical and non-physical determinants as climate, topography, structure, socio-cultural values, economy and technology, and are based on centuries of accumulated knowledge. This study is an analysis of the rural Yayla settlements of four towns in the province of Antalya, located on Turkey’s Mediterranean coast. The southern inclines of the Taurus Mountain range facing the Mediterranean, are host to number of rural settlements at different altitudes that bear some region-specific architectural features. This study aims to understand settlement pattern and house design features that have developed under the specific climate, socio-cultural and socio-economic conditions of the traditional households in rural yaylas in the different bio-climatic zones of the region. The study has revealed that designs have developed over time to result in spaces that are comfortable and climate sensitive, and which attribute importance to the local resources, economy and culture; and that the housing designs have developed offer natural means of heat control and ventilation. The new understanding offered in this paper may contribute to the conservation of the local cultural features of the area, allowing their sustainable perpetuation into the future and serving as examples of good design practice for future settlements.

Keywords: South-Eastern Mediterranean Region; Sustainable Architecture; Yayla Settlements; Traditional House.

1. Introduction

Since the publication of the Brundtland Report (WCED 1987), sustainable settlements that are able to meet the needs and expectations of the people, and that take into account also the needs and expectations of future generations, have become increasingly significant around the world. Accordingly, studies of regional design applications that counteract the effects of climate, or designs that make use of sustainable energy resources have accelerated. Sustainability, which is a much broader concept than ecological design, pays heed to both the physical and local social environment, and calls for designs that consider the various dimensions of both factors (Oktay 1999; 2001). Although the discourse is relatively new, the concept of “sustainable architecture” has become valued within the local architecture discipline of every society in different parts of the world. Local settlements follow a sustainable path in their utilization of local resources; and local architectural features develop based on the practical needs of local communities and on local topographical and climatic conditions. The systems that have developed carry features that may be learned from in the design of new environments in the region, and are thus worthy of investigation (Oktay and Pontikis 2008).

In parallel to this, in recent years there has been a gradual increase in the importance of researches into the conservation of local values vis-à-vis climate change, ecological degradation, and the diminishing and vanishing natural resources around the world. Vernacular housing has much to offer modern architecture, in the sense that rich solutions have been developed that demand maximum compliance and flexibility between the users and the physical environment, and thus constitutes a good example of sustainability. Vernacular architecture that aims to meet local needs through the use of existing local resources and appropriate construction methods has an environmental, cultural and historical context, and reflects an evolution through time (Helena 1998), being passed on through tradition and a broad accumulation of knowledge gained through trial and error (Sayigh and Marafia 1998). In summary, the solutions offered by vernacular architecture should not be underestimated in the modern day.

The traditional houses found in the rural areas of the Mediterranean region are a typical example of how design and construction become
adapted to the climate. The region has a hot and humid climate, one of the five different climates found in Turkey, however there are significant differences between the coastal and inland areas. This has resulted in the development of different structural forms across the region, most significantly on the inclines of the high mountain range that runs parallel to the coast. The aim of this study is to evaluate the yayla settlements (highland meadow), climate-sensitive design approaches and architectural features of the traditional housings that have located in south-eastern Mediterranean Region.

2. Traditional yayla settlements in the Southeastern Mediterranean Region

2.1. Location

In the Mediterranean hinterland the physical formation of cultures has been influenced directly by local geographical features. The architectural forms that have developed under the influence of both natural and cultural factors have resulted in the appearance of distinct residential areas between the coast, the mountains and the plateau. The Alpine-Himalayan System is one of the most important mountain ranges in the world. Starting in Central Europe and Northern Italy, the range traverses the Asian continent via the Balkans and southern Anatolia, and the Taurus Mountain range is an extension of this upper-system in Anatolia, featuring rich settlement textures that include coastal zones, mountain areas and plateaus, each with their own unique architectural styles (Hughes 2005; Kavas 2011b).

The borders of the region are determined by the natural features of the Mediterranean Sea to the south; the Geyik Mountains, which are an extension of the Taurus Mountains, to the north; the Taşeli Plateau, within the borders of Gazipaşa, to the east; and the Manavgat River to the west. This region, defined geographically as an “upper zone,” is characterized by the yaylas and highlands used by the Yörük people, as “yazlak” (summer settlements) (Figure 1).

2.2. Climatic features

In southern Anatolia, within the long coastal band that separates the Taurus Mountains and the

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1 The term Yayla is derived from the word yay, which in Turkish means summer, and from the word yaymak, meaning “to scatter,” referring specifically to the dispersed grazing of animals in the open air (Alagöz 1941, Zaman 2000). While in physical geographical terms the yayla-plateau is a region that is interspersed with running water but which also features clear plains, in human geographical terms it might be defined as a plain in the upper reaches of the mountains outside the village where animals are grazed in the summer, but attached to and supporting the village in administrative and economic terms, and where there are seasonally settled houses (İzbırak 1986; Doğanay 1997).
Mediterranean coast, the climate is very hot and humid in summers, and moderate and rainy in winters. The inner areas of the region are hilly, being separated from the narrow coastal band by the mountain ranges. In the upper sections of the Taurus Mountain range, a more terrestrial climate dominates, and for this reason, sub-climate bands have formed in the region. The contrasting climate between the summer and winter seasons, coupled with the altitude and the gradual expansion of plant life over the Taurus Mountains that especially small cattle seem to thrive on, has allowed the growth of the meadows that connect the coastal plains with the mountains and the plateaus (Ozgur 2010). The pasture found between 1000–2000 m is referred to as the Mediterranean Mountain Band (Atalay 2002), while the Mediterranean Sub-Band and the Mediterranean Mountain-Pasture areas can be found to the south of the central Taurus mountains. These areas are of great interest, in that in addition to the common endemic species, they are host also to relict species that survived the climate changes of the Quaternary Period. Taurus fir and cedar constitute the most important tree species for the micro-climate, especially around Akseki, which hosts also the bulbous and herbaceous species known as galanthus (kardelen). These species are the high motivation sources for the nomadic communities of the region involved in husbandry to prefer this region (Hadimli et al. 2010).

2.3 Geomorphologic structure and topography

The Mediterranean region occupies a privileged position due to its Mediterranean climate and topography, and the resulting eco-systems that have developed. The elements making up this texture have a mutually-related, specifically rich content that is highly harmonious with the topography and well-integrated with the surrounding nature; however there is a clear contrast between the abrupt and rocky geographical features in the mountainous regions and the flat areas (plains) by the coast, and this multi-structured geomorphologic pattern has resulted in a number of protected microclimatic areas (yayla settlements) in the region (Ozkaynak 1954).

The first unique zone corresponds to the village settlements and lands located at the point of transition between the lower inclines of the mountain and the plain; while the second zone refers to the settlement areas in the upper zone (yayla), characterized by rich pastures and meadows. These two zones differ significantly in their climatic features (Tuncdilek 1967); however in both cases, the yayla settlements are concentrated on the plateaus, mountain sides and at the bottom of valleys due to the availability of water (Table 1).

2.4. The socio-cultural structure

The nomadic lifestyle, or the changing of location with the seasons, was brought to Anatolia from Central Asia by the Turks, but has died out gradually under the influence of social, cultural and economic change. Over time, tents gave way to permanent dwellings, and a sedentary culture emerged as people chose to spend their winters in settlements (kışlak) in the mild coastal region, and their summers in the yayla settlements (yazlak) on the cooler mountain ridges, which were more suitable for animal husbandry (Bakır 1991). The summer and winter settlement pattern that defines the spatial organization of the Yörük culture in the region also influenced their specific construction systems. In the Taurus Mountains, the seasonal settlements and the traditional houses created by the transhumant people have also developed different formal features based on the economic activity of the owner/occupier.
3. Methodology and scope

To date, there has been little research into the bio-climatic, spatial, socio-economic and cultural circumstances and sustainability of the traditional yayla settlements within the borders of the towns of Alanya, Gazipaşa, Akseki and Gündoğmuş, and so the data for this research has been garnered from a field study. The study makes an analysis of three different zones, all with different climatic, economic and cultural features, corresponding to the yayla classification made by Hadimli et al. (2010) and Alkan (1991):

Zone-1) the yayla settlements lying at an altitude below 1500 m. These are green areas with plenty of water, and are open to the breeze coming from the Mediterranean. While in the previous years these were temporary settlements, used only as stop-off points between winter and summer, today they have been transformed into summer homes by the residents of the towns or villages;

Zone-2) the yayla settlements lying at altitudes of between 1500 and 2000 m, used by both the mountain nomadic and semi-nomadic people. They are partially at the margins of the forests but often in the steppe, close to a water source, where the climate can be quite harsh; and

Zone-3) the yayla settlements located above 2000 m, which are home to the mountain nomads (whose main source of subsistence is animal husbandry) from mid-July until the beginning of September (around 40 days). The climate at this altitude is harsher than in the second zone, trees are scarce, and the nomads must rely on artificial lakes and snow for their water needs (Figure 3).

4. The vernacular architecture in the first zone

4.1. Design features

In the yayla settlements in the lower zone the houses are designed to provide protection against the
effects of heat through the provision of ventilation. The houses are built within large gardens containing trees and other plants. The structures are located within high garden walls, which separate the private and public spheres, and shield the structure from wind in the winter months. The narrow streets of the settlement run vertically up the incline of the land, allowing the breeze coming from the sea to penetrate the internal areas of the settlement. The talvar and manar type structures, which are single story, are raised 50–60 cm above the ground to permit a natural circulation of air; while the plans of the two-story houses are similar to those found in the hot climate band on the coast. The yayla houses in the lower zone, which are able to benefit from the breeze coming from Mediterranean, are designed more open-fronted to allow ventilation from both below and above (Table 2). Humid and hot climatic conditions in this climate zone, to receive residential wind direction, was wise of issue. The hayat (hall) of the houses, where most of daily life is spent in the summer, is open to the elements on its northern and either eastern or western façades, defining the entrance (Cimrin 1996). The area below the hayat on the ground floor, known as the avlu, is also semi-open, allowing natural ventilation to the hayat from below; and there are rooms to the south of the both the avlu and the hayat. The houses are arranged in such a way that they benefit from the wind in summer while also offering protection from the negative effects of the sun.

4.2. Material utilization and construction system

The simple “müne”-type structures at this altitude are in the “talvar” and “manar” style. The region between the Taurus Mountains and the coast is characterized by light timber structures. Talvar-type structures (Alsav Seminar Notes 1996), which stand on four columns, are square in plan and are covered by plane tree branches and leaves, being entirely constructed out of timber. Manar-type dwellings are more permanent and offer more protection, and their internal spaces offer more privacy (Table 2). They are generally constructed either out of light timber or from a combination of timber and stone, in which either a timber frame with stone infill or a stacked stone system is used.

A further type of structure seen at this climate band are two-story buildings constructed out of timber and stone, the plan scheme of which resembles that of traditional Turkish houses featuring outer halls as known sofas (Figure 4). The rooms are formed from stone, generally 50 cm thick, to keep out the cold in winter and the heat in summer, and timber joists carry the upper floors. The sections open to the landscape are made entirely of timber. The timber is obtained locally,
where cedar, pine, valonia oak, oak, juniper, olive and plane trees are common and the stone is obtained from the rocky areas in the mountains. The double pitched roof is made from brick and mud, with the mud acting both as a binder and as insulation. The roofs are generally tiled. The traditional houses of the Akseki region are more modern in terms of the construction methods, with the most distinctive architectural expression of cultural identity being the masonry wall system utilizing a timber tie-beam, known as the “düğmeli wall” technique. This involves the insertion of short timber posts at 50–60 cm intervals vertically into the stone wall of the structure, which has a stone foundation. Their ends protrude by about 20 cm, and the walls, which are nearly 60 cm thick, are timber framed with stone infill. The space between the two timber beams is known as the “destur,” and the short posts fitted vertically into the stone walls are called “düğme” (Figure 5) (Kavas 2011a).

5. The vernacular architecture in the second zone

5.1. Design features

The houses presented in the middle altitude are designed with a deep understanding of the harsh climate. As there is a significant temperature difference between day and night, the houses at this altitude are built for thermal efficiency, taking into consideration the direction of the sun and wind in the placement of doors and windows. The houses stand directly on the ground to prevent air circulation and heat loss, and three sides of the houses are totally enclosed. The outer walls have only one or two windows and a single entrance door facing the courtyard, which are small to reduce heat loss and are fitted with shutters as a secondary layer of insulation (Figure 6).

Unlike the yayla settlements at lower altitudes, these dwellings face south or south east so as to maximize exposure to the sun, and are set some distance apart to prevent shade and to leave
space for the grazing of animals (animal husbandry being the primary source of income of the nomadic residents). The houses at this altitude have small gardens or courtyards, which are generally oriented towards the south, and are enclosed by fences or walls 80–100 cm in height. The gardens are used for growing vegetable and fruit, enough only to meet the family needs rather than for sale. The courtyards contain no trees in a bid to reduce shade.

The houses may be one or two story. In the two-story dwellings, livestock is kept on the ground floor and the upper floor is the living area, while in the single-story houses, the living area resembles that of a two-story dwelling, but the livestock is kept in a barn to the east or west of the house (Table 3).

5.2. Material utilization and construction system

The houses found in the mid-altitude yayla settlements distinguish from the manars in the lower altitude in terms of material utilization and practice. In these houses the carrying walls are totally built from stone material. The doors and windows are of wood. In the houses built in recent years, iron and plastic based materials are used more frequently. The roofs are covered by tiles over wooden covered gable roof. The wooden and stone elements which are used in the local houses are provided from the old, decayed houses or from the nearby forests and mountains as far as possible. Utilization of recyclable material makes these kinds of structures sustainable.

The structures are built from large stone blocks, bound together with mud, which is also used as a plaster coat on the internal surfaces. Using stone for construction reduces costs, however in recent years people have started erecting reinforced concrete buildings in some yayla settlements. The internal floor is usually compacted soil or timber floorboards on horizontal joists, while the roof is made from timber and covered with tiles. The method of construction and materials of the roof is visible from inside the dwellings (Figure 7). The rafters are covered with rush branches, and covered with a layer of mud.
6. The vernacular architecture in the third zone

6.1. Design features

The yayla houses at this altitude are single story and rectangular in plan (Table 4), and are found on the southern slopes of the valleys at an altitude of 50–100 m, where the slope starts to become steeper. The external and internal arrangements of the houses are simple, usually being built in one section, measuring 4–4.5 x 8–9 m, that is used for eating, cooking and sleeping. The narrow façades face east and west, and there are no openings other than in the southern façades of the building, which is a practical solution to preventing unnecessary heat loss (Figure 8). The entrances are located at the center of one of the longer sides, determined according to the sun and wind direction. The houses often have no garden, as the climate is harsh, making agriculture impossible, and residency is only short term.

6.2. Material utilization and construction system

In this zone, the lack of access to high quality and durable materials has resulted in the use of local stone and timber in innovative ways, with very little shaping of the raw materials. The load-bearing stone walls are left without plaster, and the main carriers of the roof are unworked timber. The roofs

<table>
<thead>
<tr>
<th>Plan Type</th>
<th>Section (Climatic Condition)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd Zone</td>
<td>Manar type house with no semi-open space</td>
</tr>
</tbody>
</table>
are covered with tile or wooden (Figure 9).

The walls are constructed using a dry-stone technique. As vegetation is sparse at this altitude there are no timber elements used in the construction. The external walls are a maximum of 1.5 meters high, topped by double-pitched roof to increase the internal headroom. The walls, lacking mortar, plaster and timber beams, are not very durable against the heavy winter conditions and so often suffer collapse and need to be repaired at the beginning of the next season. As the construction technique is simple and the materials plentiful, this does not constitute a major problem. The short-term use of settlements at this altitude make it uneconomical to construct permanent dwellings, however the more recently built houses are more robust, using modern masonry construction techniques and cement mortar.

The houses tend to have only small window openings, measuring 10 x 10 cm to 20 x 20 cm. In the orientation of the buildings, south and southwest are the preferred directions, and the east-west façades are generally plain walls.

<table>
<thead>
<tr>
<th>General Evaluation Criteria</th>
<th>Particular Variables</th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content of settlement</td>
<td>Location</td>
<td>Settlements at the altitude of 1500 m</td>
<td>Settlements at an altitude of between 1500 m–2000 m</td>
<td>Settlements above 2000 m</td>
</tr>
<tr>
<td></td>
<td>Accessibility</td>
<td>Asphalt roads or stabilized road</td>
<td>Good condition roads asphalt and partially stabilized</td>
<td>Narrow unfinished roads</td>
</tr>
<tr>
<td>Walking distance to nearby village</td>
<td>Approx. 1 hr, or turned into a village itself</td>
<td>Approx. 2 hrs</td>
<td>Approx. 4 hrs</td>
<td></td>
</tr>
<tr>
<td>Landscape Value</td>
<td>Lost its local features considerably</td>
<td>Partially lost its local features</td>
<td>Preserved its local features</td>
<td></td>
</tr>
<tr>
<td>Socio-economic and Local Issues</td>
<td>User Profile</td>
<td>Local communities/semi-nomads</td>
<td>Partially local communities/mostly semi-nomads and mountain nomads</td>
<td>Mountain nomads</td>
</tr>
<tr>
<td></td>
<td>Aim of Use</td>
<td>Summer residences or permanent settlement of semi-nomads</td>
<td>Temporary settlements of semi-nomads and mountain nomads, and some summer residences</td>
<td>Temporary settlements</td>
</tr>
<tr>
<td></td>
<td>Economic Activity</td>
<td>Other</td>
<td>Economy based on agriculture and husbandry</td>
<td>Economy entirely based on husbandry</td>
</tr>
</tbody>
</table>

Table 5. General Evaluation Criteria for the yaylas at different altitudes.
7. Discussion

The use of local materials, conformity with the topography, orientation to make best use of the sun and consideration of the climate in spatial organization means that the vernacular yayla settlements are in harmony with the existing environment. Access to water was the determining factor in the location of settlements, given its importance for drinking, the rearing of livestock and the washing of wool. The texture that has been created through the use of reinforced concrete today is totally alien to the environment.

Table 5 presents the general features of the yayla settlements.

Regional architecture develops spontaneously as simple rational solutions are sought to address social, cultural needs and climatic extremes. It is this process that resulted in the development of “talvar”, “manar”-type structures and the plan type, featuring an open hall in the region, given their suitability to the climate and the needs of the residents.

Table 6 presents general features of the houses found in the region.

8. Conclusions

In Québec Declaration (2008) defines the concept of the spirit of a place (genius loci) as tangible (buildings, sites, landscapes, routes, objects) and intangible elements (memories, oral narratives, written documents, festivals, commemorations, rituals, traditional knowledge, values, odors etc.) i.e. physical and emotional features that give meaning and value to a place. Yayla settlements under consideration are environments with authentic space characteristics that Norberg-Schulz (1980) defined with the terms structure, site and landscape. Being elements of an ineradicable tradition Yörük migrations, migration routes, settlements and their inter-relation with environment has authentic particularities of the region. The yörük tribes have continued their nomadic existence in the Taurus Mountains for centuries, and have thus been bypassed by the structural changes and the technological developments that have influenced modern society.

However, today the sustainability of the yayla settlements is coming under threat under the influence of large-scale changes in function. The yayla settlements in the first zone have all but lost their original features, and have become bona fide villages as a result of increasing housing density and rising population; and as the number of master stone masons declines, so does the knowledge of local materials and traditional construction systems. In the last 30 years, these traditional systems have been replaced by reinforced concrete, facilitating the construction of multi-story buildings that deal with the climate through mechanical means, as witnessed in almost all yaylas in the lower zone. This has caused a fundamental change in the traditional character of these settlements. In the settle-
ments at the upper altitudes, due to the strict implementation of Forestry Law, no legal incentives to animal husbandry, the permission to open meadows to agriculture and limitation of migration period and routes by government, the number nomadic yörüks is diminishing, most having adopted a sedentary life. Many properties have been abandoned and have fallen into disrepair through lack of use with the changing lifestyles, and thus these settlements are under threat of being lost all together.

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THE LAYERED DEPENDENCY STRUCTURE MATRIX FOR MANAGING COLLABORATIVE DESIGN PROCESSES.

Şule Taşlı Pektaş

Abstract
Effective collaboration and knowledge management are the major contributors of success in the construction industry. Although a huge amount of interdisciplinary knowledge is exchanged in building design processes, there is a lack of tools for representing information flows. Therefore, this paper focuses on the collaboration between architects and structural engineers and introduces an innovative matrix-based tool named “The Layered Dependency Structure Matrix” for modeling and managing the discipline-specific and collaborative design activities. The proposed method is compared with the conventional techniques used in the industry and its application is demonstrated in a beam design example.

Keywords: Collaborative Design, Design Process, Disciplinary Domains, Process Modeling, Dependency Structure Matrix, Design Structure Matrix, Complexity Management.

INTRODUCTION

The two foremost groups of building professionals are architects and structural engineers. The former aim, mainly, at providing functional, efficient, and aesthetic spatial environments, and are thus concerned primarily with space and elements related to it such as spatial organization, spatial divisions, environmental behavior of spaces, etc.; they use concepts such as “spatial flow”, “hierarchy of spaces”, and “environmental comfort”. Structural engineers, on the other hand, aim at providing strength and stability by means of structural elements that resist imposed loads or transmit internal forces, and are thus concerned with structural components such as beams, columns, and shear walls, while using concepts such as “gravitational/lateral force”, “support”, and “deformation”.

What's more, in any building project which comprises a design process, these two groups, among the different professionals associated with such a process, are those who work together for the longest period of time (Figure 1).

This collaboration between architects and structural engineers is characterized by iteration and rework, entailing an intense flow of information among the different participants. However, not many studies have been done to either understand the nature of this flow, or find ways of manipulating it (Eastman, 1999: 347). As a result, the steps and stages of the decision-making process that leads to specific building design configurations remain invisible. This is probably also due to the fact that building design is a very difficult process to manage. It involves thousands of decisions with numerous interdependencies in a highly uncertain environment. It moreover entails a large staff, and each group of experts has a distinct and different professional background.

It is also widely known that a considerable amount of building defects result from decisions made by these two groups during the design process. Although the increasing complexity of buildings and the existence of a very competitive market-place have been forcing design professionals to improve their performances in terms of time and quality, many of their projects still do not contain any systematic design planning. This is due to the common misconception of designers that design, being a creative process, cannot be planned effectively. And even when planning is done, it is carried out in an intuitive manner based solely on discipline-specific programs, although, to be effective, collaboration in design necessitates planning the flow of interdisciplinary information. However, compared to production management in construction, to which much scholarly attention has been given, relatively little research has been done.
on the management of the design process (Formoso et al., 1998), as is the case for the flow of information during the design process, as noted above.

This paper is based on the premise that it is useful to develop quantifiable models of the building design process within a systematic approach developed to understand complex phenomena related to design (Pektaş, 2007, 2010; Pektaş and Özgüç, 2011). Although "modeling" has limitations arising from the reduction of a complex situation to a (simplified, yet) more structured form, it does have valuable merits, as it allows one to learn about a process, and suggests ways by which the process may be controlled. Starting from this viewpoint, this paper proposes the use of a layered dependency structure matrix (DSM) as a system analysis and scheduling tool for building design. First, process models of design are briefly reviewed, and then the dependency structure matrix method is explained in detail. Finally, an innovative DSM-based tool, which represents the collaboration processes of architects and structural engineers, is introduced. The utilization of the tool is demonstrated through a beam design example.

PROCESS MODELS OF DESIGN

There is a distinct stream of modeling research work on design methodology that focuses on the descriptive methodological and philosophical frameworks of the design process. It includes Hubka's Principles of Engineering Design (this translation into English 1982); Pahl and Beitz's Engineering Design (this translation into English 1984); and Cross's Engineering Design Methods: Strategies for Product Design (1989), to name a few. In the models put forth by these works, the design process is described in terms of generic phases in an either linear or cyclic manner. Another characteristic common to all these works is their representing the process at high levels, and giving very little information at lower levels. On the other hand, in this paper, the focus is on quantitative and graphical models that are capable of representing design processes in detail with most of the complexity involved.

In the construction industry, chart-based scheduling is still the most widely used process modeling method. This type of modeling comprises the milestone chart and the bar chart. Charts are easy to prepare and use, but their application is limited to short design projects with few participants, since they cannot represent any design-related information beyond activity durations.

Network models can overcome some of the drawbacks of chart-based methods by incorporating activity relationships. Such models are based on the premise that once decomposed, the design process may be described as an interconnected network of design tasks which may be illustrated on a directed graph. The Project Evaluation and Review Technique (PERT), the Critical Path Method (CPM) (Galloway, 2006), and the Integrated DEFINition Language (IDEF) (Karhu, 2000) are examples of models based on digraphs which are used in the construction industry (Figure 2).

However, there are several limitations in these modeling methods, such as the following:

1. They lack the ability to model feedback and iteration in the projects, so they cannot model projects as a dynamic decision process;
2. They have a top-down approach and do not support detailed analyses which are required due to the complexity of design processes;
3. They take only the document producing activities into consideration for modeling, in spite of the fact that an important amount of information flows by informal communication in design processes;
4. They can be time-consuming to prepare, and difficult to read and update. As a result, they are often more useful in the construction phase than the design phase of the building process;
5. They suffer from size limitations, since they tend to grow rapidly for a large number of tasks, and the visual inspection of the information structure becomes very complex and also misleading.

Figure 2. An example network diagram: elevator design process model in IDEF0 notation (researched and developed by the author).
Thus, it is clear that there is a need for new process modeling methods in building design which are both compact and capable of representing iterations, dependencies, critical activities, and other components of design complexity.

THE DEPENDENCY STRUCTURE MATRIX METHOD

An alternative method for the design process, namely the dependency structure matrix method, has its roots in the 1960s, when several efforts were devoted to understanding systems. Donald Steward first coined the term “Design Structure Matrix” in 1981 (Steward, 1981: 71). The design structure matrix method gained credibility as a result of several studies at the Massachusetts Institute of Technology (MIT) in the 1990’s. In recent years, research devoted to this topic has expanded to include many new areas, and a more general term, “Dependency Structure Matrix” (DSM), has come to be used.

A dependency structure matrix is a matrix representation of a system or a project. The rows and columns of the symmetric matrix consist of a list of all elements of the system; while matrix elements represent the corresponding dependency patterns. In general, there are two types of process DSMs, namely activity (task)-based and parameter-based (Browning, 2001). The process DSM methods assume that each task (or a decision about a parameter) can be modeled as an information processing activity, using and creating information. The output information from one activity becomes the input information to another activity. Activities are indicated in the rows and columns, in roughly a chronological order. Matrix elements indicate the existence and direction of information flow from one activity to another. Reading across a row, a dependency mark reveals the flows to that element from the column activities. Reading down a column reveals the output information flows from the activity represented by that column to other activities. Thus, the marks to the right of the diagonal in a single row reveal a feedback from a later activity to an earlier one that causes iteration in the design process. By re-arranging the position of activities, unintentional iterations can be avoided and an optimum sequence may be obtained (Figure 3).

The construction of a DSM requires extensive knowledge of the system to be modeled. Besides the formal knowledge manifested in design documents, the DSM method aims also to capture informal knowledge held by the professionals. Therefore, in the initial stages, it may be difficult to produce a useful DSM. However, once an initial DSM model is built, it can serve as a platform for continued organizational learning and process improvement. The DSM method is advantageous compared to other process modeling methods, because it provides a compact, visual, and analytically advantageous format even for complex tasks. Although other process modeling techniques are also useful for scheduling activities, they do not enable an analysis of the total information structure processed in the system.

A comparison of DSM with the other process modeling methods used by the construction industry is given on Table 1.

A recent book edited by Eppinger and Browning (2012) demonstrated that DSM applications include a wide range of industries such as automotive, aerospace, electronics, building, and pharmaceutical. Krishnan (1993) has worked on sequencing and overlapping activities in product development via DSM, to improve design processes in the automotive and electronics industries. Browning (1998) has applied DSM techniques in developing lean design strategies for the aerospace industry.
industry. Rogers and Salas (1999) have built a web-based DSM system at NASA (the US National Aeronautics and Space Administration) for sequencing and monitoring design processes. Hameri, Nihtila and Rehn (1999) have studied document interdependencies on the design phase of one-of-a-kind delivery processes. English, Bloebaum and Mille (2001) have developed a DSM-based method for quantifying the strength of couplings in multidisciplinary design processes in mechanical and aerospace engineering.

Applications of DSM in the construction industry have mostly utilized high-level activity-based DSM. The method has been applied in building research at VTT (Valtion Teknillinen Tutkimuskeskus - Technical Research Center of Finland) and at Loughborough University. At VTT, Huovila and Seren (1998) have studied the applicability of DSM in understanding customer needs and in planning the building design process. The research team at Loughborough University has developed a DSM-based design planning technique called Analytical Design Planning Technique (ADePT) (Austin et al., 2002). These studies have demonstrated that activity-based DSM is a useful project management tool. However, analyses of finer granularity—at parameter level—have been needed to exploit the capabilities of the method for visualizing and managing complexity in design. A parameter-based DSM represents the information flows between parameter decisions (the lowest level activities) and allows bottom-up analysis. Black et al. (1990) have applied a parameter-based DSM to automobile brake system design. The method has also been used in planning software development for airplane design at Boeing Company (Browning, 1998). The parameter-based DSM method was introduced to building design by Pektaş and Pultar (2006) and recognized internationally by the scholars in the field. This paper further elaborates the parameter-based DSM method in order to represent information ownership in interdisciplinary design. The following section describes the proposed method.

**PROCESS MODELING FOR BUILDING DESIGN USING THE LAYERED DSM**

Browning (1998) explains that DSMs are especially useful when several participants must coordinate actions and/or information, because they provide a medium whereby the groups can visualize and explore how they must function together to achieve overall goals. Such is the condition in the collaboration of architects and structural engineers in building design. However, in a conventional DSM, a mark denotes merely existence of a dependency or an information flow. Information ownership (who produces a particular piece of information) is not visible. In interdisciplinary design tasks (like most of the activities of architects and structural engineers) decisions on design parameters are highly coupled because information ownership is often shared. This paper proposes that collaborative design processes can be described with a layered DSM with each layer showing processes of a design professional. The bottom layer is called the “Collaborative Process DSM” and it results from the superposition of discipline-specific dependencies (Figure 6).

A layered DSM may provide insights into the following issues:

1. Information ownership
2. The optimum sequence of parameter decision points
3. Critical parameters that cause large iteration cycles
4. Design decisions that can be made concurrently (parallel, at the same time)
5. Schedule of assumptions to be made in the process.

Of course, there are many parameters involved in design processes. Therefore, to capture and manage all describing parameters in building design may be unrealistic and not necessary. A selection can be made depending on the purpose of the parameter deployment. If the number of considered parameters is based on the critical tasks, the number of parameters to be captured reduces considerably. Even such a small-scale model is useful for the following reasons:

1. Sharing a DSM opens the process to its participants and facilitates a common understanding of the process. This is especially useful for collaborative projects in which participants may have difficulty in understanding how the whole system works. Designers may not be aware of what information they hold and what information they owe to others. DSM can be an efficient learning tool to discover previously unknown patterns of design and organizational architecture.
2. For many processes it is very difficult to estimate the magnitude of change and the effort required without the knowledge of the existing state. The recognition of problems in existing processes is important in order to avoid repeating the problems in the new process.
3. In building design, several assumptions are made when related information is not available. These assumptions are reviewed at some point in the process in order to validate them. What assumptions have been made and when they are to be reviewed are critical for process success. DSM makes these assumptions explicit. It identifies when assumptions should be made and how they affect the overall process.

4. Explicit definition of parameters and characteristics of information flows between them is also helpful for the development of parametric modeling systems which have attracted much attention in recent years.

An Example DSM for Beam Design

The application of the layered DSM to design processes of architects and structural engineers may be best explained by an example. The example building presented here has been adapted from Parker and Ambrose’s *Simplified Engineering for Architects and Builders* (1993). The building is a three-story office building and has a cast-in-place slab and beam system of reinforced concrete. Concrete columns provide support for the spanning structure. Figure 4 shows the structural framing plan for the reinforced concrete structure of the building. The basic floor-framing system consists of a series of beams that support a continuous, one-way spanning slab and are supported by column-line girders or directly by the columns. The beam shown by an arrow in Figure 4 carries a narrow strip of the slab as a uniformly distributed loading.

Parameter-based DSMs have been developed for the design of this beam as explained below. DSM operations were then performed to optimize the sequence of parameter decision points, to identify iterative cycles, and to decide on when assumptions should be made. A Visual Basic software program initially developed at the MIT and enhanced by the author was used in the analysis.

Building the DSM

Building of any type of DSM consists of three steps in general:
1. Determine the list of tasks or parameters
2. Build a DSM listing the system elements as row and column labels in the same order
3. Determine inputs and outputs.

Within this framework, a parameter is defined as a physical property whose value determines a characteristic or behavior of a system component. Such parameters include sizes, quantities, loads, and material resistance. For the beam design example, twenty basic parameters were identified and listed in the matrix in a roughly chronological order. Floor area, floor height, floor materials, and amount of exterior window surface were considered as input parameters and it is assumed that their values remain constant during the beam design process. The value of the slab thickness is based on assumed minimum requirements for fire protection. The clear span would not require this thickness based on limiting bending or shear conditions or recommendations for deflection control. These five parameters as well as initial values of beam width, column size, clear span of beam, and beam depth are assumed to be determined by the architect. Other parameters were in the domain of structural design and their values affected the sizes designed by the architect.

A precedence analysis helps in identifying the interactions between system elements before entering them in the matrix. The precedence relations of our example are shown in Table 2.

The DSM corresponding to this table is shown in Figure 5. Here, the letters A, B, and S denote an information flow from the column parameter to the row parameter. The letters used discriminate the information ownership with “A” indicating architect, “S” structural engineer, and “B” both, producing information for a specific parameter decision.

In fact, the matrix shown in Figure 5 can be thought of as a two-dimensional projective superposition of two overlapping discipline-specific matrices as depicted in Figure 6. Each of these DSMs represents the...
Table 2. The Precedence Relations for the Beam Design Example. The column A includes those parameters in the architect’s domain and S those in the structural engineer’s domain.

<table>
<thead>
<tr>
<th>Label</th>
<th>Decision Parameter</th>
<th>Predecessors</th>
<th>A</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Floor area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Floor height</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Slab thickness</td>
<td>1, 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Floor materials</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Amount of exterior openings</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Load estimation</td>
<td>1, 2, 3, 4, 5</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Clear span of beam</td>
<td>1, 6, 16</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>8</td>
<td>Column size</td>
<td>6, 7, 9, 12</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>9</td>
<td>Beam width</td>
<td>6, 7, 8, 12, 14, 16, 18, 19</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>HVAC and lighting space req.</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Sizes of suspended ceiling comp.</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Beam depth</td>
<td>6, 7, 8, 9, 10, 11, 15, 16, 18, 19, 20</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Floor loading</td>
<td>1, 2, 3, 4, 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Beam stem size</td>
<td>3, 9, 12</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>15</td>
<td>Beam loading</td>
<td>7, 9, 13, 14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Beam maximum bending moment</td>
<td>7, 9, 15</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Max. design shear force for beams</td>
<td>7, 9, 15</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Critical shear stress for beams</td>
<td>9, 12, 17</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Closest stirrup spacing</td>
<td>9, 18</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Required area of tension reinforce.</td>
<td>7, 9, 12, 15, 18</td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>

Figure 5. The parameter-based DSM for the collaborative beam design example.
Partitioning the DSM

Partitioning is the process of re-ordering the DSM rows and columns so that the resulting matrix does not contain iterations. This means that the DSM is transformed into a lower triangular form. For complex processes, it is often impossible to obtain a lower triangular form DSM by partitioning. In this case, the aim is to cluster the feedback marks in a block about the diagonal of the DSM so that fewer system elements are involved in the iteration cycle. The partitioned DSM of our example is shown in Figure 7. It contains three coupled blocks affecting eleven parameter decisions.

Banding the DSM

In the banding procedure, alternating light and dark bands are added to the matrix to show independent parameter decision points. The decision process for the parameters belonging to the same band can be conducted concurrently, i.e., in parallel. In a DSM, it is desirable to have as few bands as possible. As shown in Figure 8, there are thirteen bands in the partitioned matrix. The first band consists of five independent parameters, which are the inputs to beam design process. The large amount of bands denotes the highly interdependent nature of design processes of architects and structural engineers.

Tearing the DSM

Tearing is the process of choosing those feedback
marks in a cycle, which if removed from the matrix will render the matrix lower triangular. The marks that are removed from the matrix are called “tears.” Tearing corresponds to making an assumption for an unknown parameter. In DSM analysis, the aim is to have a minimal number of tears and to confine tears to the smallest blocks along the diagonal. An inspection of the partitioned DSM in the example reveals that “beam width” parameter is one of the sources of iteration in the process. If a proper assumption is made about the beam width, this item can be torn from the matrix. The resulting matrix includes a smaller iteration cycle, as can be seen by comparing Figure 7 to Figure 9.

CONCLUSION

The complexity of building design processes has been ever-increasing, but the modeling and management tools used in the industry are not still capable of resolving this issue. This paper proposed the layered dependency structure matrix as a tool for detailed analyses of interdisciplinary design processes. An application of this method was demonstrated through an example. The paper showed that the proposed method provides insights for information ownership and overlapping decisions, the optimum sequence of parameter decision points, critical (and mostly problematic) parameters that cause large iteration cycles, design decisions that can be made concurrently, and the schedule of assumptions to be made in the process. The author’s continuing research in the field of building design process modeling re-affirms the need for better tools that are based on information flows.

Figure 7. The partitioned DSM.

Figure 8. The banded DSM.

Figure 9. The DSM after tearing.
The author hopes that this new method would form the basis of useful tools for the collaborative processes of the construction industry.

**Author's Note:** An earlier version of this paper was presented in Buildings Ahoy: A Festschrift in Honor of Mustafa Pultar (limited edition of 75 copies).

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INTRODUCTION

“Architecture is best understood as a ‘symbolic technology’; it is described as ‘the science of the dwelling of the gods,’ so that cosmology is the divine model for structuring space – cities, villages, temples, and houses” (Lannoy 1971; Ghosh and Mago 1974; Rapoport 1979b). Traditional settlements such as ancient Rome, medieval Europe (Müller 1961), China (Wheatley 1973), Cambodia (Giteau 1976), and many others (see Rapoport 1979b) are only comprehensible in terms of their sacred meanings (Rapoport 1982).

Man and cosmos are intimately related to each other. Man is the microcosm and together with the cosmos, they reflect the “Metacosmic Reality.” Traditional man views the totality of architecture with its cosmic dimension and also its components as well. To understand traditional man and any form of traditional architecture, it is necessary to understand the qualitative space upon which all religious rites and orientation are based (Ardalan and Bakhtiar 1973) and consider the meanings they had for their users (Rapoport 1969, 1979a, 1979b, 1980, 1982). In that sense, the article presents the man, universe and architecture on an ontological, topological and typological basis.

This article intends to contribute to the general knowledge of the discipline of architecture with its attempt to identify spatial architectural elements with cosmologic influence on the condition of man’s well-being within a framework based on feng shui. From this viewpoint, the basic argument is that courtyard house, which is a well known archetype of spiritual and celestial qualities, exhibits an architectural conjunction between man and nature, including the generic forms of such archetype has been congruent with the environment. In regards to this, cosmology and the influence of symbols should be explained in relation to feng shui, since feng shui is a language of symbols. In doing so, first, the context of the selected region is stated; and the main factors that have contributed to the spread of this type such as environmental and climatic factors, lifestyle in terms of social and cultural context, and interior organization of the houses are addressed to justify the selection of the house design for the analysis.

In this context, the courtyard house plan type in the countries on Cyprus-China axis is taken as a case study (Figure 1). Certain criteria such as entrance-courtyard relation, building shape, water element, room arrangement, and door alignment and circulation are extracted for analysis. In this context, the article introduces a theory and prac-
feng shui, that qualifies space according to sacred geometry and an ideal plan scheme and “creates a harmony between environment, buildings and people” (Mak & Ng 2006: 1332), to reveal a different perspective to cosmology and symbolic connotations of shelter. Eventually, the article tries to see if the courtyard house on the selected geography suggests motivations for well-being of its residents.

THE CONCEPTUAL FRAMEWORK

An architecture designated as “cosmic” can be understood as “an integrated logical system, and seems rational and abstract, in the sense of transcending the individual concrete situation” and “distinguished by uniformity and ‘absolute’ order.” Forms of cosmic architecture are “static rather than dynamic” and aim at “necessity rather than expression.” In that sense, “cosmic space is strictly geometrical and is usually concretized as a regular grid” (Norberg-Schultz 1980:71).

To understand relation between cosmology and architecture, it is necessary to understand how man views himself in the cosmos and attaches himself to the universe on an ontological basis.

“Traditional man lives in a universe that is meaningful” (Ardalan and Bakhtiar 1973:xii), where both man and the cosmos reflects the “Divine Principle”. Therefore, man is the microcosm and is in direct relation to the macrocosm, the universe. In ontological reality, man attains the meaning of his existence to the cosmos through sacred architecture. All religious rites and orientation qualify space and regulate architecture for the traditional architect to achieve unity and synthesis.

However, Cartesian philosophy obliterates all memory of the qualitative space based on religion, rites and rituals and became an instrument to quantify space for Western man (Ardalan and Bakhtiar 1973:xii-xiii). Therefore Western man have forgotten how buildings can have great symbolic significance (Oliver 1975). The phenomena of indigenous attributions of meaning and significance to built structures including the systems of belief and religion are the concern of anthropologist, sociologist, philosopher or architect. Understanding these systems is a way to determine the traditional man’s world view and “place him in relation to his environment, to the natural and inanimate beings and objects with which he shares the physical world” (Oliver 1975:9).

Natural objects, such as mountains and rivers, orientation of space, the concept of traditional forms or geometry, garden and room are some of the essential elements of traditional architecture for the qualification of space. Beyond being elements to fulfill an architectural function, they have “a greater significance to correspond to an inner state of traditional man through their symbolic aspect of the spiritual principles’. Therefore, all things within the cosmos reflect the cosmic intelligence, within which man reflects it in an active sense and all things are related through their existence to “Pure Being” (Ardalan and Bakhtiar 1973:xiii-5).

One of the most direct symbols of “Being” is space. For Norberg-Schultz, “man dwells when he can orientate himself within and identify himself with an environment, or, in short, when he experiences the environment as meaningful.” Then, the “spaces” where life occurs become “places” (Norberg-Schultz 1980:5).
Norberg-Schulz argues that the task of the architect is not only as a form-giver, but also a
symbol-giver as well. Because, in the case of an
indigenous society, the form of a dwelling
is symbolic of its resident’s self-image. Society’s nature,
orGANization, family structure, and aesthetic are
all considerations of form in vernacular architecture.
Availability of materials, suitability of the structure
to climatic conditions, and the symbolic connotations of the building to the society are other
form determinants. Therefore, traditional man
gives form to his dwellings within these determinants that are as much symbolic as physical or climactic (Oliver 1975:10-12). In this respect, the
location of the dwelling is as important as its form
as well to maintain the stability of his environment
and to act in harmony with nature. For Ardalan &
Bakhtiar (1973:xii-xiii), the knowledge of qualifying
space according to sacred geography has received
its most explicit formulation in the Far East. This formulation is the philosophy of feng shui, which is the
backbone to create an evaluation model within this context.

Feng shui principles are significant, because
they are based on “the understanding of physical
configuration of geographical features” and improve the relationship between man and natural
environments (Mak 2010). These principles are embrac ed as a broadly ecological and architecturally
connected paradigm (Hwangbo, 1999).

Cosmic orientation through the applications of the principles of feng shui is “the art of adjusting the features of the cultural landscape so as to minimize the adverse influence and derive maxi mum advantage from favorable conjunction of forms” (Wheatley 1973). Courtyard, porch, gateway, room and garden are some of the symbolic
generic forms that constitute the fundamental building blocks of traditional architecture and contribute to the connection of qualitative, abstract world of the imagination and the quantitative artifacts of man. For this reason, courtyard house which is as stated by Ardalan & Bakhtiar (1973:15-67) a “traditional rhythmic syntheses of generic forms associated with specific functions”, is the primary focus of the article.

THE CONTEXT

As Rapoport (2007) puts it, the history of various forms of courtyard houses goes back to thousands
of years, and the locations of them vary in more
than forty countries spanning the earth, from Çatal Hüyük (10,000 B.P), through the Indus Valley civilization (5,000 B.P), the ancient Middle East (Turkey, Mesopotamia, Ur, etc.), China, Ancient
Greece and Rome, to the present (Rapoport 2007;
Zako 2006). For Schoenauer and Seeman
(1962:13), courtyard houses were built in the Troglo dyte villages in the Matmatas of Southern Tunisia, probably by the most primitive and homogenous societies. They add that “each dwelling-unit is built around a crater open to the sky, having sloping walls and a flat bottom, which is the court.” These primitive courtyard house examples are formed by a circular courtyard surrounded by circular rooms. In the ancient Rome and Greece, during the classical period and later during the Medieval period until today, the courtyard house plan type has been evolved. Bagneid (1989:42) observes that “geographically, courtyard houses are today spread mainly in North Africa, the Middle East, and periphery regions (Mediterranean: Spain, Greece, etc.; India, Pakistan, Iran, etc) as the predominant form in indigenous cities with hot-dry, moderate and/or warm humid climates.”

For Petruccioli, “the courtyard house has endured in the Mediterranean basin in the form of the
classical Roman atrium and Greek pastas house.” Although there is a generic similarity, “organic attitude of putting together forms” are different in a courtyard house in Jilin, China; in Fez; and a domus in Italic, Spain. He also adds that “the archetype courtyard house represents a primordial act of enclosure and construction” and “it is necessary to consider that every cultural region developed shelter and enclosure along different lines.” Based upon that fact, the Mediterranean
courtyard house has evolved “with reference to the forces intrinsic to the building plot” (Petruccioli 2006:1-3).

The Cyprus-China axis (Figure 1), which is
one of the routes on the Silk Road, has a great signifi cance for the study of the courtyard houses. Cyprus island, which is the starting point of this linear axis, has had “strategic, economic, and cultural importance due to its location on the most vital sea route” (Pitsillides 1947) which “links Asia, Africa, and Europe” (Numan and Dinçyürek 2001) and China, which is the end-point, has created a traditional wisdom aimed at bonding environment, buildings and man in a harmonious manner to enhance quality of life. Within the context of this article, the route starts from Cyprus, passing through Syria, Iraq, Iran, Afghanistan, Pakistan, India, and ends at China.

In Cyprus architecture, which was formed and improved by the influence of several cultures as a result of its geographical location, the courtyard house plan type is seen in the years 1800 – 1600 BC in Kalopsida that is situated at the east of Mesarya plain. Gjerstad states that the details of the construction correlate with Syria and Mesopotamia
Between the years 1620 – 1050 BC, the yard of a house is noticed not in the form of a courtyard, but as an extension of the rooms in Kiton and Apliki “Karamallos.” The Vouni Palace, on the other hand, that was built in 500 BC under the influence of Persians, is an example of a courtyard building. During the Roman period, in the years 58 BC – 395 AD, the Roman villa is seen as an example of the courtyard house plan type in Salamis (Salihoglu 2006: 162). However, the examples of traditional housing architecture that reached today have been constructed during the Ottoman rule (1571 – 1878). Some of the courtyard centered single or double-floor constructions were built upon Lusignian and Venetian ruins on the ground floor. In the 16th Century, the courtyard house plan type that came along as synthesis of Ottoman traditions reaches today as the traditional architecture of the island (Pulhan and Numan 2006).

In Iran, Iraq, Afghanistan and other neighbor Arab countries the functions of courtyards are shaped and determined by the society’s traditions, religion and social structure. For Memarian and Braun (2006), “there is evidence that houses with courtyards existed in Iran around 8000 years ago,” where “the rooms were positioned on one side of the courtyard, and included living spaces, stores and barns.” It is also observed that the courtyard was also an important architectural feature in the later Mesopotamian civilization (Memarian and Braun 2006). However, the role of the courtyard differs from one region to another in both Iran and in neighboring Arab countries. For Memarian (1993), the following functions of the courtyard is possible to be identified as: “the demarcation of limits of the property, the definition of a place of privacy for the family, the unification of spaces and elements in a house, the provision of a circulation element, the creation of a garden or cool place, and the promotion of ventilation” (Memarian 1993). For Schoenauer (1981), especially after the adoption of Islam, courtyard house type plan has been used as a prototype in urban housing till today. Because of its features maximizes shade area and allows the creation of microclimate in the hot weather of Mesopotamia, this plan type is still being used. The courtyard that moisten inner atmosphere with the existing plants and water element is used for social activities as well in Syria region which shares a common history with Mesopotamia. For Abidin (2006) the courtyard became an essential typological element, with the development of Arab-Islamic architecture. He states that “the previous nomadic desert life style of Arabs had a strong influence on their desire to have an open space or spaces within their permanent houses” where the courtyard fulfills “a deep-rooted need for an open area of living”. Based upon that fact, the courtyard house typology of Syria presents a number of examples, especially, in Aleppo.

Singh et. al. (2009: 879) states that “Indian vernacular architecture includes informal and functional structures designed and built with local materials to meet the needs of the people in rural areas” that also “reflects the rich diversity of India’s climate, locally available building materials, culture and ethnicity.” On the other hand, in warm and humid climatic zone, the courtyard is a common and characteristic form of residential architecture (Singh et. al. 2009: 887). The courtyard houses built between 2000 – 1500 BC in the Indus valley of India have a plan scheme that includes rooms that surround the courtyard and have with access to it. In this plan scheme that is generally formed of square and rectangular sites, the courtyard has several functions such as lighting the rooms, absorbing the heat in the summer, providing heat in the winter and providing an open air area in the inner space for social activities. Nangia (2000) states that this courtyard plan type is still used in the region.

Das (2006) states that the traditional Chinese houses show similarities with the estates in the Indus Valley. Blaser (1979: 9) also observed that in planning the courtyard houses according the north-south orientation following “a strictly axial kind, symmetrically disposed in all-embracing harmony” is reflected. Xu (1998: 272), on the other hand, emphasizes that for traditional Chinese built environments, including cities, houses and gardens, the courtyard, a central opening enclosed by buildings, is a basic model. Xu (1998) also states that “the Beijing courtyard house developed over thousands of years, reaching its apogee during the Ming dynasty (1368-1644) and the Qing dynasty (1644-1911), when Beijing, as the capital of China, was the political and cultural center for the country.” Based upon that fact, the courtyard house was the “basic unit of the city.”

**INTERPRETATION OF COURTYARD HOUSES IN REGARDS TO FENG SHUI**

Feng shui, literally means wind and water (Rossbach 2000; Collins 1999: 2; Freedman 1971: 220; Mak 2011: 28) and it is a Chinese theory and practice that relates architecture to built environment (Mak and Ng 2005: 427). Within the perspective of this philosophy, man life and faith are linked to the universe and nature, in a cosmic manner. The aim of feng shui is to attach man to nature, provide a good, peaceful life in harmony with nature (Wong 2001; Xu 1998: 271) and...
enhance the quality of life (Collins 1999:1). To provide this, *feng shui* uses one of the oldest mystical books called *I Ching*. Besides, it has principles to constitute the backbone of this Chinese wisdom. These are the *chi*, which is known as vital energy or cosmic breath; the *Tao*, which is known as the ‘way’ and is a philosophical concept of unity of opposites that describes the true nature and harmonious governing principles of man and the universe; and the *Bagua*, the eight trigrams of the *I Ching*, to which are ascribed eight characteristics relating to nature, man, family relationships, and even areas within a home. It is also the octagonal symbol of the *I Ching* (Rossbach 2000).

Mak (1995) states that the context of “*feng shui* covers the entire cycle of built environment from town planning to interior design”. Lee (1986) suggests that “*feng shui* is a Chinese traditional architectural theory for selecting a favorable site for dwellings and provides a theory of building layout and design associated with domestic architecture”. *Feng shui* researchers concern with location and spatial arrangement of built environment. For Hwangbo (1999), “the main aim of *feng shui* is a harmonious and auspicious existence in architectural design”. He states that “the practice of *feng shui* as an intuitive matter combined with cosmography and has strong parallels with western concepts of geometry in architecture”.

As Mak (2011: 16) emphasizes that western scientists seek for a “deeper understanding of the relationships between human and natural environment” recognizing that there are “similarities between modern science and eastern philosophy” and have changed “their attitude towards the ancient Chinese’s view of nature and the environment, realizing that the principles and practices of *feng shui* could contribute to the built environment.” For this reason, it is significant to use *feng shui* principles as an evaluation tool for the analysis of the selected geography.

In the theory and practice of *feng shui*, an overall analysis should be done as the architectural design process, regarding the physical surroundings. Mak (2008) identified four stages of preliminary design stages that are site analysis, concept design, sketch design and schematic design in relation to *feng shui* design modules that are surrounding environment, external layout, internal layout and interior arrangement (Table 1), and he (Mak & Ng 2005: 427-434) identified 24 key criteria according to these *feng shui* design modules (Table 2).

On the other hand, As’ad and Leylia (2011) created another group of criteria for *feng shui* evaluation based on surrounding environment, external layout and internal layout, and formed tables in comparison to Mak’s criteria (Table 3a,b,c).

Based on the former researchers’ *feng shui* evaluation models, a similar set of criteria is formed in the context of this article as well. These criteria are formed based on the external layout (Table 4a) and internal layout (Table 4b).

The main purpose of these analyses is to understand the flow of *chi*, life-generating energy, which should be understood just the same as the flow of man within the building. If the flow of *chi* is not proper, this means that the positive space continuity is obstructed to affect the residents in an unsuitable way.

Approaching the interpretation on the courtyard houses on Cyprus-China axis from the perspectives *feng shui* necessitates the analysis of the following criteria in brief:

- Entrance-courtyard relation
- Building shape
- Water element

<table>
<thead>
<tr>
<th>Surrounding Environment</th>
<th>External Layout</th>
<th>Internal Layout</th>
<th>Interior Arrangement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topography</td>
<td>Shape of Site</td>
<td>Layout</td>
<td>Door Openings</td>
</tr>
<tr>
<td>Front of Site</td>
<td>Entrance</td>
<td>Doors</td>
<td>Bedroom</td>
</tr>
<tr>
<td>Rear of Site</td>
<td>Shape of Building</td>
<td>Windows</td>
<td>Kitchen</td>
</tr>
<tr>
<td>Sides of Site</td>
<td>Orientation</td>
<td>Shape of Rooms</td>
<td>Living Room</td>
</tr>
<tr>
<td>Street Location</td>
<td>Trees</td>
<td>Staircase</td>
<td>Bathroom</td>
</tr>
<tr>
<td>Water View</td>
<td>Pond</td>
<td>Ceiling</td>
<td></td>
</tr>
<tr>
<td>Wind Direction</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Feng Shui criteria grouped in four design modules.
These criteria are the ones that affect the flow of *chi*. Bramble (2003:22) states that “*chi* can refer to the activity of life (and to the traditional mind life is an aspect of being). It can also refer to mood or to an active influence (perhaps something auditory, atmospheric, bacterial, viral or chemical)”.

Within this perspective, the entrance-court yard relation shows how the vital energy, *chi*, enters the house and reaches to the central inner court (Collins 1999:95). In this relation, when the *chi* flows easily, without any obstacles, to the center, the resident is affected in a suitable way. *Chi* reached to the central inner court can flow to the other rooms and sectors of the house. The building shape is another important criterion in *feng shui*. Square and rectangular shapes are the most desirable building shapes (Rossbach 2000). If distortion happens to the building shape by some addition and subtraction, then the residents are affected in an unsuitable way. Water elements are always crucial in *feng shui*. A water element that has a fast flow or is stagnant is unsuitable, because fast flowing water creates an aggressive environment and stagnant water does not help *chi* flows. Additionally, stagnant water may create bad smell as well. Room arrangement is significant as well. All the sectors within a house, whether a room or a yard, should be used continuously, if not, then this shows that *chi* will not enter such sectors. Doors, on the other hand, are like the ‘mouths’ of *chi* that provides the flow both for the *chi* and man. Therefore, the placement of the doors is crucially effective on the flow of *chi*. At some cases, doors

### Table 3a. Surrounding Environment.

<table>
<thead>
<tr>
<th>CRITERIA IN MÁK’S STUDY</th>
<th>CRITERIA IN AS’AD &amp; LEYLIA’S STUDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topography</td>
<td>Topography</td>
</tr>
<tr>
<td>Front of Site</td>
<td>Site</td>
</tr>
<tr>
<td>Rear of Site</td>
<td>Site</td>
</tr>
<tr>
<td>Sides of Site</td>
<td>Site</td>
</tr>
<tr>
<td>Street Location</td>
<td>Building Location</td>
</tr>
<tr>
<td>Water View</td>
<td></td>
</tr>
<tr>
<td>Wind Direction</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>Garden</td>
</tr>
</tbody>
</table>

### Table 3b. External Layout.

<table>
<thead>
<tr>
<th>CRITERIA IN MÁK’S STUDY</th>
<th>CRITERIA IN AS’AD &amp; LEYLIA’S STUDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shape of Site</td>
<td>Entrance</td>
</tr>
<tr>
<td>Entrance</td>
<td>Entrance</td>
</tr>
<tr>
<td>Shape of Building</td>
<td>Entrance</td>
</tr>
<tr>
<td>Orientation</td>
<td>Entrance</td>
</tr>
<tr>
<td>Trees</td>
<td>Entrance</td>
</tr>
<tr>
<td>Pond</td>
<td>Entrance</td>
</tr>
<tr>
<td>-</td>
<td>Building looks against neighbours</td>
</tr>
<tr>
<td>-</td>
<td>Building looks against neighbours</td>
</tr>
<tr>
<td>-</td>
<td>Building looks against neighbours</td>
</tr>
</tbody>
</table>

### Table 3c. Internal Layout.

- Room arrangement
- Door alignment and circulation

### Table 4a. Comparison criteria for external layout.

<table>
<thead>
<tr>
<th>CRITERIA IN MÁK’S STUDY</th>
<th>CRITERIA IN AS’AD &amp; LEYLIA’S STUDY</th>
<th>CRITERIA USED IN THIS STUDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrance</td>
<td>Entrance</td>
<td>Entrance-courtyard</td>
</tr>
<tr>
<td>Shape of Building</td>
<td>Building shape</td>
<td></td>
</tr>
<tr>
<td>Orientation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pond</td>
<td>Water element</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>Body of building against the entrance</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>Shape of roof</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>Building looks against neighbours</td>
<td></td>
</tr>
</tbody>
</table>

### Table 4b. Comparison criteria for internal layout.

<table>
<thead>
<tr>
<th>CRITERIA IN MÁK’S STUDY</th>
<th>CRITERIA IN AS’AD &amp; LEYLIA’S STUDY</th>
<th>CRITERIA USED IN THIS STUDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layout</td>
<td>Rooms</td>
<td>Room arrangement</td>
</tr>
<tr>
<td>Doors</td>
<td></td>
<td>Door alignment and circulation</td>
</tr>
<tr>
<td>Windows</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shape of Rooms</td>
<td>Staircase Position</td>
<td></td>
</tr>
<tr>
<td>Staircase</td>
<td>Bedroom’s Plafon</td>
<td></td>
</tr>
<tr>
<td>Ceiling</td>
<td>Interior</td>
<td></td>
</tr>
</tbody>
</table>
situated across each other shall provide a fast flow of *chi*. This type of fast flow is an unsuitable situation for representing a symbol of destruction. Besides, doors should be aligned properly and in terms of proportion, they should be same to create balance (Hale 2001:56).

**The Analysis of Courtyard Houses**

The analysis of the courtyard houses are represented by selected plan schemes and demonstrated on various tables. To reach a conclusion, an evaluation model is created to present a more in-depth and comprehensive analysis for each region of the selected geography. Eventually, the total analysis is shown as percentages to clarify the resultant outcome.

In a former research, Xu (1990) classified *feng shui* evaluation for landscaping into categories as “best, good, okay and evil”; whereas Mak (2010) categorized as “excellent, favorable, fair, unfavorable and bad”. In this study, the possible outcomes based on *feng shui* evaluation are classified into four categories as: most suitable, suitable, less suitable and unsuitable.

**Entrance-courtyard relation of Cyprus plan type**, it is seen that entrance is in direct relationship with the inner court that pulls out *chi* inside. This is a suitable situation. In case of building shape, Cyprus has the most distorted geometrical shape which is the most inappropriate case among the others. Water element is generally seen at courtyard houses. They sometimes are as small ponds and sometimes as water wells. Besides being stagnant or not, the proportion of the water element to the building is important as well. In Cyprus plan type this proportion is suitable. Cyprus plan type has the most unbalanced room arrangement, which is not suitable. Doors are very important in terms of flow of *chi* as stated before. The most unsuitable case is observed in Cyprus. In brief for Cyprus, it is seen that entrance-courtyard relation is defined as most suitable, building shape as unsuitable and water element as most suitable; and in terms of internal layout, both room arrangement and door alignment and circulation is defined as unsuitable (Table 5).

In terms of entrance-courtyard relation for Syria, it is seen that as soon as *chi* flows in courtyard house, it is gathered at a central square inner yard which is suitable to have *chi* in the center. For building shape, the purest geometrical shape and therefore one of the most favorable cases is the plan type of Syria. In terms of water element, the proportion is suitable. On the other hand, the rooms are arranged at three sides of the house and create a good flow of *chi*; whereas based on the door alignment, *chi* flows mainly on one side of the building. Briefly, it is seen that entrance-courtyard relation is defined as suitable; both building shape and water element is as most suitable. For the criteria of internal layout, room arrangement is defined most suitable and door alignment and circulation is as less suitable (Table 6).

The center represents residents’ spiritual
existence. In case of Iraq, the flow of chi through the entrance to the central inner yard is very difficult among the other regions. Therefore, entrance-courtyard relation of Iraq is not suitable, because of this situation. This factor creates an unsuitable situation for the residents. Iraq plan type is close to a pure geometrical shape that is suitable. In terms of water element, Iraq has a suitable proportion. However, in terms of room arrangement, this plan type shows an unbalanced characteristic and therefore it is categorized as unsuitable. When the door alignment is evaluated, it is seen that chi flows mainly on one side of the building. To sum up, entrance-courtyard relation is defined as less suitable; building shape is as suitable and water element is as most suitable. For the criteria of internal layout, room arrangement is defined as unsuitable and door alignment and circulation is as less suitable (Table 7).

The flow of chi in Iran plan type is in a controlled manner while reaching the center and classified as suitable. On the other hand, one of the purest geometrical shape and therefore one of the most favorable cases is this plan type. In terms of water element, the proportion is suitable. In case of room arrangement, Iran plan type is observed to have a balanced arrangement, which is suitable. However, this plan type does not get benefit from the flow of chi because of the placement of the doors. Briefly, it is seen that for the criteria of external layout, entrance-courtyard relation is defined as suitable; both building shape and water element is as most suitable. For the criteria of internal layout, room arrangement is as most suitable, and door alignment and circulation is defined as suitable (Table 8).

Entrance-courtyard relation of Afghanistan shows that chi is able to reach to the center, after passing through a protected entrance and flows to the other sectors of the house. In terms of building shape, Afghanistan plan type is close to a pure geometrical shape that is suitable. Besides, this plan type has the water element as a well and does not create an unsuitable situation. However, there is an unbalanced room arrangement. Analysis

Table 7. Evaluation of Iraq

Table 8. Evaluation of Iran

Table 9. Evaluation of Afghanistan
Based on door alignment shows that Afghanistan plan type creates the opportunity for chi to circulate all around the building. So, it is seen that entrance-courtyard relation, building shape and water element are all defined as suitable; on the other hand, for the criteria of internal layout, room arrangement is defined as less suitable and door alignment and circulation is as most suitable (Table 9).

Based on entrance-courtyard relation, chi flows easily and properly in Pakistan plan type. This plan type has some subtractions at some sectors, when building shape is evaluated. In terms of water element, the proportion is suitable. Similar to Afghanistan plan type, Pakistan plan type is unbalanced as well. In terms of door alignment, it is observed that this plan type creates the opportunity for chi to circulate all around the building. As a result, it is seen that both entrance-courtyard relation and water element are defined as most suitable, whereas building shape as less suitable; on the other hand, for the criteria of internal layout, room arrangement is defined as less suitable and door alignment and circulation is as most suitable (Table 10).

Based on entrance-courtyard relation of India plan type, chi flows easily and properly. Similar to Pakistan, India plan type has also some subtractions at some sectors. This plan type has no water element. On the other hand, the rooms are arranged at three sides of the house and create a good flow of chi; door alignment, in a similar manner, creates the opportunity for chi to circulate all around the building. It is seen that for the criteria of external layout, entrance-courtyard relation is defined as most suitable; building shape as less suitable and water element is as unsuitable. For the criteria of internal layout, room arrangement is as suitable, and door alignment and circulation is defined as most suitable (Table 11).

The relation of entrance-courtyard of China is similar to Syria, Afghanistan and Iran. After passing through a protected entrance, chi is able to reach to the center and flows to the other sectors of the house. In terms of building shape, the purest geometrical shape and therefore the most favorable cases are the plan types of China, which is similar to Syria and Iran. Like Cyprus, Syria, Iraq, Iran, and Pakistan, China plan type has a suitable proportion. In terms of room arrangement, China plan type like Iran is observed to have a balanced arrangement, which is suitable. Especially, the plan type of China is symmetrical that creates the best balanced room arrangement in terms of feng shui. Based on door alignment, it is observed that similar to Afghanistan, Pakistan, and India, China plan type creates the opportunity for chi to circulate all around the building as well. To sum up, in case of China, entrance-courtyard relation is evaluated as suitable; whereas building shape and water element as most suitable. In terms of internal layout, both room arrangement and door alignment and circulation are classified as most suitable (Table 12).

Regarding the flow of chi based on the criteria entrance-courtyard relation, building shape, doors, room arrangement, stairs and water element, Cyprus, Syria, Iraq, Iran, Afghanistan, Pakistan, India and China courtyard house plan types have been analyzed. In this respect, Cyprus and Iraq are evaluated as less suitable (LS); Syria, Afghanistan, Pakistan and India as suitable (S); and Iran and China as most suitable (MS) plan types in terms of creating a proper environment achieving well-being of man (Table 13).

CONCLUSION

In this article, an original connection between courtyard house and its residents’ well-being under the light of the spatial considerations of cosmology and feng shui are represented. Within this viewpoint, the courtyard house plan types of the countries on the Cyprus-China axis have been selected for analysis. Following a conceptual framework on the cosmology, explain the context and aspects influencing the design of courtyard houses, the cosmological interpretation of these selected plan types of the selected countries have been empha-
Based on the analysis undertaken, the entrance-courtyard relation, building shape, water element, room arrangement, and door alignment and circulation tables have been demonstrated to show the comparisons among the countries. The plan schemes reveal the data in reaching an understanding of man’s condition of well being. This article shows that the plan type of a courtyard house is a suitable plan type not only in terms of the climatic, socio-cultural and spatial organization aspects, but also in terms of cosmology and the theory and practice of *feng shui* where the well-being of residents’ is revealed within the symbolic meanings it contains. The results of this article may help to structure a code for the application of *feng shui* to improve an awareness and usage of this ancient wisdom.

Table 11. Evaluation of India

<table>
<thead>
<tr>
<th>External Layout</th>
<th>Internal Layout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Shape</td>
<td></td>
</tr>
<tr>
<td>Water Element</td>
<td></td>
</tr>
<tr>
<td>Room Arrangement</td>
<td></td>
</tr>
<tr>
<td>Door Alignment</td>
<td></td>
</tr>
<tr>
<td>Conclusion</td>
<td></td>
</tr>
</tbody>
</table>

Table 12. Evaluation of China

<table>
<thead>
<tr>
<th>Region</th>
<th>Entrance-Courtyard</th>
<th>Building Shape</th>
<th>Water Element</th>
<th>Room Arrangement</th>
<th>Door Alignment</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyprus</td>
<td>Most Suitable</td>
<td>Unsuitable</td>
<td>Most Suitable</td>
<td>Unsuitable</td>
<td>Unsuitable</td>
<td>Less Suitable</td>
</tr>
<tr>
<td>Syria</td>
<td>Suitable</td>
<td>Most Suitable</td>
<td>Most Suitable</td>
<td>Most Suitable</td>
<td>Less Suitable</td>
<td>Suitable</td>
</tr>
<tr>
<td>Iraq</td>
<td>Less Suitable</td>
<td>Suitable</td>
<td>Most Suitable</td>
<td>Unsuitable</td>
<td>Less Suitable</td>
<td>Less Suitable</td>
</tr>
<tr>
<td>Iran</td>
<td>Suitable</td>
<td>Most Suitable</td>
<td>Most Suitable</td>
<td>Most Suitable</td>
<td>Suitable</td>
<td>Most Suitable</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>Suitable</td>
<td>Suitable</td>
<td>Most Suitable</td>
<td>Most Suitable</td>
<td>Most Suitable</td>
<td>Most Suitable</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Most Suitable</td>
<td>Less Suitable</td>
<td>Most Suitable</td>
<td>Most Suitable</td>
<td>Most Suitable</td>
<td>Most Suitable</td>
</tr>
<tr>
<td>India</td>
<td>Most Suitable</td>
<td>Most Suitable</td>
<td>Most Suitable</td>
<td>Most Suitable</td>
<td>Most Suitable</td>
<td>Most Suitable</td>
</tr>
<tr>
<td>China</td>
<td>Suitable</td>
<td>Most Suitable</td>
<td>Most Suitable</td>
<td>Most Suitable</td>
<td>Most Suitable</td>
<td>Most Suitable</td>
</tr>
</tbody>
</table>

Table 13. Final evaluation
REFERENCES:


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DEMOLITION VERSUS DECONSTRUCTION: IMPACTS OF FENESTRATION DISPOSAL IN BUILDING RENOVATION PROJECTS.

Soofia Tahira Elias-Ozkan

Abstract
This paper presents findings of a comparative study on the removal and disposal of fenestration units in two separate buildings, belonging to the same period and built with similar construction materials. Demolition techniques were used for removing the fenestration units from a building that was undergoing refurbishment; while, deconstruction techniques were used for dismantling similar units from another building that was being selectively demolished.

It was concluded that the amount of energy consumed, time taken and waste generated, were far greater, and the revenues much lower, when conventional demolition techniques and tools were used. Hence, from the point of view of resource conservation (material, energy, time, and money) deconstruction was found to be more advantageous in the disposal of reusable building components.

Keywords: Demolition, Deconstruction, Resource Conservation, Reuse, Recycling.

INTRODUCTION

Many resources go into the production of a building; such as material, labour, energy, time and money. But buildings cannot stand forever, as with the passage of time they may become dilapidated, redundant or even a liability. When this happens a decision has to be made as to their fate: to renovate or to demolish. Whatever the decision may be, more resources are needed for the job at hand, while those that were used at the outset to construct the building are in imminent danger of being wasted altogether.

The question is which of these resources can be saved from being wasted and what can be done to conserve or salvage them. The only way forward is to first assess the building disposal procedures from the point of view of these resources and then analyze the feasibility of the options at hand, i.e. complete demolition, selective demolition or deconstruction. The demand for used building material in many countries is an incentive to opt for selective demolition, which in turn involves both deconstruction (of reusable building components) and demolition (of the structure).

Deconstruction is considered to be an expensive option compared to demolition since considerable time is required to deconstruct a building properly. It is believed that when a building is demolished using explosives or machines (such as excavators and bulldozers) the disposal process is speedy; and since time is money, the demolition option would be more economical. It should be noted here that the time required to dispose of a building is usually calculated as the time needed to raze it to ground. However, as Dantata et al. (2005) rightly point out, the duration of a demolition project should also account for the time taken to dispose of the waste material and to leave the site clean and tidy. Consequently, the total duration for deconstruction may at times work out to be less than for demolition; this was also the case in the comparative study presented in his paper.

Another misconception is that deconstruction is always more expensive than conventional demolition. However, the balance can sometimes tilt in favour of deconstruction if the resale of salvaged material generates enough profits to cover the extra costs for prolonged durations and additional manpower. Pun et al. (2006) investigated three scenarios for the disposal of residential buildings in Australia: mechanized demolition, hybrid (selective) demolition and deconstruction. They discovered that deconstruction has the best overall economic performance, hybrid has slightly lower profits and mechanized demolition costs are the highest. Coelho & De Brito (2011) have also compared the economic benefits of selective demolition projects in Portugal, and determined that though labour costs and duration were more for deconstruction, disposal costs for mixed waste were important in determining the total cost of the demolition project.

In addition to labour costs, waste disposal costs, duration, and amount of material salvaged for resale; energy is also a factor that needs to be...
taken into consideration. Schultmann & Sunke (2007) argue that energy consumption should be an important factor in deciding on the techniques to be used in building disposal projects. While Thomark (2006) points out to the importance of embodied energy of building materials and stresses that this energy should be kept in mind when selecting materials at the outset of the construction project, because the right choice can help reduce the overall environmental impact of buildings when they are demolished.

Despite the widespread belief in the benefits of demolition and re-construction, there is a greater tendency to renovate and refurbish old buildings because it is not always feasible to start anew. Another reason may be that it is possible to improve the environmental quality and energy efficiency of existing buildings and raise their comfort standards on a par with new ones, through strategic interventions. Many authors have listed such interventions to be the addition of insulation to walls, roofs, basements and ceilings; renewal of HVAC systems; replacement of windows; and additional shading elements (Papadopolus et al., 2002; Jakob, 2006; Uihlein & Eder, 2010; O’Dall et al., 2012).

Indeed, renovated buildings can achieve thermal standards of newly constructed buildings, simply by adding 10 to 14 cm of insulation to the building envelope and replacing existing windows with ones having a U-value of around 1.1 W/m²K (Jakob, 2006). It is estimated that such interventions in the building envelope will help reduce the energy demand of residential buildings up to 24.8% by 2020. (O’Dall et al. 2012)

According to Uihlein & Eder (2010) major building renovations in Europe take place every 40 years or so; and element replacement for energy efficiency is cost favourable in many European countries. While O’Dall et al. (2012) reveal that window replacements have increased in recent years due to a 55% tax deduction for energy saving measures in existing buildings. Be it as it may, window replacement also means window disposal; i.e. the old windows have to be removed and disposed of, by either dumping as waste or recycling, before the new ones can be installed.

**Aims of the study**

A study was carried out to evaluate the merits and demerits of deconstruction and demolition techniques that are employed to dispose of old doors and windows in building refurbishment projects. The aim was to compare the two techniques with respect to the conservation of resources; i.e. material, labour, energy, time, and revenues. To this end the removal and disposal of fenestration units was observed in two residential buildings belonging to the same period. The first was a refurbishment project where the single-glazed timber fenestration units of an old flat, in Building A, were to be replaced with double-glazed PVC windows and doors. Since the old doors and windows were to be dismantled by the crew who was to install the new ones, demolition techniques were used in the belief that they would speed up the job. The second project was the selective demolition of Building B i.e. the emphasis was on material recovery; hence the fenestrations were removed using deconstruction techniques. Details on the research methodology are given in the following section.

**MATERIAL AND METHOD**

The removal and disposal of timber fenestrations from the two buildings was observed and recorded from start to finish. A detailed study was then carried out for one unit in each building, denoted as Unit A and Unit B, respectively.

The dismantling process of the old doors and windows opening out on the terrace of Building A was not only observed and recorded on video tape but also analysed in terms of the disposal procedure followed; time-taken and material wasted or recycled. Photographs, depicting the demolition steps, which were reproduced from this video, are presented as a collage in Figure 1. Data on the area of glazing, the length of framing and the total area of the fenestration were derived from the drawings prepared by the manufacturers of the PVC fenestrations (which were to replace the old single glazed timber ones).

The dismantling process of the timber fenestration in Building B that was being selectively demolished was observed, photographed and analysed in terms of the disposal procedure followed; time-taken and material wasted or recycled. Selected photographs taken to record the deconstruction process, are presented as a collage in Figure 2. Data on the total area of the fenestrations were derived from the site visits and photographs, and durations were calculated from the times the photographs were taken.

**DATA ON FENESTRATION DISPOSAL**

Relevant information on the replaced fenestration in Building A is presented in Table 1, where, D1 denotes a half glazed door; W1, a 3-bay window with fixed glazing; W2, a 4-bay window with two...
fixed and 2 operable parts and W3, a 5-bay window with both fixed and operable parts. All the doors and windows had transom light above them. Additionally, there were three types of ventilation windows V1, V2 and V3 respectively. The total area of the replaced units was calculated to be 54.79 m² of which 37.88 m² was glazing.

Data on the number and area of the fenestrations in Building B and the time taken to salvage them are presented in Table 2 below. W1 denotes a two-bay window with one bay fixed and the other with a sash; DW, a 2-bay operable window with an adjacent door; W2, a three-bay window with one fixed and two operable parts; and V1, a small ventilation window. All the doors and windows had fixed transom lights. The total area of the 32 salvaged units was approximately 145 m² and the time taken to remove all doors and windows was four hours only.

### Table 1. Data on the area of replaced timber fenestration units in Building A and the amount of glass and timber that was salvaged or dumped.

<table>
<thead>
<tr>
<th>Unit ID No.</th>
<th>Type of Opening</th>
<th>Size of opening cm x cm</th>
<th>Area of fenestration cm²</th>
<th>Total area of glazing cm²</th>
<th>Area of fixed glazing (wasted) cm²</th>
<th>Area of glazing in sashes (reused) cm²</th>
<th>Length of timber framing (wasted) m</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>D w/light +</td>
<td>82x230</td>
<td>1.89</td>
<td>0.90</td>
<td>0.20</td>
<td>0.70</td>
<td>6.23</td>
</tr>
<tr>
<td>W1</td>
<td>3-bay window</td>
<td>210x148</td>
<td>3.11</td>
<td>2.63</td>
<td>2.6325</td>
<td>0</td>
<td>10.74</td>
</tr>
<tr>
<td>W3</td>
<td>5-bay window</td>
<td>523x152</td>
<td>7.95</td>
<td>5.58</td>
<td>0</td>
<td>5.58</td>
<td>21.10</td>
</tr>
<tr>
<td>W2</td>
<td>4-bay window</td>
<td>325x154</td>
<td>5.01</td>
<td>3.23</td>
<td>0</td>
<td>3.23</td>
<td>15.74</td>
</tr>
<tr>
<td>D1</td>
<td>D w/light +</td>
<td>82x230</td>
<td>1.89</td>
<td>0.90</td>
<td>0.20</td>
<td>0.70</td>
<td>6.24</td>
</tr>
<tr>
<td>W1</td>
<td>3-bay window</td>
<td>208x148</td>
<td>3.08</td>
<td>2.61</td>
<td>2.61</td>
<td>0</td>
<td>10.68</td>
</tr>
<tr>
<td>W3</td>
<td>5-bay window</td>
<td>465x153</td>
<td>7.11</td>
<td>4.99</td>
<td>0.59</td>
<td>4.40</td>
<td>21.54</td>
</tr>
<tr>
<td>V1</td>
<td>Vent</td>
<td>32x66</td>
<td>0.21</td>
<td>0.8</td>
<td>0.08</td>
<td>0</td>
<td>1.96</td>
</tr>
<tr>
<td>D1</td>
<td>D w/light +</td>
<td>82x232</td>
<td>1.90</td>
<td>0.90</td>
<td>0.20</td>
<td>0.70</td>
<td>6.28</td>
</tr>
<tr>
<td>W1</td>
<td>Single bay window</td>
<td>76x148</td>
<td>1.12</td>
<td>0.92</td>
<td>0.92</td>
<td>0</td>
<td>3.76</td>
</tr>
<tr>
<td>V2</td>
<td>3-bay vent</td>
<td>143x65</td>
<td>0.93</td>
<td>0.63</td>
<td>0.37</td>
<td>0.26</td>
<td>4.81</td>
</tr>
<tr>
<td>V3</td>
<td>4-bay vent</td>
<td>239x70</td>
<td>1.67</td>
<td>1.23</td>
<td>0.90</td>
<td>0.33</td>
<td>7.58</td>
</tr>
<tr>
<td>W3</td>
<td>5-bay window</td>
<td>580x153</td>
<td>8.87</td>
<td>6.45</td>
<td>2.04</td>
<td>4.40</td>
<td>25.37</td>
</tr>
<tr>
<td>W2</td>
<td>4-bay window</td>
<td>326x154</td>
<td>5.02</td>
<td>3.24</td>
<td>0</td>
<td>3.24</td>
<td>14.22</td>
</tr>
<tr>
<td>D1</td>
<td>Door w/light +</td>
<td>82x227</td>
<td>1.86</td>
<td>0.90</td>
<td>0.20</td>
<td>0.70</td>
<td>6.18</td>
</tr>
<tr>
<td>W3</td>
<td>3-bay window</td>
<td>214x148</td>
<td>3.17</td>
<td>2.69</td>
<td>2.69</td>
<td>0</td>
<td>11.01</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>54.78</strong></td>
<td><strong>37.88</strong></td>
<td><strong>13.55</strong></td>
<td><strong>24.25</strong></td>
<td><strong>173.44</strong></td>
</tr>
</tbody>
</table>

### Table 2. Data on the fenestration units in Building B.

<table>
<thead>
<tr>
<th>ID</th>
<th>Description</th>
<th>Size cm x cm</th>
<th>Area cm²</th>
<th>No of units</th>
<th>Total area cm²</th>
<th>Time/ unit in minutes</th>
<th>Total Duration in minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1</td>
<td>2-bay w/ 1 sash</td>
<td>160x130</td>
<td>2.08</td>
<td>12</td>
<td>24.96</td>
<td>5</td>
<td>60</td>
</tr>
<tr>
<td>W2</td>
<td>3-bay w/ 2 sashes</td>
<td>240x130</td>
<td>3.12</td>
<td>6</td>
<td>18.72</td>
<td>10</td>
<td>60</td>
</tr>
<tr>
<td>V1</td>
<td>Vent w/ sash</td>
<td>70x70</td>
<td>0.49</td>
<td>8</td>
<td>4.00</td>
<td>3</td>
<td>24</td>
</tr>
<tr>
<td>DW</td>
<td>3-bay + door</td>
<td>80x220 + 160x130</td>
<td>1.76+2.08 = 3.8</td>
<td>6</td>
<td>23.06</td>
<td>16</td>
<td>96</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td></td>
<td></td>
<td>32</td>
<td>144.64</td>
<td>1.66 min/m²</td>
<td>240</td>
<td>(4 hours)</td>
</tr>
</tbody>
</table>

Disposal using demolition techniques

The demolition process for Unit A is presented step by step in the following paragraphs. This unit comprised of a door (D1) and a window (W1); the window was divided by timber mullions into 3 bays with transom lights; and the adjacent door also had a matching transom light. The total width of the fenestration unit was 2.92m and the total area of the opening it was installed in was 5m². The material used in the production of Unit A was 0.198m³ of wood, 1.8m² of glass, iron nails to anchor the window frame to the wooden blocks in the wall; 3 hinges and 1 lockset with aluminium handles.

Removal: The dismantling of the old timber fenestration units was carried out in three distinct stages, the first being the removal of articulated members such as the doors and window sashes. The second was the removal of fixed glazing and the third, dis-
membering of the main frame. All these stages were executed single-handedly by one crew member.

First, the timber doors and window sashes were removed from the main frame with the help of a crow bar that lifted them free from their pin-hinges. Then, the glazing was broken with a claw hammer from inside; causing the glass pieces and slivers to fly out on the surrounding terrace. Pieces of glass that still adhered to the frame were either pulled out and thrown down on the floor (thus shattering into even smaller pieces) or were knocked off with the hammer. The mullions were cut off at a point near the sill with an electric-saw and then pulled out manually. The transom rails in units with top-lights were first sawn-off with an electric saw (which sometimes penetrated into the glazing, cracking it and creating a shower of glass slivers); then loosened with a mallet and pulled out. The transom lights were dealt with in the same manner as the rest of the glazing.

The bottom rail of the main frame was also sawn down the centre and then loosened from the sill with the help of a claw-hammer for leverage. After pulling the rail free from the embedding plaster, the jambs and the head rail were also removed likewise. This method of dismembering the timber frame rendered the wood useless for further constructive purposes. (Figure 1)

Disposal: The dismantled and dismembered timber fenestration units were disposed off in three lots: The first consisted of the doors and window sashes; the second of the timber pieces from the main frames and the third of shattered glass from the fixed lights.

The doors and window sashes that were removed intact from the hinges were taken away by one of the crew for his under-construction squatter dwelling. The fenestration frames, on the other hand, had been dismantled in such a fashion that they could not possibly be used for any other purpose except as firewood; although, this too was not advisable in view of the accumulated coats of toxic paint on the timber. Nevertheless, the dismembered main frame (173.44 m length of timber), was taken away by another crew member for this very purpose.

The broken glazing was further smashed into even smaller pieces by stamping on them. The glass debris was then swept up, shoveled into sacks and carried down by the crew, to be disposed off; thus 13.55 m² of glazing had been wasted in this way.

Duration: The total time taken for removing Unit A from the wall was 27 minutes; which did not include the time taken to dispose of the debris created during the demolition process.

Energy consumed: The timber frame was cut up with an electric saw into manageable pieces so that they could be pulled out individually. The electric-saw was used six times in Unit A alone for a total of 6 minutes. The energy used may not be significant but its consumption could have been avoided altogether if the fenestration had been dismantled.
using deconstruction techniques mentioned in the next section.

Safety measures: The dismantling of old timber fenestration and the installation of new PVC units involved working with glass that should be handled with great care. Inattention to safety measures can and does result in serious accidents. On the other hand, employment of safety procedures not only reduces risks for the workers, but also for others in the immediate work area.

Of the four-member crew, only one person was wearing rubber gloves while the others worked with their bare hands. This indifference to safety rules resulted in an accident when the glazing slipped out of a worker's hands and cut his palm. Further, though the un-conventional procedure adopted for removing fixed lights necessitated the wearing of protection visors; this safety measure was also disregarded.

Glass-breaking was done without concern for splinters, big or small, flying off to quite a distance. Broken glass was all over the surrounding terrace and there was impending danger of it flying off beyond the parapet walls, thus injuring passers-by on the ground below. Whenever the electric saw penetrated the glass while sawing off the transom rails the shower of glass particles, however short-lived, could have seriously injured the person who was using the electric-saw or, for the matter, anyone standing close by. Even after the glass debris had been removed from the site there were small slivers scattered all over the work area.

Disposal using deconstruction techniques

The deconstruction process of Unit B is presented step by step in the following paragraphs. This unit (W2) comprised of a window that was divided by timber mullions into 3 bays, thus injuring passers-by on the ground below. Whenever the electric saw penetrated the glass while sawing off the transom rails the shower of glass particles, however short-lived, could have seriously injured the person who was using the electric-saw or, for the matter, anyone standing close by. Even after the glass debris had been removed from the site there were small slivers scattered all over the work area.

Removal: The dismantling of the old timber fenestration units was carried out in three distinct stages, the first being the removal of articulated members such as the doors and window sashes. The second was the removal of the window frame from the wall and the third, replacing the window sashes. All these stages were executed single-handedly by one workman.

First, the window sashes in Unit B were removed from the main frame with a pickaxe used as a lever against the sill to lift them free from their pin-hinges. Then the window sill was broken away with the pickaxe. A sledge hammer was used to chip away the plaster around the window frame; thus revealing the location of the metal anchors, which were then dug out of the wall with the pickaxe. Finally, the window frame was pulled out of the wall and the sashes replaced. (Figure 2)

Disposal: Once the sashes were replaced and closed, the fenestration was carried down and stacked upright with the other units. When all of the fenestration units were dismantled they were transported to the demolition contractor’s yard, from where they could be sold for reuse. This technique of removal prevents wastage of useful building components.

Duration: The total time taken for removing Unit B from the wall was 10 minutes; which included the time taken to replace the window sashes in the frame after it had been taken out. The debris accumulated consisted of chipped plaster and broken sill; which would have been safe and easy to clean up and throw away, had this been a refurbishment project.

Energy consumed: The timber fenestration was loosened from its position in the wall and pulled out, using small manual tools. Power tools were not needed in this technique, hence electricity was not consumed.

RESULTS AND DISCUSSION

The two techniques that were used in the disposal of a specific building component are compared from the point of view of the resources depleted or conserved; i.e. material salvaged or wasted; manpower, tools and energy used; duration of work; and the projected revenues from the sale of the salvaged material (see Table 3).

The two processes are also presented schematically in Figure 3, which shows the steps required to dispose of a fenestration unit, using either option. It is clear that not only more steps, more tools, more energy and more time were needed for the demolition procedure, but also more waste was generated. In fact, 65% of the material was dumped as waste. On the other hand, if deconstruction techniques had been used to remove these very fenestration units, they could have been sold for reuse, thus generating a profit rather than loss due to the tipping fee. (Figure 3)
As noted earlier, the duration for both deconstruction and demolition should also include the time required to remove all salvaged material, debris and rubble from the site. The crew using demolition techniques had claimed that their dismantling procedure was fast and efficient; however, they had not taken into consideration the extra time spent on cleaning up the broken glass and wood splinters. Hence, the total duration of disposal for Unit A was actually more than the 27 minutes it took to remove the fenestration from the wall. This is almost three times the duration for removing Unit B.

Table 3. Comparison of resource conservation in the disposal of two timber fenestrations units (Unit A and Unit B) by using demolition and deconstruction techniques, respectively.

<table>
<thead>
<tr>
<th></th>
<th>Demolition Technique Unit A</th>
<th>Deconstruction Technique Unit B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>5 m²</td>
<td>3.12 m²</td>
</tr>
<tr>
<td>No. of bays</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>No. of sashes</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Tools employed</td>
<td>Crowbar, claw-hammer &amp; electric-saw</td>
<td>Pickaxe &amp; sledgehammer</td>
</tr>
<tr>
<td>Energy used</td>
<td>Manpower and electric power</td>
<td>Manpower</td>
</tr>
<tr>
<td>Labour</td>
<td>1 Workman</td>
<td>1 Workman</td>
</tr>
<tr>
<td>Duration ¹</td>
<td>27 minutes</td>
<td>10 minutes</td>
</tr>
<tr>
<td>Recovery rate</td>
<td>11.11 m²/hour</td>
<td>18.72 m²/hour</td>
</tr>
<tr>
<td>Material Reused</td>
<td>Door sash</td>
<td>Whole fenestration unit</td>
</tr>
<tr>
<td>Material Recycled</td>
<td>Glass</td>
<td>NA</td>
</tr>
<tr>
<td>Material Wasted</td>
<td>Wooden frame</td>
<td>NA</td>
</tr>
<tr>
<td>Steps in the Process</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>Revenues ²</td>
<td>Loss from disposal of debris</td>
<td>Profit from resale</td>
</tr>
</tbody>
</table>

¹ This does not include time taken to clean up the site.
² Such a unit would sell for at least a quarter of the price of a new one.

Figure 2. Disposal of building fenestration using deconstruction techniques (Photos: FZ Cakici) (i) Removing the window-sash (ii) breaking the window-sill (iii) chipping off the plaster (iv) removing the metal anchor (v) pulling out the window-frame (vi) replacing the sash.
B, i.e. 10 minutes. The reason for this longer duration may be that just like deconstruction demolition was also carried out manually with small hand-held tools.

From the point of view of energy consumption, which should also be an important factor in deciding on the techniques to be used in building disposal projects, the amount of energy consumed was considerably more for the demolition option. This consumption consisted of not only the electricity used in the power tools but also the energy expended in manual work as well as in cleaning up the debris; the fuel used to transport the material to 3 different places; the energy to recycle the glass cullet (if it were not dumped as waste) and the embodied energy wasted.

Finally, the projected revenues from the resale of all of the 32 fenestration units (145 m²) salvaged from the deconstruction project can be calculated as approximately 1500 - 2000 Turkish Lira (TL) or 750 - 1000 €. Whereas the 12 Units (54 m²) wasted in the demolition project could have generated an income of approximately 1000 - 1200 TL or 500 - 600 €. These figures have been calculated from the prices obtained by the author for a previous study (Elias-Ozkan, 2002).

Figure 3. Process chart for comparing the steps in deconstruction and demolition of fenestration units, from the point of view of resource management.
CONCLUSION

From the comparative study presented in this paper, it is safe to conclude that the deconstruction option is preferable to demolition on all counts, especially if current techniques and tools are to be used. In addition to the conservation of resources, such as material (by reusing or recycling) and energy (saved or embodied) safety is also a factor that makes deconstruction more ethical and, consequently, more preferable. Furthermore, revenues generated from the resale of the salvaged material add to the profitability of the project.

It should be noted that manual demolition in refurbishment projects entails removal of every element of the building component one by one; whereas, deconstruction means dismantling the component by removing the connections only. Thus, to facilitate the dismantling process one needs to adopt strategies for ‘Design for Deconstruction’ (DfD): “...that is designing the building and selecting materials, products and connection systems that will facilitate eventual disassembly of the building” (Kibert, 2007).

Acknowledgements

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A REVIEW OF LOFTS AS HOUSING IN ISTANBUL

Serpil ÖZKER

Abstract
Lofts are housing forms converted from warehouse-workshop into a “habitable environment” in coastal towns of Europe and the USA after the Industrial Revolution. Particularly positioned in coastal towns of New York, Loft life made an impact in the world over time. It became a new form of living when artists converted structures like factories into habitable environment. From past to today, all national and international developments during the process affected and accelerated development of the constant evolution of housing concept. In that sense, in this study, the meaning of Lofts in Istanbul and the effect and change of socio-cultural stratification on spatial conversion of housing consumerism has been examined in the context of Istanbul. Especially, process of gentrification, shaped by effects of urban transformation post 1980, and cultural development affected by this process, attendant Loft life has become an accelerating way of life. In this context, historical and stylistic value and especially usage of Loft living has been examined. In the first chapter; past, present and the post-1980 development of housing sector in Istanbul, in the second chapter, with a thriving cultural life, and Loft formation, has been examined in the context of structural criteria, resulting three different Lofts have been discussed in detail. In the third section, three different types of Loft have been analyzed in the context of space depending on examples. As a result of researches, three different types of Lofts, “Original”, “Semi” and “Imitation” concepts have become clear and it has been concluded that “Imitation Loft” formation gives direction to life in Istanbul.

Keywords: Definition of Loft, Types of Loft, Housing Sector, Urban Transmission, Process of Gentrification.

INTRODUCTION
The Loft concept was first defined as “attic,” then “warehouse/commercial building” and now it is defined as “monolithic areas of a commercial building” (Hasol, 2005). In addition to this definition, the concept of “life-hospitable house in factory premises” shaped its widely used definition today (Karagoz, 2007a). From America to Europe, and then to Turkey and particularly certain parts of Istanbul, Lofts have been regarded as a new lifestyle. Growing concerns over world ecology ensured the domination of a protection-driven concept of urban life instead of demolition in the 1970s(Koksal, 2008). This understanding, in Istanbul, interfered to change the concept of housing together with Traditional life continued until the 1980s and renewal process brought about by urbanization. Developments in the housing sector which began with attempts to integrate with the rest of the world in the 1980s and has continued to this date paced up the orientation towards Loft housing. Urbanization and migration particularly accelerated the evolution in housing sector and put the sector in competition with different housing typologies. This competition required the continuous variation of housing typologies, with 1990s, left its place to different formations, such as Loft and residences. Especially, the process of gentrification has a large effect in this change, it required rebuilt of old building or changing identity of historical places. Thus, settling of artist-scholars in the neighborhoods paved the way of converting workshop-warehouse-style buildings into houses. In this sense, Loft life has taken place in the literature as a way of life that has specific architecture incorporates and historical value. But in recent years, housing sector to be in the race has changed original identity of Loft. Thus, in the study, examination of the differences appearing in meaning of Loft such as “Original”, “Semi”, “Imitation” ranging from commercial considerations. In the study; in the first chapter; past, present and change with expanding to outside with post-1980 have been examined. In the second part, changes in urban scale due to process of gentrification and Loft life in Istanbul have been examined. Revealing that Lofts in Istanbul are produces as “Imitation” or “Semi Loft” under name of “Original Loft” is targeted. Accordingly, in the context of structural criteria, three different types of Loft have been discussed in detail. In the third section, three different Loft types have been analyzed on examples in
the context of space. The study was prepared by three different Loft were decided according to district, historical characteristic and region, source, document, photo shoot and site interviews were also done. “Hasanpasa Loft” located in Kadikoy was taken as an example of “Original Loft”, “Levent Loft” in the middle of the business district in Maslak-Levent line was taken as an example of “Semi Loft”, Incity Loft project located in Kozyatagi was taken as an example of “Imitation Loft”. One reason for the selection of those surveyed three examples was reserving different district and cultural identities. Consequently, the study aims to emphasize that Istanbul has not a prominent identification of the housing sector, construction companies use luxury housing concepts such as residence, Loft to accelerate the competition. Thus, purpose is to emphasize the loss of meaning of Loft life in changing Istanbul. As a result of researches, three different types of Lofts, “Original”, “Imitation” and “Semi” concepts have become clear and it has been concluded that “Imitation Loft” formation gives direction to life in Istanbul.

1. THE HOUSING SECTOR IN ISTANBUL

All reforms from the Westernization in 19th century to 1980s constantly modified communal living. Changing traditional life by effects of Westernization continued with restructuring process from Republican era to the 1950s. Urbanization process that occurred in the 1950s, volume of loans extended in order to modernize agriculture and more revealing the population in the agricultural sector increased internal migration from rural to urban, initiated a process of rapid urbanization (Turkdogan, 1988). Rural-urban migration and increasing population, from 1950s to the present, accelerated urban transformation that appeared especially after 1980. From 1950s to the 1970s, on the one hand, as a result of industrialization, luxury homes and apartments increased, on the other hand, trend of slum began in low-income areas (Senyapili, 1978). Demolition of old structures and construction of new ones in the 1970s is the actual spatial transformation process that changed the urban identity of Istanbul. Emergence of the build-and-sell (Contractor’s job) caused an inclination towards concretion. During this conversion, lack of attention to the design and production revealed intense apartment architecture. Towards 1980s, build and sell production, then the acceleration of rural-urban migration, has increased slums even more in a large part of the city.

Opening its doors to outside world in 1980s, Turkey ended the expurgatory period and enabled the introduction of technological developments into the country. Outsourcing policy and efforts to bring the country to a modern situation caused a great change. However, this change policies implemented in the country brought problems of cultural and social life as a result of that society was not yet ready and not able to perform this transformation (Sonmez, 2008). Foreign expansion and the ensuing population increase in the city deemed social change obligatory which paced up the need for housing areas. The housing sector that produced according to income statue became evident. 1980 era was actually a period of transformation and integration with the West. This process carried on with accelerated housing production due to private entrepreneurs by the end of 1990s. As of 1990s, the historical districts of Istanbul gained importance and historical buildings were taken under protection. Moreover, Istanbul’s skyline was now formed by skyscrapers and the transformation of several areas into business centers increased construction in those neighborhoods. A complicated urbanization arose in Istanbul and forest lands on city’s outskirt were destroyed. The upper class’s desire to move towards a calmer environment particularly caused lifestyles located in city outskirts (Ozker, 2011).

Detached houses from 19th century to 1950s, apartment housing from 1930 to 1960s, builder-seller production from 1950s to 1980s, foreign expansion in 1980s with globalization, sustainability and technology concept in 1990s increased the speed of housing production. In this period, Emlak Bank initiated a fast dwelling production, number of cooperatives increased, the builder-seller production continued building at full speed, the private sector began a large-scale house construction on large plots (Gorgulu, 2003). The 2000s saw technological innovations and dwelling production developed to the point of Original estate investment trusts. In a spatial sense, urban renovation changed Istanbul’s silhouette while meeting demands from different architectural styles under the influence of globalization process. The increase in houses and commercial buildings in city’s center made it unable to cope with the population density. Therefore, construction of houses in the suburbs especially for the high income group gained speed. As the skyscrapers shaped Istanbul’s skyline towards 2000s, an inclination began towards house forms like Lofts and residences. Mansion in the last period of the Ottoman Empire, apartment in the Republican period, and today, changing housing preferences from flats towards residences greatly influenced the city’s physical environment (Yalvac, 2008a).
In addition, the fast transformation of social life in 2000s and increasing technological opportunities made their impact on the housing sector. Becoming the center for domestic and foreign investors under the influence of globalization, Istanbul became the most affected city during this period. The urban transformation issue became crucial particularly in terms of enhancing the quality of life. With arrangements of urban transformation, the aim was to prevent the spreading of shanties and acquiring habitable environments by demolishing old structures and building new houses. The gradually decreasing capacities of builders and shanty construction are far from meeting the demand in densely populated areas. This caused both public and private sectors to focus on large-scale housing estate enterprises. The state enabled large-scale production with housing estate law and new loaning mechanisms, and created a different market from previous periods with TOKI (Housing Development Administration) (Yalvac, 2008b). In this regard, TOKI was affiliated with the Prime Ministry as of 2004 and new regulations were initiated which accelerated urban arrangement. TOKI is on agenda with urban renovation and shanty transformation projects. Also, it paved the way for private sector and local governments to conduct big, comprehensive projects. Projects for urban transformation and high life standards shaped Istanbul’s architecture.

The social change that emerged in 1980s created a process called gentrification, which is settlement in vicinities in the city’s center. Gentrification is defined as the process of “high-classes” settlement in slummed inner-city areas where low-incomers live (Ciravoglu, 2006). In these vicinities, ragged houses are renovated and former residents are removed. Gentrification process brings along the settlement of different cultures in these areas which forcefully change the neighborhood’s culture as well. Urban gentrification is usually seen as process in which middle and upper-middle classes settle in slummed historical housing areas where low-incomers and poors live and they renovate these areas according to their own live standards (Behar, Islam, 2006a). All these changes caused urban transformation to reflect upon the area in social and economic sense. Class differences according to income stature became evident; these differences damaged the integrity of a certain group. The individual’s new lifestyle caused spatial disintegration in society and created self-enclosed housing settlements. Accordingly, the ensuing sense of alienation caused disconnections within society.

In summary, events that began with destruction of historical buildings in 1960s and spread of shanties in 1980s created a transformation period for Istanbul. The increasing urban sprawl added to the pace of house consumption and induced different housing typologies to surface. In this sense, there have been many housing projects since 1980s to our day that seemed different but actually same in context and concept.

2. LOFTS IN ISTANBUL WITHIN THE CONCEPT OF HOUSING

The most important factor in the development of Loft, began by settling in buildings used for industrial purposes in New York, are cheap rents, creating a suitable environment to live and work (Pamukcu, 2009b). But in Istanbul, considering the development of Loft, it is observed that it has evolved into becoming one of the defining aspects of life in luxury. In this sense, the development of Loft, lifestyle and types are important factors in winning the ultimate goal of Loft apparent. In this context, housing typologies shaped by the effects of the western provide a basis for houses built by targeted marketing strategies. Thus, under the name of different forms of housing, many residential projects have similar characteristics. There is also a difference in spatial terms between luxury housing and Loft housing produced in recent years. In short, today, background characteristics of housing such as public housing, residential, Loft, villas, independent apartment are quite similar. Still in Istanbul, with the leadership of the artists pattern New York Lofts, numbered examples of original Lofts can be seen. Lofts, having varied forms of housing, are noteworthy in terms of differences between themselves. While a cheap live of living in New York, Loft formation, rapidly increasing in recent years in Turkey, is an expensive lifestyle in Istanbul which is incentive life of luxury.

2.1. Development of Loft in Istanbul within the Context of Housing

The changes made en route to westernization from the Tanzimat reform era to today failed to progress at the same pace with the West in sociocultural, economic, and political areas. In spite of that, relationships with the West increased with the developing commerce in country due to non-muslims residing in Galata and neighboring vicinities. These neighborhoods in time formed the city’s density and required the settlement of industrial areas in these parts. The small scale enterprises from past to present were in these vicinities and were not used, which led to secondary ownership. Also, Istanbul’s
location as a maritime city emphasized its importance in socialization and industrialization. Industrial structures and workshops from the Ottoman era that are extant today paved the way for creation of Lofts. For instance, with the developing industry after World War II, many industrial complexes in parts of Istanbul are extant today in a sheltered way. The economic balances emerging particularly after 1980 necessitated the city’s renewal. For this reason, the construction process of housing areas in gentrification period which accelerated urban transformation was exposed to renewal as well. This renewal naturally affected the sociocultural environment as well as houses. The urban renewal developing in sociocultural sense accelerated the gentrification process in these neighborhoods. In accordance with this process, the change in population composition should take place as to newcomers having a higher socioeconomic level than current residents. Improvements in physical texture of the resided area should be observed as well (Behar, Islam, 2006b). The role of artists and academicians in this process is substantially crucial. Beyoglu, Galata, Cihangir, Balat, Tarlabasi are the areas where gentrification is heavily implemented. Small workshops in these vicinities were converted into houses or house/workshops by transforming the intended use. Indicating activity in Istanbul particularly in early 20th century, these buildings laid the basis for Loft concepts. Loft, shaped by the effects of the process of gentrification, today, have been substantially amended by losing its meaning. Housing sector shaped by the effects of urban transformation has entered into the competition in line with marketing strategies. This competition required the continuous exchange of housing typologies by forcing the sector into competition. This growing competition have launched different types of housing, today, formations such as Loft, residence have taken their place as a symbol of luxury living.

2.2. Loft Lifestyle

In the early 1970s, using old industrial centers and production areas as a residence in America and Europe has started tendency of Loft lifestyle (Pamukcu, 2009a). This types of structures initially used as storages have impact on its environment in terms of socio-cultural sense with its features that make basis of Loft way of life such as high ceiling, wide window. Loft is a residence concept seen in Istanbul as a result of the gentrification process following sociocultural changes caused by new economic models and global policies in the post-1980 era. They are natural buildings with an open plan, high ceiling, wide windows, and bare structure (Karagoz, 2007b). Loft life offers spaces where natural building is preserved, dividing elements are optional, decorated with open systems, and daylight is widely benefited. When the standard designs of a house offer no flexibility, it becomes an obstacle for those who want “difference”. All Lofts vary according to their resident for those who seek a different lifestyle. Loft life is usually witnessed as personalized spaces of escaping from the city, in the middle of the city (Maralcan, 2004).

2.3. Types of Loft in Istanbul in Structural Sense

In order to prevent in today’s rapidly growing demand for housing, the housing sector offers different housing examples to customers. Increasing demand for luxury housing also accelerate the real estate sector to compete in this area. Actually, while housing sector is dealing with competition, Loft is required to convey its meaning to customer. While Original Loft is expected to have free plan (large living area), naked structured, high ceilings, large windows, use of natural materials, flexible, historical texture (semantic value), 1 +1, 2 +1 Loft examples have emerged. In this sense, Loft types are analyzed as “Original, Semi, Imitation Loft” in the context of architectural criteria, “Free plan, high ceilings, large windows, bare-structured, historical texture” (Karagoz, 2007b). (Table1)

2.3.1. Original Loft

With the 20th century, with the socio-cultural and economic conditions, some of the workshop-style structures have lost their importance, has left their place for Loft living. This formation have forced housing sector in competition into type of housing shaped by insufficient space and cultural values. Loft is free planned, naked structured, natural venues that offer flexibility. Living, eating, working, sleeping environments are combined together and largely offers the ease of movement. When needed, different functions can be installed, directed, modified, and added by separatist elements. Loft can differ from usual examples of housing by its free planning. As well as hard architectural elements, also exposes the reality. It hosts visible, natural material in its structure. Large windows of Loft allow the exploitation of natural lighting. Original Loft life in Istanbul is intensively aggregated in Galata. In the past years, commerce was important in Galata and neighboring vicinities and there were vast numbers of workshops. In addition, due to the Gasworks house in Kadikoy-Hasanpasa, there are
The gradual unplanned settlement and increasing rate of migration in the area caused housing demands to rise too.

2.3.2. Semi Loft

Semi Loft is transformation of living space of structure serving a different function which does not own historical texture. It has criteria such as high ceilings, bare structure, flexibility, interchangeability, large windows, natural-artificial materials, technological equipment. In addition, Loft can remove naked structure of exposed structural elements by referring to the industrial character of the space (Karagoz, 2007c). Still, fixed structural elements are visible. When needed, different functions can be installed, directed, modified, and added by separatist elements, wide windows of Loft allow the exploitation of natural lighting. Main difference between Semi Loft and Original Loft is alteration largely of main structure and lack of historic fabric. Semi Loft, as Original Loft, is located in converted industrial buildings, but arrangement is different. Semi Loft in Istanbul is frequently seen in neighborhoods where business centers are located such as Levent, Kozyatagi, Maslak, Atasehir…

2.3.3. Imitation Loft

Housing search reflects the way of life and Responding to emerging user needs of the post-1980, has revealed housing types formed with the same features but with different presentations. Continuity that Loft lifestyle revealed, with undergone changes, offers the user an expensive life. Therefore, the effect of the increasing demand of Loft housing and socio-cultural changes accelerates process of Lofts Imitation. Still, Loft formations based on private sector entities are usually produced in imitation. The increasing demand of Loft housing and unawareness of the sector about housing typologies cause loss in meaning of Loft. Imitation Loft is structures designed under the name of standard high ceilings, open plan, bare structure dealt with the typical architectural criteria. In the face of increasing demand in the housing sector, Loft Imitations are only those applied on the basis of well-known architectural criteria. Despite the absence of the converted structure, it is redesigned. In Imitation Loft, there is no bare structure, but noticeable quality workmanship and material. Therefore, it shows similarity with fully equipped luxury residential projects that are often preferred today. In addition, the most prominent feature of imitation Lofts, they are marketed with the type of apartment such as 1+1, 2+1. Imitation Loft in Istanbul can be seen in any neighborhood and many residential projects considered as luxury. (Table 2)

3. ANALYSIS OF SELECTED SAMPLES IN THE CONTEXT OF TYPES OF LOFT

Today, Loft housing began to lose its true meaning

<table>
<thead>
<tr>
<th>Table 1. Important Criteria According to Loft Architectural Measures</th>
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<tbody>
<tr>
<td>Loft Feature</td>
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<tr>
<td>Semantic Value</td>
</tr>
<tr>
<td>Bare Structure</td>
</tr>
<tr>
<td>High Ceiling</td>
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<td>Large Windows</td>
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<tr>
<td>Natural Material</td>
</tr>
<tr>
<td>Flexibility</td>
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<tr>
<td>Mezzanine</td>
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<tr>
<td>Cozy Living Space</td>
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</table>

Table 1. Important Criteria According to Loft Architectural Measures
due to different housing projects. Especially in this study, evaluation of position of Loft formation in housing sector, difference between Original, Imitated and Semi Loft are intended. As an example of Original Loft, “Hasanpasa Loft” was reconstructed from a workshop have been out of use in Hasanpasa, “Levent Loft” as a Semi Loft, was reconstructed from chocolate factory, “Incity Loft” as an Imitation Loft was reconstructed in Kozyatagi.

3.1. Hasanpasa Loft (Original Loft)

The Hasanpasa Loft is a duplex private residential building belongs to interior designer Tanju Ozelgin located in district of Kadikoy-Hasanpasa. This building used to be used as a workshop was converted into Loft in 1987. Ground floor is used office space, while the upper floor is used as a residence (Ozelgin, 2012). The use of concrete materials in the structure can be observed clearly. In the Hasanpasa Loft, door was not used in whole of the living environment expect entrance and bathroom. It is an Original Loft project where solutions are produced by space-limiting elements. It meets Loft properties such as bare structure, flexibility, substitutability, history tissue, high ceiling, large windows, and use of natural materials.

3.2. Levent Loft - (Semi Loft)

Levent Loft, Levent-Maslak axis, is a Loft project located in the heart of the business community. Built as factory in 1990, it was converted into a residence from chocolate factory by Akfen Construction and Architecture Tabanlioglu. Ten-folded building consisting of 144 residential units
has a number of features such as gym, swimming pool, spa, etc. (Unal, 2012). “Levent Loft” designed by Tabanloğlu architecture has been one of the RIBA 2011 award winning projects (European Project Management, 2013). Levent Loft meets Loft properties such as bare structure, flexibility, substitutability, high ceiling, large windows, and use of natural materials. Option of different apartment types and normal housing projects are also present. History tissue that should be in an Original Loft, does not meet the natural material property.

3.3. Incity Loft – (Imitation Loft)

Incity Loft is a Loft project in Kozyatağı, was rebuilt in 2009 by Dundar Construction. It consists of 322 houses in 11 blocks and 4 different types. Contains characteristics such as A swimming pool, tennis court, basketball court, fitness center, sauna, spa, etc. (Duran, 2012). Incity is today’s modern, high-rise housing projects. It contains not only residence, but also number of housing options like 1 +1, 2 +1, 3 +1. The concept of a normal in-room apartment is clearly seen in Incity Loft project. Incity Loft meets architectural criteria of Loft except wide win-
Figure 6 - 7. Hasanpasa. (Photo by Tanju OZELGIN)

Figure 8 - 11. Levent Loft Plans and Figures. (Photo by Arsel Erginbas Unal)
Figure 12 - 15. (Photo by Arsel Erginbas Unal)

Figure 16. Incity Loft Plans

Figure 17. Incity Loft Plans.
Figure 18 - 23. Incity Loft Plans and Figures. (Photo by Serpil Ozker)
3. CONCLUSION

Having emerged following an inclination of New York’s artists towards industrial buildings, the main factor in Loft housing is implementation of appropriate and cost-effective conditions for living. Loft is a housing type where there is no sense of privacy and no spatial places formed by divisive agents. The Original Loft is a living environment created by using the current structure without damaging natural texture and doing any changes. Most of the Original Loft examples abroad are warehouse-plant type industrial structures from the 1800s. These structures were converted into habitable envi-

<table>
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<tr>
<th>Table 3. Comparison of Three Different Loft Types in Istanbul</th>
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<tr>
<td><strong>Loft Type</strong></td>
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<tr>
<td>Structure</td>
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<tr>
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</tr>
<tr>
<td>Construction</td>
</tr>
<tr>
<td>Date Used For</td>
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<tr>
<td>Conversion</td>
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<tr>
<td>Date Used For</td>
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<tr>
<td>Loft</td>
</tr>
<tr>
<td>Architectural</td>
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<tr>
<td>Criteria</td>
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<td>Large Windows</td>
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<tr>
<td>Natural Material</td>
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**Conclusion**

- **Hasanpasa Loft;**
  Differs from others significantly as an Original Loft with its historical context, bare structure, high ceiling and large windows and sets forth the original features of a Loft.

- **Levent Loft;**
  Can be shown as a typical Loft with its high ceiling and large windows. But the advanced technology and different material use do not reflect Original Loft features. No Original Loft feature in structure.

- **Imicity Loft;**
  Redesigned and built with recent technology, Incity Loft does not reflect the natural Loft characteristics with its standard house, several bedrooms, partially large window features.

- **Atasir-Kozyatagi**
  Also it does not meet criteria such as historic fabric, flexibility, natural material. (Table3)
environments without damaging the natural essence.

Upon examination of Loft houses in Istanbul; It has been observed that Loft houses usually located in gentrification areas are used as houses/house-workshops. In this sense, Loft housing is a spatial transformation in Istanbul that has emerged by the influence of new economic balances and sociocultural changes.

Increase in rent in Istanbul in the period before 1980, has led to the start of the social and class differentiation and service share inequality. Thus, urban regeneration and gentrification occurring have occurred together. This gentrification process has provided emerge of Loft formation by convert of workshop-style old buildings into houses by artists in some regions.

Loft is the concept of user’s reflection of their own options on the place without facilitating any space restrictors. It is transformation of structures built for commercial use into living environment without damage to its fabric, without any change. Its difference from other housing typologies is that it does not contain any unit-by-unit spatial areas; it does not impose restrictions and offers the user flexibility in shaping the area.

The current status of Loft housing is that they are formed with modern architectural patterns in line with the upper class’s desire to live in luxury. However, it should be kept in mind that the natural structure feature of Lofts must be preserved which enables flexibility along with the integration of interior and exterior. In short, the essence of Lofts should not be distorted for competition with villas and apartments; they should be preserved in their natural structure without inflicting any damage.

In conclusion, the transformation of industrial structures into living environments in New York-Manhattan area in 1960s has now been replaced by houses that can be called as imitation Lofts. They are structures that have emerged by a gentrification process that led to recognition of a historical environment gaining value.

Regarded today as a concept of housing movement that spread from New York to other countries, Lofts are seen as symbols offering residents a luxury life in Istanbul. They are in high demand by customers with economic potential and that absorbing luxury consumption. For this reason, this demand gradually leads to luxury housing forms contradicting the Original Loft concept. However, neglecting of Original Loft’s architectural criteria causes problems in housing development.

A lifestyle to some, a new consumption object for others, and a status symbol to some few, Loft housing has gained itself a place among Istanbul housing architecture as a new housing typology. In spite of the Original Loft which has a historical textures, Lofts with same features yet newly-formed may be presented as the original. It is therefore important to be able to distinguish between converted lofts and rebuilt ones. Actually, not every workshop style structure that has survived the years is all Lofts. Another thing to keep in mind is that the originality of converted buildings and their compliance with the Loft’s architectural criteria should be examined as well. Loft houses should have a unique identity along with many housing projects in Istanbul. In this sense, it should be pointed out that Lofts, which have become one of the modern housing typologies today, should be converted by taking architectural criteria into consideration.

In this regard;

Distinguishing between Original and Imitation Loft should be made and the difference to be emphasized,

Lofts should not become structure elements that have lost all the criteria and gained a new image,

Should not be changed into a different cultural identity representing the lifestyle of urban culture,

The current identity should be displayed with respect to its historical and cultural values,

The real aim of Original Loft is cost-effective and multi-purpose residency. Loft life should not be turned into a housing form that offers a prestigious life to the upper class.

Loft, different from the traditional housing model, must be a way of life offering bare structure, historic textured places.

In this sense, criteria such as historical texture and flexibility for Original Loft life should be presented to the user with their real meaning in the research. In today’s competitive housing sector, it should not be changed into a product that addresses the higher income group as a luxury life symbol.
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Figure 2-Hasanpasa Loft, Serpil OZKER Archive
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Introduction

Virtually all people of the world build or shape their own forms of dwellings. For a long period of time, the Palestinian people retained more or less a state of equilibrium between housing supply and demand through the self-financed, family-based form of dwelling. This was the only type of housing until Mandatory Palestine was divided into two parts as a result of the Partition Plan decreed by the U.N. General Assembly Resolution 181 of 29 November 1947. After 1948, the increase in income inequality, lack of economic growth and in-out migration led to a high level of poverty (60%) and produced poor quality and insufficient quantity of various types of housing, with a high cost of both home ownership and renting (Fig 1).

Thereafter, three new forms of dwelling were created in the urban space of the Palestinian cities to meet the new needs that resulted from the prevailing geo-political developments. The first form was the mixed-use dwellings in the central parts of the Palestinian cities, with commercial spaces at the street level and offices and apartments at the upper levels. The second form was the family apartment buildings, which flourished due to the land scarcity and speculations. The third form was the housing cooperative, which began after 1956. These forms satisfied the needs of the local community until the establishment of the Palestinian National Authority (PNA) in 1994, when the housing market grew dramatically and became more diversified by new forms of dwelling. Few social housing projects were provided by either the government through the Ministry of Housing or religious institutions to host young married families and assist them in locating an appropriate shelter. The Palestinian Housing Council was established in 1993 as a non-governmental body that covered all Palestinian territories. It was funded by European resources to provide housing units to low- and middle-income families.

Abstract

This study aims to examine the housing cooperative practices employed in the Palestinian territories in the second half of the twentieth century and across diverse socio-political circumstances. This approach has been implemented to fulfill the housing needs of Palestinian society. Tracing this movement reveals an intensification of the housing cooperative approach between the years 1958 and 2008. However, in the years since, this practice has declined considerably.

This study discusses and analyses the housing cooperative practices adopted by the Palestinian community after 1956. It explores the stages, principles and concerns that characterise this practice, whether it is an approach that continues to meet a share of the demand for housing people in Palestine and how this practice can continue and receive wider support and recognition. The results of this study could aid in providing a diagnostic database, which in turn might provide a needed boost to the housing cooperative movement in the Palestinian territories.

Keywords: Housing Cooperative, Stages and Principles, Social Mix, Community, Palestinian National Authority “PNA”.

Figure 1. Housing Issues and Situation in Palestine after 1948.
Source: Author, upon modification of schema from Kamau (2006).
However, in all of these cases, the cost of the dwellings was high; thus, the dwellings were sold to people with higher social status.

Thus, the main purpose of the current study is to examine the housing cooperative practice adopted by the Palestinian community in the second half of the twentieth century. The following criterion was used to define the housing cooperative in Palestine: a legal entity that owns a real estate that consists of one or more residential buildings and common areas for the use of all residents. Housing cooperative membership is based on a share-purchase. Each member is granted, on equity principles, the right to occupy one housing unit, have equal access to the common areas and vote for members of the executive committee, which manages the cooperative. There are often restrictions on the transfer of shares, such as giving priority to other members or outside entities approved by the cooperative leadership and limits on income or market sales price. An internal by-law specifies the cooperative’s rules.

The present study will discuss the stages, principles and concerns that characterise this practice. The study will also determine whether this approach continues to meet a certain share of the housing demand in Palestine. Finally, it will clarify the main challenges that this practice must overcome to receive wider support and recognition.

A case study methodology approach based on a quantitative and qualitative analysis was employed. The components of this methodology were derived from various sources, as follows: site visits, including observations and photographing of selected cooperative projects; interviews with a number of people who were active in the creation of key cooperatives; selection of the most representative cooperatives, which will be a basis for the analysis; sources of international discourse on the housing cooperative approach, stages and principles; data available from Palestinian institutions; and the available literature on Palestinian housing cooperative issues.

Figure 2. Approaches in the private housing sector after 1870; different imported styles are implemented: A) An apartment building in Jerusalem built on an incremental basis, B) A mixed-use housing project in Jerusalem, C) An apartment building with four units in Al-Bireh City and D) The German Colony in Jerusalem
Historical Review

The traditional practice of cooperatives has been in existence in Palestine since time immemorial. In this practice, members of the community build houses together. Due to the sense of belonging and togetherness amongst the community members, even the members who do not need a house participate in the building. This form is available to all families, regardless of whether they hold a high-, moderate- or low-income status. Typically, it results from private subsidy and carries certain restrictions on the resale of initial shares because the whole structure belongs jointly to the extended family. Today, this practice continues, mainly in the construction of houses for family purposes in both urban and rural areas (Fig 2, a, b and c).

Other practices of housing cooperatives appeared as a result of the Ottoman land reforms (Tanzimat) in 1840. These reforms led to major changes in the process of land privatisation and registration, which allowed foreign immigrants to move to Palestine and obtain land based on certain religious or social beliefs. New enclaves were built for residential, religious, educational and health-related activities (Ghadban 2008). These enclaves had a predominantly agricultural framework and residence was restricted to immigrants of the national group, regardless of their socio-economic status (Fig 2, d). They became a model for the later construction of Jewish settlements in Palestine (Hubbard 1951).

After 1948, the practice of rehabilitating and revitalising existing structures, building new dwellings and forming housing cooperatives in the Palestinian territories signified much more than simply the building of houses. It became a process of resistance by building a community that joined young Palestinian people to overcome the geopolitical consequences of the division of Palestine, rebuild their community and fulfil their housing needs, regardless of their income status. This practice became a meaningful choice in relation to the various challenges and priorities facing the Palestinian community; it grouped people together and strengthened their relationships and bonds of mutual support. This practice became effective after 1974 despite a number of hindering factors, such as the Israeli restrictive measures upon the Palestinian planning and development process, Israel’s relentless annexation of Palestinian land for colonisation purposes, the increasing young immigration from Palestine, the absence of governmental housing policies or subsidies and a depressed economy with restricted growth and high unemployment and immigration.

The modern housing cooperatives in Palestine appeared after 1956. Five stages characterise their development between 1958 and 2010 (Table 1):

<table>
<thead>
<tr>
<th>Phase</th>
<th>Period</th>
<th>No. of Cooperatives</th>
<th>No. of Units</th>
<th>Current Condition</th>
<th>Means of Subsidy</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Occupied</td>
<td>Under Construction</td>
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<tr>
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<td>1958-60</td>
<td>3</td>
<td>115</td>
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<tr>
<td>2</td>
<td>1961-63</td>
<td>4</td>
<td>158</td>
<td>3</td>
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</tr>
<tr>
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<td>1</td>
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</tr>
<tr>
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<td>5</td>
<td>208</td>
<td>4</td>
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<td>1976-78</td>
<td>7</td>
<td>471</td>
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<tr>
<td>18</td>
<td>2009-10</td>
<td>0</td>
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<td>-</td>
<td>-</td>
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<td>93</td>
<td>14</td>
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<td>100%</td>
<td>56</td>
<td>9</td>
<td>35</td>
<td>68</td>
</tr>
</tbody>
</table>

Table 1: Data analysis of the cooperative housing in Palestinian territories between 1958 and 2010. Source: Author, based on data extracted from the documents provided by the Palestinian Ministry of Labor.
The first phase was between 1958 and 1966, during which the West Bank was under the Jordanian reign. A “Special Bylaw for Cooperative Associations No. 17/ 1956” and a “Cooperative Housing Associations Bylaw No. 42/ 1959” were issued to regulate the cooperative activities in the country. Both bylaws delineated the conditions for registration of cooperative associations and provided an “Internal Directive” that contained all necessary information and details for this purpose. Few cooperatives were established, the majority was successfully implemented and they all benefited from a partial subsidy provided by the Jordanian Cooperative’s Bank.

The second phase spread between 1967 and 1975, when Israel occupied the West Bank and Gaza Strip. Few cooperatives were established in this phase and they received a partial subsidy from the Jordanian Cooperative’s Bank. In this phase, a twofold system of control was established, which included the determination of eligibility for financial subsidy in Jordan and registration with the Israeli officer responsible for cooperatives.

The Joint Jordanian-Palestinian Committee (JJPC), which was established in 1974, was a key factor in the development of housing cooperatives in the Palestinian territories in the period of 1987-1991. Between 1975 and 1987, the twofold system of control continued to be enforced, but the subsidy became the sole responsibility of the JJPC, which provided a fixed loan of approximately 17000$ to each member of a registered cooperative (Sabri, 1978). Thus, the number of cooperatives greatly increased and the self-finance approach provided the remaining cost of the dwelling. The cooperatives were inaugurated by engineers, teachers and medical personnel and non-governmental, governmental and religious institutions. The JJPC was discontinued after the Madrid peace conference in 1991.

The housing cooperative practice was complicated and hampered in the period of 1988-1994 due to the First uprising (intifada) in the Palestinian territories and the disengagement resolution of 1988, by which Jordan relinquished its claims over the West Bank, halting the work of the cooperatives.

Figure 3. Approaches in the private housing sector after 1994: A) Housing apartments built in Al-Bireh city after 1994, partially occupied because of the high prices and low quality standards and B) Dense Residential neighbourhood, with low quality buildings in Um-Alsharayet neighbourhood, Al-Bireh.
Joint Committee. In 1994, the Israeli authorities relinquished the responsibility of cooperatives to the newly established PNA and the registration of new cooperatives became the sole responsibility of the Palestinian Ministry of Labor.

From 1994 to 2010, the housing market grew dramatically and became more diversified by the new forms of dwelling. The new housing policies introduced by the PNA encouraged the private sector to become actively involved in providing more housing units for direct sale (Fig 3). However, a large number of cooperatives were registered by the Palestinian Ministry of Labor. In the absence of financial grants, these dwellings were entirely accomplished by their own financial means. Since 2010, no new housing cooperative has officially registered in the Palestinian territories.

**Theoretical Framework**

Dwelling is both process and artefact. It is the process of living at a location and the physical expression of doing so. However, the dwelling place is more than the structure. The bond between people and their dwelling place transcends the physical limitations of the habitation. Thus, the dwelling has double significance - dwelling as the activity of living or residing and dwelling as the place of structure, which is the focus of residence. As such, the dwelling encompasses the manifold cultural and material aspects of domestic habitation (Oliver, 1987: 7-8). In most languages and cultures, home is a fundamental conceptual entity. People understand its meaning effortlessly, nearly unconsciously and employ it to anchor their being in the world (Dayarate and Kellett 2008).

In a world that is increasingly market-driven, many view housing cooperatives as the ultimate source of shelter for practically every income group (Rohan 1966: 1323). According to Hays (1993), housing cooperatives provide contemporary housing advocates that reinforce joint ownership of property among residents and empower both low- and moderate-income families. Under the cooperative structure, residents own and control their housing (Leavitt 1995), which stands in contrast to the traditionally subsidised rental housing in the majority of developing countries. With housing cooperatives, residents not only take responsibility for their actions, but also experience the direct consequences of those actions on the cost and quality of their housing (Thomas et al 1994).

The experience of developing countries, such as Egypt, Jordan, Kenya, Thailand, Indonesia, Colombia, Botswana and South Africa and developed countries, such as China, Australia, USA and Canada, demonstrates that cooperative practices share the same values of self-help, self-responsibility, democracy, equality, equity and solidarity. They apply the same principles of voluntary and open membership, democratic member control, member economic participation, autonomy and independence, provision of education, training and information, cooperation among cooperatives and concern for the community (Rwelamira 2010). They maintain the importance of the role of community in housing supply and offer feasible solutions through people’s direct participation (Malusardi and Kammeier 2002).

However, in the traditional form of cooperatives, in contrast to the modern cooperatives, members had a greater sense of commitment and belonging, mutual trust and voluntary involvement in the cooperative activities. Ouma (1988) argued that although these associations of group effort could be deemed as ‘self-help’, which is a form of cooperative, the modern cooperative movement owed much of the cooperative idea to the early practices. Kamau (2006) defined three main stages of the housing cooperative process (Fig 4):

1) Land acquisition stage, which begins with purchasing land, subdividing it into individual parcels with title deeds and installing the basic site infrastructure,

2) House construction stage, in which resident involvement begins from the earliest steps of planning and design through the on-site building work, including the purchase of building materials, “sweat equity” labour of residents, financing, administration, management and supervision, preparation of infrastructure networks and construction of other communal facilities on the site, and

3) House occupation stage, which encompasses completed houses, cases of “incremental” construction, landscaping and future improvements. Examples from developing countries show that people prefer to move into houses before completing them (incremental construction) to gradually divert the amount of rental expenditure into the final house construction.

Several principles can be learned from the housing cooperative practices. Mun (1992) defined the cooperative approach as more than simply the building of houses and describes it as “Community Development” through joining together and strengthening bonds, ties and support within the community. He added that it improves productivity due to the direct benefit of “group” labour and management and provides economies of scale...
through more efficient work practices, lower prices through bulk buying and delivery and sufficient guarantees for recovering the costs of land. Although Lewin (1981) explained that most of the problems that the self-help housing for low- and middle-income households face can only be solved within a framework or an organisation, a “cooperative society” that exercises internal control enables collective savings accumulation, repayment of loans, servicing costs, management and administration that allow members to participate in the process of establishing the housing cooperative.

According to Kamau (2006), this grouping can utilise “local materials and technologies” that are readily available, less costly than exported goods, create linkages with the local industry and generate employment. Burns and Shoup (1981) found that self-builders are more satisfied with the houses that they develop compared to people living in public rental housing due to their more active involvement in decisions that govern the planning of their neighbourhoods and the construction and maintenance of their dwellings.

Finally, Seeling (1978) discussed the possibilities of expanding or contracting the dwelling over time. This “flexibility and adaptability” in the size and space quality of the housing unit is important in two ways. First, it allows the family, according to its financial means, to improve its home over time. Second, it allows for the expansion of the unit as the family grows.

Analysis and Main Findings

The fieldwork was conducted in view of the previously provided definition of the housing cooperative. It constituted the emergence of 167 registered housing cooperatives in Palestine between 1958 and 2010, geographically situated as shown in Table 2. Gaza strip was excluded from the fieldwork because no housing cooperative was ever registered there. In the absence of clear and dynamic cooperative policies at the governmental or non-governmental levels, the majority of these cooperatives were accomplished by the community to avoid the segregation and polarisation of social classes among their members. A key to this ethos was the collegial and friendly relations, as cooperatives were established by engineers, teachers, medical personnel, government employees and workers in private establishments within a politicised context such as the Israeli-Palestinian problem. This situation likely called for a higher degree of “connectedness” and resolve among members of the cooperatives. This was observed in nearly all of the studied cooperatives. For example, in the Cooperatives of Employees in Jerusalem Water Undertake in Al...
Bireh, Birzeit University Employees’ Housing Cooperatives I & II in Ramallah, the Cooperative of Engineers in Nablus, the Post-office Employee’s Cooperative in Beit-Hanina, the social mix or social integration was a key component in avoiding the development of low-income ghettos. Despite this, the fieldwork confirmed that upon completion of the dwellings, most of cooperatives continued to exist only formally, providing annual administrative and financial reports to the Ministry of Labor, holding annual meetings and electing their administration, but no further incentives were created to help them strengthen their conditions.

Once the community group was formed, the cooperative members launched discussion on the type of cooperative they intend to establish, separate houses or apartment buildings. Accordingly, the discussion included the potential number of cooperative members and the specifications of the land they needed for construction and the required area, followed by the purchase of the land by self-

<table>
<thead>
<tr>
<th>No.</th>
<th>Governorate</th>
<th>No. of Cooperatives</th>
<th>Stages of Involvement</th>
<th>Typology of Construction for Houses from Occupation Stage</th>
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<tr>
<td></td>
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<td></td>
<td>Land Acquisition Stage</td>
<td>House Construction Stage</td>
</tr>
<tr>
<td>1</td>
<td>Jerusalem</td>
<td>25</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>Ramallah and Al-Bireh</td>
<td>72</td>
<td>55</td>
<td>44</td>
</tr>
<tr>
<td>3</td>
<td>Hebron</td>
<td>12</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Bethlehem</td>
<td>17</td>
<td>17</td>
<td>13</td>
</tr>
<tr>
<td>5</td>
<td>Nablus</td>
<td>13</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>Jenin</td>
<td>14</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
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<td>Tulkarem</td>
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<td>8</td>
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<td>-</td>
</tr>
<tr>
<td>9</td>
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<td>6</td>
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<td>3</td>
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<tr>
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</tr>
<tr>
<td></td>
<td>Totals</td>
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<td>139</td>
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</tr>
<tr>
<td></td>
<td>Percentage (%)</td>
<td></td>
<td>83</td>
<td>64</td>
</tr>
</tbody>
</table>

Table 2. Distribution of cooperative housing on the Palestinian Governorates according to the stages of involvement and the principles that characterised the housing cooperatives in Palestinian territories. Source: Author, based on data extracted from the documents provided by the Palestinian Ministry of Labor.
For both loans through the cooperative and mortgage system, the land was subdivided into parcels and each parcel was designated for use by one member.

The fieldwork illustrated that most of the housing cooperatives were located in the fringes of the major cities, mainly in the central mountainous area of Jerusalem, Ramallah and Bethlehem (Table 3). The distribution of the housing cooperatives was strongly affected by the socio-political and economic conditions in these locations before 1993, the concentration of PNA governmental institutions, local and foreign NGO headquarters, the settling of the majority of Palestinian returnees from overseas after 1994 and the system of Area jurisdictions (Areas A, B and C) ushered in by the Oslo Accord (Fig 5) (Table 4).

The Palestinian cooperative practice represents a multifaceted planning and architectural experience. The following three types of housing cooperatives were observed: apartment buildings, separate and row houses (Figs 6a and 7). The separate and row houses (the horizontal layout) were popular at the early stages (1958-1993) and the apartment type became well known in the late stages due to the previously mentioned reasons and the land speculations that began taking place at the local market. Beginning in the earliest stage, residents were involved in the production stage, including the plan and design, purchase of building materials, “sweat equity” labour, administration, management, supervision, preparation of infrastructure networks and construction of other communal facilities on the site. Members did not know the exact location of their share and the entire cooperative was built collectively to the end of the skeleton construction phase, which generated significant cost savings. Then, houses were distributed among members through a lottery. Further savings were generated from collective public works and services, including sidewalks, asphaltalting internal roads, internal underground works for electricity, water and telephone and common landscaping. The collective finishing of units was not common practice; however, for some projects, a few members completed their houses collectively.

All realised cooperatives were built using natural stone, materials produced locally and local...
building manpower and technologies, which were less costly than exported goods. The members’ labour participation was virtually non-existent because the education system in Palestine concentrates on academia and neglects the importance of training young generations in the field of Building Know-How. Therefore, their labour contribution was observed only in the finishing works that do not require a specific expertise, such as maintenance and landscaping.

The possibility of completing or expanding the dwelling over time comprises another area of concern. In the Palestinian case, flexibility and sustainability in the size, quality and gradual finishing of the dwelling is an important factor because it allows the family to complete its home while the family grows. The concern is due to factors such as the lack of sufficient financial means, continuous changes in the quantitative and qualitative structure of the family, changes at the personal level of the family members, including education, taste, desires and aspirations and changes in the lifestyle of either the family or the society (Ghadban 2003: 59).

For most of the observed cases, the members were 28-40 years old when their cooperatives were established. Due to their financial status, they began moving into their new houses before the houses were completed to gradually divert the

<table>
<thead>
<tr>
<th>No.</th>
<th>Area</th>
<th>No. of Cooperatives</th>
<th>Period of Establishment</th>
<th>Current Condition</th>
<th>Stage of Infrastructural Services</th>
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<tr>
<td>1</td>
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</tr>
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<td>Percentage (%)</td>
<td>100</td>
<td>33</td>
<td>67</td>
<td>56</td>
</tr>
</tbody>
</table>

Table 4. Distribution of cooperative housing on the areas defined by Oslo Peace Accord according to their number, period of establishment, current condition and infrastructural services. Source: Author, based on data extracted from the documents provided by the Palestinian Ministry of Labor.

rental expenditure (typically 25% of their monthly income) to the further completion of their houses on an incremental basis. This was manageable because the dwelling areas varied between 120-150m² for the apartment type and 180-220m² for separate and row houses, which were typically constructed on more than one level due to the hilly character of the land. The construction schema for all types allowed each member to design and continuously change the interior of his house. The horizontal typology was more adaptable because it allowed the adding of new floors, horizontal expansion, separation of the floors into independent dwellings or division of the large floors into smaller dwellings. This is evident in Table 4, as 52% of the housing cooperatives adopted the horizontal configuration (Fig 7).

Interviews with some key persons and residents of several housing cooperatives highlighted the diverse degree of owners’ satisfaction with both the process and the results. In most cases, the building process consumed a long period of time (6-8 years) and was largely conducted through individual financial means. This explains why the majority of cooperative members considered these dream houses that belonged to them and why they were willing to put forth all effort required meeting their expectations and needs.

The observations showed that less than 30% of the cooperatives members sold or rented out their dwellings and this action mainly applied to the apartments and row houses. Various factors led to the sale or renting of the dwellings, as follows: residents’ financial inability to complete the dwellings, disappointment with the quality of the construction, which fulfilled emergent needs rather than satisfying future needs, inability to create additional living space coupled with their desire to continue living with their children after they establish families, or failure to integrate into the community. In some cases, residents failed to integrate even though all of the members worked in the same organisation. For example, the great majority (approximately 85%) sold or rented out their units in the Municipality of Al-Bireh housing project (Fig 6a). Property speculations due to the increasing market prices motivated a significant number of stakeholders to sell their houses, which became overly close to the central urban area and search for another site to build new houses and accrue...
However, most of the newcomers wished to integrate into the cooperative’s life. After 2008, no new cooperatives were officially registered (Table 1).

However, a new phenomenon has recently been observed (Fig 8). People have organised “informal cooperatives” for the purpose of jointly building their own dwellings. They implement all of the stages and principles of cooperative formation but without officially registering as a cooperative entity. Based on ties of friendship, this approach allows the members to jointly purchase a suitable piece of land, obtain the required permits for their building project and begin the skeleton construction phase with their own resources. For the finishing works, each member obtains his savings from the deal.
own bank loan and gradually completes his dwelling on an “incremental” basis. All the while, the external finishing works, landscaping and internal control continue as a collective responsibility, which results in collective savings. It also enables the participation of all members in the processes of site planning, ongoing maintenance and improvement. However, this new approach provokes serious property speculations due to the increasing market prices, as some stakeholders seem to use the approach as a means to achieve financial gain rather than to solve a housing shortage.

Conclusions

The analysis of the Palestinian housing cooperative practice showed that it was carried out by people’s efforts and voluntary involvement, with very limited involvement from the government. The role of the government in this practice changed from innovator of idea and facilitator in 1956 to an absent body in 2010. The urban middle-income people appear to appreciate this method of housing, utilising various forms of housing cooperative solutions. However, high and low tides were evident between 1956 and 2010. Many of the reasons that were previously identified for promoting this housing practice remain relevant, such as the desire to form a community and acquire a dwelling to fulfil family needs and the desire for social acceptance, respect and personal dignity.

This practice is rich, thriving and full of lessons for the future. It has generally progressed through the main stages and principles of housing cooperative development, land acquisition, house construction and house occupation. Attempts to advance the cooperative housing concept must build on this practice and integrate it into the educational and training systems while increasing the public awareness about how to build a cooperative community that embodies strong social relations and shares an appropriate vision. This practice contains principles that could be learned, such as community development through a social-mix approach, variety of types, flexibility and adaptability through incremental development and the promotion of local materials and techniques. Comparing the present market prices, the present cost of a dwelling built by this approach is much cheaper than that of a new commercially built dwelling.

Finally, the need to enhance this practice is dictated by the rapid socio-economic and political transformation that the country faces. The entire process must be reviewed and assessed to ensure that the socio-economic realities are addressed and true cooperative principles are embraced. This can be accomplished through the adoption of new housing strategies and an adequate legislation while providing sufficient free space to advance the cooperative movement and emphasizing the primary value of people banding together to solve their housing problems through their own hands-on efforts.

Finally, the author hopes that the outcomes of this fieldwork will stimulate the development of further in-depth research. Such explorations might address the many aspects of the housing cooperatives in Palestine and lead to a clearer understanding of this practice and the other types of dwellings that have recently emerged in the Palestinian territories.
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1 Tanzimat literally means re-ordering; the work refers to the administrative reforms that divided the territories of the Ottoman Empire. Palestine was divided into three Sanjaks and administrative sectors.

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IMPLEMENTATION OF OPEN SPACE: THE NEED FOR UNIFORM POLICY?

Melasutra Md Dali, Safiah Muhammad Yusoff, Puteri Haryati Ibrahim

Abstract
The provision of open spaces within a residential development is often seen as unimportant. The Malaysian Government targeted to provide 2 hectares of open space per 1000 population to be achieved as a developed nation status by the year 2020. This vision can be seen as the Government attempt to ensure the sustainability of open spaces in Malaysia. The Federal Department of Town and Country Planning, Peninsular Malaysia (FDTCP) has produced a planning standard guideline to supervise the implementation of the open space policy in Malaysia. According to FDTCP; until December 2009, Malaysia has achieved a percentage of 1.19 hectares of open space per 1000 population. Achieving the standard requires commitment of local authorities to implement the open space policy. However, the adoption of open spaces policy differs among local authorities, from a simplistic general approach of land ratio techniques to an ergonomics method. The paper examines the local allocation practices using 5 different approaches and it argues that implementation of open space by local planning practices requires the knowledge of and understanding by planning profession towards a long term sustainable green objectives.

Keywords: Open Space Policy, Residential Development, Urban Planning, Local Authority Planning, Environment Sustainability.

Introduction
The importance of open areas or open spaces has been widely covered by writers and researchers. This is because open spaces provide huge benefit to human lives in terms of quality of life. However, a review by Luqman et al. (1999) highlights the fact that developments in cities are being designed solely to emphasize commercial values and profits. Green spaces are sacrificed to make way for the development in cities. This has resulted in the neglected interest and welfare of city dwellers as the developers’ main focus is to reap maximum return on investment. By and large, developers have not been adequately providing open spaces for city dwellers for outdoor activities. Sometimes the provision of open spaces is merely to meet the approval requirements set by state governments and local authorities (LA’s). Therefore, it is important that the state governments in Malaysia ensure that the implementation policy for its open spaces is in accordance with the Planning Standard Guidelines for Open Spaces and Recreation (JBPD 7/2000) issued by the Federal Department of Town and Country Planning, Peninsular Malaysia (FDTCP). The commitment by each LA to implement the open space policy within their respective jurisdiction is a key step in ensuring that the provision for open spaces is not ignored by the developers in their proposed developments. Thus, the research will be focusing into the aspect of policy implementation by the decision maker and planning administrative at the local level. Emphasis on the implementation and application of open space policy is the first step taken before a development can be approved. Therefore, strong enforcement by the LA’s will is highly needed to ensure the sustainability of open spaces will be more secure.

Definition of Open Spaces
It is believed that the term ‘open space’ was first used in 1833 by a committee in a “public trail” in London. This committee is also believed to be the agency responsible for creating the term ‘open spaces’ (Maruani & Amit-Cohen, 2007, p.4). The usability and design of open spaces evolved in line with the developments and trends of the times. Today, the term ‘open spaces’ is adopted worldwide as areas for various activities such as recreation and as places to meet and socialize. In the Malaysian local context, the definition of open spaces under Section 2 (1) Town and Country Planning Act 1976 (Act 172) is “any land that is
enclosed or not enclosed, for use or reserved for the use in whole or in parts as public gardens, public parks, public sports and recreational fields, tourism areas, pathways or public places” (p.15). In general, open spaces can be considered as an open area designated for the public to carry out their recreational activities. Grose (2009) has similar views with regards to the definition of open spaces as that in Act 172, and defines open spaces as ‘public spaces’. It can be deduced from the definitions in Act 172 and writings of Grose that open spaces are areas built for public recreational purposes. Thus, it should be noted that the term ‘open spaces’ used in this paper refers to the open spaces in residential areas provided for the public use of recreational activities.

3.0 Conservation of open space as a tool for sustainable development

It is widely known when a new development occurs it involves the opening of an area. The total area of development is based on the capital and the greatness of the project to be developed. If the development occurred on the outskirts of town; the problem of land is not a big issue. However, if the location of the project is in the city centre, developer will face a problem to find a suitable location. Review of Girling and Helphand (1994) indicates that green space is gradually decreasing in addition to the development of more houses especially in urban area. This situation is in line with the current situation in Malaysia in which the urban population will increase up to 70 percent by the year 2020 (Department of Statistics Malaysia, 2000). Review of Bengston, Fletcher et al. (2004), states open space protection is the main issue of sustainable development. This is because to achieve the objective of sustainable development, it should have some allocation of open spaces for public use. Developers are required to provide open spaces and greenery in each development undertaken. This is important for the fact that people need open spaces to perform outdoor activities while green areas are necessary to act as a buffer zone and green belt area. Open spaces provision indirectly provides ‘balance’ between development and environmental protection. Thus it appears clearly that conservation of open space is one of the right ways to accomplish sustainable development. Therefore, preservation of such spaces is highly important to ensure a better quality of life can be achieved.

4.0 Existing Policy for Open Spaces in Malaysia

As a result of rapid development urban areas are experiencing a critical shortage of green areas. Thus, for every development within and near urban areas, the location and allocation of open spaces must be seriously considered by the authorities to prevent the reduction in the urban green areas due to development. To realise the concept of “a city in a park” mooted by the former Prime Minister of Malaysia, His Excellency Tun Dr Mahathir Mohamad, FDTCP issued a general guideline which is the JBPD 7/2000. The main objective of the guideline is to assist state governments through their respective LAs to achieve the vision in making Malaysia a “Garden Nation”. The intention of the guideline is to assist town planners, developers, and the general public to better understand the key issues of open spaces with respect to financial provisions, sizes, definitions, usage, and design requirements that must be met. With respect to open spaces, the Town and Country Planning Act 1976 (Act 172) is important and relevant as open spaces are clearly defined in this Act. As stated in Section 2.0, a clear description of what constitutes ‘open spaces’ in Act 172 is vital as it serves as the basis of reference in defining the true meaning of open spaces in the Malaysian context. The provisions in the Act seem to be genuine and workable. The approaches and measures by the government in the agenda are to ensure the preservation and sustainability of open spaces and green areas in the country.

5.0 Implementation of Open Spaces Policy at States Level

Malaysia comprises of 14 states, 12 states are located in Peninsular Malaysia, while Sabah and Sarawak located in Borneo Island. In relation to open space policy, the 11 states in Peninsular Malaysia are bounded by the Act 172 (Town and Country Planning Act) with exception of Federal Territory of Kuala Lumpur, Sabah and Sarawak. The Town and Country Planning Act 1976 (Act 172) was passed by the Malaysian Parliament with the intention to coordinate matters relating to the laws and town and country planning in all the states of Peninsular Malaysia (Lee, Abdul Mutalip et al., 1990; Goh, 1991). The states under Federal Territories (Kuala Lumpur, Labuan and Putrajaya), Sabah and Sarawak, as mentioned uses its own act because the states under the Federal Territories have adopted the Federal Territory Act 1982 (Act 267). Likewise, Sabah and Sarawak are not bound
by Act 172 because the two states have adopted different acts which is referred to as the Town and Country Planning Ordinance (Sabah Cap.141) and the Town and Country Planning Ordinance (Sarawak Cap.87) (Phang, 2006; Zakaria, 2006; Ainul Jaria and Bashiran Begum, 2009). (Figure 1)

In general, FDTC has set a policy of 10 percent for open spaces for each development application. However, the 10 percent policy is merely a base reference. According to FDTC (2009), the states bound by Act 172 have the option of implementing the open spaces policy in various ways for development in their respective states. Table 1 shows the guidelines for open spaces adopted by the states that are enacted under Act 172. It is believed that the adoption of open spaces policy differs among LAs within states because many LAs are responsible for all administrative matters at the local level. Each authority has its own guidelines with respect to matters in open spaces. Table 1 present five basic types of approaches that the 11 state governments in Peninsular Malaysia adopt to determine the appropriate guidelines for use in their respective areas. The approaches can be divided into general, ergonomics space, land ownership, number of housing units, and the size of the development area. The common denominator is the provisions of open spaces, but the approaches differ because of the differences in economic development status, population, demand, and physical locations of the approved areas. Below is a brief discussion of the guidelines:

5.1 General Approach

The ‘general approach’ implemented by Negeri Sembilan and Kelantan is based on the basic 10 percent provision of open spaces for all types of residential development. The general approach is applied in total (stand-alone) or as a continuous policy as set by FDTC.

5.2 Ergonomic Space Approach

The ergonomic space approach implemented in Pulau Pinang for the provision of open spaces refers to the measured requirements for an individual to feel comfortable. The measurement for an ideal ergonomic space can be visualised by stretching out both human arms. The ergonomic space with an area of 2m x 2m for each individual is believed to be ample for the individual to move freely and feel comfortable in carrying out activities in open spaces.

5.3 Land Ownership Approach

Determining the percentage for the provision of open spaces for each development in Terengganu is based on the ‘land title’ or ‘land use’ areas to be developed. The 10 percent provision approach is not easy to apply for developments on government land because the LAs are occasionally forced to be lenient towards certain parties who request exemptions.
Perlis, Pahang, and Kedah adopt the number of housing unit approach to determine the percentage for the provision of open spaces required of the developer. However, it was discovered that the conditions under which this approach is implemented differ between the three states because the number of developments and population differ greatly.

Table 1. Existing Open Spaces Guidelines in the States of Peninsular Malaysia Source: Federal Department of Town and Country Planning, Peninsular Malaysia (2009).

5.4 Number of Housing Unit Approach

Selangor
- for development of ≥ 10 acres, 10% of open spaces must be provided
- for development of 5 – 10 acres, option to provide open spaces or pay contribution fees
- for development of ≤ 5 acres, payment of contribution fee based on the following rates:
  - RM 50,000/acre for areas within the Klang Valley
  - RM 35,000/acre for areas outside the Klang Valley

Guideline Manual for Selangor
- for development ≥ 10 acres, provision of 10% of open spaces
- for development ≤ 5 acres, provision of 5% of open spaces

Perak
- adopts the 10% base for open spaces
- for development > 5 acres
  - semi-detached housing and bungalow development, approximately 7% of open spaces must be provided
  - low cost, medium high/low cost housing, flats development, 10% of open spaces must be provided
- for development ≤ 5 acres
  - semi-detached housing and bungalow development NOT required to provide any open spaces
  - low cost, medium high/low cost housing, flats development, 5% of open spaces must be provided

Johor
- at least 10% of the size of the development site
- from the total, 7% must be the absolute open spaces and 3% can be considered from the public facility reserves handed over to the government.
- exemption to the application for housing development of less than 2 acres, also for application for homestead development.
- For the purpose of calculating open spaces, 30% from the public facilities can be considered as open spaces.

5.5 Size of Development Area Approach

There are four states that have adopted the size of development area approach as a method to determine the percentage for the provision of open spaces required of the developers. In Melaka, for developments that achieve the minimum qualification, the provision of open spaces by the developer is at the discretion and goodwill of the LA. While in Selangor, developers are required to pay a contribution to the LA if they cannot meet the provision of open spaces due to limited land or minimum development qualification. In Perak, the emphasis is on
the provision of open spaces for high-rise housing development. Developers are not given any leniency in the provision of open spaces for high-rise housing development. Last but not least, the state of Johor breaks down the percentages for the provision of open spaces into ‘absolute open spaces’ and public facilities. ‘Absolute open space’ here means a completely open area.

Undoubtedly, the five approaches discussed have their own issues and problems. Whichever the approach adopted, it should promote the provision of sustainable open spaces for public use. However, each approach adopted must be implemented with a single goal, which is to ensure that the provision of open spaces in housing developments cannot be easily neglected.

6.0 Research Approach

As the research focus on policy implementation by the decision maker and planning administrative at the local level, respondents involved in the survey were the town planning officers and their technical assistants. The survey manages to obtain a sample size of 240 units with response rates of 52.6% from 98 local authorities in Peninsular Malaysia. The first section of the research looks into personal information of the respondents such as gender, age, job position and council status. Section 1 of the survey will include questions with regards to dissimilarity in application of open space policy among LAs, Section 2 will be discussing on independent policy implemented by the states in Peninsular Malaysia. Finally, Section 3 will talk about the effectiveness of the JBPD 7/2000 guideline.

7.0 Research Findings

The research findings indicate male respondents formed the majority (59.6%) of the respondents; the remaining 40.4% are female respondents. The average age of respondents was 35 years old. The planning officers formed the major group of the respondents with 57.5% while the remaining 42.5% was the response of the technical assistants. The respondents involve in the survey work in three categories of council status which are city council, municipal council and district council. Majority of the respondents work in a municipal council that comprises of 43.9%; followed by a district council that is 43.1% and 13% out of the respondents work in a city council.

<table>
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<tr>
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</tr>
</tbody>
</table>

Table 2. Dissimilarity in application of JBPD 7/2000 guideline

<table>
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<th>Frequency</th>
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<td>Agree</td>
<td>162</td>
</tr>
<tr>
<td>Total</td>
<td>236</td>
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</tbody>
</table>

Table 3. Difference in application is due to development situation

Different application of open space policy by LAs.

The first section of the survey was to investigate the differences in the application of open space policy guideline by the LAs from 11 states in Peninsular Malaysia. Two questions were asked to draw out respondent’s opinion with regards to the differentiation; (1) do the respondent’s aware of dissimilarity in the application of JBPD 7/2000 guideline among LAs; and (2) the differences in application of JBPD 7/2000 is due to the development situation in the jurisdiction.

As expected, majority of respondents stated that they are aware of the differences in application of JBPD 7/2000 guideline among LAs. Table 2 shows high percentage of 91.7% (n = 220) agree with the statement. Out of 240 respondents only 5 was not aware of the differences and 13 was not sure. The result provides initial observation; majority of the respondents are highly experience planning professionals. A small percentage of 2.1% that was not aware of the differences was probably young and inexperienced respondents.

Table 3 also indicates high percentage in term of agreement - more than half of the respondents agree (67.5%) the differences in application of the JBPD 7/2000 guidelines is because of development situation. The remaining 32.5% was not sure and disagree with explanation of diverse application of the JBPD 7/2000 guideline by LAs in Malaysia is because of distinction in development pace. The initial result from the two questions can be concluded; the JBPD 7/2000 is standard open space guideline used by the states government for the purpose of open spaces provision. However, through the respective LAs the guideline has been “adopted and adapted” to suit with the development situation in jurisdiction.
Different guideline approaches implemented by the state governments.

Section 2 of the survey focus on independent policy implemented by the states in Peninsular Malaysia. As been indicated in Table 1, there are five basic types of approaches that the state governments adopt from the JBPD 7/2000 guideline pertaining to open space provision. The approaches was different and independent therefore what is seem to be appropriate to be implemented in one state might not be suitable to other. Consequently, the state government needs to determine the most appropriate procedure for the use in their respective areas. In Section 2, respondents were asked to select the open space guideline application that is put into practice by the LAs they work with. The purpose of the question is to calculate the percentage for each methods of open space policy application used. Before proceeding with the question, the research needs to explore the distribution number of LAs for the 11 states in Peninsular Malaysia.

Table 4 presents the statistics of LAs based on their status that are bounded under Act 172. It was observed the state of Kelantan, Kedah, Pahang, Perak, Johor and Selangor have more than 10 LAs for each state regardless of council status. Three states has the least number of LAs which are Perlis (1); Pulau Pinang (2); followed by the state of Melaka (4). Last but not least, the state of Terengganu has 7 LAs and the state of Negeri Sembilan has 8 LAs. The number of LAs in each state is indeed important in the survey because it will affect the estimated potential respondents.

Table 5 shows the percentage of guideline application that was put into practice by respondents involves in the survey. Out of five types guideline approaches used by the 11 states in Peninsular Malaysia; total of land development method scores the highest percentage of 50.9% (n = 112). In this method, the size of open spaces in an area will be based on calculation; 10 percent out of total development size.

As expected this method will have the highest fraction because four states adopted this approach. The second highest percentage score is the total of housing unit method and three states opted for this approach with 21.4% (n = 47) of respondents indicated this technique is put into practice by the LAs they work with. In this method the amount of open spaces need to be provided in a development will depend on the numbers of houses built. The general approach which is implemented by the state of Kelantan and Negeri Sembilan, scores the third highest percentage with 19.5% (n = 20) followed by the land ownership approach with 6.4%. (n = 7) applied in Terengganu. The lowest percentage of 1.8% (n = 4) is the ergonomic space approach which was implemented by a single state in Peninsular Malaysia; Pulau Pinang. Considering the distribution of LAs in Table 3 confirm the percentage and number of responses obtained in the survey. It was difficult to accomplish higher number of respondents in the states that have a few LAs. Other than that the types of guideline application opted by the state government also play important roles in anticipating the result.

Effectiveness of the JBPD 7/2000 guideline.

Although the 11 states have options of implementing the open space policy in different ways the JBPD 7/2000 guideline plays an important role to prevail the general parameters with regards to open space provisions. As an attempt to investigate views on the effectiveness of the JBPD 7/2000 guideline among LAs town planners and technical assistants; series of questions were asked to elicit their opinion with regards to the stated guideline. The identified attributes listed to measure effectiveness in the study are (1) do the respondents feel the guideline is important for open space planning; (2) to what extent the respondent think the guideline is a useful planning tool; (3) usage of the guideline as a reference material in daily work.

As expected; majority of respondents feel that JBPD 7/2000 guideline is indeed a very important guideline. Table 6 shows a total of 53.3% (n = 128) agree the guideline is indeed significant for open space planning. The remaining 27.5% dis-
Table 6. Important Policy and Useful Planning Tool.

<table>
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<th>Useful Planning Tool</th>
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<tr>
<td>Not sure</td>
<td>45</td>
</tr>
<tr>
<td>Agree</td>
<td>128</td>
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<tr>
<td>Total</td>
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</tr>
</tbody>
</table>

agree with the statement and 18.9% was unsure. Even though there was a big difference in agreement for this, Table 6 also indicates almost half of the respondents (49.2%, n = 118) agree the guideline is a useful planning tool. This is because the guideline indicates detail parameter pertaining to open space planning. The results provide an idea that the guideline is considered fundamental with respondent’s nature of work. The JBpd 7/2000 guideline can be said as an essential reference material in the preparation of conducive open spaces.

The effectiveness of the guideline further examined with regards to its usage as a reference material. The result indicated 44.6% (n = 107) of respondents stated they always use the JBPD 7/2000 guideline in their daily work and 29.6% indicated they seldom use the guideline. Of those who responded, only 59 (24.6%) said they never use the JBPD 7/2000 guideline. The research predicted this is probably because of the nature of their work. The Planning Department in LAs have various units such as planning control, GIS and research and development unit. Therefore, it was envisaged respondents who never use the guideline does not involve in process of planning permission.

The research further interested to know usage rate among three council groups namely; city council, municipal council and district council. Based on the descriptive analysis obtained, there were differences observed between the means. District council had achieve the highest mean score (M = 4.76, SD = 1.660) followed by municipal council (M = 4.83, SD = 1.700) and city council (M = 3.77, SD = 1.765). However it should be noted; higher mean scores for the district council group does not signify respondents from other councils is less using the JBPD 7/2000 guideline. It was observed higher number of respondents a single council group will contribute to higher mean scores.

<table>
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</tbody>
</table>


At first a one way analysis of variance was conducted to examine the usage rate among the three council groups. An interesting finding was discovered in term frequency of usage by respondents working in city council, municipal council and district council. The result in Table 7 indicates; there was a significant difference in the usage of the guideline among the groups [F(2,233) = 6.855, p = 0.001]. Despite reaching statistically significance the effect size, calculated using eta squared was 0.0555. This mean only 5.55% of the variances in JBPD 7/2000 guideline usage is explained by the difference among the levels within the council status. According to the guidelines proposed by Cohen (1988, p.284-7) for interpreting the value of eta squared; 0.0555 is considered small. In addition, a Post Hoc comparison using Scheffe test was carried out to identify the differences occur between the three council groups. The output of the Post Hoc test indicated that the difference in the mean scores between city council (M = 3.77, SD = 1.765) and municipal council (M = 4.83, SD = 1.700) and between city council (M = 3.77, SD = 1.765) and district council (M = 4.76, SD = 1.660) are statistically significant with p = 0.001. However, the difference between municipal council (M = 4.83, SD = 1.700) and district council (M = 4.76, SD = 1.660) was observed to be not statistically significant.

8.0 Discussion

Clearly, policies with respect to open spaces adopted by the states in Peninsular Malaysia differ from one another. This is because the JBPD 7/2000 guideline issued by FDTCP is a general guideline. The guideline describes the need for open spaces in every development. It outlines several approaches that must be adopted by all parties involved in ensuring the provision of open spaces for public use. For that reason, all state governments have taken the initiative to produce guidelines specifically to assist their respective LAs to carry out their tasks in realizing the government’s vision for Malaysia to become a garden nation. High awareness level among town planners and technical assistants regarding different application of the JBPD 7/2000 guideline was expected since as a decision maker and planning administrator in the LAs; both town planners and technical assistants are the main implementer of the open space policy at their jurisdiction. Therefore, respondents are aware open space policy adopted by the states governments is
different and independent. Apparently several approaches that have been discussed will raise issues and problems.

Even though the FDTCP has set a policy of 10 percent for open spaces for each development application, the 10 percent policy of open spaces for each development maybe difficult to implement in states with developed status. A good example is Pulau Pinang, with its excellent geographical location and very rapid development. However, the size of the main areas on the island is rather small making it difficult for Pulau Pinang to cope with the rapid development in the state. This has resulted in most housing developments being high-rises. The state government has provided an alternative, which is the provision of ‘roof top gardens’ to replace the open spaces. Roof top gardens seem to be a good solution to overcome the land shortage in Pulau Pinang. However, roof top gardens in the context of the definition of open spaces in the Town and Country Planning Act 1976 (Act 172), do not conform to open spaces for public use as highlighted in the said Act. Roof top gardens are clearly not for public use because it is the exclusive rights of the owner of the high-rise.

The research also interested to investigate the effectiveness of the JBPD 7/2000 guideline in the opinion of LAs town planners and technical assistants. However, review of Koomen, Dekkers et al. (2008) states, the effectiveness of a policy is difficult to be analysed. This is because according to Ingram and Mann (1980) success or failure of an established policy is very subjective depending on the person who evaluates it. Based on the result obtained, it can be assumed the JBPD 7/2000 guideline has been productively helping LAs planning professionals in the matter of open spaces planning. In term of usability of JBPD 7/2000 guideline between councils, the researcher expects the differences occur between respondent’s working in city council and district council is because of development situation. It is well known that development rate in rural areas are less compare to urban areas therefore respondent’s working in city council might receive more application for planning permission. Thus it will lead to more usage of the JBPD 7/2000 guideline for reference purposes. Therefore higher usage of the guideline as a reference material is expected from respondents working in urban areas because the planning administration and decision maker need to be more stringent in term of open space matter since urban areas are experiencing land shortage and high demand from the public.

On the other hand, there are several factors that contribute to the ineffectiveness of policies initiated by the government. The demand or the need for open spaces is a factor in determining the effectiveness of an implemented policy. Population density, especially in large towns, causes residents to demand provision of more open spaces for them to release stress from the daily hustle and bustle as well as congestion of urban environments. It is believed that LAs in states experiencing rapid development like Johor are more stringent in ensuring that the open space policy is implemented properly. The Johor state government stresses the need for a 7 percent absolute open space out of the 10 percent required of developers. The “no compromise” approach by the Perak state government requiring developers to provide open spaces irrespective of the development size should be an exemplary. There are other scenarios in states experiencing slow economic development as in Perlis and Kelantan. The need for open spaces by residents in the two states is not as critical as that faced by the residents of Selangor and Pulau Pinang. This may be due to an abundance of unused areas, and subsequently, the states possess plenty of green areas. The LAs are believed to be concentrating on the main affairs such as formulating strategies and ensuring the provision of good infrastructure in their respective areas. Thus, it is not surprising that the implementation of policies with respect to open spaces in these states is not as stringent compared to that for states that are experiencing more rapid development.

9.0 Conclusion

It can be summarized that the above discussion clearly shows that the different applications and implementation of the provision of open spaces policies by the states implied in the Town and Country Act 1976 (Act 172) may have several implications within the context of the government’s target to provide 2 hectares of open spaces for every 1,000 residents as achieved by developed countries (as; New York, Melbourne and Toronto). In line with Vision 2020 for Malaysia to become a developed country, several important steps must be taken to ensure that this target can be achieved. The issuance of the JBPD 7/2000 guideline by FDTCP is a prudent move to ensure that the provision of open spaces for public use is not neglected. However, a uniform guideline should be issued by FDTCP to standardize the application and implementation of open spaces policies in all states. The uniform guideline should focus on the various types of development rate undergone by the states. This is difficult task but important in order to avoid the implementation of open spaces policy in states that are not facing a critical need for open spaces.
FDTCP should not focus solely on the total average of open spaces for each state, but should recognize the differences of size and growth rates. In other words, the policy formulated should be responsive to growth pressures and at the states level the willingness to change the state policy environments. As discussed, the introduction of the alternative rooftop gardens to replace the provision of open spaces for high-rise housing in Pulau Pinang is an effort at conforming to the criteria in terms of definition, and thus the definition of open spaces as in Act 172 and its related policy application should be expanded.

Acknowledgement

The authors would like to thank the Research and Development Unit, Federal Department of Town and Country Planning, Peninsular Malaysia (FDTCP) for the information and support given.

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1 All the 11 states are Johor, Kedah, Kelantan, Melaka, Negeri Sembilan, Pahang, Pulau Pinang, Perak, Perlis, Selangor, and Terengganu.


3 The questionnaire survey was conducted for a period of three months from 1st January 2011 and ended on 31st March 2011 using a mail method. Since the study will be focusing on the execution of the Planning Standards and Guidelines for Open Space and Recreational Areas (JBPD 7/2000) among local authorities in Peninsular Malaysia; for the purpose of writing, this guideline will subsequently be referred as the JBPD 7/2000 guideline.

4 Melaka, Perak, Johor and Selangor.

5 Kedah, Perlis and Pahang.

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LANDSCAPE AND SUSTAINABILITY: THREE RESIDENTIAL COLLEGE BUILDINGS IN THE TROPICS

ADI AINURZAMAN JAMALUDIN, NILA KEUMALA, ATI ROSEMARY MOHD ARIFFIN, HAZREENA HUSSEIN

Abstract
Three residential colleges located in a university campus at the capital city of Kuala Lumpur and built in different decades were selected for landscape studies with respect to species and position of the trees, as well as the effects of the current landscapes as a shelter in reducing solar radiation on buildings, as a pre-assessment for the Low Carbon Cities Framework (LCCF) and assessment system. These landscape designs were carefully studied through on-site observation. The name and location of the matured plants were redrawn and visualised with standard normal photographs. The studies revealed that the old residential college landscape is dominated by tropical forest trees which are able to provide a significant shade to the buildings and offered a potential to achieve sustainable development due to a higher rate of carbon sequestration. While, palm and hybrid fruit plants were most extensively cultivated in the landscape of new residential colleges due to low maintenance and being fast growing.

Keywords: Residential College, Landscape Design, Low Carbon Cities Framework (LCCF), Sustainable Development, Tropical.

Introduction
Urbanization magnifies the microclimate and global carbon cycle. The changes of the land physical surface from natural or semi-natural ecosystems to build structures create typically darker surfaces while emitting large amounts of CO2 due to energy consumption and transportation (Akbari et al., 2001; Sani & Sham, 2007; Chen et al., 2011; Strohbach et al., 2012). Moreover, Jim and Chen (2009) found out that the rapid urbanization and massive infrastructure developments affect the urban plant diversity and landscape patterns. Therefore, much research on the landscape has been carried out recently in achieving sustainable development and a healthier environment especially in urban areas (Vilenishe, 2008; Matsuoka, 2010; Selman, 2010; Ling & Dale, 2011; Thompson, 2011; Zheng et al., 2011).

Based on a case study in Guangzhou, China, He and Jia (2007) proposed a framework of three dimensions for implementing sustainable concepts in residential landscapes in the urban context, which includes ecology, socioeconomic and cultural aspects. Then, Lau and Yang (2009) have discussed introducing the natural space and its potential role with the objective of creating a health-supportive and sustainable campus environment through four design strategies. 1. Enhance visual connections of the healing gardens and their surroundings, 2. Manipulate space morphology to improve user perception, 3. Careful plant selection and, 4. Use of green roof gardens and green walls. These four strategies are relevant to the area with compact and high-density profiles when the existing green spaces do not encourage large groups of people to access them and which the common phenomenon now in urban areas is.

The presence of a landscape provides better environments than open sky (Monteiro & Alucci, 2009) when significant filtration capability of the tree canopy contributes to reduce terrestrial radiation, cooling the ground surfaces by promoting more latent heat, reducing air temperature by promoting more evapotranspiration and effectively improves the outdoor thermal comfort particularly in tropical open spaces (Shahidan et al., 2010). According to Tooke et al. (2011), trees on average reduce 38% of the total solar radiation received by residential building rooftops and strong correlations were found between measures of tree structure (average height, three height variability, and normalized tree volume) and intercepted direct radiation in the summer. Then, the potential and capability of landscapes; as well
as of specific species of tree, as carbon sequestration by fixing CO₂ during photosynthesis and storing the excess carbon through its biomass (Nowak & Crane, 2002; Gratani & Varone, 2006) have been extensively documented especially in urban areas Gratani & Varone, 2007; Tratalos et al., 2007; Hutyra et al., 2011; Strohbach & Haase, 2012).

In Malaysia, the landscape was highlighted as an element to support holistic sustainable development. The urban greenery and environmental quality is one of the performance criteria for the Low Carbon Cities Framework (LCCF) and assessment system, as an urban environmental element. The LCCF is an extension of Malaysia National Green Technology Policy to contribute towards the Prime Minister’s commitment at United Nations Climate Change Conference Copenhagen (COP15), where a conditional voluntary target to reduce carbon emission intensity of up to 40 per cent of Gross Domestic Product (GDP) as compared to 2005 levels, where Greenhouse Gas (GHG) reduction approach is used in this document (KeTTHA, 2011).

Generally, there are four key elements of LCCF and its assessment system namely urban environment, urban transport, urban infrastructure and building as shown detailed in Table 1.

Under these four key elements, there are further 13 performance criteria and 35 sub-criteria to help stakeholders to comprehend the carbon footprint, as well as to assist in taking the applicable reduction measures (KeTTHA, 2011). Focusing on performance criteria UE 3 - Urban greenery and environmental quality, carbon emission reference and recommendations for carbon emission reduction were detailed out as presented in Table 2.

Regarding the sub-criteria UE 3-2 Green open space and UE 3-3 Number of trees, there are two relevant carbon factors where the environmental quality can be improved through strategic plans which are, 1. Increase in green open space/trees resulting in...
an increase in carbon sequestration, and 2. The types of trees and vegetation determine the quantity of CO2 being sequestered (KeTTHA, 2011).

Nevertheless, the rate of carbon sequestration depends on the growth characteristics of the tree species, the conditions for growth and where the tree is planted (Gratani & Varone, 2005), whilst it is the greatest in a large tree with relatively long life spans (Nowak et al., 2002). Then, the amount of CO2 sequestered in a tree can be estimated given the tree’s age, trunk diameter and height (KeTTHA, 2011).

The aim of this work is to study the landscapes of three residential colleges which were built in three different decades, with respect to species and position of the trees. The landscape design of residential colleges and its effects as a shelter in reducing solar radiation on the building were studied. Indirectly, it becomes a pre-assessment of the approaches of the LCCF and assessment systems under the performance criteria of urban greenery and environment quality. The approach will only be mitigated a particular selected sector as described in the main criteria and not all the criteria in the LCCF will be considered (KeTTHA, 2011).

### Research method and its application

#### Residential college description

Three residential colleges with different years of establishment were chosen in this study, name-
Table 3. Description of the three residential colleges.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Residential colleges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year established</td>
<td>CS-A 1966</td>
</tr>
<tr>
<td></td>
<td>CS-B 1985</td>
</tr>
<tr>
<td></td>
<td>CS-C 1997</td>
</tr>
<tr>
<td>Form of building</td>
<td>Low-rise</td>
</tr>
<tr>
<td></td>
<td>Low-rise</td>
</tr>
<tr>
<td></td>
<td>Low-rise</td>
</tr>
<tr>
<td>Building layout &amp; arrangement</td>
<td>Courtyard arrangement</td>
</tr>
<tr>
<td></td>
<td>Linear arrangement</td>
</tr>
<tr>
<td></td>
<td>Courtyard arrangement</td>
</tr>
<tr>
<td>Orientation to sun path</td>
<td>N-S</td>
</tr>
<tr>
<td></td>
<td>N-S, NW-SE &amp; NE-SW</td>
</tr>
<tr>
<td></td>
<td>N-S &amp; W-E</td>
</tr>
<tr>
<td>Shape of the building’s floor plate</td>
<td>Rectangle</td>
</tr>
<tr>
<td></td>
<td>Rectangle</td>
</tr>
<tr>
<td></td>
<td>L-shape</td>
</tr>
<tr>
<td>Wind direction of the locality</td>
<td>SW</td>
</tr>
<tr>
<td></td>
<td>SW</td>
</tr>
<tr>
<td></td>
<td>SW</td>
</tr>
<tr>
<td>Floor level (excluding GF)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Capacity / No. of residents</td>
<td>885</td>
</tr>
<tr>
<td></td>
<td>765</td>
</tr>
<tr>
<td></td>
<td>897</td>
</tr>
<tr>
<td>Total floor area (m²)</td>
<td>18,212.51</td>
</tr>
<tr>
<td></td>
<td>11,274.23</td>
</tr>
<tr>
<td></td>
<td>34,305.32</td>
</tr>
<tr>
<td>Density (No. of residents/m²)</td>
<td>0.049</td>
</tr>
<tr>
<td></td>
<td>0.062</td>
</tr>
<tr>
<td></td>
<td>0.026</td>
</tr>
<tr>
<td>EEI (kWh/m²/year)</td>
<td>34.52</td>
</tr>
<tr>
<td></td>
<td>83.96</td>
</tr>
<tr>
<td></td>
<td>24.23</td>
</tr>
<tr>
<td>Typical room’s floor area (m²)</td>
<td>16.35</td>
</tr>
<tr>
<td></td>
<td>14.78</td>
</tr>
<tr>
<td></td>
<td>20.00</td>
</tr>
<tr>
<td>Typical room volume (m³)</td>
<td>45.78</td>
</tr>
<tr>
<td></td>
<td>47.30</td>
</tr>
<tr>
<td></td>
<td>57.40</td>
</tr>
<tr>
<td>Window area (m²)</td>
<td>6.41</td>
</tr>
<tr>
<td></td>
<td>3.34</td>
</tr>
<tr>
<td></td>
<td>Type A: 1.65 / Type B: 4.12</td>
</tr>
<tr>
<td>Window to wall ratio</td>
<td>0.66</td>
</tr>
<tr>
<td></td>
<td>0.38</td>
</tr>
<tr>
<td></td>
<td>Type A: 0.14 / Type B: 0.36</td>
</tr>
<tr>
<td>Operable window area (m²)</td>
<td>4.20</td>
</tr>
<tr>
<td></td>
<td>3.34</td>
</tr>
<tr>
<td></td>
<td>Type A: 1.10 / Type B: 2.75</td>
</tr>
<tr>
<td>Operable window to wall ratio</td>
<td>0.43</td>
</tr>
<tr>
<td></td>
<td>0.38</td>
</tr>
<tr>
<td></td>
<td>Type A: 0.1 / Type B: 0.24</td>
</tr>
<tr>
<td>Window design</td>
<td>Centre pivot &amp; awning</td>
</tr>
<tr>
<td></td>
<td>Louver</td>
</tr>
<tr>
<td></td>
<td>Casement &amp; Turn window</td>
</tr>
<tr>
<td>Window location</td>
<td>N-S</td>
</tr>
<tr>
<td></td>
<td>N-S, NW-SE &amp; NE-SW</td>
</tr>
<tr>
<td></td>
<td>N-S &amp; W-E</td>
</tr>
<tr>
<td>Ratio of soft and hard landscape</td>
<td>61.39</td>
</tr>
<tr>
<td></td>
<td>72.28</td>
</tr>
<tr>
<td></td>
<td>58.42</td>
</tr>
</tbody>
</table>

Note: N - North, E - East, S - South, W - West, NW - Northwest, NE - Northeast, SE - Southeast, SW - Southwest EEI - Energy efficiency Index

Landscape design studies

The buildings’ drawings, which include a site plan, architectural and landscape drawings, were the main source of data for the landscape design studies. Site observations on each residential college were also carried out in order to gauge actual conditions, since most of the drawings were drawn 30 to 40 years ago, and since then, numerous renovations and add-ons have been carried out.

The landscape design of each residential college was re-drawn to illustrate precisely the species and location of the matured plants, which gave significant influences of shade. The standard normal photographs were also taken on bright days to analyse the effects of landscape as a shelter in reducing sunlight radiation and penetration in the buildings. The suitability of photographs as a visual landscape

...equipped with air-condition by using split unit systems, while all the residential units/rooms in the residential blocks were non-conditioned and provided with a ceiling fan and a fluorescent lamp.

...
assessments have been expressed extensively by Sevenant and Antrop (2011), who also revealed standards of normal photographs, appeared to be more suitable for measuring certain variables rather than in situ landscape and panoramic photographs.

Results and discussion
The landscape design of CS-A

CS-A has the second largest ratio of soft and hard landscape area, which is 61:39 compared to other two residential colleges. Nevertheless, most of the trees in the CS-A landscape is well matured and the tree canopies cover the ground and also give shade to the residential building from maximum sunlight penetration.

The CS-A is surrounded by a highly vegetated area with high diversity of plant as located next to the foothill of Rimba Ilmu, tropical botanical garden (University of Malaya, 2005) as shown in Figure 1 and 2.

The presence of Cinnamomum sp., A. champeden, N. lappaceum, P. longifolia, D. suffruticosa, M. malabathricum and M. gignea significantly reduces the late afternoon solar radiation to Block E by filtering, reflecting and scattering the sunlight (Figure 2a). Whereas, the presence of C. inophyllum and M. atropurpurea in one row shades Block B from excessive morning sunlight (Figure 2b). The same situation also occurs in Block D with the presence of C. nucifera, J. chinensis, C. lanceolatus and C. lakka (Figure 2c). Unfortunately, it only covers a certain level and area especially the ground floor and balcony. In Block C, which is located at a higher altitude, the east wall is freely exposed to morning sunlight even though there is a green area at the front of it (Figure 2d).

Moreover, a row of P. pterocarpum, and L. floribunda at the north orientation of Block...
<table>
<thead>
<tr>
<th>No.</th>
<th>Botanical name</th>
<th>Common name</th>
<th>Height (m)*</th>
<th>Form**</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><em>Pterocarpus indicus</em></td>
<td>Angsana, Sena</td>
<td>30</td>
<td>Spreading</td>
<td>A</td>
</tr>
<tr>
<td>2.</td>
<td><em>Ficus benjamina</em></td>
<td>Weeping Fig, Benjamin’s Fig, Ficus Tree, Waring, Beringin, Ara Beringin</td>
<td>24</td>
<td>Dropping</td>
<td>B</td>
</tr>
<tr>
<td>3.</td>
<td><em>Calophyllum inophyllum</em></td>
<td>Ballnut, Penaga Laut, Paku Achi</td>
<td>18</td>
<td>Round</td>
<td>C</td>
</tr>
<tr>
<td>4.</td>
<td><em>Milletia atropurpurea</em></td>
<td>Purple Millettia, Tulang Daeng, Jenaris</td>
<td>30</td>
<td>Conical</td>
<td>D</td>
</tr>
<tr>
<td>5.</td>
<td><em>Jut悬sperma chinensis</em></td>
<td>Blue Juniper</td>
<td>10-15</td>
<td>Conical</td>
<td>E</td>
</tr>
<tr>
<td>6.</td>
<td><em>Callistemon lanceolatus</em></td>
<td>Bottlebrush</td>
<td>&lt; 10</td>
<td>Conical</td>
<td>F</td>
</tr>
<tr>
<td>7.</td>
<td><em>Thuja orientalis</em></td>
<td>Thujas, White Cedar, Yellow Cedar</td>
<td>&lt; 10</td>
<td>Conical</td>
<td>G</td>
</tr>
<tr>
<td>8.</td>
<td><em>Durio zibethinus</em></td>
<td>Durian</td>
<td>25</td>
<td>Spreading</td>
<td>H</td>
</tr>
<tr>
<td>10.</td>
<td><em>Nephellia tappaceum</em></td>
<td>Rambutan</td>
<td>15</td>
<td>Spreading</td>
<td>J</td>
</tr>
<tr>
<td>11.</td>
<td><em>Microcos balanifoila</em></td>
<td>Chenderal, Bural</td>
<td>-</td>
<td>Spreading</td>
<td>K</td>
</tr>
<tr>
<td>12.</td>
<td><em>Mesua ferrea</em></td>
<td>Ceylon Ironwood, Penaga, Penaga Lalin, Ironwood Tree, Longgusus</td>
<td>20</td>
<td>Conical/</td>
<td>L</td>
</tr>
<tr>
<td>13.</td>
<td><em>Peltiphorum pterocarpum</em></td>
<td>Yellow Flame, Batai Laut</td>
<td>20</td>
<td>Spreading</td>
<td>M</td>
</tr>
<tr>
<td>14.</td>
<td><em>Lagerstroemia floribunda</em></td>
<td>Kedah Bungor, Bungor, Bungor</td>
<td>18</td>
<td>Conical</td>
<td>N</td>
</tr>
<tr>
<td>15.</td>
<td><em>Shorea sp.</em></td>
<td>Temak, Seraya, Meranti Sarang Punai, Kepong, Meranti Sengkawang</td>
<td>30-50</td>
<td>Round</td>
<td>O</td>
</tr>
<tr>
<td>16.</td>
<td><em>Bambusa sp.</em></td>
<td>Bamboo, Buluh</td>
<td>12-30</td>
<td>-</td>
<td>P</td>
</tr>
<tr>
<td>17.</td>
<td><em>Macaranga gigantea</em></td>
<td>Elephant’s Ear, Giant Mahang, Telinga, Gajah, Kubin</td>
<td>20</td>
<td>Spreading</td>
<td>Q</td>
</tr>
<tr>
<td>18.</td>
<td><em>Alstonia angustifolia</em></td>
<td>Pulai</td>
<td>25</td>
<td>Spreading</td>
<td>R</td>
</tr>
<tr>
<td>19.</td>
<td><em>Garcinia mangostana</em></td>
<td>Mangosteen, Manggis, Mesotor, Sementah, Sematoh</td>
<td>18</td>
<td>Conical</td>
<td>S</td>
</tr>
<tr>
<td>20.</td>
<td><em>Hopea odorata</em></td>
<td>Merawan Siput Jantai, Chengal Pasir, Chengal Kampung</td>
<td>30</td>
<td>Conical</td>
<td>T</td>
</tr>
<tr>
<td>21.</td>
<td><em>Mimusops elengi</em></td>
<td>Spanish Cherry, Medlar, Bullet Wood, Tanjung, Mengkulah, Mengkum, Bakul</td>
<td>12</td>
<td>Round</td>
<td>U</td>
</tr>
<tr>
<td>22.</td>
<td><em>Sambucus javanica</em></td>
<td>Javanese Elder, Kerak Nasi</td>
<td>5</td>
<td>Spreading</td>
<td>V</td>
</tr>
<tr>
<td>23.</td>
<td><em>Artocarpus champeden</em></td>
<td>Campedak</td>
<td>15</td>
<td>Conical</td>
<td>W</td>
</tr>
<tr>
<td>24.</td>
<td><em>Dillenia suffruticosa</em></td>
<td>Simpoh Ayer</td>
<td>15</td>
<td>Round</td>
<td>X</td>
</tr>
<tr>
<td>25.</td>
<td><em>Melastoma malabathricum</em></td>
<td>Singapore Rhododendron, Senduduk</td>
<td>5</td>
<td>Spreading</td>
<td>Y</td>
</tr>
<tr>
<td>26.</td>
<td><em>Polyalthia longifolia</em></td>
<td>Ashoka Tree, Cemetery Tree, Memisang</td>
<td>18</td>
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<td>Z</td>
</tr>
<tr>
<td>27.</td>
<td><em>Michelia alba</em></td>
<td>White Champaka, Cempaka Putih</td>
<td>23</td>
<td>Conical</td>
<td>AA</td>
</tr>
<tr>
<td>28.</td>
<td><em>Phyllanthus acidus</em></td>
<td>Malay Gooseberry, Oathuri Gooseberry, Ceremai, Chermai</td>
<td>10</td>
<td>Spreading</td>
<td>AB</td>
</tr>
<tr>
<td>29.</td>
<td><em>Hymenospor combaral</em></td>
<td>West Indian Locust Tree, South American Locust, Stinking Toe, Old Man’s Toe</td>
<td>33</td>
<td>Round</td>
<td>AC</td>
</tr>
<tr>
<td>30.</td>
<td><em>Hevea brasilienisis</em></td>
<td>Rubber Tree, Getah</td>
<td>44</td>
<td>Round</td>
<td>AD</td>
</tr>
<tr>
<td>31.</td>
<td><em>Artocarpus heterophyllus</em></td>
<td>Jackfruit, Nangka</td>
<td>17</td>
<td>Conical</td>
<td>AE</td>
</tr>
<tr>
<td>32.</td>
<td><em>Adanosperma pavoventia</em></td>
<td>Barbados pride, Coral wood, Saga, Suga</td>
<td>20</td>
<td>Round</td>
<td>AF</td>
</tr>
<tr>
<td>33.</td>
<td><em>Cinnamomum sp.</em></td>
<td>Wild Cinnamomum, Kayu Mansis, Medang Wangi</td>
<td>12-15</td>
<td>Round</td>
<td>AG</td>
</tr>
<tr>
<td>34.</td>
<td><em>Mangifera indica</em></td>
<td>Indian Mango, Mangga, Mempelam, Pauh</td>
<td>27</td>
<td>Conical</td>
<td>AH</td>
</tr>
<tr>
<td>35.</td>
<td><em>Nelumbo</em></td>
<td>Nipm Tree, Mindi Kecil, Persain Lilac, China Berry, Sentang, Setan, Setang</td>
<td>10-50</td>
<td>Spreading</td>
<td>AI</td>
</tr>
<tr>
<td>36.</td>
<td><em>Piper aduncm</em></td>
<td>Spiked Pepper, Menuda</td>
<td>7</td>
<td>Spreading</td>
<td>AJ</td>
</tr>
<tr>
<td>37.</td>
<td><em>Ravenda madagascariensis</em></td>
<td>Traveller’s Tree, Traveller’s Palm, Pisang Kipas</td>
<td>7</td>
<td>-</td>
<td>AK</td>
</tr>
<tr>
<td>38.</td>
<td><em>Xanthophyllum sp.</em></td>
<td>Minyak Berok, Sosor, Minyak Berok Laut</td>
<td>25-30</td>
<td>Spreading</td>
<td>AL</td>
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</table>

<table>
<thead>
<tr>
<th>Palms</th>
<th></th>
<th></th>
<th>Height (m)*</th>
<th>Form**</th>
<th>Symbol</th>
</tr>
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<tr>
<td>39.</td>
<td><em>Areca catechu</em></td>
<td>Betelnut Palm, Pinang</td>
<td>&gt; 9</td>
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</tr>
<tr>
<td>40.</td>
<td><em>Elaeis guineensis</em></td>
<td>African Oil Palm, Kelapa Sawit</td>
<td>&gt; 9</td>
<td>-</td>
<td>AN</td>
</tr>
<tr>
<td>41.</td>
<td><em>Cocos nucifera</em></td>
<td>Coconut, Kelapa</td>
<td>&gt; 9</td>
<td>-</td>
<td>AO</td>
</tr>
<tr>
<td>42.</td>
<td><em>Cyperostachys laka</em></td>
<td>Sealing Wax Palm, Pinang Merah</td>
<td>3-9</td>
<td>-</td>
<td>AP</td>
</tr>
<tr>
<td>43.</td>
<td><em>Caryota mitis</em></td>
<td>Clustered Fish Tail Palm, Babok, Beridin, Dudok</td>
<td>3-9</td>
<td>-</td>
<td>AQ</td>
</tr>
<tr>
<td>44.</td>
<td><em>Licuala grandis</em></td>
<td>Fan Palm, Palas Kipas</td>
<td>&lt; 3</td>
<td>-</td>
<td>AR</td>
</tr>
<tr>
<td>45.</td>
<td><em>Chrysalidocarpus lutescens</em></td>
<td>Butterfly Palm, Area Palm, Golden Fruit Palm</td>
<td>&lt; 3</td>
<td>-</td>
<td>AS</td>
</tr>
<tr>
<td>46.</td>
<td><em>Calamoace sp.</em></td>
<td>Rattan, Rotan</td>
<td>1-2</td>
<td>-</td>
<td>AT</td>
</tr>
</tbody>
</table>

Note: 
* Height (m) 
** Form 

Figure 1 Continued.
A (Figure 2e), and a line of *M. atropurpurea* (Figure 2f) and a dense canopy of *P. indicus* (Figure 2g) at north and south orientation of Block B, directly moderates solar radiation which reflects from the tarmac. In other words by creating a recreation ground for the residential community and providing a shelter for the wildlife such as *Acridotheres striatus*, *Macaca fascicularis*, and *Gallus gallus*, and other small plants to grow under their canopies (Elevith, 2006). The higher populations of wildlife and plant diversity are visibly presence at the north, south, and west of CS-A which is dominated by *Bambusa sp.*, *M. gigantea*, *E. guineensis*, *D. suffruticosa*, and *Calameae sp.* (Figure 2h&i).

Although there is a row of plants which consist of *N. lappaceum*, *Shorea sp.*, and *G. mangostana*, the height and canopy of these trees are not able to be a shelter in reducing solar radiation which reflects from the tarmac.
Figure 3. Landscape plan of CS-B (with reference to Said et al., 2004; LaFrankie, 2010; Jabatan Perangkaan Bandar dan Desa, 1995).

![Diagram of landscape plan of CS-B]

<table>
<thead>
<tr>
<th>No.</th>
<th>Botanical name</th>
<th>Common name</th>
<th>Height (m)</th>
<th>Form*</th>
<th>Symbol</th>
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</thead>
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<tr>
<td>1</td>
<td>Garcinia mangostana</td>
<td>Mangosteen, Manggis, Musotot</td>
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<td>2</td>
<td>Mangifera indica</td>
<td>Indian Mango, Mangga, Mempelam, Pua</td>
<td>27</td>
<td>Conical</td>
<td>B</td>
</tr>
<tr>
<td>3</td>
<td>Bambusa sp.</td>
<td>Bambu, Bubal</td>
<td>12-30</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Bamboo sp.</td>
<td>Bambu, Bubal</td>
<td>15</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Nypa fruticans</td>
<td>Wax Apple, Love Apple, Java Apple, Water Apple, Mokatein Apple, Jamua Air</td>
<td>12</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Nypa sp.</td>
<td>Weeping Fig, Benjamin’s Fig, Ficus Tree, Wanting, Beringin, Anu Beringin</td>
<td>24</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Ficus benjamina</td>
<td>Weeping Fig, Benjamin’s Fig, Ficus Tree, Wanting, Beringin, Anu Beringin</td>
<td>20</td>
<td>G</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Mecynorhiza gigantea</td>
<td>Elephant’s Ear, Giant Muntang, Telinga</td>
<td>10</td>
<td>H</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Leucaena leucocephala</td>
<td>Petal Belatang, Petal Jawa, Petal Belanda, Petal Tiga Bulan</td>
<td>10</td>
<td>I</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Morea forbesii</td>
<td>Ceylos Ironwood, Pongga, Pongga Lilib, Ironwood Tree, Lenggopus</td>
<td>5-8</td>
<td>J</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Punica granatum</td>
<td>Pomegranate, Delima</td>
<td>5-8</td>
<td>K</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Typical/Average matured height

---

Figure 3 Continued.
solar radiation at the east orientation of Block E especially at the higher level (Figure 2j). The same condition also occurs at Block A when shadow of C. inophyllum covers the adjacent field (Figure 2k). With the presence of T. orientalis as a border between the court and Block A, as well as Block C, the solar radiation from the direct reflection of sunlight on the court was present especially during the afternoon (Figure 2l).

**Landscape design of CS-B**

As located in hilly and valley area, not so many big trees were planted due to safety issues.
Even though, CS-B was the greenest with 72:28 ratio of soft and hard landscape area compared to CS-A and CS-C. Most of the risky areas were planted with grass, Paspalum conjugatum, small decoration plants, fruit plants and palms (Figure 3 & 4).

Generally, the landscape of CS-B was not intended to give shading effects to the residential building from maximum sunlight penetration. Most of the areas between residential buildings were either built with hard surface structures or planted with small fruit trees and palms. There is a tennis court between Block E and Block F while a basketball court between the Block B and Block C (Figure 4a). At the back of Block A and Block D, there have covered parking lots for motorcycles. In generating a typical scene of the village house, S. samarangense were planted between Block A and B, Block D and E (Figure 4b) while a row of V. merrilli and P. macarthurii were planted in the same part surrounding the court (Figure 4c). On reducing sunlight penetration and heat radiation, CS-B is dependent on the shading effect of adjacent buildings and slopes (Figure 4a). A row of C. lakka and P. longifolia along with Block A (Figure 4d), and C. nucifera together with P. macarthurii, D. zibethinus and P. indicus by the side of Block C (Figure 4e) is incapable of providing a full shelter from the direct west-east sunlight penetration. There is also a row of C. mitis, V. merrilli, Citrus sp., P. granatum and P. guajava at the side of Block F (Figure 4f). Nevertheless, some part of Block A and Block E especially at the end of the block is shaded with a row of D. suffruticosa and A. auriculiformis which was planted on the outside of CS-B area at a higher altitude (Figure 4g).

For a boundary, a row of J. chinensis were planted on the north area (Figure 4h), D. suffruticosa and A. auriculiformis at the south area (Figure 4i). Whilst, P. indicus and C. lakka in the east area (Figure 4i), which plays a role in soil conservation when the tree canopy absorbs the impacts of rain while and its roots help retain the water in the soil (Thomson, 2006). Indirectly, it also provides a shelter from the sun for the recreational area nearby which is dominated by palm trees.

A role of trees for shade can further be identified at parking lots close to the main entrance when this area is surrounded by M. elengi and P. longifolia(Figure 4k), while a row of P. macarthuri, C. lutescens, C. nucifera and M. indica gives a shading effect to the prayer hall/musollah from afternoon sunlight (Figure 4l).

Figure 5. Landscape plan of CS-C (with reference to Said et al., 2004; LaFrankie, 2010; Jabatan Perangkaan Bandar dan Desa, 1995).
Landscape design of CS-C

Noted as a new residential college on campus, established in 1997, there is only a small area covered by trees especially at the northeast boundary which plays a role as a buffer zone between the residential area and the Anak Batu River. CS-C has the lowest ratio of soft and hard landscape areas (58:42) compared to the other two residential colleges. The landscape plan of CS-C is presented in Figure 5.

A typical scene of the village house compound is shown at CS-C when the greenery is dominated by the fruit trees and palms. A row of S. samarangense, N. lappaceum and G. mangostana were planted as a boundary between CS-C area and the experimental farm, as well as tennis court other than a chain link fence (Figure 6a & b). All these trees are still small and incapable of providing shelter from the sun for the residential building. Some parts of Block B, particularly facing the east receive high radiation from excessive morning sunlight and is the hottest area in CS-C (Figure 6c). The presence of a high elevated highway, SPRINT Highway at the northeast gives shade to the court and other multipurpose areas located nearby.

A row of B. nobilis and A. alexandreae at the front area is able to give a shading effect to the administrative block (Figure 6d) whereas Block C is freely exposed to solar radiation from the west in the early afternoon (Figure...
Nevertheless, the large double storey buildings of the Sport Centre on the elevated ground opposite to Block C shorten the duration of exposure. The open space which also houses the parking lots next to Block C and D were shaded by two *E. guineensis* (Figure 6f). Whilst, a group of *C. nucifera* which was planted near the administrative block only gives an aesthetic value to that area (Figure 6g).

The trees of *Leucaena sp.* which grows at the buffer zone between residential areas and Anak Batu River gives a significant shading effect to the some part of Block D especially for the room that faces the north (Figure 6h). The tree canopies cover the ground and directly reduce the temperature, whereas the presence of *A. alexandrae*, *L. grandis* and *N. lappaceum* enhance the absorption of excessive radiation (Figure 6i). Theoretically, this area is the coolest area with high humidity in the CS-C area.

**Conclusions**

Initially, CS-A has a big potential to achieve sustainable development according to performance criteria UE 3 - Urban greenery and environmental quality. There are diversities of mature tree species that help to increase the rate of carbon sequestration, although CS-B has the highest percentage of green open space, which is only based on the ratio of soft and hard landscape area. As a new residential college on campus, the numbers of tree and vegetation coverage at CS-C is still small compared to other residential colleges. Thus, fast growing, decorative and low-maintenance types of vegetation have been highly considered in creating a sustainable environment.

The acceptance, suitability and effectiveness of tropical forest trees in residential college landscapes have been accepted to the old residential colleges, CS-A is dominated by
tropical forest trees. There are C. inophyllum, M. atropurpurea, P. pterocarpum and L. floribunda. With large crowns and decent growth rates, these types of trees are able to provide shade to the building from excessive sunlight penetration, which reduces the cooling cost of the building and improves urban air quality (Akbari et al., 2001; Jamaludin et al., 2011). Moreover, the selection of tropical forest trees is a key to successfully improving its urban green infrastructure, which has been described by Thaïutsa et al. (2008), who have done an assessment on urban green space, street tree and heritage large trees in Bangkok, Thailand. According to KeTTHA (2011), one hectare of tropical forest absorbs 4.3 tCO2/year to 6.5 tCO2/year, whilst one tree absorbs approximately 1,000 kg of CO2. Regrettably, through observation, the cleaning work of fallen leaves become a long term issue.

The trees of D. suffruticosa is widely used as a border or natural fences when this species is a large, evergreen shrub with continuous yellow flowers and can easily be grown especially in swampy ground (Corner, 1998). Unfortunately, this species is wildly grown and indirectly creates a small secondary forest at the border area of CS-A and CS-B.

Then, to generate a village scene and home living environment, fruit plants such as D. zibethinus, S. samarangense, N. lappaceum, G. mangostana, A. champeden, A. heterophyllus, M. indica, P. guajava, D. longan, A. carambola, M. kauki, P. grantum, and Citrus sp. have been used in the landscape of residential colleges which have been built in the 1980s onwards, such as CS-B and CS-C. With new hybrids and the development of synthetic seeds of fruit plant species, plant disease resistance was increased and it helps to lower the maintenance and able to establish a large canopy of trees in a shorter duration (Roberts, 2007; Rai et al., 2009).

Palms were most extensively cultivated in the landscape of residential colleges when these types of plants are easy to take off, able to survive in various condition of climate and possess prominent leaves with a characteristic shape (Jones, 1995; Stewart, 1994) which provides a shelter from the direct sunlight. Thus, it helps to maintain the humidity level and lowers the water requirement which directly creates microclimates within the landscape area by encouraging partial shade and full shade plants to grow (Bergman, 2011). Aesthetically, the E. guineensis was also used in the residential college landscape. The matured plants able to provide a dense canopy which creates a heterogeneous habitat (Potts & Luskin, 2011). The trunk offers conditions for bird’s nest ferns, Asplenium nidus to grow and provide a stable microclimate in a hot and dry area (Fayle et al., 2010). As the world’s largest producer and exporter of palm oil (Sumati et al., 2008), this plant became a part of national identity.

The Leucaena sp. is a suitable plant in the buffer zone between residential college areas and river side as ability to grip the ground and provide stability in the bank/slopes when this plant increase soil penetrability and shear strength, presumably due to the outstanding biomass and extensive root system (Osman & Barakbah, 2011). Moreover, it gives a significant shelter and shading to the building classified as fast growing plant and needed least maintenance compared to the other plants. The same potential was also discovered with P. indicus where the tree has excellent potential for windbreaks planting where space permits, soil stabilization, especially along drainage lines and flood plains, due to its adaptation to such sites, large buttresses, and extensive, spreading, near-surface root systems (Thomson, 2006). Unfortunately, cleaning work of fallen leaves will become an issue.

In summary, there are lots of improvements at residential college landscapes in urban area towards sustainable development. The empty spaces, especially between the residential buildings should be planted with high rate of carbon sequestration trees that are also capable to give shade in reducing solar penetration.

Acknowledgement

The authors would like to thank all residential colleges in the University of Malaya campus for their permission to observe and including full support in supplying data to be used in this study. This work was conducted as part of the fulfilment of the requirement for the degree of Doctor of Philosophy and financially supported by the IPPP, UM under PPP (PV063/2011A) managed by UPGP.
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Demystifying Doha
On Architecture and Urbanism in an Emerging City
Ashraf Salama and Florian Wiedmann, both at Qatar University

‘The authors provide an authoritative account of the development of Doha in the context of the rapid growth of Arabian Gulf cities. The book identifies the social and cultural changes associated with this growth and its positive and negative impact on the city of Doha. Such unbridled growth as seen in Doha can have deleterious consequences as the authors clearly identify. They propose the need for an urban development vision that integrates social, cultural and economic factors. Consequently, this book is a necessary guide for Doha’s decision makers in the public and private sector as well as design and planning educators and professionals. Although Salama and Wiedmann focus on the Arabian Peninsula they develop a unique investigative approach relevant for the study of other regions as well.’

Henry Sanoff, North Carolina State University, USA

‘The book gives a comprehensive overview of the urban and architectural development of the Arabian Peninsula but in particular about the rapid growth of Doha. It offers a profound documentation of the urban structure and environment as well as the architectural forms of the city, while introducing significant knowledge on an area, which is often not well considered by international professionals planning in the metropolis. Salama and Wiedmann concentrate not only on Doha, Qatar and the Arabian Peninsula but also analyze the evolution of architecture and urbanism as products of contemporary global trends in governance, development strategies, image-making and the human encounters with the city. Demystifying Doha is a valuable source for every planner and architect working in Doha as well as those working in neighboring countries of the Arabian Peninsula.’

Albert Speer, Albert Speer & Partner GmbH, Germany

‘Salama and Wiedmann offer a far-reaching examination of the city of Doha within the larger context of the Arabian Peninsula. While their main focus is on the evolution of the city and its morphological transformations, they successfully map such evolution to socio-cultural, economic, and environmental aspects that characterized the growth of the city. Addressing the institutional environment in which decisions are made, the book highlights important aspects of urban governance. Discussing the multifaceted aspects of sustainable urbanism, the authors propose a framework for future investigations in similar contexts. The inclusive nature of the book makes it a necessary reading for policy makers, academics and professionals in architecture and urban planning. This is a great addition to the library of architecture and urbanism in the Middle East.’

Attilio Petruccioli, Qatar University, Qatar and Polytechnic University of Bari, Italy

Contents: Preface; Introduction: globalisation and the emerging city; Overview of architecture and urbanism in the Arabian peninsula; The urban evolution of Doha: from a vernacular settlement to an emerging service hub; Contemporary urbanism in Doha: from decentralised governance to integrated urban development strategies; Contemporary architecture and image-making practices in Doha; Dynamics of population and the urban environment of Doha; The challenges of sustainable urbanism and the future of Doha; Conclusion: introducing an analytical framework for emerging Doha; bibliography; Index.

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BOOK REVIEW

by Dr. Jia Beisi,
Department of Architecture, The University of Hong Kong.

Although experimental buildings have been built around the world, the difficulties of implementation on a larger scale prevail. Only a few efforts have been made to organize the knowledge and to formulate the implementation strategies for the builders and designers. The research on flexible buildings addresses the technical components, but the possibility of integration with the current housing market is overlooked. Thus, this book is a significant contribution in the effort to fill the gap “between theories pertaining to flexibility and the reality of housing market” not only for North America, as the author explained, but also for the rest of the world. The publication of the book is a significant addition to the literature on flexible housing.

The objectives of the book are premised on the understanding that flexibility has not been generally accepted in North America because of the problems of implementation. It intends to develop a project based decision-making model to assist designers and builders in determining the relevant level of flexibility which is best fit to their particular projects.

The book is informative and serves as a conceptual instrument for the housing decision makers, including governmental housing organizations, private housing developers and builders, designers, and other promoters who want to design flexibility projects. It is useful for programmers, housing researchers, and students of architecture and building management. It can provide inspiration to residents and the general public who are interested in new living styles as well as in benefits from monetary savings and better living standards during their residency.

Selected keywords: Flexibility, implementation, strategies, economics, alternatives.
Design Studio Pedagogy: Horizons for the Future
Ashraf M. Salama & Nicholas Wilkinson (editors).

This groundbreaking book is a new comprehensive round of debate developed in response to the lack of research on design pedagogy. It provides thoughts, ideas, and experiments of design educators of different generations, different academic backgrounds, who are teaching and conducting research in different cultural contexts. It probes future universal visions within which the needs of future shapers of the built environment can be conceptualized and the design pedagogy that satisfies those needs can be debated.

Addressing academics, practitioners, graduate students, and those who make decisions about the educational system over twenty contributors remarkably introduce analytical reflections on their positions and experience. Two invited contributions of N. John Habraken and Henry Sanoff offer visionary thoughts on their outstanding experience in design pedagogy and research.

Structured in five chapters, this book introduces theoretical perspectives on design pedagogy and outlines a number of thematic issues that pertain to critical thinking and decision making, cognitive and teaching/learning styles, community, place, and service learning, and the application of digital technologies in studio teaching practices, all articulated in a conscious endeavor toward the betterment of the built environment.
32 years of back issues. Available on DVDs as well as on-line. This digital collection consists of 128 issues with approximately 1,024 articles dealing with settlement, planning and housing design, education, adaptability, open building, sustainability, affordability, user participation, design roles and many other aspects of housing and settlement design. Many case studies from around the world are included. Open House International is covered by EBSCO Publishing Thomson ISI and Elsevier Scopus databases.

University References:

"One major contribution of Open House International is its ongoing emphasis on open-ended design as an important attribute of environmental quality of built environments. Through this, Open House International has ensured that this topic has not been forgotten and has continued to develop." Prof. Amos Rapoport, University of Wisconsin, USA.

The high academic level of the journal is an example to be followed. We are privileged by our affiliation with you and the journal. I think that our disciplines are hungry for the level of academic rigor that OHI demonstrates on a sustained basis." Guillermo Vasquez de Velasco, Dean, College of Architecture and Planning, Ball State University.

"Open House International provides a unique, international forum for presentations of the multi-dimensional nature of housing with illustrative examples from all continents around the globe. Today this perspective is rare in mainstream academic and professional publications." Dr. Rod Lawrence, University of Geneva, Switzerland.

"This is a journal with a long standing history of exploration into issues of development, built environment and housing. It distinguishes itself in the unselfconscious way it invites writings reflecting people, work and thinking not yet part of the mainstream." Prof. Nabeel Haridi, Oxford Brookes University, Oxford, Great Britain.

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"Since its beginning in 1976 Open House International has been the only journal to cover the extremely important ground between the traditional and the "new" concerns of architects and builders and those of development studies. This is of increasing significance in the context of the international agendas for the next millennium." Prof. Pat Wakely, Emeritus, Development Planning Unit, University College London, UK.

Among the journals focused on the built environment, Open House International (OHI) has always stood for the possibility of informed discourse on cross-cutting, global and local issues linking methods, the culture of building, built form studies, technology, pedagogy and user-centred public policy and planning. Thank goodness it is there for students, teachers and practitioners. Prof. Stephen Kendall, Ball State University, USA.

"...In recognition of the high quality and relevance to the scientific community of Open House International we are pleased to inform you that your publication has been selected for coverage in the Elsevier Bibliographic Database Scopus as of 2007."

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