Rethinking Shangri-La

Revival of the sustainable courtyard dwellings

Kathmandu, Nepal

Rethinking Shangri-La
Revival of the Sustainable Courtyard Dwellings

A Design Thesis Submitted to the
Department of Architecture and Landscape Architecture
of North Dakota State University

By

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In Partial Fulfillment of the Requirements
for the Degree of
Master of Architecture

5/11/11
Primary Thesis Advisor

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May, 2011
Fargo, North Dakota

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Table of Contents

Abstract:

While technology and globalization continue to prevail in every aspect of the world, the scope for the sustenance of regional culture is rapidly disappearing. Kathmandu, the capital city of Nepal, hasn't been left behind in the process of rapid urbanization. Globalization has infiltrated the built form of developing nations by disturbing the long established sociocultural, ecological and economic norms. Traditional courtyard housing which has been forgotten now was built in harmony with the environment and the sociocultural needs of the place. This projects seeks to meet culture with technology in Kathmandu to create a sustainable , "sense of place," which is slowly fading in the wake of globalization.

A sustainable row housing prototype in an urban metropolis of Kathmandu will be used as a tool to illustrate my research plan. The narrative of this project examines the importance of this project as it relates to the site and how we as designers can create spaces that will preserve our identity while adapting to the modern world. Courtyard housing that uses passive design principles as it was done in the past will be coupled with advanced sustainable technology. Case studies from different parts of the world are presented to conform to the ideas of theoretical premise/unifying ideas. History of the site and the historical context of globalization of built form in Nepal in also presented. Housing will be accessible to the ever increasing population of the valley. The main parts of the project are courtyard for semi-private space, housing units and a community space.

Keywords:
Globalization, culture, sustainability, modernity, critical regionalism

Problem Statement

As a growing metropolis in a developing nation, how can the built form of Kathmandu valley take part in a universal civilization while preserving its local culture?

Statement of Intent

Typology: Sustainable Housing Prototype

Claim:
The built environment of the developing world should embrace modern sustainable technology to meet its current and future needs while respecting the social and cultural patterns of the city.

Premises:
Modern sustainable technologies are capable of creating an impact in the developing world where resources are scarce.

Colonization in the past and globalization at present has enabled the transfer of ideas to the developing world.

The built environment of the developing nations faces the challenge to adapt to the modern world and is losing its "sense of place". It should be able to preserve its identity since response to shelter is closely affiliated with cultural, social, climatic and economic factors.

Conclusion:
Globalization has many pros and cons. It has made technology transfer possible, which the developing world can use in its built environment to meet its current and future needs. Furthermore, the built environment should respect its established cultural and social norms.

Project Justification:
It is important to have modern thinking in this global world, but people should be able to preserve their identity. There are great problems in the developing world that need to be addressed at present and they cannot be solved by simple cultural imitation. Globalization could be used for the betterment of the society rather than just using it to fulfill gross materialistic wants.

The Proposal

Narrative:

The twentieth century marks the era of globalization and there is no foreseeable escape from it. Globalization will remain the most important phenomenon of our time, whatever side one aligns in the spectrum of the global debate. Critics of globalization lament that it is the grand plan of the rich corporations and market forces controlled by the affluent West against their poor counterparts of the world. Globalization which was perceived as an economic integration phenomenon is no longer just political or economic, but it is a cultural phenomenon as well (Pokharel, n.d).

According to Pokharel (n.d), culture is the bond between individuals in the community sharing a common set of mores, values, tradition and beliefs and it is what sets us apart from the others. Increasing interaction and integration across borders diminish differences between nations, causing global norms, ideas, and practices to dilute local cultures. The spread of factors influencing culture is unbalanced and heavily weighted in one direction, from rich countries to poor ones.

As an international student from Nepal studying in the US for the past 6 years, I have been able to experience the cultural difference between both the countries. When I travelled home in 2009 after 5 years, I saw a wave of change in the Kathmandu Valley. There had been an influx of population from rural Nepal to the valley due to political insurgency and also for employment opportunities. In general, the people of the valley had become more materialistic.

Around 2000, I had heard that McDonalds could not expand its market in the valley because they believed people were not so interested in American fast food and the next thing I hear in 2009 is that teenagers are lined up at the opening of Pizza Hut and KFC at King's way. There was an increased number of department stores that were selling foreign goods. The housing industry had plummeted since 2001 and these houses were sold at 30-60% higher than ordinary houses and they were adorned with elaborate ornamentations in the facade, used luxurious material and

finishes, had expensive chandeliers etc. According to Kobayashi, the new life-culture of the valley is characterized by European-American culture with no authenticity (Kobayashi, 2006).

This increase in population is directly proportional to the increase in human wants and therefore the resources of the country are being depleted at an alarming rate. The basic needs according to Maslow's Hierarchy of needs are food, clothing and shelter, but I believe the basic need of people of city would be food, clothing, shelter, clean water, electricity and sanitation. Due to the growing population, the demand for clean water and electricity has not been able to meet the supply in this part of the world.

I believe that globalization could be used for the betterment of this growing metropolis. At the same time, the character and communities should be able to preserve their identity. Pokharel, on the issue of cultural homogenization states that "To what extent they can retain whatever was theirs and to what extent they adapt whatever wasn't theirs determine the nature of their survival." Indeed we ought to seek what is good for our society and fulfil those needs while at the same time preserve our identity in this global world and prevent it from falling into ruins. Thus, this project seeks to integrate culture with technology to create a sustained-global community which has retained its identity.

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User Client Description:

The development will be managed by the housing developers who will ensure that the needs and wants of the users will be met. The users are listed in the order of the importance and the estimate number of users, peak usage time, parking, physical restrictions, issues and special needs are discussed.

Dwelling Residents:

The most important users of this development will be the dwelling residents since they are the ones occupying the most spaces in the development. The project is open to all classes of people. Since Nepalese have close ties with families, it is expected that the dwellings would be home to nuclear as well as extended families. Due to the migration of young people from villages to the cities for higher education and employment, newly established young professionals who have steady sources of income will also be its residents.

Amount: The residential users of the development will make up the majority of the housing units and will outnumber any other users.

Peak Usage: The elder generation of the family household will use the spaces almost throughout the day, whereas parents, children and working professionals would most likely use the spaces mostly in the morning, evening and nights. The usage in the weekends, however, varies depending on if the family stays home or decides to go out which can be expected according to the culture.

Parking: Since a majority of the middle class and upper middle class as well as working professional -s rely heavily on motorcycles to commute and the majority of the upper middle class can afford cars, there would be one small parking garage which will be also used as storage. However, using public transportation is encouraged. Public transportation include Buses and electric vehicles called 'Safa Tempo' that are both located as close as .2 miles from the site and a bus stop in the central farmers market.

Physical Restriction: Most residential users, except

for the old, handicapped and children will have physical restriction; however every space will be accessible for all users.

Medical or Mental Health issues: Medical and mental health issues will depend on a case by case basis.

Special Needs: Students and professionals require spaces that are private for their individual growth yet at the same time they have a high level of community involvement. They also have visitors coming in at odd hours sometimes.

Older people stay home most of the day and they need activities that keep them engaged throughout the day or a smaller community within the development.

Management/Maintenance Staff:

For the smooth operation of the systems of the community, security, management and maintenance staff play a vital role. Since there might be technological issues that need to be addressed occasionally as the technology used might be substantially new to this development, management and maintenance staff will play a vital role.

The management and maintenance staff will function from an on site office and the maintenance staff will be provided with storage of the supplies.

Number: One manager/technician will be employed on site, but assistance could be provided from the central office if necessary. Two maintenance staff will be employed to take care of the community spaces and other common spaces.

Peak Usage: The staff will work during regular business hours which is 9:00am-5:00pm. In case of emergency, residents will need to contact the central office for technical problems.

Parking: Four parking spaces will be allocated for management/maintenance staff.

Physical Restrictions: The spaces that the staffs will have access to will have no barrier.

Medical or Mental Health Issues: Medical health

will be dependent on circumstances like environment and individual case. But the workers will be in sound mental health condition in order to ensure sound service to the community.

Special Needs: The manager needs permission from the central office if he/she requires leaves, but there will be one manager/technician in the office regardless and maintenance staff needs to deal with absence in a similar way.

Assuming that the maintenance staff will be from a low income background, they might be faced with family and societal problems. The maintenance staff could be poor women who might need to bring children along at work and the needs of the workers as well as the accompanying member should be considered in the design.

Major project Elements:

The typology of the project is a sustainable housing prototype and by its nature the major project element of the development would be dwelling units. Since the project seeks to meet technology with culture, there should be another unifying element of the culture which bonds the community together. The major project elements that comprise this typology are described below.

Residential dwelling units:
The sustainable housing units will employ technology that is currently needed in this part of the world to make the day to day life of the dwellers convenient. Apart from technology, passive design principles would be employed to make the unit self sufficient for energy production and usage.

Each dwelling unit will have 2 bedrooms, 2 bathrooms, 1 guestroom/study room, a central living room, dining room and garage/storage.

Green Space/Courtyard:
Since courtyards were an integral part of the traditional residential design of the people of Kathmandu, there will be a number of courtyards in the development surrounded by the residential units. Courtyards also help in improving neighborhood security. It will be the central space that also serves as green space. It could be used as playgrounds, for recreational activities and other community activities.

Many city dwellers go for a morning walk around the temple areas in the dense urban areas. The residents in this development could simply use the green paths within the development as an alternative.

Community Building:
Community living is fostered in this development. There will be a lobby, community gathering space, possibly a grocery store and workout space in this facility.

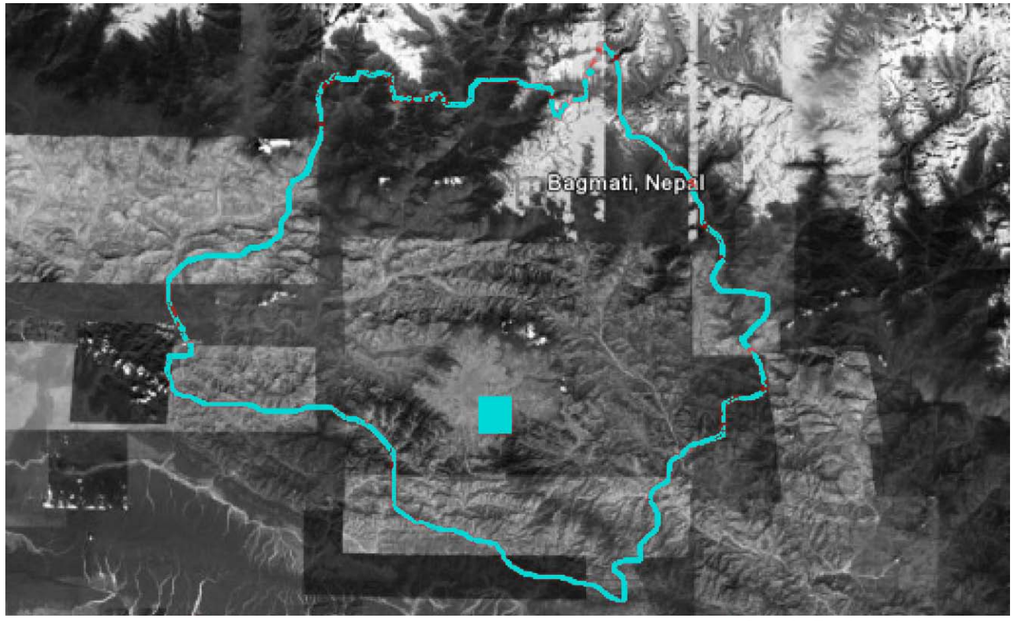
The management and technical service needs an office space to facilitate the residence. They could bring any issues to the office as well as pay off their

monthly community dues here.

Parking Space:
Each dwelling unit has a space enough for just one car since the middle/upper middle class people living in this city can just afford about one car per family. However, almost every man owns a motorcycle and every woman seems to rely on mopeds, so there needs to be ample parking space. However, the usage of public transportation is encouraged in this community which located within .2 mile from the site and the bus stop is located within the Farmers market.

Site Information:

MACRO: Regional
Bagmati region is located in the Central Development Region of Nepal. It is amongst the 14 zones of Nepal and is named after the river Bagmati. Gandaki, Narayani, Janakpur and Tibet border this region in the West, South, East and North respectively. This zone consists of the Kathmandu valley which has an approximate population of 1.5 million. The Kathmandu Valley resides at an altitude of 4297 ft. and it is 58.2 sq.miles (Kathmandu facts).



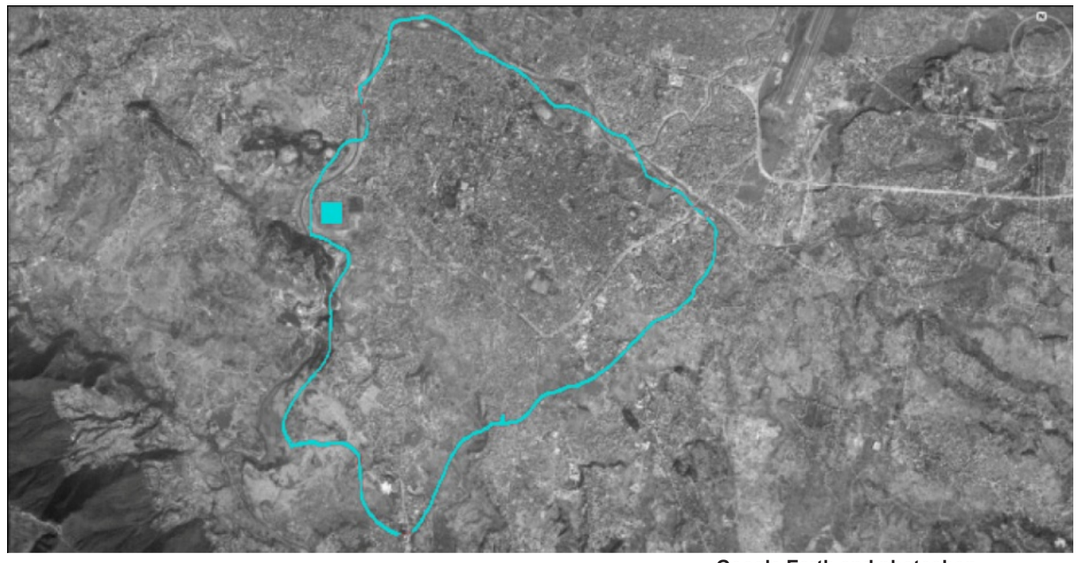
Google Earth and photoshop

Site Information:

MACRO: City

Patan is the second largest city within the Kathmandu valley. The other two important cities are Kathmandu and Bhaktapur. It is located 5 km Southeast of the capital Kathmandu. 337,785 people live within an area of 38 km2(Jom, 2007).

It is also known as Lalitpur which means the 'city of beauty' and indeed this city is a living example of traditional fine arts of the valley. The city is filled with Hindu temples, Buddhist monuments, sculpture and fine wood and metal carving (Geller, 2006).



Google Earth and photoshop

Site Information:

MICRO: Site

Located in the outskirts of Patan, this site (Baghdol) has potential in regards to the nature of the thesis. It is situated within an urban fabric which has a rich history and culture. At present the land in the valley is densely populated and only high-rises can be built within Ring Road that surrounds the valley (Nepal Housing and Land Developers Association).

The nature of the typology for the thesis is dense housing, but it will be individual dwelling units and the site offers substantial opportunity to work with it. Furthermore, Chobhar lies to the Southwest which has an excellent view. The site is located less than .2 miles west of Ring Road, which has public transportation available. Also, Modern Indian School and a temple lies within a 1 mile radius.

Google Earth and photoshop

Project Emphasis:

This thesis will focus on two things in particular: what can Kathmandu learn and leave behind from globalization?

Research will be conducted on how the sense of identity of built forms can be preserved while trying to adapt to the modern world. This part concludes the latter half of the question asked above. The chosen site provides a basis of understanding of this question. It is located in an urban fabric where people have adapted to the modern world and they have preserved their art and culture because they believe it to be one of the major sources of income.

Careful research on the problems faced by the people of the Kathmandu valley at present will be investigated. Emphasis will be on identifying the modern technologies that will be best suited for the chosen site. Careful consideration of climate, economic, social and political research will be necessary to determine the feasibility of the technology and design that will be employed.

Plan to Proceed:

Research Direction:

Research will be conducted in the areas of theoretical premise/unifying idea, project typology, case studies, historical context, site, and programmatic requirements to ensure that the proposal is comprehensive and pertinent to this thesis.

Design Methodology:

The ixed Method Quantitative and Qualitative approach will be employed for data collection and analysis. Theoretical premise will be the guiding force directing the nature of the research. Concurrent transformative strategy will be used as a model for conducting the research.

The qualitative and quantitative data from my travels to Kathmandu, ongoing quantitative and qualitative research will be analyzed and applied at a continuous process. The findings of the research will be presented graphically as well as in text.

Design Documentation:

Sketches, photographs, texts, models and digital renderings will be used as a means to document the designs. All these design elements will be compiled and represented digitally to ensure that the data is well preserved. The documentation process will be carried out on a weekly basis or biweekly basis to show the process of the design evolution and will give the audience a thorough understanding of the outcome of the final thesis.

The design documentation will be presented in the final thesis as well as this project book. Important elements of the design documentation will be presented in the final thesis boards.

Digital models are preferred over hard copy because of the easy availability to future scholars and it will be well preserved.

Previous Studio Experience:

Second Year Studio:

Fall Semester 2007-Mike Christianson
- Tea House-fargo, ND
- Boathouse-Minneapolis,MN
- Retail- Fargo, ND

Spring Semester 2007- Stephen Wischer
- Orphanage/temporary shelter- Fargo, ND
- Dwelling for a widow- Fargo, ND

Third Year Studio:

Fall Semester 2008- Steve Martens
- Ornithological Research Center- Ely, MN
- Masonic Lodge- Millerville, MN

Spring Semester 2008- David Crutchfield
- Performing Arts Center- Austin, TX
- Boutique Hotel for Space Travellers- NM

Fourth Year Studio:

Fall Semester 2009- Don Faulkner
- Mixed use High Rise- San Francisco, CA
- Musical Instrument

Spring Semester 2009- Darryl Booker, Paul Gleye, Frank Kratky
- Slum Rehabilitation- Santo Domingo, Dominican Republic
- Slum Housing- Santo Domingo
- Livingston School- Kigoma, Africa

Fifth Year Studio:

Fall Semester 2010- Cindy Urness
- Minnesota Utopian Transit Center- Evansville, MN

The Program

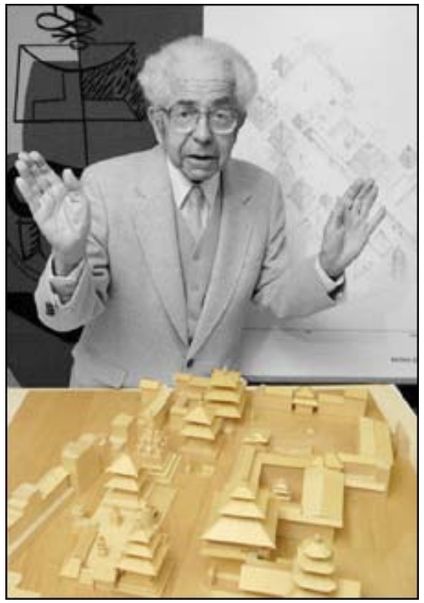
Theoretical Premise-Unifying Idea:

Introduction:

Tzonis, Lefaivre and Bruno quoted Minnette de Silva, 'As an architect I believe in and so cannot subscribe to copying the architecture of an era that is long past. As an architect, I believe in building to suit our living needs in a living way, utilizing the most suitable modern and progressive means at our disposal, and on adopting these sound and fundamental principles of building of the past, which are as authentic today as before. It is from this that a beautiful and satisfying modern architecture can result ' (Tzonis, Lefaivre, & Stagno, 2001, p.31).

Minnette de Silva was a Sri Lankan architect who made a critical reformation of tropical architecture in Sri Lanka and she was one of the two most important women architects who were trained in architecture in London in 1949, with a practice of their own after the post war period, along with Lina Bo Bardi of Brazil (Tzonis et al. 2001, p.32).

When walking down the streets of Beijing, Manila or Singapore, one is often made to wonder where exactly he or she has found him or herself in the world. The new urban centers of Beijing closely resemble those of Minneapolis, Boston or New York. Globalization and technology have infiltrated into the far corners of the world and Kathmandu hasn't been left behind in this process of creating a 'global village.' The process of creating a "global village' is the development of a symptom called 'social and cultural homogeneity" (Bandhopadhayay, 2010). Globalization manifests not only in economy, but also in other fields like architecture. The classical definition of city gets diluted and loses interpretive power in today's urban context. Part of the reason for this change is the large expansion of urban areas and the other reason is the acceptance of a popular trend in architecture which fails to acknowledge the physical architectural characteristics that individualize the city. This phenomenon of buildings that look the same regardless of culture and climate is called homogenization of architecture (Gonzalez and Medina,



Richard Sekler(Pruscha's advisor) showing the model of Kathmandu Valley
Image courtesy: www.news.harvard.edu/gazette/2004/06.03/05-sekler.html

Carl Pruscha
Pic courtesy: Google Images

2004).

Technology and globalization is ubiquitous in today's world and in this section of the book, I have tried to examine if globalization poses a threat to the social and cultural identity of the Nepalese society or if it could be used for the betterment of the society. For simplification, I have divided my research into different categories that will form the basis of my design idea.

Identity in Globalized World:

According to Carl Pruscha, 'For thousands of years, human dwellings have developed in an incredibly rich diversity, reflecting man's ability to respond to the environment-topography and climate-and to create social norms and physical standards for his habitat. Our western world has become accustomed to a standard of living that is not only unsustainable in the long run, but also lags behind previous achievements which are in danger of becoming forgotten. We have limited our choices to two equally unsatisfying and extreme dwelling alternatives: the high rise apartment block and the free standing single family homes. These have become the epitomes of contemporary American and European city and those are both uneconomical in terms of infrastructure and maintenance and nevertheless they are being copied universally' (Pruscha, 2004).

The idea put forward by Pruscha is exactly what is happening in the Kathmandu valley which was once a sustainable urban center. There are highrise condos sprouting randomly throughout the valley, and new town houses featuring western lifestyle and western finished material are being built everywhere. Traditional dwelling were the response to the environment and the society and not merely highly controlled mechanical buildings. The Western world is capable of following the homogenous fashion of architecture like international, modernist, post-modernist, constructivist or deconstructivist etc but not in a resource poor economy. In the hype of modernization and following the popular trend of architecture around the world, countries around the world undergo a relentless erosion of their own culture and unique

cultural identities. A major difference between the values of Western and Eastern culture as pointed out by Pruscha is that the Western culture puts emphasis on individuality whereas the Eastern counterpart is directed towards a harmonious, all embracing compatibility. This collectivist attitude is demonstrated by the inward looking houses toward the courtyard in the Kathmandu valley. Art, music, literature, dance and handicrafts are mostly the manifests of local whereas architecture is barely influenced by the roots. Pruscha also criticizes that those who try to copy the vernacular architecture blatantly to create an atmosphere that might appeal to a tourist as a typical image of a country is like creating a local pseudo –identity (Pruscha, 2004).

What we need right now is not a false imagery of the Western façade and lifestyle, but something which is authentic yet adaptive to the changing society. We lose our sense of place when a glass tower is erected amidst low rise dwelling units and new townhouses extensively use western imported finished goods. What is our stance when apartments and housing features of bourgeois lifestyle when the infrastructure is not capable of meeting the demands due to the rapid urbanization and the environment is falling into ruins? Can the valley maintain its image as a sustainable urban core once again?

The answer is ' Yes . Hence we rely on globalization to learn the techniques and technology of the west to put them into good use by adaptation, assimilation and further innovation and define our identity as a sustainable urban center as it was in the past by considering our cultural and social needs.

Critical Regionalism in the Age of Globalization:

In the book Tropical Architecture, Beng states that 'in the face of globalization and the transcending power of media and consumer culture, the role of architecture in place-making and in the evocation of specific traditions has been questioned. In the context of Asia, it has become quite apparent during the last couple of decades that the conscientious architects are pursuing an


Kenneth Frampton
Image courtesy:Google Images

engagement with traditions and specifics of locality with renewed vigour. Growing ecological consciousness as well as the ideological quest for national identity are extensively debated today. Regionalism is the counter-trend to the universalizing force of modern architecture and the manifestation of identity' (Tzonis et al., 2001, p. 92).

There are countless theories in regionalism like picturesque regionalism, romantic regionalism, over-familiarizing regionalism etc, but I am interested in the framework that allows me to look at the interaction between the old and new system critically. Critical regionalism will be used as a reference for my thesis to develop a new kind of architecture for the Kathmandu Valley as it progresses towards modernity.

Lewis Mumford, an American writer, cultural historian and critic was the first to systematically rethink regionalism and in this section we look at the five points of rethinking regionalism. The five points are strangemaking vs. Historicism, advanced technology vs. nostalgic craftsmanship, sustainability vs. picturesqueness, multicultural community vs. traditional community and the fusion of local and global.

Mumford's first point in rethinking regionalism was his approach towards tradition. Although he was for the protection and preservation of actual historical buildings, he was against the imitation of the tradition in the newer buildings. Mumford criticized Jefferson's University of Virginia and asserts that it was a mistake on Jefferson's part of using the local schist for the capitals of the columns just because it was a local stone as it was a brittle stone and there was much damage to the ornaments. Instead Mumford favored Richardson's adaptation of the local to the new building techniques and new materials. (Tzonis et al., 2001, p.23)The second important point Mumford points out is that he rejected the picturesqueness, the purely aesthetic or spiritual enjoyment of the landscape. Instead he believed that regional forms are those which most closely meet the actual conditions of life and which fully succeed in making people feel at home in their environment; they do

not merely utilize the soil but they reflect the current conditions of the culture in the region (Tzonis et al., 2001, p. 25).

Mumford advocated the use of the most advanced technology of the day for all his ecological concerns. He was an aficionado of Buckminster Fuller's Dymaxion car, the Union Pacific Train, Brooklyn bridge, etc. Mumford was in favor of air conditioner used under special circumstances like in offices which is evident from his Honolulu texts (Tzonis et al., 2001, p.26). Mumford was against the traditional regionalist idea of mono-cultural community based on tribal association, blood ties and an attachment to a soil that was purely native. His view of community was multicultural. In his report on Honolulu, he envisioned a multicultural city of original Polynesians, Japanese and Chinese, Western people which makes it a significant hybridization of cultures which will perhaps make a future development of the human society (Tzonis et al., 2001, p. 26).

The idea of 'Local vs. Universal' or 'regional vs. global' was not opposed my Mumford. Tznonis, Lefaivre and Bruno Stagno quotes Mumford : '…every regional culture necessarily has a universal side to it. It is steadily open to influences that come from other parts of the world, and from other cultures, separated from the local region in space or time or both together. It would be useful if we formed the habit of never using the word regional without mentally adding to it the idea of universal-remembering the constant contact and interchange between local scene and the wide world that lies beyond it. To make the best use of local resources, we must often seek help from people or ideas or technical methods that originate elsewhere….As with a human being, every culture must both be itself and transcend itself, it must make the most of its limitations and must pass beyond them; it must be open to fresh experience and yet it must maintain its integrity. In no other art is that process more sharply focused that in architecture'(Tzonis et al., 2001, p. 28) .

While Mumford developed the idea of Critical Regionalism, Kenneth Frampton, a professor of architecture, brought the issue into a greater understanding when he published a groundbreaking

essay called "Towards a Critical Regionalism: Six points for an architecture of Resistance' in 1983. The essay was a reaction to the Post-modern architecture of the time and the encroaching urban sprawl. Post-modern architecture, which fancifully copied the native and foreign techniques in the most superfluous way just to relate to the site was considered to be a bad architecture. His essay provided vision for the architecture and the cities that were blatantly undergoing cultural universalization, superficiality, mediocrity, consumer society and sentimentality by arguing that the site, geographic location, topography, structure and sustainability should be the driver of architectural designs (Frampton, 1983). Needless to say the Nepalese housing market is repeating the same mistake 25 years after Frampton published his essay. There are highrise condos sprouting randomly throughout the valley without any regard to the context of the site. Some of them advertise about employing the Nepalese architecture, but what is the point of copying the architectural detail of the era that is long gone? Also new townhouses feature the excessive use of foreign imported materials.

In his essay "Prospects for Critical Regionalism", Frampton quotes Mexican architect Luis Barragan that 'Everyday life is becoming much too public. Radios, TV, telephone all invade privacy. Gardens should therefore be enclosed, not open to public gaze…Architects are forgetting the need of human beings for half light, the sort of light that imposes tranquility, in their living rooms as well as in their bedrooms. About half the glass that is used in the so many buildings-homes as well as offices-would have to be removed in order to obtain the quality of light that enables one to live and work in a more concentrated manner. Before the machine age, even in the middle cities, Nature was everybody's trusted companion. Nowadays the situation is reversed. Man does not meet with nature, even when he leaves the city to commune with her. Enclosed in his shiny automobile, his spirit stamped with the mark of world whence the automobile emerged, he is, within nature, a foreign body. A billboard is sufficient to stifle the voice of nature. Nature becomes a scrap of nature and man a scrap of man" (Frampton, 1983).

Indeed such is the enigmatic fate of urban areas around the world nowadays and Kathmandu hasn't been left behind in this process of cultural universalization. Kathmandu is at a fascinating point of the 21st century and I believe that its new buildings should reflect the local history and at the same time use the most advanced sustainable technologies to keep abreast with modernism instead of being inclined to the philosophy of consumerism and repeating the mistake of superficial decoration of the building facades.

Kathmandu Social, Economic and Environmental Changes:

For the theoretical framework of Critical regionalism to be relevant in the Kathmandu valley, it is important to understand the current socioeconomic, ecological condition of the Kathmandu valley. It is also important to understand the opportunities and the drawbacks of the traditional and modern dwellings to come in conclusion with the principles of Critical Regionalism.

Nepal is a small country situated between two of the world's fastest growing economy, India and China. With the influence of two giant neighbors, development of information and technology and the influence of media, the changes taking place predominantly in the Kathmandu valley, which is the capital of Nepal, are inevitable.
The Nepalese politics changed from monarchy to democracy in April, 1990. The Nepalese economy became free from governmental control and thus family trusts cooperated with foreign enterprises and Indian companies became more prevalent. The number of new Industrial entities increased from 5000 to 9000 every year after the year 1992 according the Economic survey. GDP share of industry had grown from 8% before 1990 to 13% after 1994 and the share of agriculture decreased from 51% in 1990 to 43% in 1994. The wave of change in democracy brought all forms of economic and social changes in Nepal, particularly the Kathmandu valley because most of the Industrial establishment had concentrated in Kathmandu and few in the industrial areas of Terai ,which shares borders with India (Kobayashi, 2006). But Nepalese society was exposed to the outside world in 1951 after the end of autocratic Rana Regime and this is the time

http://sajanashrestha.files.wordpress.com/2010/12/urbanization-01.jpg

period that Kathmandu started modernization (Pokharel, 1987).

Another change noticed in Nepal after the introduction of democracy in 1990 is the in-migration of population in the Kathmandu valley and the out-migration of people from the country. Temporary out-migration to countries like Saudi-Arabia, Kuwait, Malaysia, UAE and UK as laborers and soldiers was sought out as an option for employment for the rural youth. Another life strategy change in Nepal is now concentrated into the non-agricultural sector and gaining educational background relating with global economy including the IT industries that have recently been developing (Kobayashi, 2006).

The out-migration of youth from the valley can be accounted for wanting foreign education in countries like US, UK, Australia, Netherlands, India, etc. However, I am more concerned about the in-migration of rural population in the Kathmandu valley, which started increasing from 1996 when the Communist Party of Nepal- Maoist started their armed struggle and started oppressing richer families in rural Nepal for 'special taxes.' The fear of the Maoists and the reluctance to join the Maoist force compelled mostly the youth population to migrate to Kathmandu. Besides the political instability, Kathmandu also allured the younger generation for better employment opportunities, education and better life (Kobayashi, 2006). Pokharel quotes ICIMOD that the current growth rate of the population in the valley is estimated to be 4.71 % per year which is one of the highest in the world today (Pokharel, 2008).

Kathmandu has also been experiencing rapid urbanization along with the growth of population. The rate of urbanization in Nepal was 6.6% per annum, which was the highest among the Asia Pacific region followed by Cambodia (6.2%), Bangladesh (5.3%), Pakistan (4.4%), India (2.9%) and SriLanka (2.2%). Urbanization can be accounted for the transformation of agricultural land and forests into built-up area. The environmental quality of the valley has thus been degraded due to high population growth, fragmentation and dramatic land usage and socio-economic transformation. A new kind of housing development is encroaching

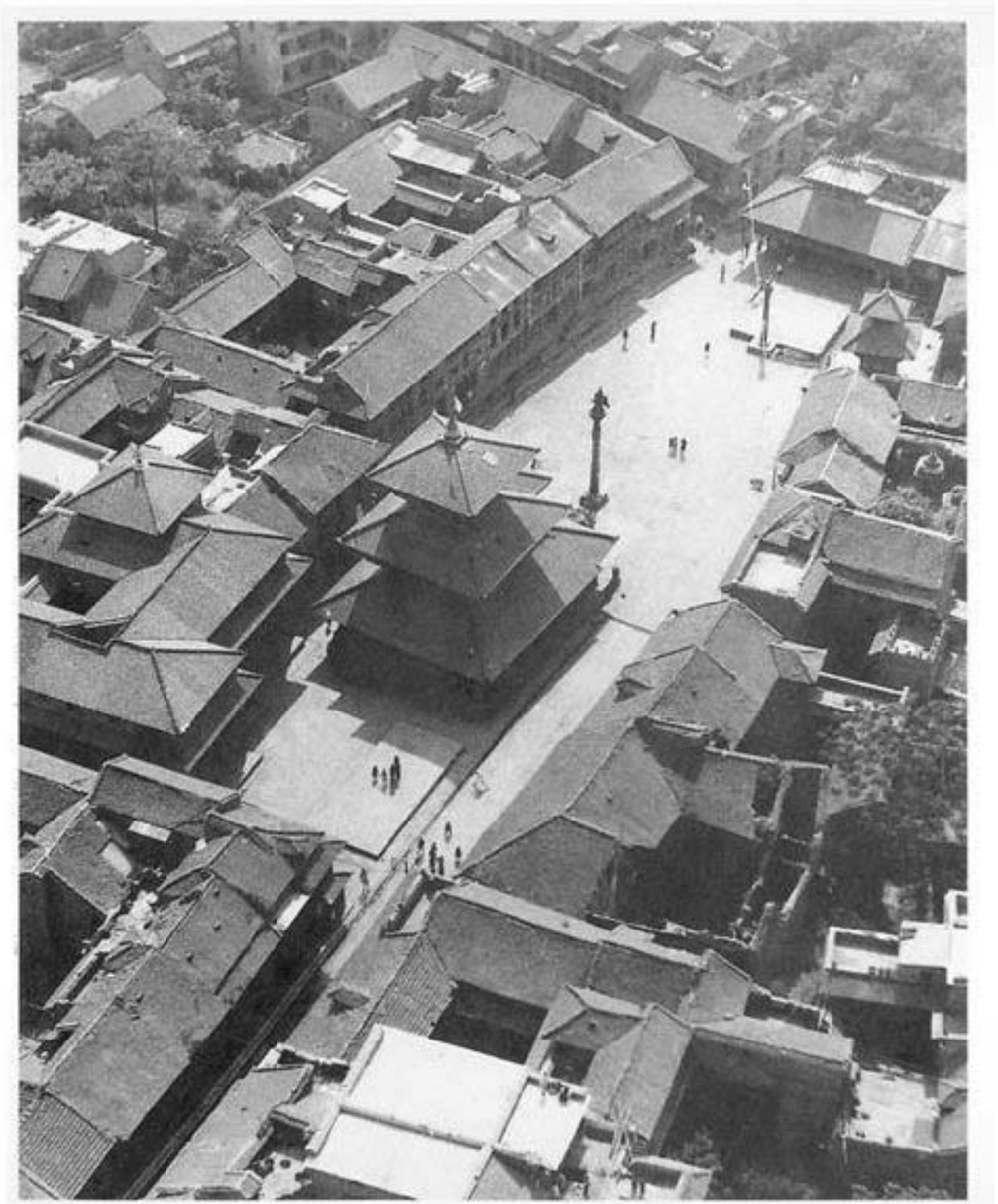
the historical fabric (Thapa and Murayama, 2009).

The valley, which was historically sustainable from an environmental and socioeconomic point of view, is now undergoing a dramatic change and is experiencing an explosion of population. New kinds of townhouses around the suburbia and high class condos have been constructed throughout the valley. However, the supply of consistent power, proper sanitation and clean drinking water hasn't been proportional to rate of urbanization (Thapa and Murayama, 2009). Hence, we could use globalization to our benefit to address these issues of urbanization by using the most advanced sustainable technologies and learn valuable lessons from the traditional courtyard dwellings to maintain our integrity.

Kathmandu Vernacular Architecture:

The term vernacular architecture is expressed as both built and natural environments and since an overwhelming part of the built environment consists of vernacular architecture, it cannot be overlooked or neglected. Traditional vernacular architecture provides a perfect response to the environment, makes use of local materials and takes the culture and technological aspects into account. Pruscha mentions that the professionalism in architecture is in danger of losing touch with the basic needs of people and society at large and lessons learned from vernacular builders need to be included in the curricula of professional architecture education (Pruscha, 2004).

'The indigenous agricultural developments, the traditional house forms, the urban design, the artistry of Newars (in Kathmandu) form a successful environment for the social, religious family systems which is still a whole. This balance between environment and people must be preserved and should form the basis for modernization in the valley.' This is an excerpt from the book '*Kathmandu valley towns*' by Hosken which sums up how Kathmandu should view modernization. Limited resources were used by the traditional builders to achieve maximum comfort and climate was the major determinant in the building techniques. Modern buildings are less concerned with



pic courtesy: http://www.nepagallery.com/categories.php?cat_id=15&sessionid=da8s5mnq125lllelceqsh8hft2

Oldest part of Bhaktapur one of the 5 municipalities of Kathmandu valley showing the courtyard dwellings arranged around a temple.

the climate and advanced building techniques have made heating and cooling the buildings easy. (Upadhyaya, 2006)

The traditional approach to design of houses included clustering of row houses to accommodate the extended family system that was applicable to conserve the land for agriculture, which is rapidly diminishing today. Traditional home builders constructed houses that were generally about three to four stories tall considering the fact that the valley lies in a seismic zone. Traditional houses also featured courtyards which fulfilled the need of semi private space to provide playgrounds for children, drying clothes etc and for security reasons. Courtyards also served well for bringing natural light and fresh air into the compact houses. The collectivist and the strong family oriented culture are symbolized by the inward looking nature of the houses. Privacy of the dwelling units increases with vertical progression. Entrance and utility would be placed in the ground floor, Common living area in the first, bedroom on the second and Kitchen and Living room in the uppermost floor. The sloped roof overhangs provided an excellent solution in passive solar heating and cooling (Pokharel, 1987).

However, with the changing society as discussed in the previous section, although extended families are still prevalent, the nuclear family lifestyle has been gaining popularity for those who aspires to own independent housing units. Another problem with the traditional system is the flexibility to expand horizontally, but not vertically due to the intricate roofing details. The traditional systems also lack thermal insulation which only consists of adobe brick walls. Also, traditional designs lack proper sanitation, damp-proofing, etc. Traditional dwellings are designed mostly based on the orientation toward the temple rather than toward the orientation of sun (Pokharel, 1987).

Modern Dwelling:

The modern housing estates in Kathmandu have become more of a commodity than a 'place' as described in the section that talks about globalization. It boasts about spaces that have a magazine look and is shifted toward the bourgeois lifestyle. Pokharel mentions that totally modern

design in dwellings causes both problems in its use and construction. The modern designs, as would be carried out in any part of the world, have arbitrary spatial layouts that are incompatible with the cultural needs of the users. Sometimes the users end up changing the layout of the spaces after the dwelling has been constructed. Some of the example she points out include the addition of a worship room, separation of private and semi-private areas (Pokharel, 1987).

Pokharel states that the specification of modern materials and foreign construction leads to problems during execution and that include the difficulty in used participation (Pokharel, 1987). Pokharel quotes Joshi that in a resource-poor economy when the users are unable to participate and have to rely on occupational labor, housing not only becomes too expensive but also less satisfactory (Pokharel, 1987).

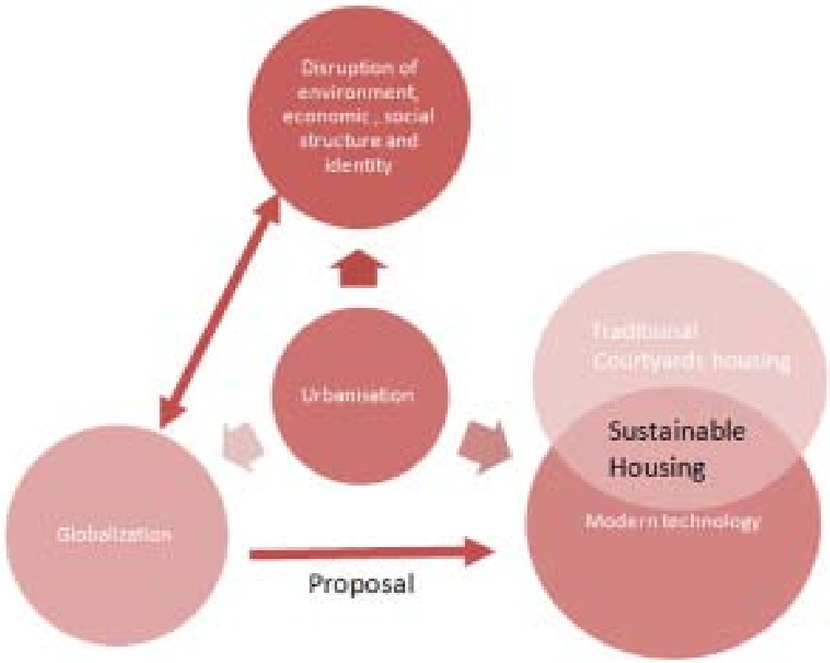
The qualitative aspects of the spaces are lost in trying to fulfill the materialistic aspects of it. The new townhouses feature a bourgeoisie lifestyle with expensive wooden floorings, chandeliers, imported hardwood floors and the location of the site which would require ownership of private vehicles.(Kobayashi, 2006). Despite certain drawbacks, the newer materials and technology of modern systems are helpful in certain aspects of the design like damp- proofing, waterproofing, improving energy performance of the building, increasing fire and seismic resistance, improving the sanitary system of the dwellings and the provision of water supply which is not well coordinated in the traditional dwelling systems.

Rethinking the Approach to Housing:

By looking at the advantages of each of these systems, the current problems the valley is facing and the kind of critical rethinking that Mumford outlined in his writings, a synthesis of the traditional and modern systems is best suited for the housing design in Kathmandu when the forces of globalization are ever more present with the regional realities- cultural, social, technical, economic and ecological. Once a historically sustainable urban core from an environmental and social standpoint, Kathmandu can still maintain its image as a sustainable place if the modern housing markets focus more on a sustainable side rather than on creating the status symbol.

http://www.civilhomes.com/index.php?link=phase&phase=IV&home-type=apartments

Summary:



'Globalization' as discussed in the section 'In Regards to Globalization' is a phenomenon which is believed to have started after the Cold War and it is a phenomenon which cannot be ignored in this century. Although it started with economy, it also has much to do with influencing culture, language, built form and the list goes on. With two of the world's fastest growing economies as neighboring countries, the influence of globalization is inevitable in Nepal. Until the 1950s, the Nepalese citizen were under the autocratic Rana rule and were not exposed to the outer world, although the Ranas did bring some European technology and experts to Nepal for building their palaces, but after their reign was over, Nepal opened its door toward modernization and experienced a number of social and economic changes, particularly in the Kathmandu valley. Globalization is responsible in creating a universal vocabulary of architecture, but I believe that we need to have a sense of place as we move toward modernizing ourselves.

Although the critics of globalization argue that it is the part of neo-liberal conspiracy controlled by the affluent West against their poor counterparts, I believe we can make globalization benefit developing nations by providing the poorer countries a platform for a global market of goods and services and transferring technology and knowledge cross-culturally. One of the most notable changes in the valley has been the population explosion and consequently rapid haphazard urbanization which poses serious threats to the environment. In addition to that, the rate of urbanization hasn't been proportionate to the rate of clean water supply, sanitation management and power supply. In Kathmandu, an urban catastrophe of importing western housing models like post-modern highrises and the free-standing suburban townhouses where the citizens are now more concerned with materialistic wants and not in creating a sustainable ideal city which it used to be in the past, has been observed. These housing developments do not respond well to the local context and could be placed anywhere in the world. High rises are a good solution for urban densification but are not ideal when placed randomly in the historic city fabric without proper city planning.

Critical Regionalism provides a solid frame-

work for my analysis of the theoretical premise/ unifying idea. The nature of architecture should be reflected by the culture and the context, sustainability, climate, topography and structure instead of blatantly copying the universal language of architecture. Mumford's five points on Critical Regionalism are an excellent resource on how we can create a unique architecture in the 21st century and still take part in modernism.

By looking at the advantages and disadvantages of both the traditional dwellings and the modern dwellings and the current problems the valley is facing due to rapid urbanization and globalization, I propose a synthesis approach. Once a historically sustainable place from an environmental and socioeconomic standpoint as discussed previously, houses in Kathmandu can still maintain its image as a sustainable city if we rely on the most advanced technology of the current time and reflect on some of the viable traditional housing approaches.

CASE STUDIES:

Typological Research:

Case Study 1:

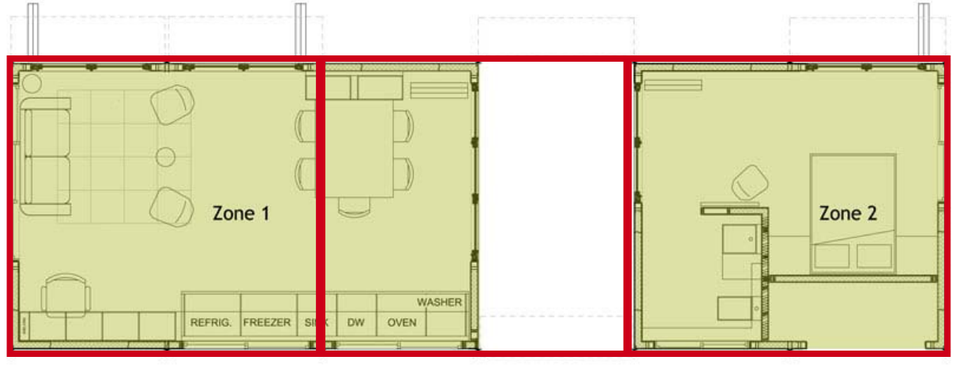
RE-FOCUS

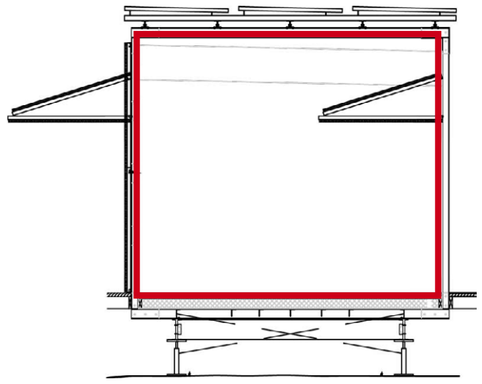
Designed by University of Florida
Solar Housing: Participant of 2010 European Solar Decathlon

RE-FOCUS is one of the two projects from the US that was selected for the European Solar Decathlon. It features an 800 sq. ft space which is the modern interpretation of the traditional Florida 'cracker house' that has a well covered porch for sun protection. The house is designed using high tech photovoltaic panels, solar passive design and prefabricated modular construction. ("Re-focus," 2011)

Laura Ettedgui, one of the 125 participant students, said that the cracker homes were the homes that people lived in before air-conditioning came into existence in Florida and one of their primary goals in designing the RE-FOCUS was to passively cool the house and reduce the demand for electricity. The living and dining areas of the house are separated from the bedroom with a breezeway in the middle and porches on each side and is naturally ventilated and oriented for best solar access and to cool the house in the hot, humid south ("Re-focus," 2011).

When bi-folding screen doors on the façade are raised, the porch opens the breezeway like the traditional cracker house. The entire roof and the southern façade of the building are covered with solar panel and produce 14.6 KW of energy which is more than enough for the 1 bedroom house. Reclaimed, reused and recycled material, energy efficient appliances, etc, make this house sustainable ("Re-focus," 2011).





Analysis:

Structure: The structure of the building is made of 6 modular steel frames, and SIPs make up the wall and the ceiling of the building. SIPs are relatively cheap and they provide additional structural support to the building as well as high insulating properties.

Natural Light: Abundant light is introduced in the Northern façade without overheating the house by using three sets of low emissive, insulated glass doors. Privacy and lighting are also controlled by an adjustable exterior shading device.

Massing: The overall mass of the building is two simple cubes connected with a breezeway.

Plan to Section/Elevation: The plan and elevation relationship is equal.

Geometry and Hierarchy: The overall mass of the building is a simple cuboid and is devoid of any hierarchy.

Conclusion:
This project was an exploration on how historic back to basic design can be used with modern advanced technology to create something which is poetically sensible as prescribed in the theoretical premise and unifying idea.

Case Study 2 :

Gelsenkirchen Solar Housing Estate, Germany

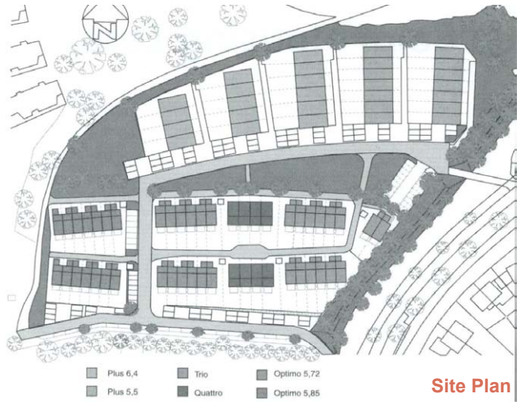
Gelsenkirchen, which lies in the Ruhr region of Germany used to have a steel and coal economy and the city has been undergoing major transition due to sharp decline in these economy. This city which was a 'city of 1000 fires' is changing into 'the city of 1000 suns' due to changing economy. The housing campaign of building 50 planned 'solar settlements' was started in 1997 and this project was the first which was built on a former coal mine site (Hastings and Walls, 2007).

The objective of the project was to minimize the energy requirement through appropriate construction methods and to supply the remaining energy needs with solar energy.
The building site is 38,000 m2 and 2 types of housing are developed in the same site. 22 light construction houses and 16 massive houses were built on the southern part of the site whereas 33 massive houses with gabled roof were built in the northern part of the site (Hastings and Walls, 2007).

The 22 light construction houses on the southern tract have 5-6 rooms in 3 stories. One third of these houses have no basements and the remaining have unheated basements. The roof slopes at an angle of 8 degrees and is covered with vegetation (Hastings and Walls, 2007).

The unheated basements of the 16 massive houses in the southern tract makes it different from the light construction house. However, the 33 massive houses of the northern tract have gabled roofs that are oriented to the south and they have 5 to 6 rooms in 2 stories (Hastings and Walls, 2007).

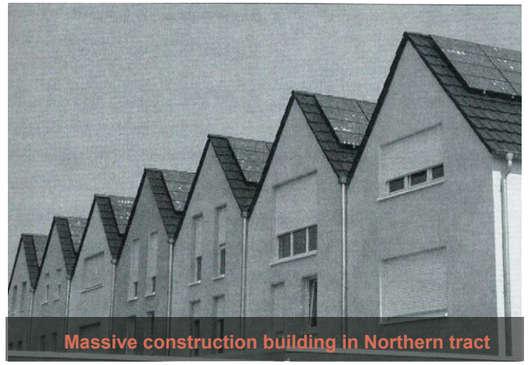
The heating demand for all the houses was achieved with active and passive solar energy use (Hastings and Walls, 2007).

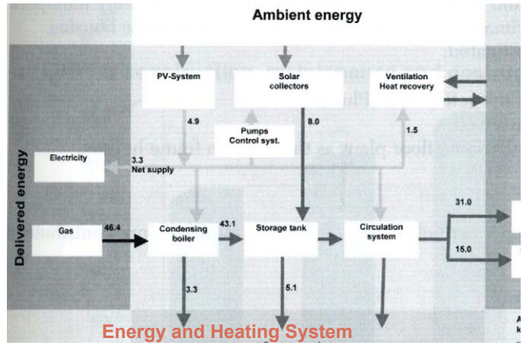


Site Plan


Light construction building in southern tract


massive construction building in southern tract


Massive construction building in Northern tract

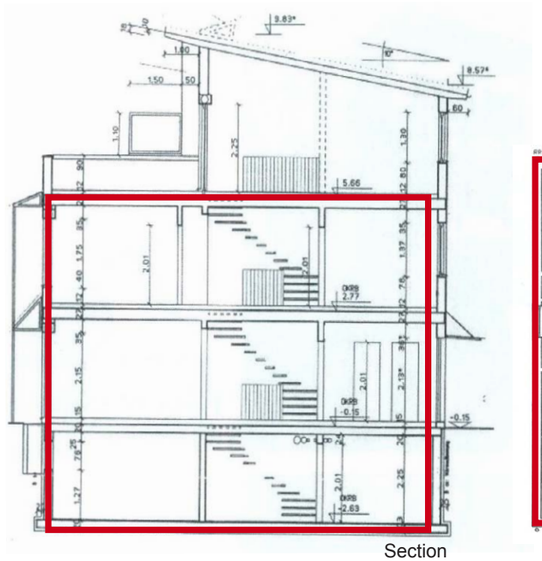


Energy and Heating System

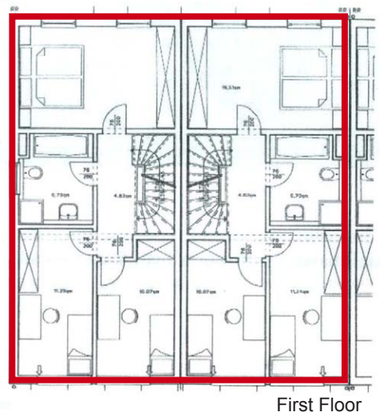
The building wall is comprised of gypsum board, plywood, board siding and mineral fibre batts/ framing. The floor slab on grade was constructed of cement with PE- foil, sound deadening insulation, concrete floor slab, gravel and clean fill. The roof was constructed using gypsum board/PE foil, mineral fiber insulation, wood fiber panels, roof weather barrier and substrate for planing (Hastings and Walls, 2007).

Electricity in all the buildings was produced using a grid connected photovoltaic system. In the northern tract, photovoltaics are installed as a part of roof system whereas the houses on the southern tract use photovoltaics as a sun shading device in the south-facing windows (Hastings and Walls, 2007).

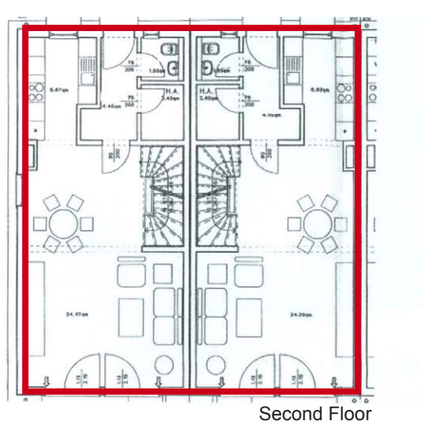
The houses in the southern and northern tract have different heating systems. Solar assisted gas fired condensing boilers satisfy 65% of the energy demand in 29 single family houses in the northern tract. The 48 single family houses in the southern tract satisfy their energy needs using a micro-district heating system per house as well as the solar heat and electricity produced on the rooftops. A local utility company manages the central units (Hastings and Walls, 2007).



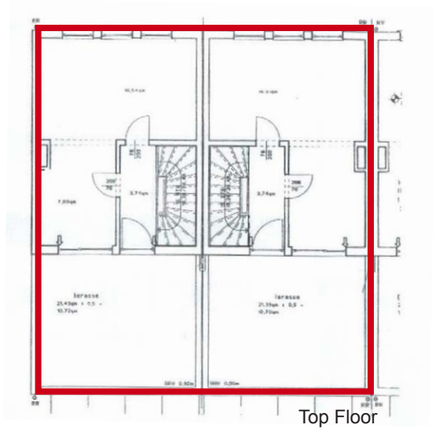
Section



First Floor



Second Floor



Top Floor

Analysis:

Structure: From a different energy analysis, it was concluded that the massive houses in the southern tract required the most energy, followed by the massive building in the northern tract and the light frame building on the southern tract required the least.

Natural Light: Orientation of windows in the main rooms are to the South. Photovoltaic panels are used as a sunshading device in the houses situated in the southern tract.

Massing: The overall mass of the building is simple cuboid with slanted roofs on the houses in southern tract and gabled roofs on the Northern tract.

Plan to Section/Elevation: The plan to section relationship is equal.

Geometry and Hierarchy: Gelsenkirchen uses simple rectangular geometry based off of a rectangular grid. Hierarchy is seen on the top floor of the building in a way that is different from the rectilinear form of other spaces.

Conclusion:

This project is a site responsive design as stated in the theoretical premise and unifying idea.

One of the objectives of the building was to build affordable housing for young families and it was successful through subsidy programs introduced for solar energy housing estates by the ministries in North Rhine-Westphalia.

This project is relevant for the thesis as it was developed out of the need to shift the economy from a coal/ steel based economy to a solar economy.

Case Study 3

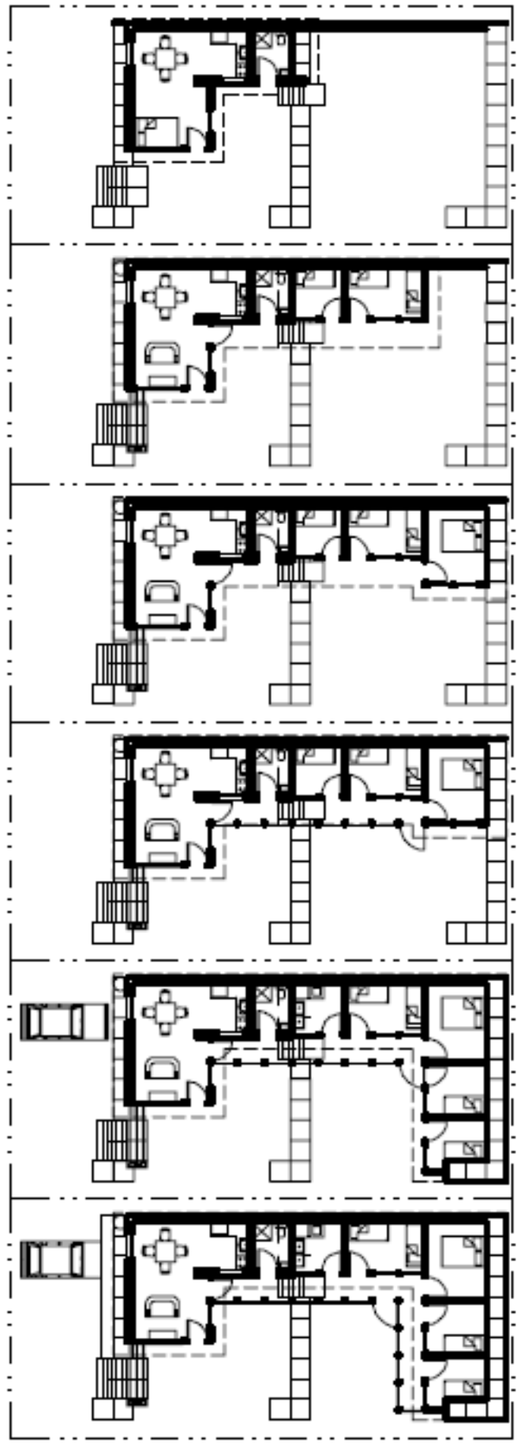
A Low Cost Sustainable Housing Prototype for Tijuana, Mexico

Designed by faculty and students of California Polytechnic University Pomona, this project is an exploration of utilizing local materials and technology appropriate for the cultural and economic conditions of the community of Tijuana. The technologies incorporated in the project are inexpensive home-made solar heating systems that minimize the usage of energy, water and materials to attain human comfort with the least resources. Some of the other factors incorporated into this project are addressing the security concerns of the residents, food production alternatives, management of waste and water system to protect public health. Other lesser developed countries could adopt the principles used in this project (Roche, Ramirez, Brown, Whitsett, Wehinger, Carranza, Lum & Reed, 2006).

The plan of the project is an 'L' shape which can be extended to a 'U" shape. The 'L' shape consists of a multiuse space and a bathroom which will be expanded to a 'U" shape that will eventually form a living/dining room, kitchen and bedroom of different sizes. The first phase is 29.75 m2 that includes a kitchen, sleeping area and a bath. The addition of bedrooms in later phases morph the plan into a U-shape which shows the flexibility of growth (Roche et al.2006).

The shape of the building maximizes the surface to the South, while allowing cross ventilation. Topography is maintained with the construction of three Gabion walls (Roche et al.2006).

The soil generated from the grading process in the site is used for building the walls of the structures while rocks from the site are used for gabion units. Local materials like concrete, having high thermal capacity, are used to store heat in winter and act as heat sinks in summer. Hydronic systems with solar collectors are placed in the south wall to heat the water. Operable windows are placed along the southern and eastern facade to maximize daylighting and natural ventilation conditions (Roche et al.2006).

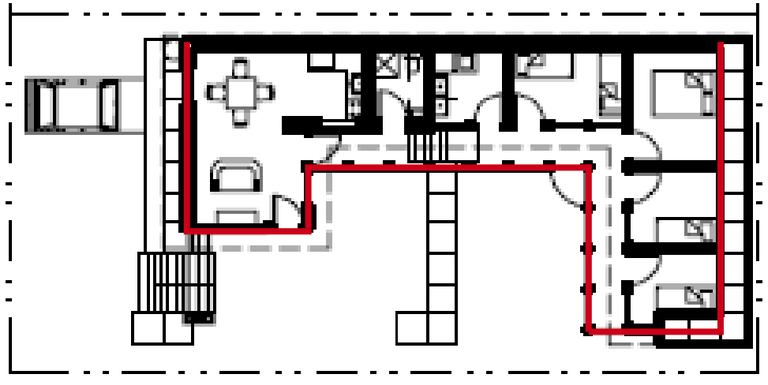


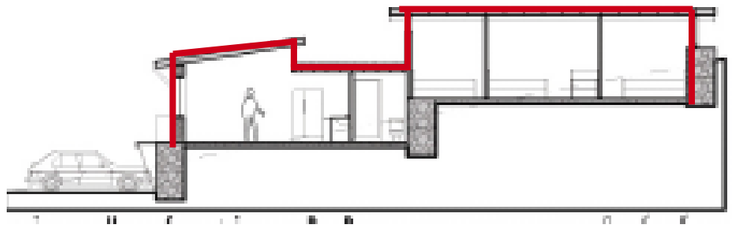
phase 1

phase 2

phase 3

Rain catchment systems and greenroofs will help in storm water run-off. The courtyards will be utilized for landscaping and food production. The site is mostly covered in permeable structures which helps in retaining water on site and excess water is drained off the parking area at street level by using French drains (Roche et al.2006).





There exists an analogous relationship between plan and section. The configuration of plan resembles the shape of the section although there is some irregularity between the two.

South Elevation

Analysis:

Structure: The rock and soil generated from grading of the site is used for building the gabion which is used for walls and retaining walls. The gabion units which is square wire baskets filled with rocks are roughly one cubic metre. The interior of the building is plastered like the earth bag walls.

Natural Light: The southern and eastern facades consist of operable windows providing natural light and ventilation and solar gain in the morning and during the whole day in winter in the southern elevation.

A jalousie system in the southern facade provides security and privacy and also solar protection during winter.

Massing: The overall mass of the building is really simple cuboid which shows additive characteristics.

Plan to Section/Elevation: There exists an analogous relationship between plan and section. The configuration of the plan resembles the shape of the section although there is some irregularity between the two.

Geometry and Hierarchy: This prototype uses simple rectangular geometry based off of a rectangular grid. The dominant space seems to be the multiuse space which is constructed in the 1st Phase which seems to have higher ceiling heights and looks trapezoidal in elevation.

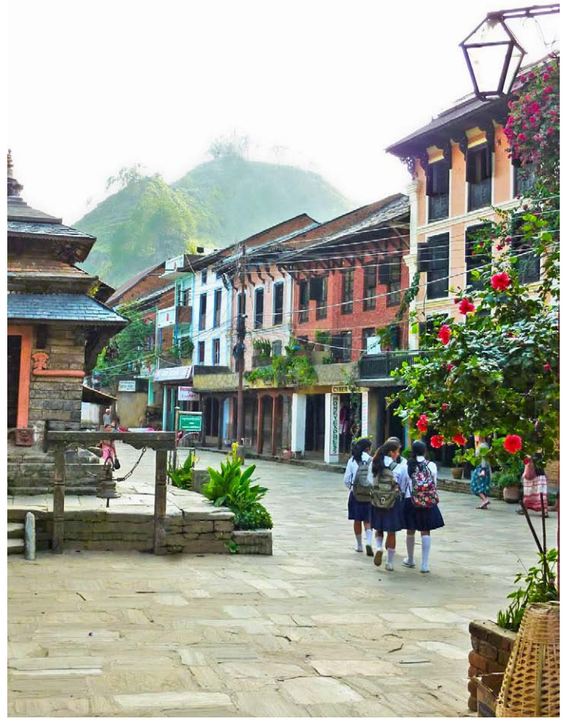
Conclusion:

This project is a site responsive design as stated in the theoretical premise and unifying idea. It uses affordable and local material for construction. Since the project is designed as a prototype applicable to other developing countries of the world, it could be applicable to my research area.

Case Study 4:

TheTraditional Newari House, Kathmandu, Nepal :

The vernacular houses were built in the flat land of the Kathmandu valley mostly around the royal cities of Kathmandu, Bhakta pur and Lalitpur. These types of construction have been carried out for more than 200 years. The typical configuration of plan is 2 rooms on each floor and a staircase on one side, whereas the example presented is an L-shape. The buildings constructed later have larger openings and windows are made of wood. The size of the window varies with the progression of each floor. In the older buildings, ornate windows called *San Jhya* are placed at the third storey level. Alteration to the modern concept of this window is usage of larger windows and lesser masonry material. Courtyards are also important aspects of designing dwellings. Courtyards help in creating semi-private space and also serve the purpose of community living. Temples usually occupy the central courtyard and the orientation of the buildings depend on it (D'Ayala, & Bajracharya , 2003).



Analysis:

Structure: Unreinforced stone masonry of adobe bricks are used as load bearing structures.

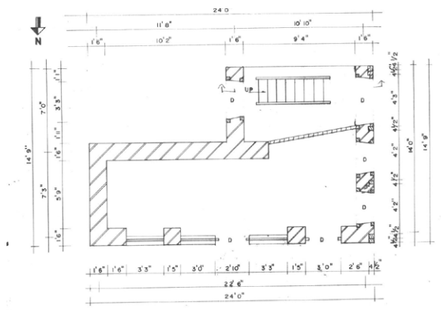
Natural Light: The size of windows varies according to each floor and different daylighting requirements.

Massing: The overall mass of the building is very simple with mostly cuboidal mass with a sloping roof.

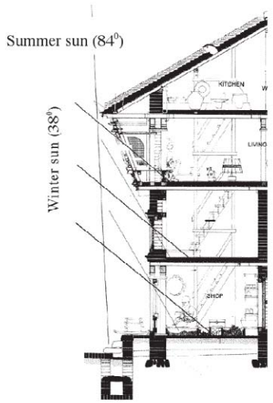
Plan to Section/Elevation: Plan to section elevation is proportional. The courtyard provides the opportunity of semi-private space and a common area for people to socialize.

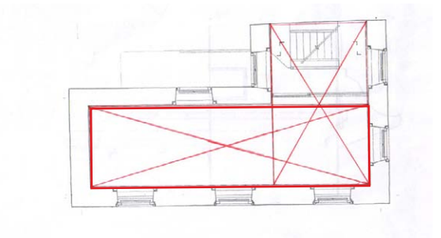
Geometry and Hierarchy: Hierarchy is determined according to placement of rooms. The important spaces like the kitchen and worship room are places in the uppermost floor followed by the bedroom, then the livingroom and the utility-rooms on the ground floor.

Conclusion:
Understanding of vernacular architecture helps in designing building that will fit into the context and also makes it clear how passive design principles were perfectly employed in the building design.

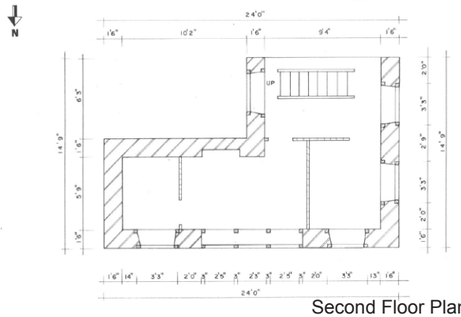


Ground Floor Plan

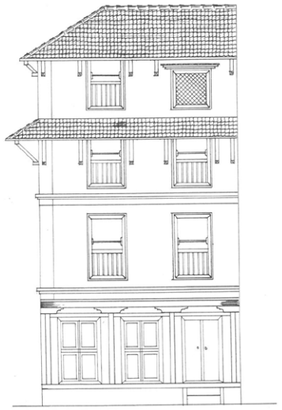




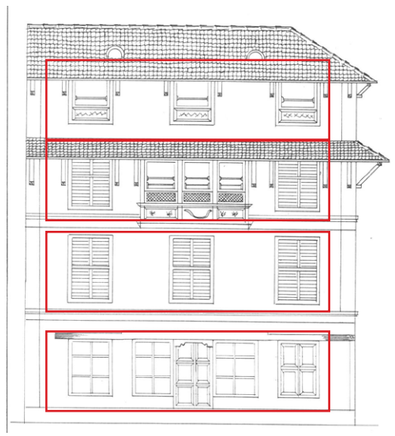
First Floor Plan



Second Floor Plan



West Elevation



North Elevation

Summary:

All of the above case studies presented were done in conforming with the conclusion generated from the theoretical premise and unifying idea. The first three case studies presented were from different parts of the world and how the technologies and design fit into the local conditions. The last case study was conducted in order to gain a better understanding how the people used to live in the traditional dwellings which was considered sustainable living during that time.

The first case study, RE-FOCUS designed by University of Florida, uses the latest technology in gaining user comfort and creating a house which produces its own energy. This was the most modern sustainable project that was studied to understand how integrated modern technology can be best utilized with lessons learned from vernacular architecture in the most developed country of the world. The second case study was a solar housing project in Germany which mainly focused on creating affordable yet highly energy efficient housing. It was an interesting project to study because there were three different types of housing constructed on the same site. This project was also a good source of information of how the active energy systems could work in the building. Also solar energy is used in the project to generate electricity after the failure of the coal economy and Kathmandu has a great potential for solar housing (Chinanese et al., 2009).

The third project was from Tijuana, which was an exploration of utilizing local materials and technology appropriate for the cultural and economic conditions of the community and use of passive design principles to meet the energy needs, which was very similar to the conclusion generated from the theoretical premise and Unifying Idea. The last project was from the traditional Newari House of the Kathmandu valley and it was an important part of the case study series since it is the vernacular architecture of the valley.

All the case studies had different spatial configuration. The simplest one was the Lumenhaus, which was the most technically advanced one followed by the dwelling in Mexico, which had a linear arrangement of spaces. Gelsenkirchen Solar Housing Estate, Germany had spaces distributed in three floors with the addition of basements in some of its dwellings among the three types. The most specific in terms of spatial layout was the traditional dwelling of the Kathmandu valley which had a hierarchy of spaces according to the most important and private spaces being located at the top most floor and the lesser private spaces being placed on the lower floors. It also had another unique feature of a courtyard for the purpose of semi-private space. The courtyard also served as a playground for children and communal activity which demonstrates the collectivist nature of the people of the Kathmandu valley in the past.

Each of the four buildings studied had its own unique characteristics; however, they were all sustainable buildings and conformed to the concept of the theoretical premise/unifying idea.

Historical Context:

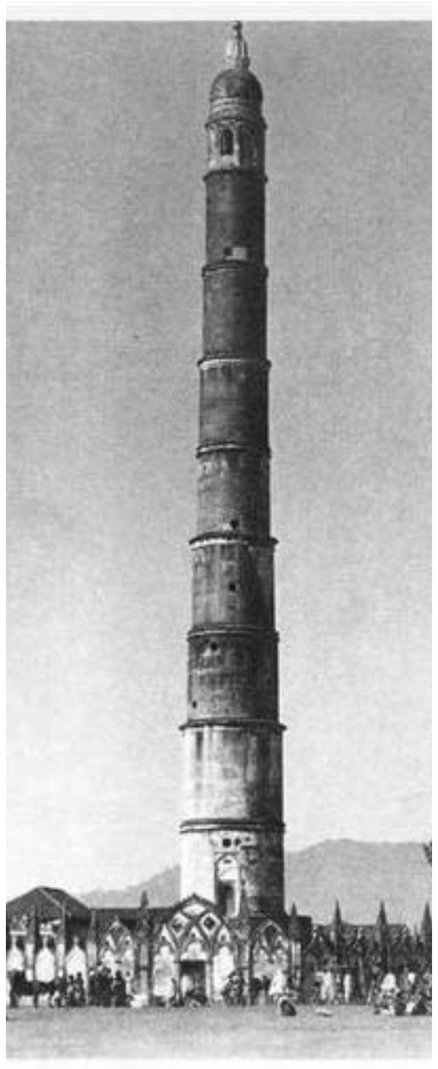
Globalization of built form to/from Nepal:

Although economic globalization started in Nepal only after the April of 1990 after the end of Monarchy to Democracy, the cross cultural flow of ideas and trade dates back centuries earlier. (Kobayashi, 2006).

'Arniko' who is referred as the greatest artist of Nepal is compared to Brunelleschi, Michelangelo and Leonardo in the West. In 1257-71, Jaya Bhima Malla, the King of Nepal was asked by the Chinese Emperor Kublai Khan to send 100 great artists from Nepal to erect the 'golden stupa' in Tibet and Arniko was the head of the artisans to head to Tibet in 1261. A few of his contributions in the Tibetan and the Chinese empire include the White Pagoda in Beijing, the Golden Pagoda in Tibet, a great deal of monasteries, Confucius shrines and artworks. The great works that he produced while in China had earned him Imperial positions in the Yuan Dynasty and his contribution to Eastern art is the story of how Himalayan Buddhist art became popular (Shakya, n.d).

During the Lichhavi period (300-1200AD) in Nepal, the art and architecture of the Nepal seemed to be somewhat influenced by the Guptas/Kusans of Indian Origin. During the Malla period (1200-1769AD) and the Shah period (1769-2008AD), there were influences of Indian architecture. General Bhimsen Thapa had erected Dharahara, a minaret like structure borrowed from Moghul design 1826, which collapsed during the earthquake of 1934 and was restored to the current height of 203 ft.(Shah and Rana Period Architecture).

The Ranas were the prime ministers in the country for a century (1846-1950) who established their autocratic rule. Their reign was marked with building palaces in Neo-classical, Baroque and industrial style with columns of different orders, French windows and white plaster. They had maintained close relationships with



Dharahara Pre-earthquake
http://www.nepagallery.com

the British East India Company during their reign, which made it possible to borrow the new style of architecture in the country. According to Vijay, "The Ranas bequeathed to the nation a style of buildings completely different in scale and design as a projection of their autocratic hold on power and the inclination to outdo each other in the grandeur of the building in favor of the traditional design. The warm brick buildings of the Malla period was replaced with White stucco walls" (Shah and Rana Period Architecture). Singha Durbar which was built in 1903 by Chandra Shumsher as his residence was a neo-classical building which had more than 1000 rooms arranged around seven quadrangles and it was once among the largest building in South Asia. The building is surrounded by formal gardens, parks and pavilions and it currently serves as the Parliament of Nepal as well as headquarters of Radio Nepal and Nepal Television. They also built exotic gardens with plants imported from Brazil and Japan. The Rana period can be well described not only in oppression of people and the Kingdom, but oppression of local architecture as well (Shah and Rana Period Architecture).

After the downfall of Rana regimes in the 1950s, modern developments started in the Nepal with technical assistance from various foreign countries and foreign architects. Some modern architects who stayed to make important contributions include Carl Pruscha, David Dobereiner, Goltz Haagmueller, John Sanday, Louis Kahn etc. These architects were impressed by the traditional built environment of the valley and developed designs according to the context rather than installing stereotypical modern projects from their countries of origin. Swiss architect Weise re-introduced local architectural scale and the sloping roof forms which are characteristics of traditional architecture. Hotel Annapurna, The Yellow Pagoda Hotel, the Nepal Army Headquarters, residences and projects in Tribhuvan University are some of his fine examples of the synthesis of modern and traditional designs (Shah, 2010).

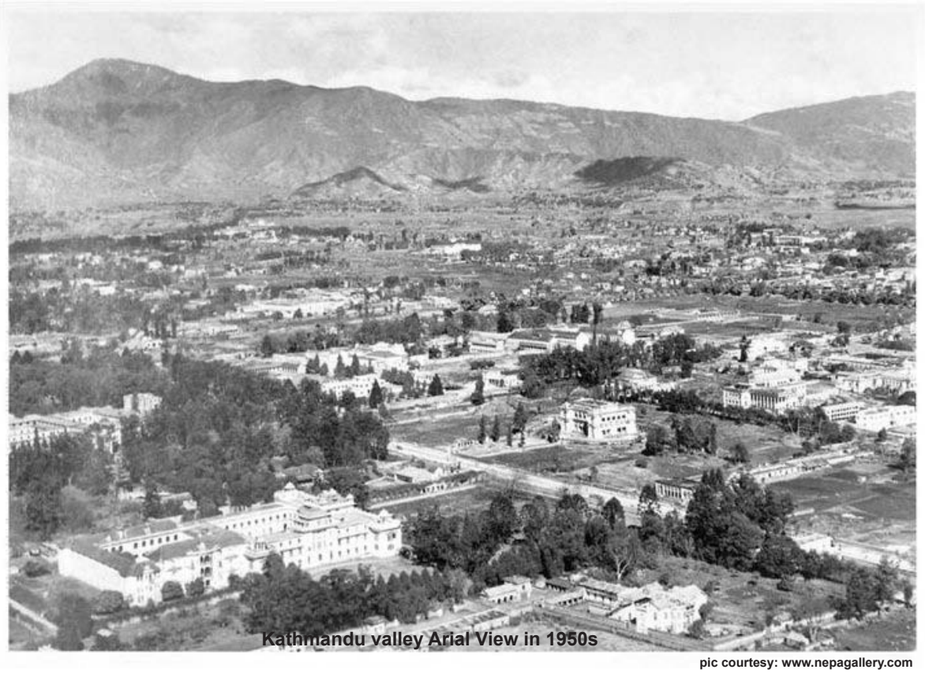
In the late 1960's, Austrian architect Carl Pruscha came to the valley on a UNDP assignment to produce the first urban development plan of the valley. Some of his work includes the CEDA (Center for Economic Development and Administration)

building for Tribhuvan University and Taragaon Hotel, which was to serve the foreign consultants coming to the valley. This building is an excellent example of modern design amalgamated with the traditional element of the valley. Wooden windows evoking the spirit of the valley are integrated with exposed brick vaults. The CEDA building is also composed entirely of exposed brick that is integrated into the sloped agricultural terraces. The building is modern yet is designed with the understanding of the site (Shah, 2010).

Gotz Haagmueller was another Austrian architect appointed to restore several heritage buildings in the Bhaktapur area in the 1970s and he designed buildings like Patan Museum and Keshar Mahal garden which demonstrate the range of contemporary design possibilities in restoration of old buildings for current use (Shah, 2010).

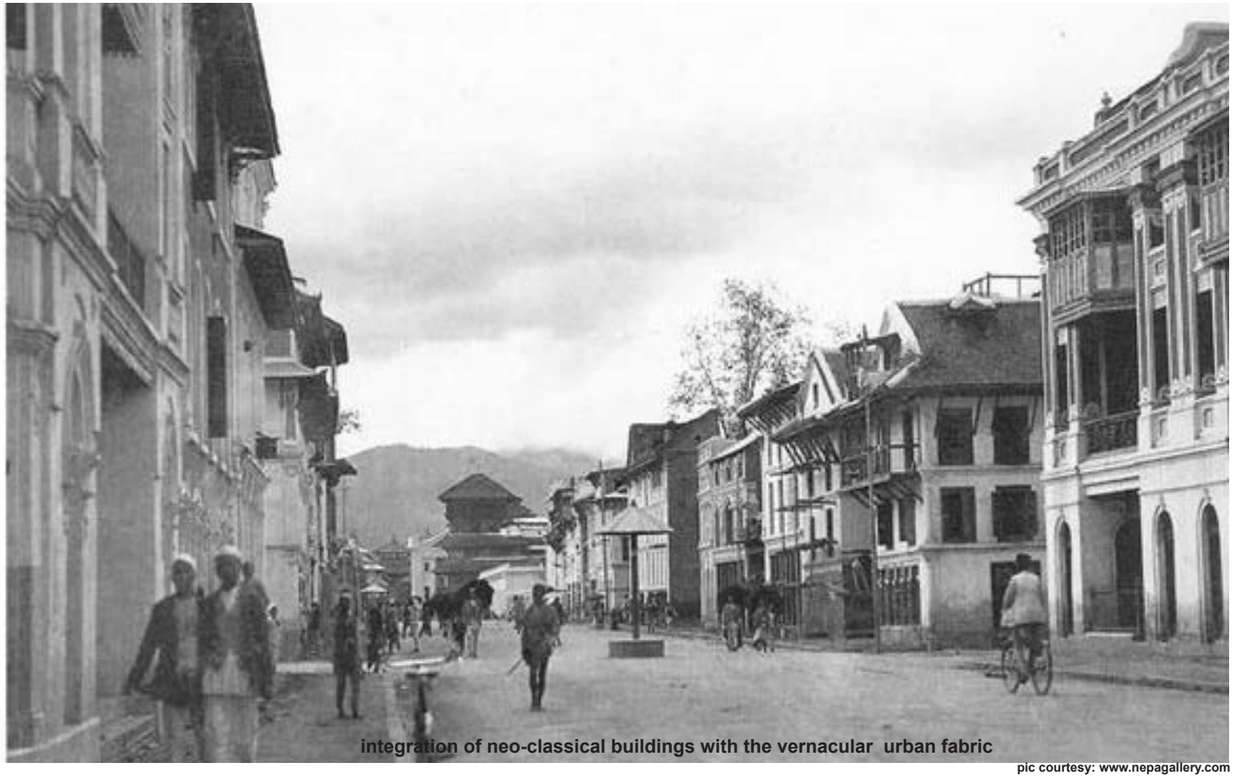
Some of the modern projects designed in the valley include Louis Kahn's Family Planning Center in the year 1970-1974. However the entire masterplan of the area prepared by Louis Khan was only partially followed. The building was a symmetrical composition of exposed brick piers interspersed by vertical window strips. Another notable American architect, Benjamin Polk, designed the Narayanhiti palace which is a modern project, but he emphasized on restoring cultural identity of the Nepalese without being too extravagant. Another project carried out by the famous Japanese architect Tadao Ando was Women's and Children's Hospital in Butwal in the 1990s. This building is yet another example of simple modern composition using the locally produced exposed brick (Shah, 2010).

The recent housing developments and modern shopping centers in the valley are due to booming property market and population influx from rural Nepal to the valley. Most of the larger complexes are designed by the larger architecture firms from India because of their expertise. However most of these recent modern buildings are commoditized and they lack context. Shah fears that the reliance of property market on Indian firms will jeopardize the opportunities for the local architects (Shah, 2010).



Kathmandu valley Arial View in 1950s

pic courtesy: www.nepagallery.com



integration of neo-classical buildings with the vernacular urban fabric

pic courtesy: www.nepagallery.com

An important lesson learned from this section of research is how some of the modern buildings fit right into the context without being too extravagant and how some buildings are like any buildings that could be placed anywhere in the world without having any meaning.

Historical Context of Lalitpur:

Lalitpur, a sub-metropolitan city, is one of the three major cities of the Kathmandu valley and it is one of the most vibrant cities of Nepal. Patan, Lalitpur and Yala are the three names given to the city. The name 'Patan' is used by Nepali speaking people and commonly known to foreigners. 'Lalitpur' is the formal name of the city which means 'beautiful city.' 'Yala' is the name given by the Newar community which might have come from the name of Kirati King 'Yalambar' who ruled the valley at one point. It is the third largest city of the fifty eight municipalities of Nepal. The city boasts of its rich historic past, centuries old living culture of people and the thriving developments that are going on today (Gellner, 1996).

The Licchavi period (5th to 9th century):
According to Geller, the city of Lalitpur was founded by King Bir Deva around 644 and 680 CE. During the Lichhavi period, the kings supported both Buddhism and Hinduism in the city, but Buddhism was more prevalent. They arecredited for building many monasteries in the city and one such example include 'Chakra monastery' (Gellner, 1996).

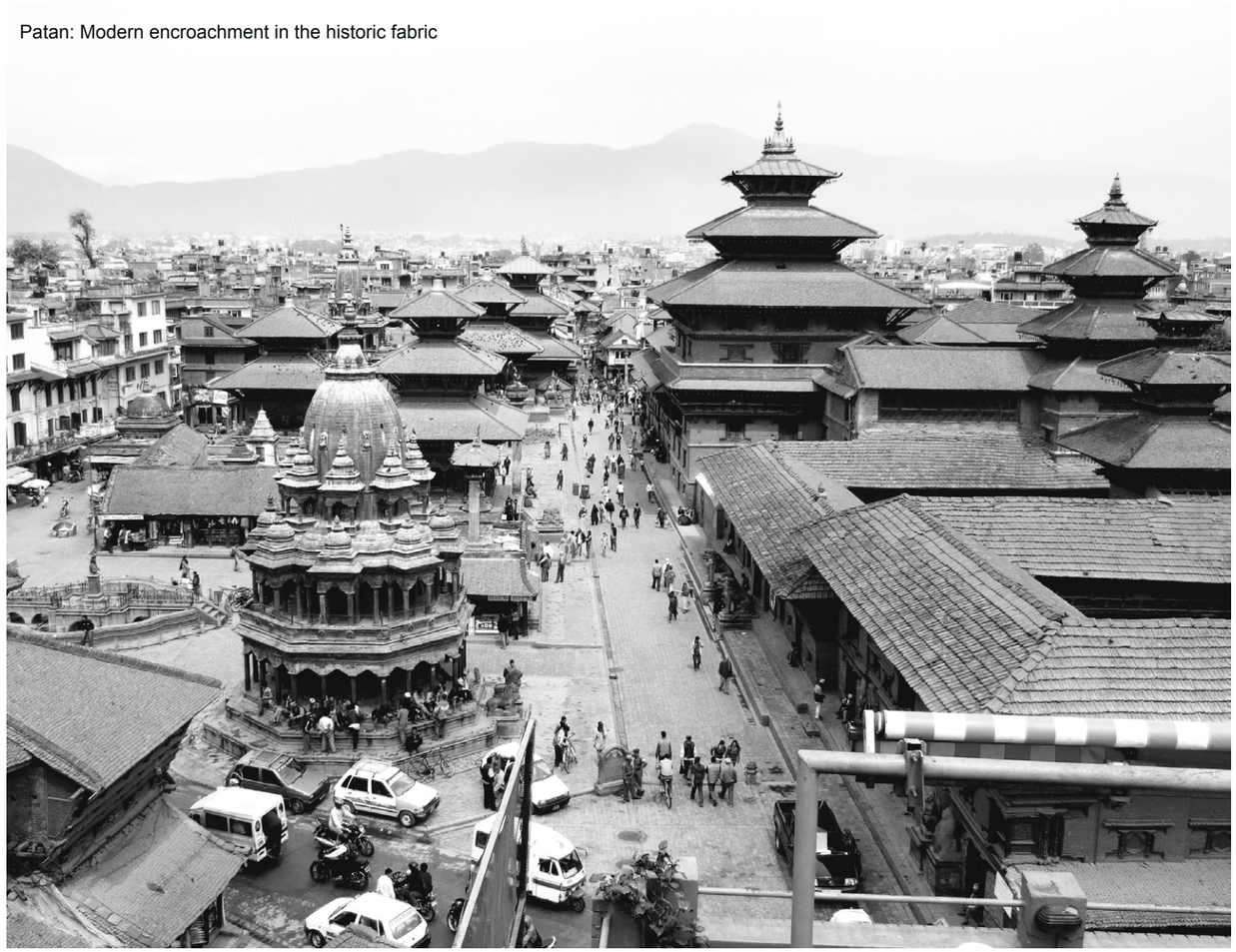
The Thakuri or Transitional period (879 -1200) and the early Malla Period (1200-1382)
The political history of this period is complicated as power was much more decentralized than before and after this period. The dynastic links between 879 and 1200 are confusing. However, Buddhism still remained significant in Lalitpur and there were more monasteries being founded during this period. Some of the monasteries that existed during those periods are Rudravanrna, Su Bahah, Ha Bahah, Tanga Bahah, Kwabaha etc (Gellner, 1996).

The later Malla Period (1382-1768):
Nepal was unified and generally peaceful during the Malla period. Although the capital was Bhaktapur, Lalitpur and Kathmandu were still maintained as royal centers. The Malla kings Siddhi Narasimha (1619-1660), his son Sri Nivas (1660-1684) and his son Yog Narendra (1684-1705) can be credited with the present day cityscape of Lalitpur. They built great palace squares and central bazaars in the city. During the Malla rules, the Hindus and Buddhists lived in the city harmoniously. The Hindu Malla Kings ruled over a large Buddhist population of Lalitpur by giving the Buddhist priests, gods and rituals a valid place within the Hindu framework.The traditional Newar dwellings can also be attributed to this period Gellner, 1996).

The Early Shah (1769-1846) and the Rana (1846-1951) Periods:
The arrival of the Shah period is attributed to the creation of the modern state of Nepal because of the unification campaign by the ruler Prithvi Narayan Shah. The majority of the Buddhists, who could be recognized as Buddhist state, was now a minority since the Kingdom had been unified to a greater Nepal instead of just the Nepal Valley, currently the Kathmandu valley. Gellner quotes Wright that its general aspect is much as same as that of the capital. The streets are as narrow and the temples even more numerous; but it appears much more dilapidated than Kathmandu, many of the houses and temples being in ruins.' The Ranas had pressurized conversion to Hinduism and there were many caityas(Buddhist temples) which was constructed with a north facing jaldroni, which is a characteristic of Hindu norm especially in Kathmandu and this was found only in one place in Lalitpur called *Bhelche twah*. The earthquake of 1934 caused great destruction to the built forms in the city as elsewhere in the valley. Renovations followed after that. Although the Ranas created neoclassical buildings in Kathmandu and around the country, they maintained the traditional fabric of this town. However they did not renovate the traditional wall created by the Mallas around the city (Gellner, 1996).

Recent Trends (1951-present):
After the establishment of democracy in 1951, the whole Kathmandu valley saw a wave of change. Theravada Monasteries were built in the city where the modern form of Buddhism was preached. The rituals were far simpler and stressed education and modern methods of communication such as magazines (Gellner, 1996). There was also an influx of population from other parts of Nepal and the city is a melting pot at present. Although the core of the city, Patan, still looks traditional, there are modern buildings being constructed around the fringes of the town. 'Patan Durbar Square' was listed in the World Heritage Sites by UNESCO in 1979. It is interesting to see how the residents of the city live in these traditional building and still practice traditional crafts and arts; however, they are still consumed by modern gadgetry and modern living in this part of the world. They value the importance of what brings income to the valley, so have historically preserved their art and craft, but have still adopted modern ways of living (Gellner, 1996).

Patan: Modern encroachment in the historic fabric



pic courtesy: www.nepagallery.com

pic courtesy: Grande Towers, Dhapasi, Kathmandu

pic courtesy: Google images

Modern developements: Highrise and suburbia

Goals:

Setting goals for the project at this stage is helpful in organizing data and staying on top of the project until its completion. The main goal of my thesis project is to critically evaluate what Kathmandu as an emerging city can learn and leave behind from globalization. Drawing on examples of case studies of sustainable housing from different parts of the world, I intend to utilize important aspects learned from each project to generate appropriate design quality for my project.

Architecture is a competitive field, but my academic goal in this thesis project is not to earn the highest grade, but carry out thorough research, gather valuable lesson and produce quality work that other students can learn from in the future.

Throughout human history, societies have been constantly evolving and change is almost inevitable in the 21st century for developing nations to adapt to the modern world. I hope to further my understanding of how Kathmandu as a growing metropolis can create architecture which can adapt to the modern society, but at the same time create a 'sense of place.' My goal is also to create a sustainable model city concept which can be applied to other developing cities.

My academic goal doesn't end at taking advice from just my advisor, but taking guidance from other expert faculty members, expertise of sustainable design and responsible personnel at housing authorities in my hometown. I would also take expert opinions from my fellow classmates from time to time. Furthermore, I intend to visit similar projects during winter recession and before /during the course of the Spring semester before I make my final design decision. The library will be my friend throughout the course of the next semester as well.

Speaking from a professional standpoint, I have quite a few perspectives. First, my goal is to produce quality work that will help me land a job successfully. Secondly, although I do not mind working at any kind of firm, I eventually aim to find a niche in residential architecture, particularly sustainable residential architecture and I hope this project will eventually help lead me to it.

My personal goals for putting this project together would be to organize my research data and keep records on my sketchbook. I will also write down weekly narratives and draw sketches to keep myself on the right track. Another goal I've decided to set for myself is that I will make a schedule for the development of my project if there already isn't one. The end result of my project will be the synthesis of all the hard work in compiling the data and sketchbook records.

While doing research, often times my mind wanders to irrelevant details that are interesting, but I shall forbid myself from doing so and focus on what my basic objectives of the project are. My final goal is to create the best computer renderings I've created so far using knowledge gathered over the course of four years.

Site Analysis

Having lived in the Kathmandu Valley for 18 years of my life and being away from home for the past 5 and 1/2 years, I had realized what I'd missed waking up to every morning. The moment you looked out of the window, you notice the panoramic view of the hills and the Himalayas. So I decided to revive my good old memories and embrace a place that I utterly missed for my thesis and decided to pick the site in my hometown Kathmandu. When I travelled home in June 2009, I'd noticed the housing sprawl all over the valley due to rapid population increase. So before my site visit in the winter, I had figured out a couple of potential sites around the valley using satellite images.

In Dec 2009, I travelled through the crowded metropolis to pick my site and my eyes lay upon the very site that I'd visited first, Baghdol, a serene niche amidst the busy hustle-bustle of the valley. Though Baghdol is not very far away from the urban fabric, it has its own natural charm with a spectacular view of nature and some modern buildings and some old. Continuous visits followed the first and my investigation of the site will be presented in this thesis.

On my first visit, I was captivated by the serene landscape. As I peered through the layers of the landscape, I was interested by the juxtaposition of nature and built form around the site, the juxtaposition of old buildings and modern buildings around the site. The site had to be accessed from foot trails since there was no gravel road leading to the site.

Although the site was only about 3 miles away from the heart of the capital, *Hanumandhoka*, it had the freshness and characteristics of rural Nepal. Peculiar to the site was a *chautari* (a manmade place to sit at a foot of a tree) which is common only in the villages of Nepal where travellers take rest after a long hike. All these little details fascinated me and I could not surpass the very first site that I picked as the final site to proceed with my investigation.

photo courtesy: Shristee Shrestha

SITE CHARACTERISTICS:

GRIDS:

According to Pant and Funo (2003), the ancient cities and towns of Kathmandu Valley settlements used to be organized in the cluster settlements around courtyard structures. Particularly in Patan, the residential dwellings clusters around Buddhist monasteries in grid multiples of 19.2m which is equal to 1 *rajju* or 9.6, half *rajju*. (p.83)

Rajju is the vedic (Sanskrit) system of measurement.
In order to analyze my site, I overlayed a grid system in the site itself and the neighborhood. Each square is measured to be 19.2m on each side. The site conformed to be laid out according to the ancient system of town planning.

photo courtesy: Google Earth

TEXTURES:

The Textures occuring on the site vary according to the season as it is mostly covered with grass currently. The lush green grass changes to dead grass when winter comes. There is an iron post in the South Eastern corner of the site and earthy foot-trails surrounds the site.

photo courtesy: Shristee Shrestha

LIGHT QUALITIES:

Light quality depends on season and time of the day. During the first visit in June of 2009, the air was clear and the grasses were lush green. During the second visit in Dec, 2009 the light quality was hazy due to the dusty-dry roads. The sunlight was still very strong. Since the site is open, there were no shades or shadows.

PLANT COVER:

Plant cover on the site primarily consists of perennial wild grass and wild hedges. Across the river on the southwestern side of the site, the Chobar range is covered with deciduous mixed forest and it seems to be well thriving in the hill. The site seems to be used for grazing purpose at present because I noticed a couple of cattle around the site during my visit.

BUILT FEATURES AND GEOMETRIES

The built features and geometries are analyzed under one heading since they correspond to each other. Basically the site is surrounded by built features scattered here and there, except for the northern part, which is densely populated. The built features closest to the site in the 4 cardinal directions are analyzed.

The northern (fig.1) and northeastern (fig.2) part of the site is dense with buildings that are three to four storied, and a newer apartment complex called sunrise homes can be seen in the north-eastern side. Most of the buildings are simple cuboid with additive slanted roofs or overhangs. Refer to fig.1.

photo courtesy: Google Earth

photo courtesy: Shristee Shrestha

photo courtesy: Shristee Shrestha

photo courtesy: Pooja Vaidya

There is a resting place built of brick at the foot of the tree (*chautaree*) in the west side of the site. (fig.3)
There is a school (Modern Indian School) in the southern part of the building which makes it a feasible site for developing housing since the residents would not have to send their children far away for quality education. The Building form is simple cuboidal, but there are smaller buildings on the school premises which have gabled roofs (fig.4).

photo courtesy: Shristee Shrestha

WIND:

The wind condition of the site was very calm during my two site visits. The wind in the Kathmandu Valley mostly blows from the South and West according to the Kathamandu Wind Rose data. Due to Chobar hill in the southwest part of the site, it seems that the site will not be affected by strong wind conditions at all.

However, Kathmandu suffers from air pollution and the concentration of particulate matter may increase according to the wind direction (Giri, Murthy and Adhikari, 2007).

Since the wind direction has no co-relation with air pollution in the site as the prevailing wind direction is blocked by Chobar range; however, the unpaved road conditions at present might account for some air-pollution around the site.

HUMANS:

Although there are some adjacent unbuilt site around my site, the site seems to be affected by human and animals. I believe that it is being used as grazing land and it is also being used for recreational purpose.

Open land currently being used for paragliding

photo courtesy: Pooja Vaidya

WATER:

The nearest water body around the site is River Bagmati which flows approximately 500 feet away from the NW, W and SW parts of the site respectively. The clarity of the water is very poor probably since the river used to be used for drainage in some part of the valley. I believe that the river doesn't have any living water creatures considering the pollution.

Also, there were some swamps near the southern part of the site. It might just be water that percolated from the river.

DISTRESS:

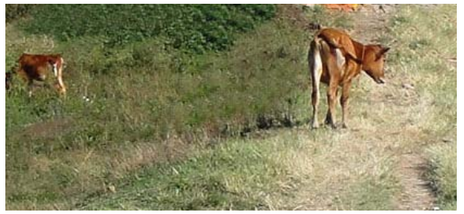


photo courtesy: Pooja Vaidya

It doesn't seem that there is a lot of distress in the site except for the issue of water pollution in the river that flows close to the site which seems to be prevalent throughout the Kathmandu valley due to improper water regulations. Most of the river water throughout the valley is unfit for human use.

The above figure refers to the quality of water around the site.

Although the site is also currently being used as a grazing ground, problems of overgrazing do not seem to exist.

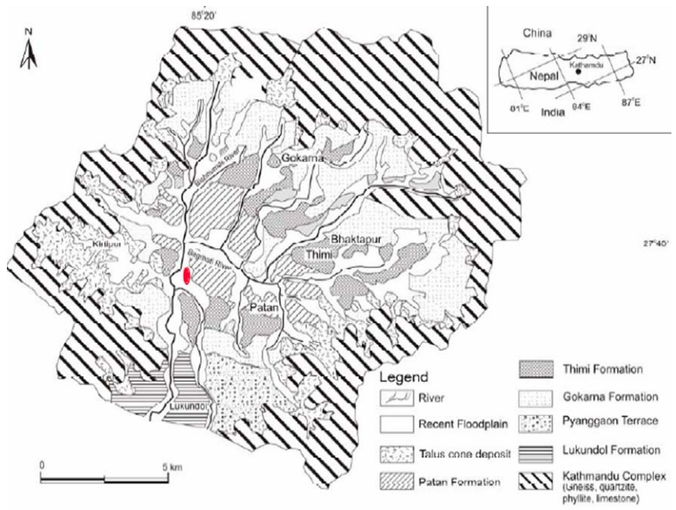
SITE STATISTICS

SOIL DATA:

Soil in the Kathmandu valley can be categorized into two types: Gokarana, Kalimati, and Chapagaun formation. The site lies in Lalitpur area which have Kalimati and Chapagaun formation. Kalimati is grey to dark silty clay and clayey silt in which organic clay, fine sand beds and peat layers are commonly found. Since the site is located close to the Bagmati river, the soil on the site could have a moderate to high liquefaction factor which is prone to seismic damage. (Argudo, 2002)

WATER TABLE:

There are hardly any buildable sites in the valley left and the site lies in a recent flood plain according to Igarashi 1998. Therefore preventive measures like building a levee should be deemed necessary before the construction of the buildings in the area.

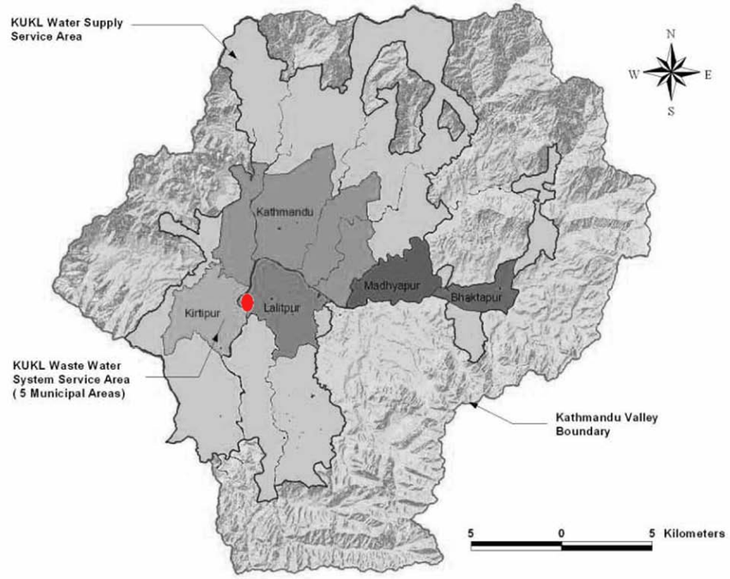


NEPAL: Kathmandu Valley Water Distribution, Sewerage, and Urban Development Project (pic courtesy)

UTILITIES:

The site gets it water supply from KUKL (Kathmandu Upatyaka Khanepani Limited) and it seems to be close enough to the KUKL waste water service treatment area.

Currently there seem to be no utility lines in the empty site but Nepal Telecommunication Center and Nepal Electricity Authority are designated to provide the facility with Telephone/ Internet and electricity lines respectively. The utility lines are projects on poles when development commences.



NEPAL: Kathmandu Valley Water Distribution, Sewerage, and Urban Development Project (pic courtesy)

TRAFFIC (vehicular/pedestrian)

The site is accessible by motorcycles and it lies close to Ring Road, which has public transportation like Minibus and Electric Vehicle (otherwise known as Safa Tempo). Ring Road has two way traffic. Currently the site is surrounded by foot trails which will be black topped as the project proceeds. Pedestrian traffic on the site is quite minimal except for a few people using the trails to get to the open land for paragliding at present.

All the major roads in the site are two way roads except the dirt road which needs to be developed.

Bridge

Busy traffic

Light traffic

Moderate Traffic

Dirt road

photo courtesy: Google Earth

TOPOGRAPHY SURVEY/ SLOPE ANALYSIS:

According to Thapa and Murayana, the site lies in the elevation of 1100 m and the slope of the land is less than 5 degrees. This is suitable for movement and all kinds of activites; however, since it lies below the circuation, grading and drainage have to be considered carefully (Thapa and Murayama, 2009).

MAPS SHOWING SITE FEATURES

According to the basemap shown below, my site is approximately .77 miles from the nearest hospital and 1.6 miles from the nearest university, Tribhuvan University. The site is close to the Ring Road which is one of the major road system of the Kathmandu Valley.
It is approximately 1 mile away from Modern Indian School.

WATER BODIES

MAJOR CIRCULATION

VEGETATION

BUILT FEATURES

photo courtesy: Google Earth

BASEMAP:

The basemap was generated to show the important features of the site and also to show the photogrid corresponding to the numbers indicated in the basemap. It shows legal boundaries and property lines and location of major circulation around the site.

property line

circulation

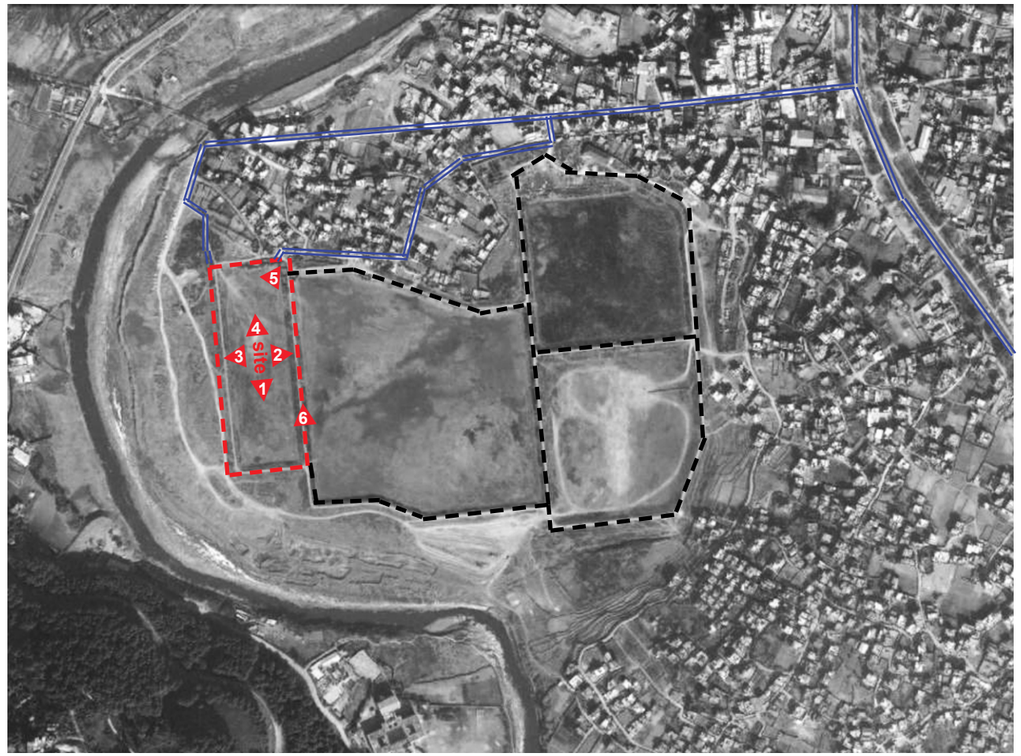
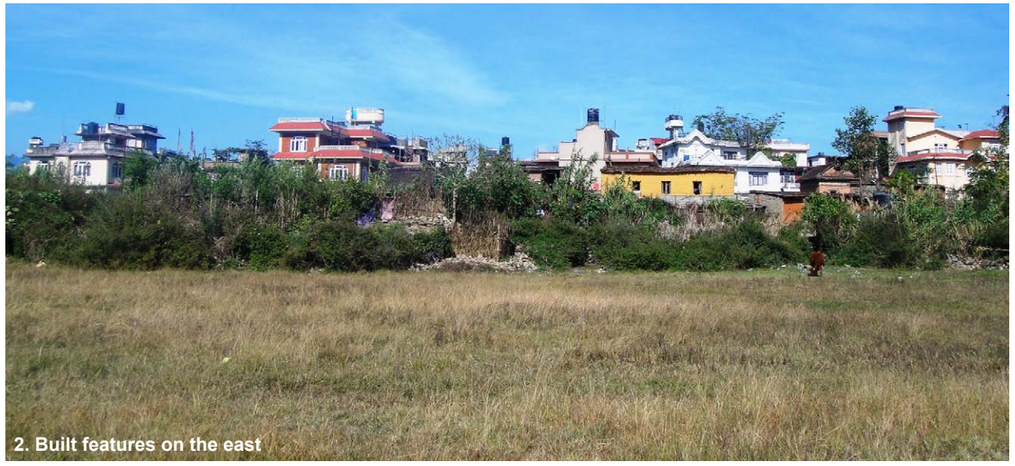


photo courtesy: Google Earth

1. Southern view toward Modern Indian School



2. Built features on the east

3. Chobar on the west

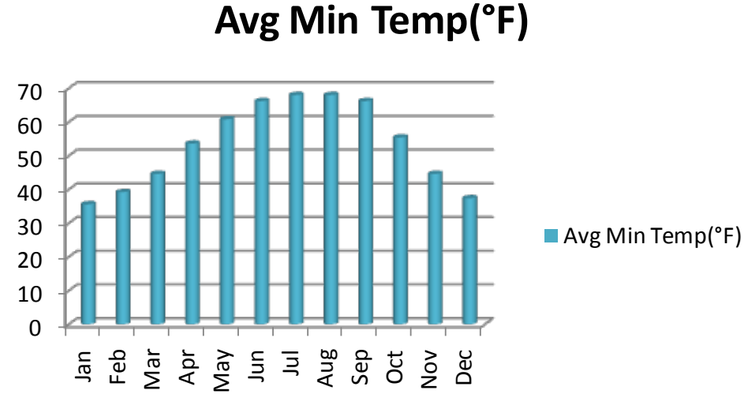
4. Panoramic view on the north

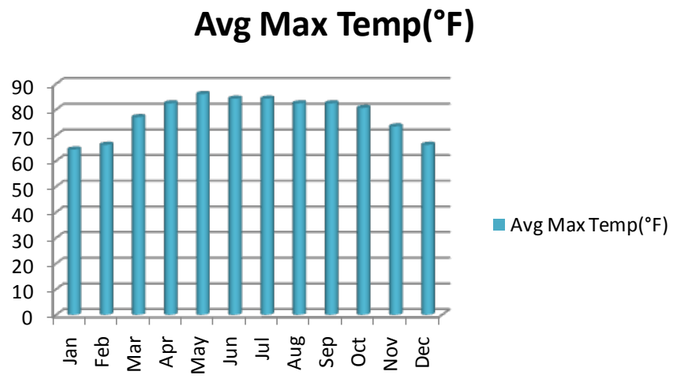
5. Sunrise homes in the northeastern view

6. Western access

CLIMATE DATA/ WIND DATA:

The average temperature of the coldest month within the valley doesn't fall below 32°F (0°C) but can reach up to 27.5°F (-2.5°C). However the winters are still chilly in the valley. Similarly the average temperature of the warmest month is more than 82.4°F (28°C) for the extended period from May through September, resulting in long, hot summers.

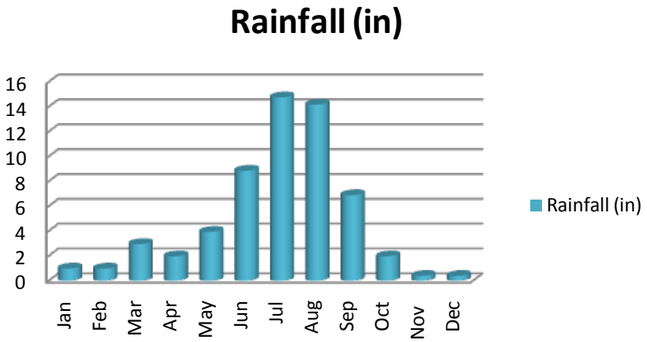


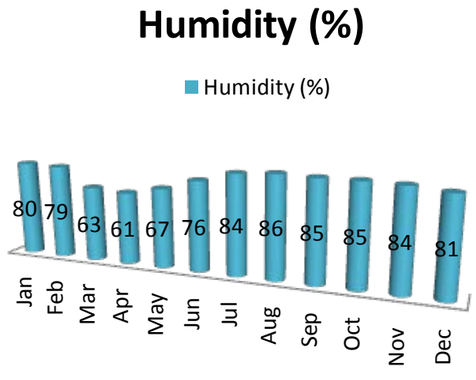


RAINFALL/HUMIDITY

The rainy season lasts from June to October accounting for 80% of the rainfall. The dry seasons last from October to May. In the summer season, light wind is accompanied by high temperatures and humidity.

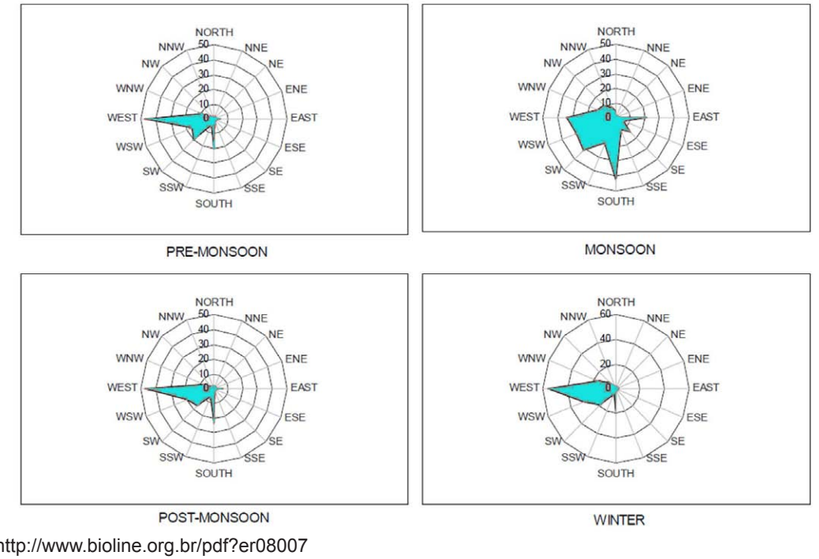
The relative humidity starts decreasing from January and attains the lowest level of 65% in April. From May onwards, there is an increase in relative humidity as the monsoon arrives. In winter it reaches up to 100%.





WIND:

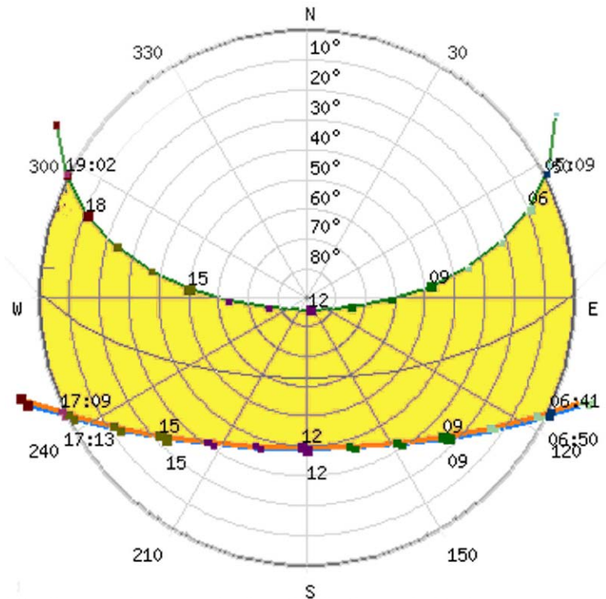
The Wind Rose data of the valley suggests that it mostly blows from the South and the West. The site is located close to the Chobar range which lies on the west side, so it might not experience extreme wind conditions.



http://www.bioline.org.br/pdf?er08007

SUNPATH

This sunpath diagram represents the path of the sun during different times of the year in the Kathmandu Valley. The upper green line represents the path of the sun on the 21st of June. The middle grey line represents vernal and autumnal equinoxes. The lower blue line represents the sun's path in Dec 21st and the orange line close to the blue line represents the current sun path, which is that of Dec 6th. Overall the Kathmandu Valley gets enough sun throughout the year, which makes it a good source of power for on site electricity generation.



http://www.gaisma.com/en/location/kathmandu.html

Program Requirement:

The program will comprise two kinds of spaces: private spaces and semi-private spaces. The dwelling units will comprise the private spaces whereas the neighborhood courtyards will create the semi-private spaces.

Semi Private Areas:
Courtyards

House Program:360 sq.ft footprint and interior spaces vary with the owner requirement
Kitchen/Dining
Worship Room
Living Room
Bedrooms 2
Bathrooms 2
Parking/Garage

Community Building:
Lobby
Workout room
Gathering space
Office

Design Process and Solution

CONCEPT AND PROCESS:

In order to find the mid-ground between the vernacular and modern dwelling units which I propose in my theoritical premise/unifying idea research, I began my process by listing out the advantages and disadvantages of both vernacular and modern dwellings.

Popular modern dwelling alternatives:

Advantages:

- Comfortable lifestyle
- Solves the issue of density
- Helps in preservation of land which could be utilized for agriculture
- Mixed use

Disadvantages:

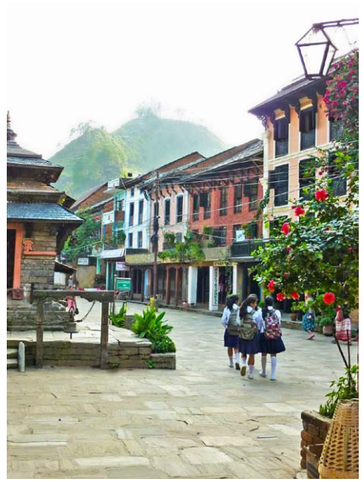
- High maintenance cost
- Heavy reliance on Active Systems
- Although community spaces are allocated, residents are mostly confined within their own condos and apartments
- City seems to lack the sense of identity

Advantages:

- Ownership of land
- Comfortable lifestyle
- Green lawn
- Modern amenities in the colony
- Aesthetically pleasing

Disadvantages:

- Bigger footprint
- Built out of luxury than need
- Circulation prioritize automobiles than people



Advantages:
- Focus on community living
- Usage of local materials like stone, teracotta, brick, wood
- Harmony between architecture and nature is preserved
- Mixed use with retail on ground floor for commercial activity
- Focus on human scale
- Architecture that responds well the climate, culture and society
- Density is considered

Disadvantages:
- Lacks proper sanitation and damp-proofiing
- Structural strength could be enhanced by reinforcement

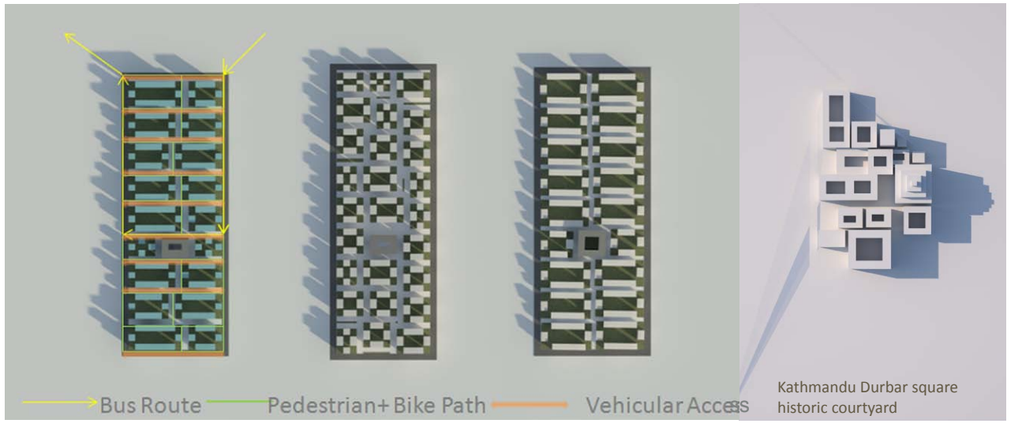
Advantages:
- Focus on social interaction
- Solves the issue of privacy without needing walls and gates
- Allows daylighting and natural ventilation

Disadvantages:
- Access could be a problem for modern living if there is need for fire-trucks or emergency vehicles to pass
- Corner houses do not get enough sunlight and ventilation

Solution:
Row houses and apartments are clustered in courtyards. Central courtyard in the development features a farmers market, leasing offices, solar power storage space for battery and a bus stop. Units are arranged around the courtyard for the possibility of maximum day lighting and natural ventilation. Central artery of the development is only for pedestrian and bike paths. The periphery artery is for bus route and for cars but it is not encouraged. I envision only solar powered cars that can again be charged in the central courtyard.

COURTYARD CONFIGURATION STUDY:

Courtyard configuration study



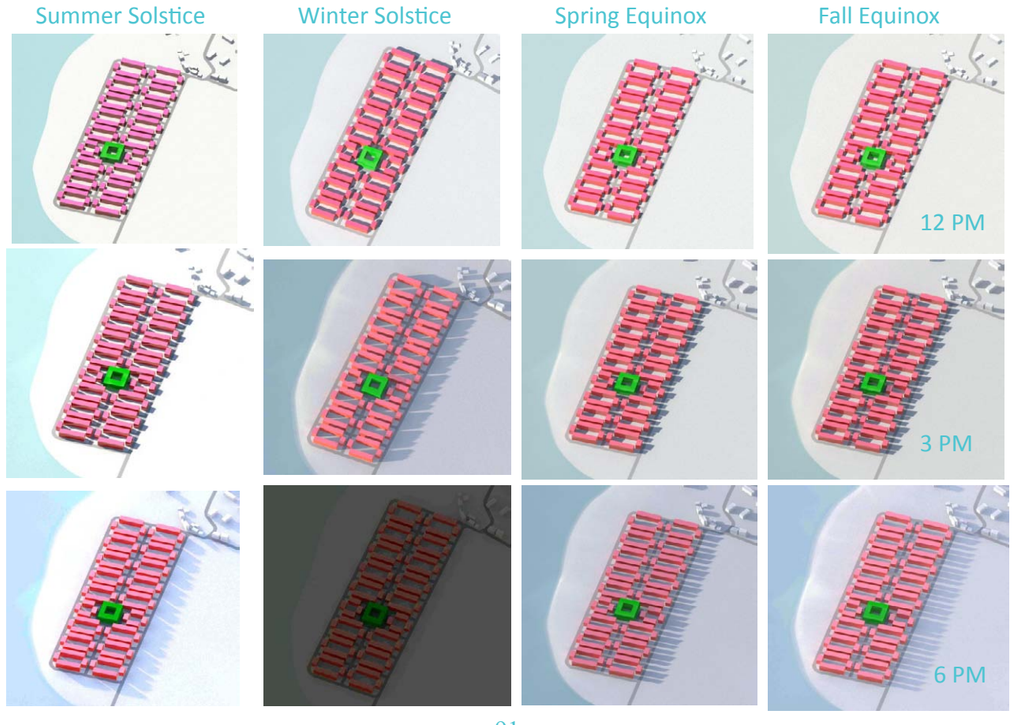
STEPS FOR SIZING THE PV:

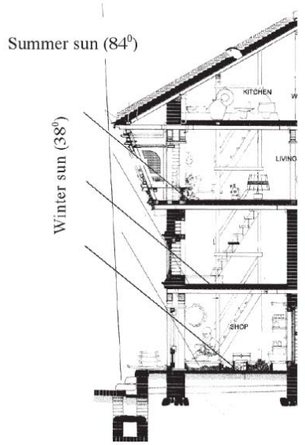
1.Energy used per day= 3590WH
2. Adjusted load to account for system losses=(WH/day) X 1.5= 5385WH
3. Number of sun hours= 6
4. Required peak watts (Wp) = Adjusted load/ sun hours = 897.5 Wp
5. a.Divide Wp by 12 for single crystal silicon cells =74.79 sq.ft
b.Divide Wp by 8 for amorphous silicon cells =112 sq. ft

According to this calculation, 6 monocyrstalline silicon panels produce more than enough energy required to sustain the basic daily activities since half of the roof structure of the units is approximately 90 sq.ft.

Appliances	Watts	Hrs used/day	Watt hrs/Day
	7X10	8	560
	75	6	600
	30	6	180
	200	3	600
	75	2	150
	1000	15mins	250
	750	1	750
	500	1	500
		Total Watt	3590W

SOLAR STUDY:





SUSTAINABLE STRATEGIES

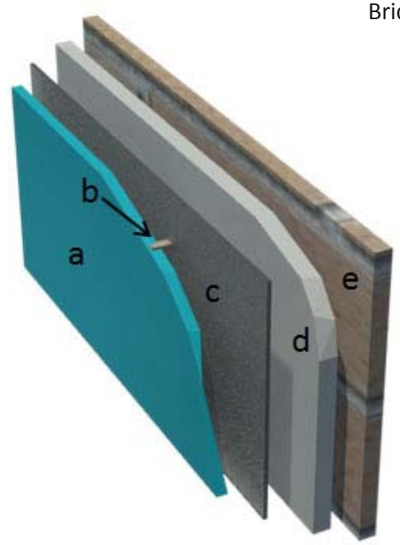
The roofs of the dwelling units are covered with 6 modules of monocrystalline silicon panels which produces more than enough energy according to requirement of Kathmandu, the excess of which can be sold back to the grid. Photovoltaic panels are oriented toward the South with the angle of 26.9° which corresponds with the latitude of the valley.

Each unit is provided with two solar water collectors. One of them is used to provide hot water for domestic use and other one is dedicated for the purification system for grey/ rainwater in conjunction with the living machine. Daylighting is made possible with the extensive use of curtainwall facade and operable windows make natural ventilation possible as the wind normally blows from the south which works well with the orientation of the units. The roofs and overhangs are designed in such a way that it allows enough light in the winter to heat up wth terracotta tiles to warm up the space and keeps the warm sun away during summer. Also deciduos native trees like peach and persimmon help in keeping the sun away in summer and warming up the spaces in winter.

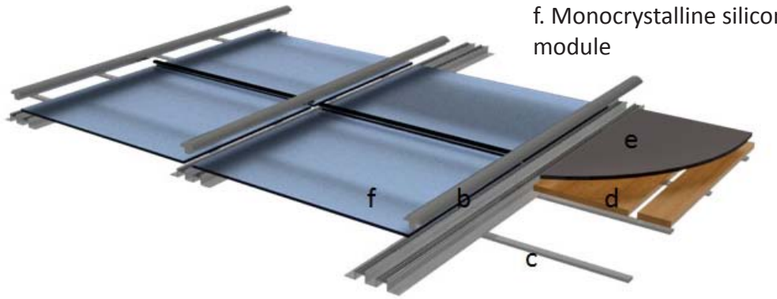
SECTION PERSPECTIVE

DETAILS

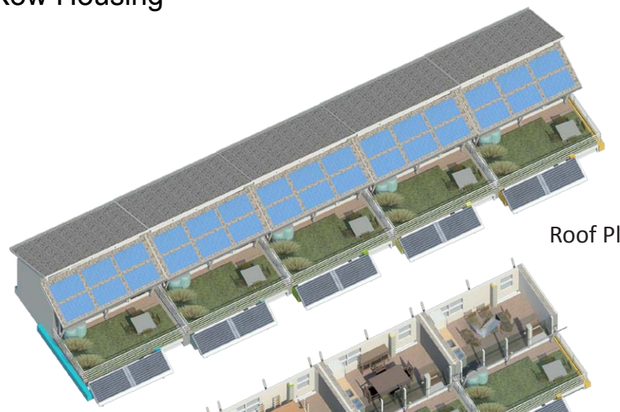
Wall Detail:
Reclaimed Zn Painted
Corrugated steel anchor
Vapor Retarder
Insulation
Brick back up wall



Roof Detail:
a. Aluminum struts
b. Rubber seal strips
c. Roof battens
d. 2”X6” deckings
e. Tiles
f. Monocrystalline silicon module



FLOOR PLANS:
Row Housing

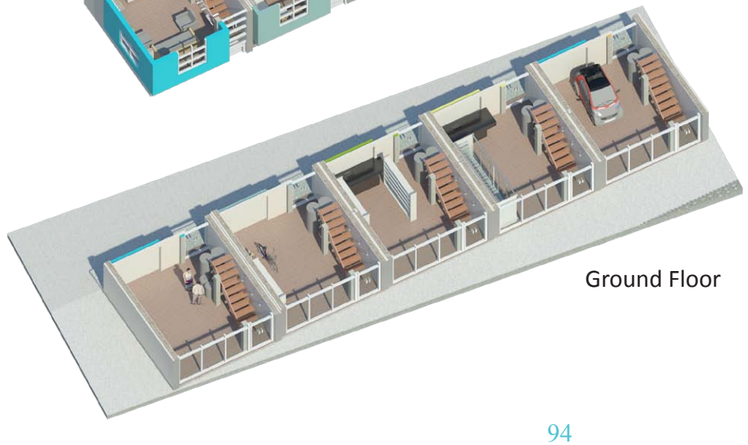


Roof Plan

Fourth Floor

Third Floor

Second Floor



Ground Floor

Open floor plans are sold to the residens siince needs of each family differ. Possible arrangement of spaces and furniture layout are shown here

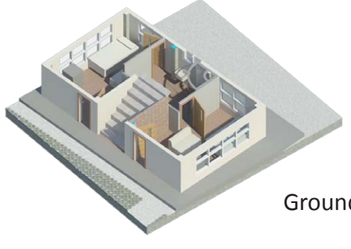
FLOOR PLANS:
Apartments

Roof Plan

Fourth Floor

Third Floor

Second Floor

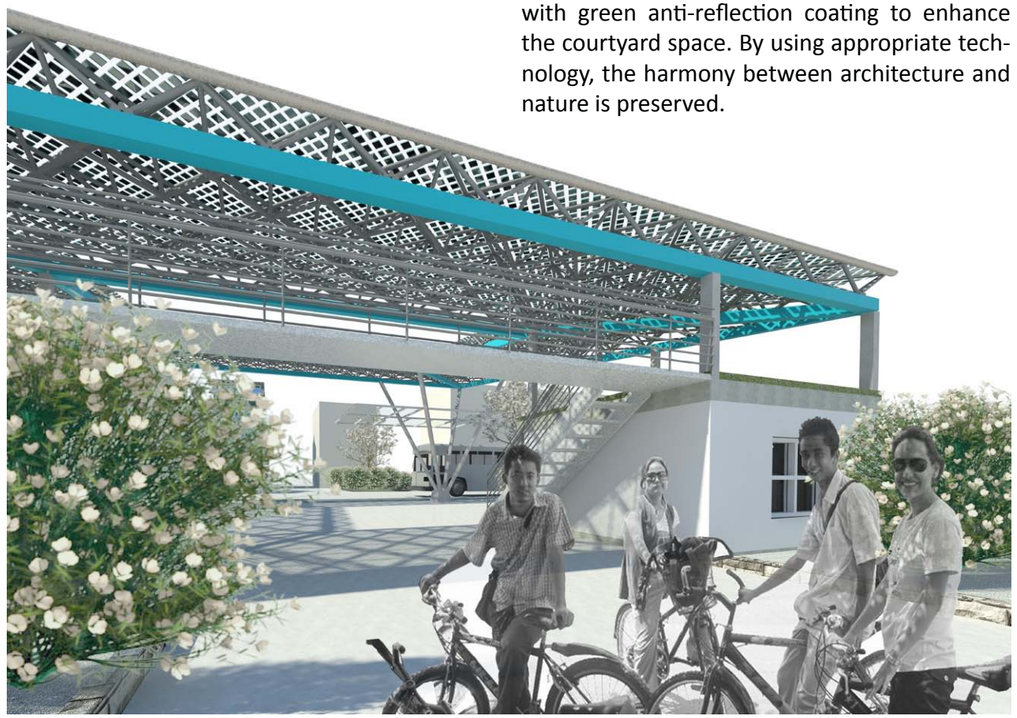


Ground Floor

Ground floor-efficiencies
Second Floor-Bedrooms
Third Floor-Common Living
Fourth Floor-Common Kitchen
Roof Plan

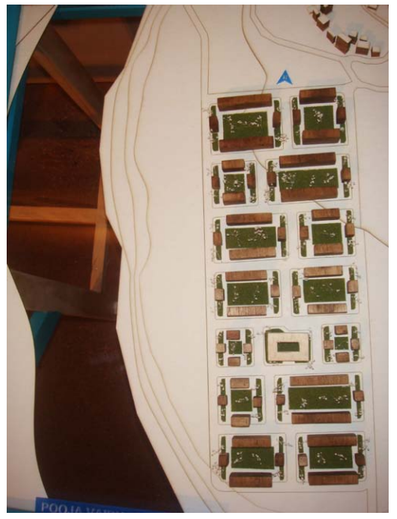
FARMERS MARKET/BUS STOP PERSPECTIVE

Monocrystalline silicon cells are embedded in a transparent substrate and is coated with green anti-reflection coating to enhance the courtyard space. By using appropriate technology, the harmony between architecture and nature is preserved.



FINAL BOARD LAYOUT


RETHINKING SHANGRI-LA
REVIVAL OF THE SUSTAINABLE COUNTRY SIDE




OOJA VAIDYA
DAVID CRUTCHFIELD


SCALE = 1/3

Acknowledgements:

Special thanks to Dr. Doug Schulz for being the secondary advisor, Professor Mike Chrsitenson for Theory Research Papers, co-worker Kenneth Anderson for the trip to the Icon Solar House, Minnesota, Shristee Shrestha for the images of the site and the site analysis information.

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Personal Information

‘The University’ described by former President Joseph A. Chapman as "an institution of choice" has indeed been a right choice for me