Green Vertical Neighborhood

(studi su quartiere verticale verde a tipologi residentiali verticali)

By

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To my Parents

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In High-Rise Residential Buildings

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Abstract:

Designing the green vertical neighborhood or green vertical community has come up to be investigated not so long ago. In an integrated research project I tried to study and develop the concept of green neighborhood narrowly in vertical orientation. Fundamentally residential buildings and high rise residential buildings have been set as the vehicles for this research. Having established a pragmatic framework I took into account the meaning and definitions around many terms like green movements, dwelling, residential building, high rise building, neighborhood, responsive environment and sustainability. The background and theoretical studies have been considered historically and the different points of view have been distinguished accurately. Naturally the scale of neighborhood unit studies varies through macro (urban), mid (district) and micro (architecture).Several similar case studies around the world have been set to be analyzed according to the research process goals and finally these case studies built the ultimate outcomes. Consequently an integrated sustainable model of green vertical neighborhood guidelines is offered based on the theory of Ken Yeang about green vertical building design. Pushing forward the previous model of Yeang' theory and setting a new critical framework in order to Improve the life quality in residential buildings regarding the responsive guidelines of green vertical neighborhood for high rise buildings is the main goal of this research.

Keywords: green, vertical life, neighborhood, residential building, high rise building

Green Vertical Neighborhood

In High-Rise Residential Buildings

Abstract:

Progettare il quartiere verticale verde o comunità verticale verde ha messo a punto per essere indagato non molto tempo fa. In un progetto integrato di ricerca ho cercato di studiare e sviluppare il concetto di quartiere verde strettamente con orientamento verticale. Fondamentalmente gli edifici residenziali e grattacieli residenziali sono stati impostati come i veicoli per questa ricerca. Dopo aver stabilito un quadro pragmatico ho preso in considerazione il significato e le definizioni in giro molti termini come movimenti verdi, abitazione, edilizia residenziale, edificio alto, quartiere, l'ambiente reattivo e sostenibilità. Lo sfondo e gli studi teorici sono stati considerati storicamente ed i diversi punti di vista si sono distinti con precisione. Naturalmente la scala di studi unitari quartiere varia nel macro (urbana), a metà (distretto) e micro (architettura). Diversi studi di casi simili in tutto il mondo sono stati impostati per essere analizzati in base agli obiettivi del processo di ricerca e, infine, questi casi di studio hanno costruito il risultati finali. Di conseguenza, un modello integrato sostenibile del verde di quartiere orientamenti verticali è offerto basato sulla teoria di Ken Yeang in merito alla progettazione della bioedilizia verticale. Spingendo in avanti il modello precedente della teoria Yeang 'e definisce un nuovo quadro fondamentale al fine di migliorare la qualità della vita negli edifici residenziali per quanto riguarda le linee guida rispondono di verde quartiere verticale per edifici alti è l'obiettivo principale di questa ricerca.

Keywords: verde, vita verticale, quartiere, edilizia residenziale, edificio alto

Introduction

Tekeli's interpretation has had a great role about what we know and experience about the residential high-rise buildings. The important question this thesis attempts to answer is how high-rise residents feel about living in a residential high-rise building.

A Green Neighborhood, in term, is a kind of neighborhood that is typically dense, having a set of uses, and applicable for people and pedestrians first. A network of paths and streets, human-scaled buildings and pedestrian-oriented street design. It has "Green" elements, including a network of green spaces and corridors, street trees, significant private landscaping. Buildings are often green buildings with excellent environmental performance.

On the other hand Green Vertical Neighborhoods are mixed-use communities holding green spaces, green infrastructure, and often green buildings together array in vertical orientation. And also other design elements encourage social connections between residents and others are considered in the design of green vertical neighborhoods

The main body of this research will have a close study on the sustainable existing patterns of spatial neighborhood relationships in order to clarify the background research and studies around the greening the residential skyscrapers. Offering integrated guidelines for residential buildings as a pattern considers as .Green Neighborhood Design Framework is set as the main Goal of this PhD research. This is particularly crucial in the case of many of today's new intensive urban buildings, many of which are literally cities within buildings. We see these building types emerging in the increasingly intensifying urban areas in our cities. Whether these structures are actual skyscrapers or common residential buildings we find an increasing provision of enclosed or partially-enclosed public spaces with in their densely packed and intensively built forms.

"High-rise building is thought of by some as the show of technological power, or the transition to another century, or the contemporary solution to the inescapable urban population increase; by others, a source of disaster because of the disastrous problems it creates [.]."

(Tekeli, 2004).

Research Areas

Urban and landscape , Sociology, Behavioral science, Philosophy of dwelling, Future of urban design, Urban theories, Sustainable design, Eco-friendly considerations on design, Traffic. Green spaces, Public spaces, Low (zero) carbon footprint design.

Statement of the Problem

The majority of researchers who have investigated residential high rise buildings fall into one of the two following groups:

1. Those that have focused on the design and construction phases as concerning architects and/or engineers;
2. Those who have concentrated on the psychological and social well-being of men-women, or children elderly who reside in high-rise buildings.

Design certainly is an issue to build a framework as it has been determined for this research. That is to say that any urban dweller of the early twenty-first century would be the high rate of crime commuted in the shared public areas of high-rises. This research will certainly does not claim that it is possible to imagine an architectural design process that is isolated from and devoid of any social, psychological, economic factor. That would be an abstract project, indeed. By focusing the study on unquestionably residential neighborhood buildings, however, one may arrive at a relatively purer ground open which to identify Green issues relevant to Green vertical neighborhood. Milan residents are people who can afford most amenities available for purchase. Thus there would be fewer factors interfering in a direct perception of design issues. One immediate example would be that lack of life quality satisfaction with the existing residential high rise buildings inside Milan likely to result in alterations, on lack of satisfaction with internal building materials would result in replacements of these with green and green concepts. Hence one needed to inquire into the choices of persons who could afford alterations and replacements.

One other aspect of this study that places it in an innovative international context of group and renders it original in the studies conducted in Milan, is that its sphere of investigation is not limited to the urban fabric of Italy. The present study identifies the factors affect residential neighborhood satisfaction thoroughly in the both vertical and horizontal orientation.

Methodology and Approach

This study is based on in-deep literature review around related subjects thoroughly. The terminology and definitions of basics I have used terms which specialist from a variety of a discipline we find accessible. The tasks that were proposed to be carried out in the cause of this research were the following:

-Definition and analysis of the residential buildings, skyscrapers, high-rise buildings, green, neighborhood and etc.
- Historical overview of theories, and related disciplines
- Review of the literature and focus on previous studies
- Investigation of the Project, case studies and Its Architectural Properties
- Preparation of the thesis framework
- Utilization of information to analyze the factors and set the guidelines
- Analysis and interpretation of the findings

Anticipated Outcomes

Broadly, this research will attempt to create a sustainable framework for designing and creating responsive Eco-friendly green vertical neighborhood. On contemporary urban researches, its place and functionality is inevitably up most. Responsive residential units in every district are like the main cell of a complete body. The final theoretical guidelines will be a first hand guide for all urban and landscape designers and also urban designers.

Scope of the Study

There is not any doubt that the architect-urban designer has determinant role in the creation of urban context. Thus architectural design is directly relevant to residential satisfaction. The significant contribution of this thesis is the vision, however, that does not limit residential satisfaction within the boundaries of the flat, but defines it in the larger context including the building neighborhood within which the flat is situated and the environment exterior to the building. Perhaps the most fundamental value determining the scope of this thesis is the value it attaches to the personal control over space. Thus this thesis privileges architects and urban design needs and its primary focus is on their detailed investigation. The result is that this conception places larger responsibility upon the design process.
The basic goal of the thesis study; since the argument of this thesis is that green vertical neighborhood in residential high-rise buildings is to be approached theoretically holistic, design guidelines to the issues observed as problems in Milan would entail an interdisciplinary project of revision bringing together planners, materials engineers, construction engineers, management specialists, and architects. Thus the ultimate scope of this study is to identify factors of residential neighborhood satisfaction which ought to be taken into consideration in the design process and approach.

Chapter 1:

Definitions and history behind the words of skyscraper, high rise building and multifamily housing

Chapter 1

The first chapter of this research mainly deals with the definitions and history behind the words of skyscraper, high rise building and multifamily housing around the world. It brings many instances and case studies to prove the different attitudes to this phenomenon during the last two centuries. In the second part of this chapter mostly I describe the high rise typologies and explain the different factors which affect the creation and dwelling varieties in the height. The terms of residential skyscraper, residential high rise building and multifamily housing in three different categories are being discussed and consequently the multifamily housing typologies came to be clarified here. Bio climatic discourses as a new approach to residential skyscraper design is being explained and its relation to green movement on high rise skyscrapers comes to be introduced at the end of this chapter.

Given the multifarious history of the high-rise and given the fact that it is an architectural phenomenon determined equally by technological development, design conceptual change, and social transformation and psychological structure, defining the high-rise is a complex task. Extant definitions equally engage the facets enumerated above so that to extricate from this complex body a definition concerning the relationship between the architectural design and the consumer once again requires looking at multi- and inter-disciplinary definitions. As a result, the high-rise is a phenomenon that has as many definitions as there are researchers devoting attention to it.

Taranath had implied in 1988 that tallness was a relative matter. In some parts of the world, a five story building will appear tall, while in other parts a 25-storey building will be the tallest. In Chicago and New York this number will jump to somewhere between 70 and 100 floors.

At the end of the nineteenth century, tall buildings were called high-rise buildings. Which we may describe as a name that primarily took into consideration their none conformity and particular relation to their surroundings and the environment. The word high-rise building, as an adjective describing the tall building, first appeared in the United States in 1884, and was used as a noun around the year 1889.

"What is the chief characteristic of the tall office building? It is lofty. It must be tall. The force and power of altitude must be in it, the glory and pride of exaltation must be in it. It must be every inch a proud and soaring thing, rising in sheer exaltation that from bottom to top it is a unit without a single dissenting line."

Louis Sullivan's The Tall Office Building Artistically Considered (1896)

Definitions

The definitions around high rise buildings and the difference between the similar worlds always have been argued in the history after its birth, however, argues that the first known dictionary to include the word “skyscraper” was Maitland’s American Standard Dictionary in 1891; When we turn to Maitland’s, we find that it defines the “skyscraper “as “a very tall building such as now are being built in Chicago” [1]

As late as 1933, the Oxford English Dictionary included six different definitions of the word “skyscraper” including, among instances of usage cited, a high-standing horse and a very tall man. Generally speaking, by the advent of World War I almost everyone had learned what as “real” skyscraper was: a building having many storeys [2].

That is to say that the Oxford Dictionary even explains the word “skyscraper” as “A high building of many storeys, especially one of those characteristic of American cities”.it is mentioned there that in 1891 this word has been used in a newspaper as a title of : “How the skyscrapers are built?” And then published that year in November 1891, for the first time.

In architecture there are pretty vast variety definitions for the word of “high-rise”. These definitions are as vague as they are numerous. In fact points out that “the term is inexact”. [3]

According to Burcher [3] the definitions can be categorized in three parts; The first band are made by storeys; the second by the plan, ground area, forces, design and the use of the buildings; and the third by comparing the words with each other.

Definitions that may be listed of the first group by story are the following:

A multi-storey steel-framed building, typical of New York where the Bedrock is only 15 m (50 ft) below ground and makes an excellent foundation for a 50- storey building (Scott, 1974, p. 116). 10 or more storey buildings due to their obligation to take special precautions according to the fire regulations in big cities. [4]

According to the construction regulations in the United States, the buildings which exceed the top height limit of the surrounding structures by 12 storeys. [5]

German standards define high-rise as .buildings above 22 m. This limitation is accepted to be 12 storeys in the United States. [6]

Buildings that surpass other structures in the same part of the city in terms of height. [7]
High-rise is the kind of building that exceeds 25 stores, and it is generally planned for office use, necessitates the implementation of high technology due to its vertical development, and creates a prestigious image with its visual impact. [8]

According to public works regulations in Turkey, a building having 10 storeys or more is accepted to be a high-rise. [9]

High-rise Buildings and Skyscraper

Nowadays people use the word “high-rise building” more than the word “skyscraper” but we know that the first word that appeared in the dictionaries and newspapers was the skyscraper. Of course it should be said that in meaning nowadays there are different attitude to these two words and also they carry different weight of meaning themselves.

High-rise building is a type of building that generally affects its near and distant environment from the aspects of physical environment, urban layout, and every kind of urban infra-structure. If the ceiling of the final story is above 30.80 m or if the total number of stores is more than 13, including the basement and excluding the thirteenth story, the building is accepted as high-rise

(Metropolitan Municipality of Izmir, High-Rise Building Regulation)

1- *Girouard ,1985)*
2- *(Ford ,1994)*
3- *Burcher, 1996*
4- *(Beedle, 1984, p. 6)*
5- *(Çýlý , 1989, p. 279)*
6- *(Aytis, 1991, p. 48).*
7- *(Acerknacht, 1984, p. 9)*
8- *(Ye_il, 1993, p. 7)*
9- *(Eren, 1996, p. 5)*

A building of thirty-five meters or higher, which is divided at regular times into levels. [10]
High-rise is a building which has a comparatively large number of storeys, usually above 10-12, which is equipped with elevators. [11]

High-rise is defined as a building with six or more storeys or 75 feet above the lowest fire department access to the highest floor, intended for occupant use. [12]

Other definitions in the second group based on plan, ground area, forces, and design are as follows:

Multi-storey building tall enough to require the use of a system of mechanical vertical transportation such as elevators. The skyscraper is a very tall high-rise building

(Britannica, 2003)

A building in which "tallness" strongly influences planning, design, and use, or a building whose height creates different conditions in the design and construction. [13]

Generally slender buildings like towers having a small ground area with a height more than the dimensions of the ground. [14] High-rise buildings are tall buildings which must cope with the vertical forces of gravity and the horizontal forces of wind above ground and the seismic forces below ground. [15]

From the point of view of structural design, it is simpler to consider a building tall when its structural analyses and design are in some way affected by the lateral loads, particularly sway. Sway or drift is the magnitude of the lateral displacement of the top of the building relative to its base. [16]

Obviously according to the mentioned definitions, the exact definition of the high-rise has not yet determined. It is not possible to define the high-rise in specific terms related to height or the number of stores. For the purposes of this thesis, if a limitation by the number of stores is necessary, a building having more than 13 stores is defined as a high-rise building.

The third part is made by comparing either the height or the name of the building. For example, High-rise building and skyscraper are categorized in two, according to the height:

a) High-rise: Up to 25 storeys.
b) Skyscraper: More than 25 storeys [17]

To criticize this order, Öke comes to an agreement with Özek and Erdo_about th terms and words "high-rise" And "skyscraper". But he also put the buildings into five divisions according to their height as in the following:

1st Category: Buildings which are not high, with 8-12 storeys.
2nd Category: Buildings with 12-25 storeys.
3rd Category: Buildings with 25-50-55 storeys. In these types of buildings special precautions are taken.
4th Category: Buildings with 55-75 storeys.
5th Category: Buildings above 75 storeys which are called .super skyscrapers.[18]

He uses the word "skyscraper" for buildings more than 25 storeys here for the third, fourth and fifth categories. He also says that, otherwise, it is more correct to call them "high-rise buildings". [18]

10- (Skyscrapers, 2002).
11- (Burden, 2002, p. 216).
12- (Muthalbox, 2003).
13- (Moore et. al, 1980, p. vi).
14- (Büyük Larousse, 1986, p. 503)
15- (Schueller, 1986, p. 3).
16- (Taranath, 1988, p. 8).
17- (Özek and Erdo_an, 1992, p. 51).
18- Öke (1991)

Residential High-rise buildings

Residential high-rise buildings are considered as tall buildings whish provide living accommodations and sometimes parking for residents. They are called tower blocks, multi-dwelling units or high-rise apartment buildings as well. Unlike many high-rise buildings that house offices and other businesses, residential towers are devoted to residences, though they may have a store or two and a few offices. Building residential towers is one way to create more living space, especially in crowded urban environments.

1-1. Castle Village, NY

England and in the US are two countries that the first high rise buildings were built in their lands. Building some high-rise buildings to address housing-needs after the World War II bombings in England was often thought a quick way of solving housing problems.

Castle Village, In the US was the first set of residential buildings, erected in New York City in 1939. Some of the early residential towers built in the US became quite popular, and were well maintained. Others were specifically designed to help people in need of low-income housing.

it should be mentioned that after the mass production of residential towers in us many of them converted to be the main palace which high rate of crimes happened in .the US is now in the process of demolishing some of the worst residential towers, because they are in such a state of decay. Commercial residential towers have fared much better since they are designed to make a profit. Therefore interest in upkeep is higher.

1-2. Trump World Tower, NY

Appealing to city inhabitants with large incomes, commonly now there are residential towers that feature luxury flats and accommodations,. Many people actually own their residences within residential towers, and participate on housing boards to keep the buildings in excellent shape. Due to high monthly maintenance and or homeowner fees, owning a residence in a residential tower can be just as costly, if not more so, than owning a freestanding home.

When the residential building of Ronan Point tower collapsed in 1968, popularity of residential towers significantly declined In England, just a few weeks after people had moved into the building. The collapse was due to a gas explosion, and sadly it took the lives of four people, and injured another 17. With safer building techniques, the UK is seeing a new interest in building new residential towers, especially as it moves to address housing shortages in urban environments.

There are pretty well and famous residential buildings in the world that can be always referenced. The two tallest are in Australia, with the Q1 tower standing 1058 feet (322) tall. Surprisingly, America's tallest residential tower, the Trump World Tower, only makes number seven on the top ten-list. Preceding it are one other tower in Australia, two towers in Dubai, and residential towers in Moscow and Seoul.

Multifamily Housing

"Exploring the Elusive Metropolis, concludes that its this rapid edge development that could cloud the boundary between what we typically saw as urban, suburban, and rural. The edgeless city development is now responsible for sixty percent of development in some metro areas. It is this fast growth that makes toady's suburbia more ambiguous and uncontrollable than ever. The evolution of the suburb is a vast topic onto itself, but the important thing is to see where its going and what designers can do about it."

Edgeless Cities, Robert Lang

Designing the Residential buildings, immediately and in with the lots of efforts began in US, but might be considered as a failed attempt. The mass production of successful multifamily projects has come from Europe, Japan, and many developing countries where space is limited and urban living is embraced. These projects have been designed by both American and International architects however.

But, they have created different willing and culture than the rest of the world due to land availability, and this is what creates the problem with the implantation of an existing foreign typology with a different inherent set of design priorities. Americans want individual ownership and space. This is reflected by the typical subdivision development full of fenced yards, sport utility vehicles, mini-vans, and mammoth roofs. The answer for ownership of land and open space has always been to look outside the city, not at the spaces left behind by population shifts. A successful design must provide what Americans want, and what makes multifamily housing successful with some elements of suburbia and multifamily housing.

This kind of planning includes an increase in density from suburbia, but a decrease in density from past multifamily housing and the incorporation of a range of users to meet what new American families desire. This approach to multi-family residential design can address the developing problems that have been articulated by the Urban Land Institute. A study of the recent trends in 2003, describes a need for multi-family housing in America, which according to them could answer problems such as sprawl, urban decline, and environmental deterioration.

In US Suburban sprawl is not yes considered as a new issue. It has been slowly growing since the early 20th Century, but instead of growing at a steady pace, it grows exponentially. The suburbs grew out of the after the World War II housing mass-production. This need for quick, expansive housing allowed for a market niche in which developers emerged to take control of projects rather than architects. Then you through in mass production of construction materials and the emergence of the expressway system in the 1950's and there are the origins of a large problem. This rapid standardization and availability allows for rapid realization of the American dream. No longer do blue collar, inner city tenement dwellers have to settle for less. By moving to the suburbs, they too can live the American dream. All of these things together create a void that quickly becomes filled with architectural uniformity and an aesthetic that is not driven by competent designers, but by the tastes and income of the suburban residents. Everyone should want to strive to have the best living conditions and financial situation for their family. This is one quality of life that makes America distinctly different than the rest of the globe. However with potential for rapid growth there must be boundaries and guiding factors. By the early 1970's the amount of suburban growth and population was equal to that of the urban metropolis in the United States. Some of these larger areas today have been coined.

Many attempts architects and planners have done over the years to try and solve this problem. New Urbanists like Andres Duany, Seaside, Florida, addresses creator, the fact that suburbs are not only bad for people; they are also very badly designed. He attests that our suburban sprawl turns the residents into unhealthy and dangerous urban castaways. The suburbs are designed to corrupt and create problems because of their isolation, segregation, and wasting of natural resources.Duany concludes that this version of the American Dream is a corrupted, bastardized version of what the American Dream should be. The problems he addresses with sprawl are not only functional ones, but he also looks at the aesthetics of suburban sprawl as detrimental to residents. This .assaulting. Aesthetic quality is blamed upon the range of suburban housing forms, the separation of land uses due to zoning, and the gearing of design towards the automobile.Duany attributes his blame towards mainly the planners and bureaucrats who keep spawning new suburbs. These groups are the ones who have allowed for zoning and the standardization of roadways, dominance of form for the automobile, and misguided governmental policies. These factors then dictate a change in the hierarchy of form. Instead of putting the built environment first, they put the roadways and articular spaces first to dictate the form of the buildings. This then creates a paradox for designers because the built environment no longer is number one; it takes a back seat to secondary infrastructure.

At those moments the multifamily housing was new building type to the United States and precisely it couldn't solve multiple problems, not only the ones that this thesis addresses. Besides housing needs and revitalization the main problem is suburban sprawl. With population growth and movement away from cities, the mass of the population is shifting. Also with the movement from urban to suburban, there is a shift from high density housing to an extremely lower density of housing. To counteract this, one can implement higher density multifamily complexes that would contain some of the outward movement. One of the most appropriate sites for these new complexes would be the voids left by the population shift in the interstitial space of urban zones, therefore not moving outward but filling the voids within.

They reduce the amount of required infrastructure such as roads and sewers that developer neighborhoods require. Multi-family housing can also have a lower environmental impact than low-density residential housing. Since multifamily housing requires fewer infrastructures than low density residential, there is use of fewer raw materials, less consumption of energy to create infrastructure, and less digging up and stripping of land.

"Create efficiencies in garbage, mail, and recycling that reduce energy consumption; are more compact and have fewer impermeable surfaces; and their residents have tendencies to use public transportation or have lesser commuting times."

The ULI states that multifamily structures:

To understand the need for effective multifamily housing today one must examine its past and origins. The Urban Land Institute defines multifamily housing as five or more dwelling units within the same building, side by side, or on top of each other. This definition is important to examine the right typologies in or past and present culture. Pre-19th Century there was an abundance of multifamily housing. Many families would live together in the same roof, related or not. This was mainly due to the economics of the 1700's and the fact that many people could not afford to be landowners, let alone sole homeowners. At this time only about one in six people in the United States owned property. At this time in New York City, there were many property owners doing ground leases. Landowners would lease out land to multiple tenants and it was their responsibility to keep up and improve upon the parcel and the building. Once the lease was up their duty was over.

Industrial Revolution happened in 1800's and following it, growing immigration and industrialization was creating a population boom in the inner cities. Factories springing up in the cities also meant that this was where the jobs were and that's where the blue-collar population went.

1-3. Unite D'Habitation Marseille, Le Corbusier

The term tenement still has a terrible connotation today. While tenements where built close to the factories and meant walking to work, this also meant extremely high pollution, especially in major industrial cities like Chicago, New York, and Pittsburgh. Tenement landlords made good profit because of the fact they could maintain a low level of upkeep and the fact they could jam as many people into these buildings as possible. Tenements became the home of disease and death because of their bad construction, terrible plumbing and sewage, and overcrowding. This separation of the wealthy and the poor and immigrants became the birth of the inner city ghetto and slums. [19]

1-4. Lakeshore drive apartments by mies van der rohe; 1951

The progress in public transportation and technology at the end of the 1800's, allowed better off families to move out of the city to the suburbs and commute by trolley or train. The slums were a continuing problem ever with this slight shift. In 1893, the Board of Health concluded that more than one million New Yorkers lived in multifamily dwellings. This was seventy percent of the New York population, of which eighty percent lived in tenements. With the publication of Jacob Riis., How the Other Half Lives, in 1890 and an 1894 publication by the Commissioner of Labor on slums, the population of the United States began to grow aware of the terrible problem in the inner cities. New York was the first city to begin passing laws and codes for tenement housing and health codes. Reform began slowly and the slums began to slightly improve. Up until this time not all multifamily housing was tenements.

Land value-increases caused only the rich to be able to afford a separated house. Apartment complexes began to be developed for the middle class. More respectable then tenements, these buildings had amenities such as electricity and indoor plumbing. These buildings were very popular because of their style of living, but also because developers made very good profits because of the high demands. These apartments did not change the common American's opinion towards multifamily housing however. Apartments and tenements were accused of being the source of crime, disease, and sexual depravity.

Thanks to the steel frame and elevators allowed for high-rise, high-density dwellings in the city with more space and comfort. As of the census of 1920, more Americans lived in the city than in rural areas. Like in colonial America, being a homeowner was nearly impossible, so more multifamily buildings were being constructed and old row houses were being subdivided for rent. This trend continued through the 1920's and the construction boom was only aided by the standardization and mass production of construction materials and with the leadership of the hero architects. [19]

1-5. Colonial Village Apartment Gustave Rings first project in Arlington

Le Corbusier and Mies van der Rohe two well-known architects designed similar high-rise multifamily urban apartments, but they were often for the upper class and not affordable by the targeted class. The common American Modernist public housing projects like Pruitt Igoe and the Robert Taylor Homes failed to meet expectations and were considered 20th Century failures, permanently giving public housing and its users a black eye .[19]

Local governments were the owner of these new buidligs cnsiquently, and despite early resistance were very successful. During World War II, the housing industry declined to focus on wartime production. Once the war was over in 1945 and the population returned from overseas, there was an extreme shortage of homes. The 1950's saw a boom in housing production, mostly in the suburbs due to the availability of land, the implementation of the highway system, and the emergence of the residential builder as a major player in the housing industry. Although almost all of these homes were single family, there was one post-war innovation in the multifamily sector. Gustave Ring's mass production of garden apartments became the new typology of the 30's and 40's. This multifamily model has stuck around and .between 1960 and 1978.

19. Schmitz:2000).

The High-Rise Typology

Thanks to repeating a plot of land vertically, Buildings redefine spatiality, the high-rise building and the numerousт ecological advances that make it possible push us skyward, freeing us from the earth, creating space where there was none, and generating financial returns for invented land.

The high-rise as being 10 or more stories tall were defined by CTBUH, deriving the definition from the height of a fire truck's ladder. Generally, this definition is accepted as the rule, but architect Ken Yeang differentiates the high-rise building from the tall building.

Unlike any other typology, the high-rise buildings differ our conceptions of spatiality. It intensifies land use beyond comprehension, generating the greatest possible economic return for the smallest plot of land. It not only creates new space, but it does so repetitively, exponentially increasing the value of the land. It has brought about unprecedented urban densities and restructured the physical, social, and cultural landscape. The high-rise building magnifies possibility and formulates potentiality.

Multiplying a single plot of land many times over while other building types consume sizable land areas for a limited amount of usable space creates high-rise typology. Conceptually, the high-rise is nothing more than a lot copied numerous times and stacked vertically in space. Each floor is a re-creation of the site at a higher elevation. It multiplies the land that we have available to us, making land where there was none before. This is the genius of high-rise building as a typology. It extracts the value of a piece of property so that the site can be used again, and again, and again. The multiplication of the site does more than just increase the usable area.

In residential high-rise buildings, each floor has its own character and as an individual recreation capable of taking on any programmatic function independent of the floors above and below. The floor need not be considered a part of a building, but a whole new site. The high-rise is merely the construct that makes this multiplication a possibility.

Since building pan is designed to accommodate repeatable modules, repetition is most readily apparent and significant in the high-rise building section. All building typologies benefit from plan efficiencies, but the high-rise typology fully utilizes sectional efficiencies as well. In the tower, the efficient floor plan is reproduced vertically, multiplying the spatial efficiencies of the plan. As Koolhaas describes, buildings benefit from efficient usage of surface area. For the amount of material needed to stack additional stories significant increases in interior volume are made. The efficiencies of repetition are facilitated by mass production, requiring limited specialization and decreased labor. To the extent that repetition brings about significant savings for the client, it has become the calling card of the high-rise typology, dictating everything from furniture systems, to construction techniques; it is the efficiency that brings the high-rise building into being.

"Physically, the high-rise building might be defined as a multi-story building, generally constructed using a structural frame, provided with high-speed elevators, and combining extraordinary height with ordinary room spaces, and such as would be found in low buildings. The high-rise is a building typology that offers numerous challenges and possibilities to the designer."

Ken Yeang

"They [New York designers] exploit and formalize it [the detachment of surface from program] in the architectural equivalent of a lobotomy. The surgical severance of the connection between the frontal lobes and the rest of the brain to relieve some mental disorders by disconnecting thought processes from emotions. The architectural equivalent separates exterior and interior architecture. In this way the Monolith spares the outside world the agonies of the continuous changes raging inside it. It hides everyday life."

Rem Koolhaas

The repeating-nature-character of the high-rise conceptually, is made manifest in the formulation of the typical plan, an entire floor unit reproduced vertically. The typical floor governs design, defining form through the stacking of space. Architect Harvey Wiley Corbett described:

"*The usual procedure in most plan studies is to start with the ground floor and build up. But in planning office buildings, one must reverse this process and start from the top and build down. That is to say, one develops a typical upper floor plan first, because there are a large number of typical upper floors to one ground floor. The major income is from these typical floors, and if some sacrifice in plan arrangement is to be made, it might be better made once on the ground floor than to be repeated twenty or thirty times on typical floors. In the same way, and for the same reason, the typical floor must be planned on the basis of the typical office unit. So one first plans this unit, then one strings several of these along both sides of a corridor, then places the necessary line of vertical circulation at a central point off the corridor making sure that no unfortunate tenant has to walk over 100 feet."* [20]

Based on its repetitive nature the high-rise typology formulates compartments of space within the greater construct of the tower. The expansive volumes enclosed in the high-rise building are entirely capable of being subdivided into understandable spatial componentry: floors, rooms, and halls. While these are components of nearly all architecture, they take on unique properties in the urban landscape.

The high-rise, In the density of the urban space allows for the amalgamation of disparate componentry into a unified building construct, such that the tower can be considered not as a singular construction, but a container of discreet volumes of space entirely independent of one another. This compartmentalization takes place both in the stacking of individual floor plates, and in the separating of the interior program from the external realities.

1-6. Book : Delirious New York A Retrospective Manifesto for Manhattan (1978)

In the book of Delirious New York, Rem Koolhaas says the vertical compartmentalization that occurs in high-rise construction. He categorizes the regular stacking of floor plates as a schism that insulates the activities of one floor from the next. As such, the floors become autonomous realms unto themselves, each capable of housing a unique and individual programmatic function.

The building typology creates a literal layering of individual state within the construct of a unified rationality. It develops into a structure of congruent geometries occupied by incongruent uses. The elevator enables the stratification. By eliminating traditional means of vertical expression in architecture stairs the elevator allows for complete visual disconnect between floors. There is no need for physical connection between floors, except via elevator. It makes possible the complete isolation of one floor from the next. Each individual floor plate is, thus, conceived as a separate, isolated world unto itself. The building merely becomes the structure that allows for the creation of this space. The floor is like an adjustable shelf slotted into the casework. Its contents are indeterminate, flexible, and subject to change.

Lobotomy is a word which Koolhaas hires to explain a kind of split, in that the façade is no longer relegated to the "honest" expression of the space that it contains. It is detached, formulating an acceptable public mask. The compartmentalizing properties of the high-rise occur not only in the layering of floor plates, but also through the separation of interior and exterior space that takes place at the façade.

20. Corbett; The Architectural Forum, 1923

The natural separation of the building exterior from the interior is described by Koolhaas. Probably it was, formally made possible by William LeBaron Jenney's applied cladding in the Equitable Life Building, in Chicago. Jenney's application divorced the exterior wall from structural responsibility, thereby allowing for a lightweight exterior solely responsible for separation. Removing the load bearing function of the exterior wall, freed the envelope from any required correlation with the interior, establishing an important separation, whereas, the exterior surface became totally independent of the interior program. The lobotomy is the application of this separation, not in terms of structural performance, but in terms of its physical response. Free of structural requirement, the skin is able to take any desired shape. It becomes a malleable surface, capable of acting independently from the programmatic relationship of the interior. The lobotomy hides the chaos resulting from the programmatic implications of stratification.

The concept of lobotomy is naturally a kind of protection from the outside world. Inside anything can happen because the skin serves as an .agent of misinformation, showing the city some degree of normalcy despite its irrational contents. It is a mask, an application of dignity to utility. It is the clean break between public and private. On the surface the building responds to its inherent nature as a monument, but on the inside, it accommodates the .change which is life. In such a way that the building can be adapted to meet a wide range of possible uses. The facade presents a dignified edifice while the interior allows life to happen, in all its inherent chaos. As Piera Scuri writes, .What is looked for in fantasy is a reality purified of all unpleasant and painful aspects. Happiness can only be reached through illusion. Koolhaas's architectural lobotomy provides this fanciful illusion of perfection amidst encapsulating chaos. Still, the enormous enclosed volume of the high-rise building suggests an importance of the internal program. This establishes a significant split in the theory of high-rise building design. To the daily passerby the tower building is free from its program. It need not look like its function or type. It is an applied treatment that disguises the undesirable, like frosting on a radish.

"To look at it, the high-rise building seems powerful and immobile, grandiose and static, while inside all is nervous and active, fragmented and frantic. Perhaps it is for this reason the sensations felt at sidewalk level in New York are so different from those aroused by gazing at the profile of the Wall Street high-rise buildings. Contrasting against the strength and immobility of New York.s image is a tumultuous, fragmented space of crowds, speed, automobiles, movement, and a barrage of billboards."

Piera Scuri

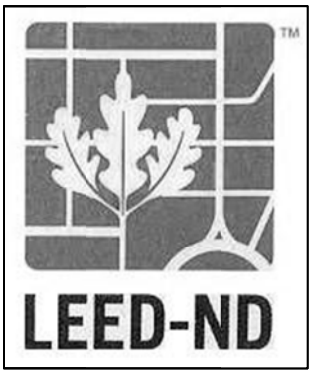
The High-Rise Building and Sustainability

The history of sustainability backs to the history of human awareness concerning our impact on the natural environment. With such a description, one could argue that philosophers of ancient times were the first to address the issues of sustainability. The physician Hippocrates, practicing 2,400 years ago, wrote about air quality and climate being directly related to health and national character. Aristotle's compendium in ten parts on zoology noted issues such as climate change due to land preparation for agriculture. At this time in the eastern world, the development of Taoism called for a life of simplicity and an oneness with nature.

After the World War II that environmental integration started to give solution to an architecture which demanded the use of artificial energy to produce comfortable work environments. With the onset of World War II, many European modernists, such as Mies van der Rohe, fled their countries for safe haven in the United States. They brought with them their ideals of structural simplicity and technological integration. Some modernists sought to destroy the idea of the traditional city and replace it with a more geometrically ordered configuration of glass-clad structures surrounded strategically by open plazas and parks. Although formally beautiful in concept, this movement started the disintegration of commercial architecture and the environment. High-rise buildings used fixed panes of glass and discarded the central open-air wells which were so crucial to the function and livability of the earlier buildings. A second problem was that these new designs introduced much larger floor areas, which effectively separated occupants from natural light and the outdoor environment. Yet the main problem, which proved to be one of many factors leading to the current Sustainability Movement, was that new technology introduced air conditioning and artificial light, both of which relied solely on the use of fossil fuels to produce electrical energy and heat.

During the past decades architectural trend has contributed to the scrutinizing analysis of the economic viability of high rise design. In fact, throughout the eighties and nineties, during the height of urban sprawl, large companies chose to locate their headquarters in low-rise commercial campuses in the suburbs for many reasons, including lower energy prices and a closer proximity to their employees. More importantly, they relocated in response to not needing to be centrally located on land that was exuberantly priced. This led to the large suburbanized commercial parks which surround so many of today's cities. Although cities benefited from a decrease in energy consumption in heavy load areas, they lost the civic strength of the urban core. Also, with the increased use of computers throughout the nineties, energy was no longer being used for just building systems. It now had an entirely new function of supplying the mass with immediate information, a function which, in its own right, was more important than building systems.

Many countries have implemented design standards which must be met in order to construct commercial buildings, as a result of this need for energy efficient design. These standards take into account the overall energy consumption of a building, from the hvac systems, to the lighting, to the power usage. Buildings of similar size are compared, creating a standard dependent on height, occupiable square footage, and building function. A recent example is the LEED standards for Neighborhoods (NH-LEED) in the United States, which many clients are now requiring when presenting an architect with a commission. While standards such as these are established to a much greater extent in other countries, it is necessary to recognize their importance to our society, for many believe that they represent the future of architectural design.



1-7. LEED-ND

The significant and unique opportunities thanks to the high-rise typology were introduced for the development of sustainable design. Ken Yeang coined the term “bioclimatic high-rise building” to define an ongoing revision of the high-rise building paradigm .as a tall building whose built form is configured by design, using passive low-energy techniques to relate to the site’s climate and meteorological data, resulting in a tall building that is environmentally interactive, low-energy in embodiment and operations, and high quality in performance. Posited as the next great advancement of the high-rise typology, the bioclimatic high-rise building is rooted in the full integration of the building into the natural environment. It rejects the notion of individual, isolated componentry in favor of a synthesized design approach that seeks maximum return on every investment.

The need for high-rise construction does not continue as the inert concentration of inorganic mass on a ruined site. Rather, through the multiplication of the land, the high-rise offers the possibility of reparative biological intervention. At minimum, introduction of vegetation throughout the construction can alter urban environments from places of biological homogeneity to areas of increasing biological diversity. There is possibility of transforming the building into a framework for the support of all life forms.

The high-rise presents the possibility of transforming from an object of exorbitant consumption to a construction for positive generation and production. Proposals have been developed for the inclusion of wind turbines into the structuring of the tower with the capacity to generate more power than our current freestanding turbines. The large surface areas necessary for enclosure provide potential for photovoltaic integration, which far surpass the areas made available through rooftop integration. Rainwater can be harvested, stored, and used for non-potable applications, preserving our precious and dwindling water supplies. It is the scale of the high-rise building that increases its generative potentialities, allowing for maximum harvesting of our free and natural resources by structures already needed for habitation and occupation. It is this type of multi-functionality that will propel the continued necessity of the high-rise typology through the 21st century.

The thinking about Energy conservation has been come after-thought in high-rise building design because of the high initial costs of new technology. Because many of these projects rely heavily on speculative office space, high costs often prevent economically-motivated developers from integrating this new technology in their buildings. Recent energy shortages worldwide as well as increasing energy prices, however, have introduced the need for effective energy conscious design in order to ensure the economic viability of high-rise buildings in the long term.

Back to the History

19th Century

"What is the chief characteristic of the tall office building? It is lofty. It must be tall. The force and power of altitude must be in it, the glory and pride of exaltation must be in it. It must be every inch a proud and soaring thing, rising in sheer exaltation that from bottom to top it is a unit without a single dissenting line."

Louis Sullivan, 1896

Louis Sullivan recognized the interactive power of the high-rise building and steel frame. To begin with, in 1868-1870, George B. Post designed the Equitable Life Assurance Building in New York, which was eight stores high. The [steel] frame has been the catalyst of architecture, but one might notice that it has also .become. Architecture, that contemporary architecture is almost inconceivable in its absence [.] It would be fair to say that the frame has come to possess a value equivalent to that of the column for classical antiquity and the Renaissance. [21]

Tacoma Building in Chicago In 1889, were completed by Holabird and Roche, which was 50 m, 13 stores high. In 1890, George B. Post had built the 16 stores World Building in New York, which was 94 m. It was made of mixed loadbearing masonry and steel frame construction. Between 1890 and 1894, Charles Atwood had designed, and Burnham and Root completed, the Reliance Building in Chicago, which was 70 m, again 16 storeys high.

The Wainwright Building In 1891, by Adler and Sullivan was built (41 m), 10 storeys. Again in 1891, Burnham and Root designed another tall building in Chicago: the 16-storey Monadnock Building, which was 60 m. Both of the Burnham and Root buildings had outer walls constructed by conventional masonry. In 1893-1894, Kimball & Thomson designed the Manhattan Life Insurance Building in New York, with twenty storeys including its tower. From the late 1880's up until 1894, buildings ranging from twelve to sixteen storeys went up all over central Chicago in considerable numbers.

Again in 1894-1895, Louis Sullivan and Dankmar Adler built the Guaranty Building in Buffalo, which was 13 storeys high. This was, in fact, the building which led Sullivan to the observation quoted at the left.

20th Century

"I found myself agape, admiring a high-rise building the prow of the Flatiron Building, to be particular, ploughing up through the traffic of Broadway and Fifth Avenue in late afternoon light"

Dupre, 1996

Singer Building, in 1908, designed by Ernest Flagg the in New York, which was 200 m and 34 stores high. In 1913, Cass Gilbert planned the Woolworth Building in Lower Manhattan, which was the first to reach 60 stores; with 241 m .Woolworth is the Mozart of high-rise buildings. In 1930, William Van Alen designed the Chrysler Building in New York, which was 319 m, 77 stores high.

The quality of Chrysler comes from its ability to be romantic and irrational and yet not quite so foolish as to be laughable; it stops just short, and therefore retains a shred of credibility amidst the fantasy rather like New York itself [21]

The willingness to create increasingly taller structures and the race for height stopped in North America around the 1930's, with the construction of the Empire State Building by architects Richmond Shreve, William Lamp, and Arthur Harmon. Without the 67.7 m television antenna added later, the Empire State Building was 381 m high.

21 - Paul Goldberger, 1979

The Empire State's ambitious mass is, take it from the critics, class.[21] it was taller than the 300 m Eiffel Tower in Paris, which had been the highest structure of the nineteenth century.

Mies Van der Rohe designed the Lake Shore Drive Apartments In 1949-1951, which were 82 m, 26 storeys high. In 1952, Skidmore, Owings & Merrill built the Lever House in New York, which was 92 m.

To a much greater degree than any other country, the United States is a steel and production-line economy. It follows logically that its architecture has become industrialized: the basic materials in which it works steel, aluminum, glass, plastics all come from the production line [.] It is to SOM's credit that we have taken prefabrication and made a design asset of it [22]

Frank Lloyd Wright had designed the Price Tower In 1955, whose original plan included 24 storeys but the number of storeys was reduced by five during the construction. "The high-rise building is no longer sane unless in free green space", wrote Wright in 1953, .In the country it may stand beautiful for its own sake. Wright had not only moved tallness out of the urban density, but had also innovated in its design.[23]

The first major change brought on by a new material and structural system was in the Price Tower by Frank Lloyd Wright, where re enforced concrete and a core system of cantilevering made possible a more flexible ordering of the floor spaces and an exterior that broke away from the square or rectangular box. [24]

In 1956, Ludwig Mies Van Der Rohe and Philip Johnson built the Seagram Building in New York City, which was 515 ft (157 m), 38 storeys high. The Seagram shows the grander side of Mies's vision. Its austerity of form coupled with its luxuriousness of effect proclaims not only Mies's feeling for the potential of structure to create noble order [.] but also his conviction that modern architecture of consequence in a period dominated by technology will occur only by factoring this truth of its time [25].

The administrative abstraction of business and government corresponds to abstraction in art and literature. The perfect design of the box goes hand in hand with the mechanization of all production: ready-made clothing, mass produced automobiles, tin cans, electrical appliances, and so on. We live in a mass society which is controlled, governed, measured and stored in boxes. [26]

John Portmen designed the Peachtree Center Plaza, in 1967, which was 230 m, 73 stores high. In 1968, Schipporeit and Heinrich built the Lake Point Tower in Chicago, which was 196 m, 70 stores high. This building, as is known, constitutes an impressive turning point in the use of glass, and reminds us of what Adolf Behne wrote in 1919, 68 years after the Crystal Palace, about the use of glass.

"Glass is a completely new, pure material [.] It works in the most elementary way. It reflects the sky and the sun; it is like clear water; and it has a wealth of color, form, and character which is indeed inexhaustible and which can be a matter of indifference to no person".[23]

The John Hancock Center in Chicago by Skidmore, Owings & Merrill built In 1969,, which was 344 m, 100 stores high. Again in 1969, Murphy-Jahn Inc. Architects designed the Bank One Plaza in Chicago, which was 259 m, 60 storeys high. In 1972, Minoru Yamasaki planned the World Trade Center in New York, which was 419 m, 110 stores high.

"Let cynics and supersensitive souls say what they will about American materialism and machine civilization. Beneath the surface are poetry, mysticism and inspiration that the Empire Building somehow symbolizes. In that giant shaft I see a groping toward beauty and spiritual vision. I am one of those who see and yet believe."

Helen Keller, 1933; in High-rise buildings, 1996

"As the old buildings disappear radical new ones rise immediately in their place, and the pattern of progress becomes clear: business palaces replace private palaces; soap aristocracy replaces social aristocracy; sleek towers of steel framed blue, green or gray tinted glass give the avenue a glamorous and glittering new look [.] The staples of our civilization soap, whiskey, and chemicals have identified themselves with advanced architectural design and their monuments march up the avenue in a proud parade."

Ada Louise Huxtable, 1957

22. Gordon Bunshaft, 1957
23. Dupre, 1996
24. Price Day, 1932
25. Winston Weisman, 1970
26. Jordy, 1972

About the fortieth floor, my knees started to give in. I didn.t think I was going to make it. My co-workers kept egging me on. Let's keep going. We only have forty floors to go. We only have thirty. We only have twenty. So I kept going, and I'm not sure my knees will ever forgive me. [26]

The death of modernism by Charles Jenks was set to that moment in July 1972, when the first three blocks of St Louis. Infamous Pruitt- Igoe Housing complex were dynamited: Modern architecture died in St Louis, Missouri on July15, 1972 at 3.32 p.m. (or thereabouts) when the infamous Pruitt-Igoe scheme, or rather several of its slab blocks, were given the final coup de grace by dynamite.

A turning point in the history of the high-rise was the failure of these residential high-rise buildings, at least as far as the United States is concerned. In 1973, Jacobs-Ryan Associates designed the Standart Oil Building (Aon Center) in Chicago, which was 1136 ft (346 m), 80 storeys high. In 1974, Skidmore, Owings & Merrill built the Sears Tower in Chicago, which was 1450 ft (443 m), 110 storeys high. About the latter, Paul Gapp wrote in 1980 that, "The Sears Tower clearly and exultantly asserts itself as a giant whose elements assume a lighter character as they rise, in a manner somewhat akin to that of high-rise buildings built in the 1920's". [23] It is the third highest high-rise building in the world following the Petronas Towers and Taipei 101. Petronas Towers designed by Cesar Pelli & Associates in Kuala Lumpur, Malaysia, which, as we saw above, is (452 m, 88 storeys high. Taipei 101 is the highest building in the world built by Brian Micklethwait in Taipei, Taiwan, which is 508 m, 101 storeys high on the ground and 5 storeys high under the ground. In 1976, Loebl, Schlossman, Part & Hackl designed Water Tower Place in Chicago, which was 262 m, 74 storeys high. In 1977, The Stubbins Associates with Emery Roth & Sons planned the Citicorp Center in New York, which was 279 m, 59 storeys high. Hugh Stubbins commended on this exquisite building in the following terms: .What monuments we leave behind in the form of buildings reveal more clearly than anything else the value we place on the quality of life. In 1982, Swanke, Havden and Connell designed the Trump Tower on New York.s Fifth Avenue, which was 210 m, 80 storeys high.

The impeccable structural logic of Nervi's career came into conjunction with certain formal preoccupations of Ponti's and the world now has a building that is not formalist in spite of the care given to the study of its form, a tough-minded-business building that is not just a rent box, an advertising symbol that is not just a gimmick and all this realized in a building that is manifestly a unified, integrated conception, in spite of the hours of sweat and horse-trading around the conference table that must have gone into its design. [27]

Early concepts of the high-rise building in Manhattan offered architects the opportunity to create unique worlds on every floor of the building. This provided architects with the opportunity to decorate the exterior of these enormous monuments with allusions to the past that had nothing to do with the expression of their interior. An example of this can be found in the Gothic exterior expression of the Woolworth Building (1913). This was the first step in the lobotomy and schism of the building's exterior from its interior. In addition, these early creations, such as the Flatiron Building (1902), maximized the amount of space they could achieve by simply extruding the lot the building sat on in its exact shape. It was later found that these exact extrusions limited the amount of light that could get to the street and caused health problems in the city. As a result, a zoning law was enacted in 1916 that required buildings to have setbacks once they reached a certain height. This zoning law coupled with stylistic shifts in Manhattan resulted in Art Deco classics such as the Chrysler Building (1930).[28] these new high-rise buildings were

27. Raquel Vidal, 1993
28. Reyner Banham, 1975

a symbol of the prosperous island and only furthered the lobotomy and schism that was integral to Manhattan high-rise building design.

The high-rise building boom in Manhattan came to an abrupt stop after the stock market crashed. This left New York architects, such as Hugh Ferris, Raymond Hood and Harvey Wiley Corbet, to work on theoretical ideal projects for Manhattan. Hood worked on ideas about creating high-rise buildings as independent cities throughout Manhattan and Corbet worked on separating cars and pedestrians.

1-8. Rockefeller Center

When John D. Rockefeller decided to create Rockefeller Center both architects were called back to practice. This project entailed the development of several New York blocks. The design of Rockefeller center was one of committee. However Raymond Hood dominated the discussions and as a result his influences are most apparent in the design. The program of the building bases, television studios, required little natural light. Therefore the bases were designed to be extrusions of their sites up to the height allowed by the zoning laws. Atop these bases, towers were place on what became the new ground level. This new ground level was a roof garden with cafes and restaurants for the employees who used the building. Both Hood and Corbet realized their visions in this building. Hood and the committee created an independent roof top city that separated the pedestrian from the car.

With the Modern movement the next step in high-rise building design came. Disgusted but the congestion of Manhattan, Le Corbusier wished to place his ideal Radiant City there. Radiant city would call for the destruction of the grid. In contrast to the Manhattan that then existed, Le Corbusier envisioned a city where the ground was kept natural and cars were placed on elevated structures to separate them from pedestrians. Enormous glass box high-rise buildings were to be placed throughout the city to house all classes of life.


1-9. Radiant City; , Le Corbusier

in Manhattan, this building becomes nothing more than another experimental form placed within the grid, albeit a bigger portion of it Le Corbusier urban ideas typified in his theoretical Radiant City could never be realized in Manhattan. However, Modernism as a stylistic movement did take hold in Manhattan for a period of time. Many glass boxes were placed in the city's skyline. One of the best examples of this is the Seagram Building (1958) by Mies van der Rohe and Phillip Johnson. However, these glass boxes were not placed in the Modernist urban landscape they were initially conceived for. They were placed within the gird of Manhattan and therefore merely became the next type in formal high-rise building expression found within Manhattan.

The end of the Modern stylistic movement came in 1977 with Citicorp Center. Although, for all intents and purposes, this building was a modernist glass box, the building contained one bold move away from Modernism. It did not have a flat roof. The early 1980.s ushered in a new stylistic movement reminiscent to that of the early high-rise buildings. This style was known as Post Modernism. As a stylistic movement Post Modernism reacted to the universal facades of Modernism through historical references and allusions, similarly to the fashion in which early Manhattan high-rise buildings were clad. However, the historical allusions typical in a Post Modern building were less direct than those found in an early high-rise building.

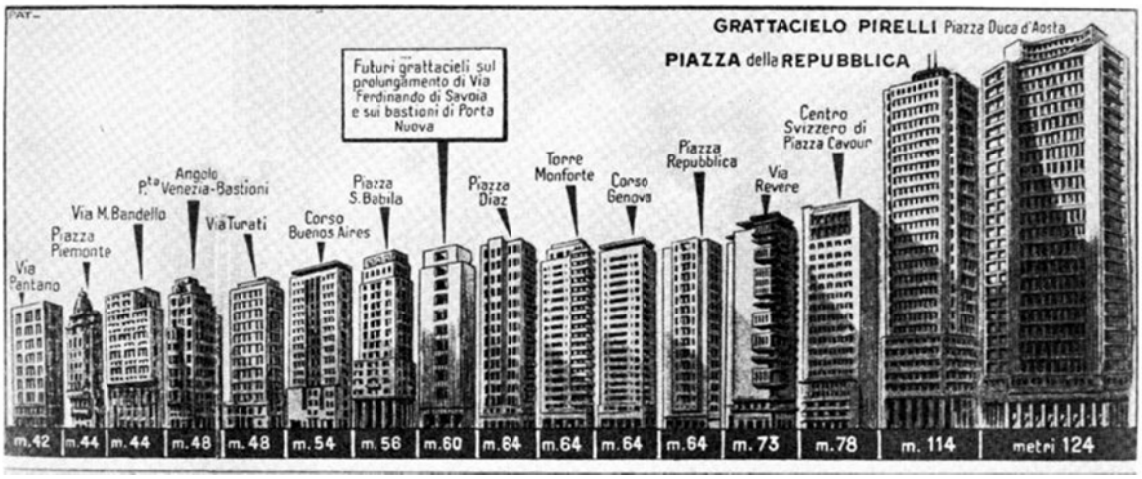
An example of a Post Modern high-rise building is AT&T Headquarters (1984), by Philip Johnson They were in fact more of a tongue and cheek reaction to the strict rigidity of Modernism.. The postmodern style as implemented in New York was the next formal language to support the schism and lobotomy of interior from exterior that is an ingrained part of the culture of Manhattan.

Lipstick Building (1986) by Philip Johnson a high-rise building in New York, represent an iconic set of buildings not belonging to any specific style. However, the omnipresent grid is still in place. These new high-rise buildings represent the newest formal expressions in the culture of congestion. Additionally, these buildings also maintain the lobotomy and schism that is characteristic of Manhattan.

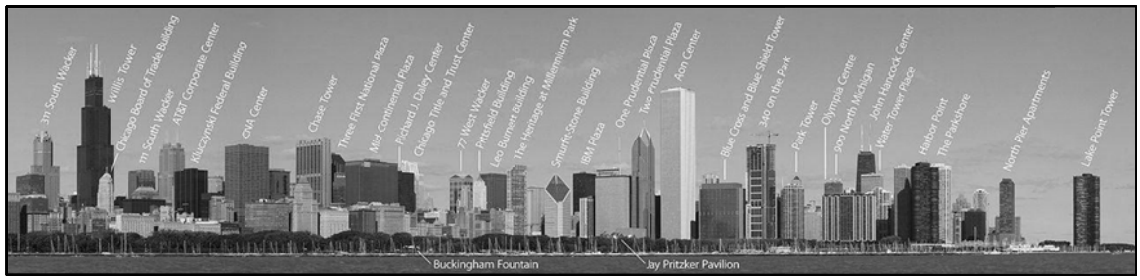
1-10. Lipstick Building (1986) ;Philip Johnson

After the collapse of the World Trade Center, new attitude has been done to high-rise building design throughout the world and inevitably new ideas will surface in Manhattan. An unavoidable question in the next stage of Manhattan's architecture is what role does it play in the destruction of the earth. This question is less about architectural style than it is about architectural responsibility. Conceivably, a building can be designed in such a way that it does not play a role in the depletion of life on the planet and mimics any architectural style that has already been developed. However, the nature of style in architecture is one of exploitation. Most lasting styles of architecture did not start as an attempt to create a style but rather as an attempt to further architectural understanding.

The present of a healthy building will not take on the attributes of some previous style that has been already implemented in Manhattan Therefore, as it is only now incubating. Also it won't take on the formal expression that has been developed in so called sustainable architecture that has generally taken place in less urban environments.



1-11 Milan; High-Rise Buildings



1-12 Chicago, High-Rise Buildings

1-13 New York, High-Rise Buildings

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Chapter 2:

The concept of going vertical instead of horizontal expansion

Chapter 2

The concept of going vertical instead of horizontal expansion is the essence of this chapter.it argues the multi-dimensional characteristics of life quality and its requested attributes in vertical orientation. Mixed used communities and environmental aspects of living in high rise skyscrapers come to be discussed in this chapter and the problems of residential skyscrapers decoded in this part of the thesis. Probing this question whether it worth to live in residential towers or not opens in this chapter.

The character of the city is so that attract the people to it and also allocate the events in the center. This is not the correct method for redeveloping a city. Art museums, new stadiums, and downtown food-fests do not reinvigorate a community and turn it back into a thriving metropolis; they invigorate a specific site within the city for a few hours on a Saturday afternoon. The city center has the opportunity to return to the days when people lived, worked, and played in a lively and exciting downtown environment twenty-four hours a day throughout the year.

Some cities seems to be their office occupancy rates in the Central Business District are not very low, yet their city seems to be a lifeless and boring place that people run from at the end of the workday. The city infrastructure is able to handle the increased growth within the center better than it can handle the continuous expansion into the former countryside. Buildings, utilities, transportation, and city services are currently underutilized within the center. The center has been relegated into a single-use zone, mostly set aside for offices and businesses. Sports teams, art exhibitions, and restaurants don.t use infrastructure; people use the infrastructure. Cities and people must realize that they can be better off financially and socially in a denser environment where the city is able to provide much needed services and contacts. The central city infrastructure is able to provide these services, while the suburban infrastructure is becoming overcrowded. The suburbs and city have reversed historic roles. The city now represents order, stability, community, and the human scale. The suburbs have become the example of constant change, gigantism, uncontrolled technological forces, and the rule of the marketplace. Whereas once the city symbolized a merciless, soulless world, and the suburbs calmness, family, and nature, the two worlds have almost completely traded places in what they represent.[1]

1. Marshall; 2000

The city center changed to be a place where people could live, work, and play from the beginning of 1920's, at the mid of 1900's city center become occupied by building use, with offices relegated to the Central Business District. As a result, over the past 50 years, the Central Business Districts of many cities in the United States have experienced the effects of urban sprawl. People moved to the suburbs to get away from dirty, crime ridden and over-dense cities; as a result, businesses and stores have followed to the suburbs to be near their employees and clients. People continue to move further away from the city as more of their social, business, and entertainment needs move out to the suburbs. In addition, digital technologies make it easier to communicate across long distances, which also encourage people to move further away from the city. When one considers that the Central Business District of any city has been its traditional information and business center, and that information is disappearing into the digital realm, it is possible to anticipate the disappearance of the Central Business District itself. Its role must be rethought or the city center will become a black hole. A desolate zone that will waste away while people continue to destroy the countryside as they move away from the city.

Urban Sprawl

The 1920's were America's first suburban decade. [2] An American would typically live outside the city center and take their horse drawn carriage into the city for business, but the 1920's saw the invention of the automobile. This allowed many Americans to leave the congestion and gritty nature of the urban core. The expanding white-collar executives wanted to live in areas nicer than their blue-collar workforce. Goldfield and Brownell state that the outskirts were the popular choice because in the 1920's the suburb was both more accessible and affordable for the expanding middle class than ever before. [2] The 1930's and 1940's saw a rapid growth in neighborhoods on the outskirts of major metropolitan areas including New York, Boston, and Chicago.

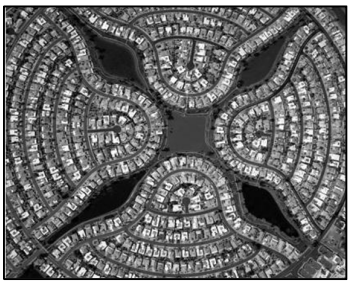
2-1. urban sprawl Arizona subdivision

Widespread urban sprawl in the United States began shortly after World War II when the federal government started a number of projects and instituted a number of policies to encourage growth of the nation [3]. The problem, says Duany, began with the Federal Housing Administration and Veterans Administration which provided low interest loans for new home construction. In addition, the federal interstate highway program allowed people to move efficiently to the outskirts of the city. The people, thus, built new homes in the suburbs at prices significantly lower than renting in the city. The story continues, says Duany, as the people moved away from the city, the stores began to follow. Eventually, corporations began to move their operations to the suburbs to provide their CEOs with a shorter commute time from their suburban mansions. The final issue that contributed to the rise of sprawl was single-use zoning which effectively prevented mixed-use neighborhoods from forming in the outskirts. Eventually all but the largest corporations and their supporting businesses left the central core of the city, leaving a wasteland of vacant structures and underutilized infrastructure. It does seem absurd at first to have a family of four in a 5,000-square foot house. Until you realize this has always been the standard for the well off, and nothing compared to the mansions occupied by the truly wealthy. [4] After World War II, a symbol of status among the middle class was home ownership. As this has become the norm, people want to own larger

2. Goldfield and Brownell, *Urban America, a History*
3. Duany; *Suburban Nation*
4. Alex Marshall; *How Cities Work*

homes and the new status symbol is a three-car garage. The home and the land it sits on are the measuring stick of middle-class wealth. Since homes and the lots they occupy must get larger to meet the latest in middle-class status requirements, people are continuously moving away from the city and the small houses of the suburbs in search of the new subdivision with homes more symbolic of their preferred status. Although the problem began as early as the 1920's,

Duany shows there are five Components of Sprawl which exist today. The components are Roadways, Housing Subdivisions, Shopping Centers, Office and Business Parks, and Civic Institutions. The important thing about these five components is that, due to zoning regulations, each component is strictly segregated from the others. That is to say, suburban communities do not represent a mixed use situation, but the roadways allow them to be connected to different components within the metropolis. In the case of the downtowns, the Central Business District actually contributes to urban sprawl because it represents only office and business uses; this forces people to either drive elsewhere for their daily needs or live without them. Therefore, if the CBD is to become a viable neighborhood, it must learn from the segregation that sprawl encourages and begin to incorporate a mixed-use environment.



2-2. urban sprawl Arizona subdivision

We have allowed the car and highway engineers to design and shape our lives unfortunately, this has become the case. Cities today are not designed to accommodate people; they are designed to accommodate the car and by doing so they have. [5] As Roberta Gratz says, .separated, segregated, and isolated the American people. People can even go all day without stepping into their community; they wake up, get into their car, leave the garage, drive to work, park in the garage and enter the office. The process is the exact opposite at the end of the workday. Even worse, people find it more enjoyable to wait in traffic jams on the highways leading to the city than to wait for a bus within the city. Regardless, the city's public spaces have changed from the public plaza into the public parking lot; this is the place where people are most likely to encounter others.

2-3. urban sprawl California Deer Crest Subdivision

Another problem with the automobile is cost of maintenance. Streets are extremely expensive to maintain, yet they have shifted from something necessary for movement into something of a luxury. The urban grid of streets grouped around a port of train station or a streetcar line has ceased to be the central marketplace of society.[6] it has been replaced by a tangle of streets built around freeway exits. Maintaining this infrastructure of streets is an expensive endeavor for any city, but people continue to push out and pave new roads. Unfortunately, they never stop complaining about the older roads that are in disrepair. A dense environment allows the city to keep the roads operational and allows the expansion funds to go into social programs.

Automobiles act to divide our population into the "haves" and the "have-nots". Middle class people drive away from the city after work, returning to their quaint suburb where they are safe from the "have-nots" or the people who are not able to afford cars. The road segregates the community so people no longer socialize with people outside their class, which effectively homogenizes entire areas and groups of people. Cars not only destroy the city, but they destroy the social makeup of a metropolis, denying people the opportunity to learn from and engage with people unlike themselves. In a 2003 Urban Land Institute publication, Richard M. Haughey makes a case for helping to reduce the consequences of sprawl through multifamily housing developments. Single family housing tends to segregate families because they have little contact with other individuals within their neighborhood, whereas multifamily housing encourages more social interaction due to a high density of people on a plot of land.

5. Roberta Gratz
6. Alex Marshal, 2000

"Because of its compact development form, multifamily housing usually requires less public infrastructure, including roads, sewer and water pipes, and electricity and gas lines. In addition, because retail and commercial uses require high concentrations of housing units within a short commuting distance, multifamily housing makes it financially feasible to incorporate these uses into the neighborhood."

Richard M. Haughey

Local states can brings money back since their per-housing fiscal impact is lower than suburban developments, which allows governments to focus their budget to other more important endeavors such as education or other public services. Another reason multifamily housing makes sense is that the typical family structure has changed since 1950's legislation encouraged building single-family dwellings. One neighborhood of the 1950's, Levittown, New Jersey, was made up of about 12,000 inhabitants, almost all of which were part of the traditional husband-wife-two children group. [7] it is shown that even important child rearing texts, such as Dr. Spock's Baby and Child Care, encouraged children to be raised solely by their parents with little outside influence from other family members or neighbors. While this may have made sense in the mid-twentieth century, the makeup of households has changed dramatically. Haughey refers to data from the 2000 census, which shows that only about one-quarter of the United States population belongs to the traditional two parents with children group. People belonging to non-traditional households, those who are widowed, divorced, single, or single with children, may be more receptive to multifamily housing situations due to their nontraditional living style, which is more suited to dense city life where many conveniences are easily accessible.

Easy access to daily needs is one thing that is required by all people whether they live in the city or in the suburbs. The conditions of sprawl tend to make access to goods less convenient than they would be in the city setting. Not only do suburbs make access to goods harder by forcing people to drive multiple miles for them, but they also pull resources from the city, forcing city dwellers to also drive long distances to find their products. Mixed use communities make these daily tasks easier by providing goods and services only a short distance away, sometimes within walking distance. Unfortunately, sprawl has decentralized our lives and forces us to travel long distances to find goods. Goldfield and Brownell show that during the 1950's .Downtown was becoming less a place of shopping and more exclusively a place of work.

"The myths of convenience and of consumer advantage are popular. Malls and superstores, according to the argument, are convenient because people can drive to them, park, and drive home. Downtown, in contrast, has no place to park, prices are high, and choices are limited. In reality, this is backwards. Distance, private cost of travel, public impact costs, and a whole host of other expenses. Are conveniently left out of the equation."

Roberta Gratz; Cities Back from the Edge: New Life for Downtown

By developing large areas of commercial space away from the residential neighborhoods Suburbs also designate zones for visitors and also zones for residents. Encouraging a denser mixed-use situation in the city center will encourage more diversity and promote neighborhoods that are populated by both visitors and residents. This will make cities active at all times of the day and night, creating a safer and more lively environment where homes, shopping, businesses, and cultural institutions are easily accessible and conveniently located for all classes of people.

Among suburban people, a common perception is that the suburbs make everyday tasks more convenient and cheaper than living in the city. People have an easier time getting around the suburbs and can easily drive to a store for any good they need without having problems finding a parking spot.

Many people believe that the suburbs provide a cheaper cost of living than the city. On the surface this is true, but people fail to notice the hidden costs of expanding infrastructure, environmental costs due to automobile exhaust and destructive development, and the monetary cost of erecting new buildings as existing buildings lie dormant. Also left out are personal expenses for maintaining a vehicle, such as gas, insurance, and repair costs. Gratz points out, .The public, in effect, carries the cost for temporary cheap goods. Sprawl is not only an economic burden for individual people; it also affects the budgets of cities, regions, and nations. A 1998 study by the Sierra Club, entitled Sprawl: The Dark Side of the American Dream, notes that communities are paying huge amounts of money to allow people the luxury of a larger home on a larger lot.

7. Goldfield and Brownell; *Urban America a History*

In The Costs of Sprawl, many pieces of literature pertaining to the costs of sprawl are reviewed and compared. This report shows the challenge of obtaining quality data because of the wide variety of issues that each specific development encounters. This particular report looks at three major studies, two done in 1989 and one done in the mid-1990s, and averages the numbers in them to determine the economic effects of sprawl. They found that sprawling communities spent 25% more on roads, 5% more on schools, and 80% more on utilities than compact communities.

It is clear that the trend is in a higher cost of low-density development when compared to higher-density developments although the numbers vary in each study regarding the cost of sprawl, The money being spent to extend and maintain the city infrastructure to suburban developments could be used to improve the quality of life for all residents of a community and can provide funds to improve education, which is a serious problem among large metropolitan areas. The economic impact of sprawl is significant and must not be ignored.

In 1950's urban sprawl was created under policy, but continues today with the addition of telecommunications technologies. Since the beginning of time humans have had to acquire, process, and transmit information to each other. Initially, the information was transmitted orally from one individual to another, which held little requirement for the physical space in which the transmission took place. As communication progressed, humans began to graphically display their ideas in the form of cave paintings. The cave art came from the fact that humans occupied caves, but eventually it became problematic to transfer ideas in this manner. Portable devices such as tree bark were used to transmit information on the move. Eventually, the Chinese developed paper which was lighter and more durable than the tree bark. Paper evolved and the printing press was developed, which brought written words to the common man since people could rapidly and cheaply reproduce large amounts of information. Storage of and access to these books was required and the library was developed. We have moved into the era of digital information, which allows huge amounts of information to be stored in relatively small areas and promotes quick and easy transmission from virtually anywhere in the world to any other locale in the world.


2-4. urban sprawl; Eden Prairie Florida

Vertical Mixed Use

The standards for the mixed use buildings:

-Must have a mix of uses
-Must have pedestrian-oriented ground floor
-Must contain residential dwelling units

A combination of residential and commercial make a vertical mixed use building. Normally, commercial uses are located on the ground floor, while residential units are located on upper levels. In an effort to encourage vertical mixed use buildings, the City Council established a vertical mixed use overlay district. The district includes most commercially zoned and used properties along Core Transit Corridors and Future Core Transit Corridors as defined in the Commercial Design Standards. Core Transit Corridors include roadways that have or will have a sufficient population density, mix of uses, and transit facilities to encourage and support transit use. The benefits of these kind of buildings are encourages density on commercial corridors with higher levels of transit service focused on the creation of a high quality pedestrian and transit-supportive environment consistent with envision central Texas preferred scenario and provides a more sustainable development pattern

To have a relaxed and easily developing residence some of which require a residential affordability component. As it was described in earlier chapter tall building, also known as the high-rise building, found its beginning during the late 1800's in Chicago. There are two main reasons for building vertically. The first was the desire to locate the entire population of Chicago, which was growing rapidly, in the downtown area known as the .loop, an area measuring only nine blocks square. The second reason for building taller buildings was the economic desire to earn the most income from a single plot of land.[8]

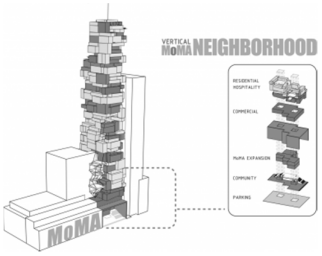
2-5 Norman Foster's Hong Kong and Shanghai Bank

The people at the time of high-rise building prominence were not received well by all. Urban advocates enjoyed the profitability of the tall buildings, but noticed a decrease in the health and happiness of residents as the tall buildings sheltered the city streets from light and fresh air. Carol Willis notes that there had been building height and bulk limits proposed as early as the 1890s.The financially productive high-rise building form, where the building lot was extruded vertically, which provided to maximum amount of floor space, changed in 1916 with the passing of New York City's first building ordinance. The 1916 Zoning Resolution restricted the vertical height of buildings at the sidewalk and required setbacks to allow natural light to advance to the city street. This was different from Chicago's building codes which strictly limited the height of buildings. These were the earliest social and health concerns over the dense living and working conditions associated with districts of high-rise buildings and other tall office buildings. Other social conditions within the high-rise building pose problems for people living and working within the spaces. For instance, the repetitive copying of floor slabs vertically tends to segregate occupants of different floors making it hard for them to interact socially.

In addition, the large size of the building make the people sense of unconvinced, effectively making them feel as though they are an inconsequential part of the whole. One building that took these social concerns into account was Norman Foster's Hong Kong and Shanghai Bank, which attempted to cluster spaces within the building and adjust floor heights to allow interaction among building occupants on different floors. The density created by the large size of high-rise buildings is something that encourages social growth and interaction, yet it also introduces severe problems for the world in terms of ecology and sustainability issues. Ken Yeang states the concern well in his book The Green High-rise building by stating, .Cities and their large buildings demand greater attention with regard to their ecological design because these are the places where the problems of resource-consuming and environment-polluting economic relations and ways of life threaten global natural resources and ecosystems most clearly and most insistently. The amount of energy used within a tall building is daunting in that the air must be conditioned, people must be able to move vertically with elevators and

8. William Curtis; Modern *Architecture Since 1900*

escalators, and businesses require electricity to operate. Denser environments allow people to share the resources within a building, which reduces per-person-cost, but they still use large amounts of energy. Ken Yeang shows that the amount of energy used can be cut by over half by simply incorporating natural ventilation principles. Dense areas will inevitably use large amounts of energy, so it makes sense to attempt to develop strategies that will help lessen the effects of energy consumption on the natural environment.



2-6 Vertical Neighborhood MoMA Tower Proposal

Long distance in the cities and urban sprawl have depleted the inner core of many cities and left partially or completely vacant structures. Since the central city infrastructure can handle more density, and a denser living situation can help the environment, it seems to make sense to reuse the tall buildings of the Central Business District. The entire district must be rethought to incorporate a mixed-use environment so that the neighborhood can act as a self-sustaining object, making the burdens of transportation easier and less hazardous to the environment.

Environmental Concerns

To erect new buildings an enormous amount of energy uses, especially when the buildings are of a significant size, like those found in the Central Business Districts of the world. These buildings represent a large amount of energy consumed and destroying them represents the waste of that energy plus that required in the destruction and removal of debris. Include the energy required in erecting a new building, and the amount of energy used becomes significant. Calvin W. Carter states that the energy required is not just the energy necessary to run the construction machinery, but also that which is required to manufacture and ship the materials to the building site. He goes on to show that it makes more sense to reuse existing buildings that are in good condition rather than replace them. Making the Central Business District into a viable neighborhood with a complete offering of a traditional neighborhood would save on auto emissions from workers coming into the city from the suburbs. With current energy and environmental concerns weighing heavily in the minds of people around the world, it only makes sense to develop a strategy for reuse of buildings that will go empty in the near future.

"When the rehabilitation of old buildings is subjected to scientific analysis and computation; there is no doubt that it saves more energy than does new construction."

Calvin W. Carter

The Brands brings the respect from the community .they sums up the issue by stating that as buildings mature,; they develop a value for the city and the people of the city. The argument is that the value of the building and the site moves beyond the monetary cost of replacing it and into an issue of social pride in the city and the value that the buildings have in the image put forth by the city. Therefore, buildings that are well known and respected shall be saved and reused once their original usefulness has passed.

In his book, Architecture of the City, Aldo Rossi speaks about collective memory. He speaks of how the people understand a city in terms of its history and how they place themselves into that history to understand where they belong.

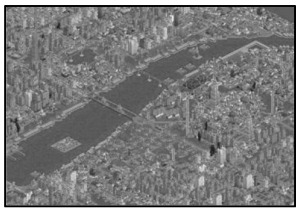
Rossi states that the physical artifacts of the city's history are extremely important to the people's understanding of their role within the city and how the city shapes their everyday life. The buildings represent the city; they represent the people; and this becomes very important to the image of the city.

"One can say that the city itself is the collective memory of its people, and like memory it is associated with objects and places. The city is the locus of the collective memory. This relationship between the locus and the citizenry then becomes the city's predominant image, both of architecture and landscape, and as certain artifacts become part of its memory, new ones emerge. In this entirely positive sense great ideas flow through the history of the city and give shape to it."

Aldo Rossi

Recombinant Architecture and Urbanism

Along with sprawl accompanying the environmental, and iconographic effects, it makes sense to reuse underutilized spaces and infrastructure that currently exist in the city, more specifically in the Central Business District. As sprawl and digitization continue to suck people and objects from the center, more and more space will be available. The Central Business District, occupied mainly by offices and retail, will see a sharp drop in occupancy leaving many office towers available for new development. Adapting these towers will prove beneficial for the occupants of the city, the economy of the region, and the environment surrounding the city. Significant amounts of space exist and can be reconfigured to meet the needs of society and a mixed-use neighborhood, but the spaces currently do not serve the uses that are required to make the neighborhood vibrant and enjoyable.



2-7 an image from the book of City of Bits; William J. Mitchell

In his book, City of Bits, William J. Mitchell describes his idea of recombinant architecture as a new way of designing buildings in the digital age. His argument is that because of the way digital technologies change how we interact with information and space, the spaces we use will have to be analyzed, modified, and recombined to form new spaces that recognize the new technologies. Since the idea is good in principle, it is not solely applicable to digital technologies. The ideas of analyzing spaces, modifying them, and recombining them in new ways works in any location where a force is changing the way people interact with architecture. It is specifically useful in the Central Business District where the spaces will eventually not be used in the ways for which they were originally designed. Therefore, the spaces will be modified to meet new demands and social activity which will take place in a location that was designed with other ideas in mind.

Freely moving from one location to another is a process that involves moving through the city. While pedestrians use sidewalks and cars use the street, the process allows enough freedom to start and stop as necessary to take advantage of the city's offerings and provides the right mix of structure and spontaneity. The reason this works well is the horizontal layout of the city at street level which creates a continuous plane of vision not interfered by height. One problem associated with incorporating city systems into the tower is that of vertical circulation. Vertical circulation requires a large amount of space and energy to be efficient. The typical arrangement is a series of elevators located in the building.s core with fire stairs used mainly for emergency evacuation. Unfortunately, this hinders the flow that is associated with traversing the city. A new system of moving vertically is necessary to better incorporate the different floor levels and provide more visible access within the building.

A problem with the high-rise buildings is the way in which it has been designed to make efficient use of floor space for office tasks. Unfortunately, the efficiency of floor space reduces the social comfort of the space and hinders interaction among occupants. It becomes necessary to break the floor planes to allow views and interaction between floors, which encourage interaction and community. Varying the building section will make for more interesting spaces and encourage more interaction which will foster a sense of comfort and belonging lost in the typical office tower.

Relatively, the high rise buildings provide an existing framework of infrastructure that can be used in the new design. Water, sewer, electrical, communications, and HVAC equipment in the office environment are capable of handling most requirements for the kinds of mixed use that is desired in the tower and the city. These systems can be used or upgraded at a cheaper cost than rebuilding the entire structure and its systems.

Designing public environments in vertical high rise buildings needs a change in the way people understand the tower. Typically, the first two or three floors of the tower are dedicated to more public uses such as retail and restaurant and above that the spaces become completely private. People are not used to sitting in a public space on the 20th floor of a building, but they have little problem relaxing for lunch in a nearby park. Moving these street-level parks into the air requires a new understanding of public space and who is required to monitor and use the space. Regardless, these spaces must be incorporated into the vertical circulation system and should provide the kinds of things seen on the typical street within a city. Cafes, parks, gardens, and playgrounds offer a mix of neighborhood requirements that can be used by the varying occupants of the building and will encourage more interaction than a varied circulation system alone. Once people understand they are able to relax within an atrium on the 20th level, they will have the opportunity to encourage the growth within the building as well as encourage more vibrancy on the streets of the city.

The neighborhoods cannot be created in the residential high-rise buildings on their own. No one building should contain all of the necessary resources within a city; the buildings and open spaces of a city should work as a network that connects all of the things that people need. Enclosing all of a person's needs in one building will serve to homogenize and segregate the population as much as sprawl. The buildings and outdoor urban spaces must be planned to encourage a proper mix of use and people, so the city remains lively at all times of the day. Therefore, the exterior streetscapes and public spaces should encourage urban life and act as intermediaries to the buildings; comfortable spaces that add to the urban experience rather than simply acting as connectors similar to today's streets and highways. Buildings, atria, and exterior public spaces must work together to encourage growth and community within the city.

Surely, this needs people to rethink their remarks of the city. Experiencing the city at the regional level must include an analysis of the things in each sector that are missing for the city's neighborhoods. While the merits of zoning are impossible to ignore, the downfall is a city that is segregated by use, forcing people to drive long distances for their goods and services. A denser living situation within the city, including an incorporation of mixed-use programs, will help to develop a city that meets the needs of all of its people, rather than only a small portion. Neighborhoods must have a character of their own, providing its people will different and exciting opportunities, while never ignoring the basic daily needs of its citizens. Not only must the buildings within a specific district be examined in this context, but the entire city must be studied to make the best of its resources.

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Chapter 3:

Neighborhood Definitions

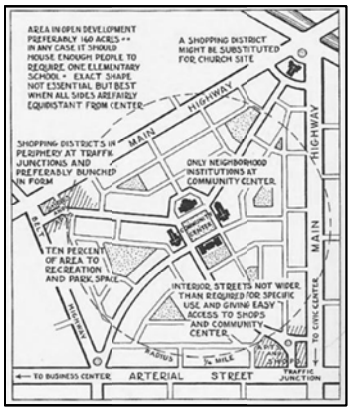
Chapter 3

This chapter on neighborhoods defines neighborhood in many ways. it explains from particular patterns and activities. Definition, history and background theories came out here. The concepts of neighborhood, neighboring, neighbors, neighborhood satisfaction, factors on neighborhood satisfaction, socio-demographic characteristics and physical factors in neighborhood are being discussed as well. At the end of this chapter is also the sense of community in a neighborhood unit is discussed.

Clarence Perry's 80-year-old definition of a neighborhood has proven enduring.[1] He saw a neighborhood as a residential community with one elementary school and a population of about 5,000 to 6,000 residents. National Neighborhood Indicators Project staff note that, "assuming a density of 10 families per acre, the neighborhood would occupy about 160 acres that, if in a circular form, would have a radius of about one quarter of a mile" A walkable neighborhood.

As tempting as that definition is, most researchers, including leading figures like Claudia Coulton [2] ,Gerald Suttles [3] and George Galster [4] recognize that neighborhoods have a variety of definitions depending on the aspect of neighborhood one considers and that, even individuals define their neighborhood differently depending on the purpose they have in mind. In urban settings, Robert Sampson points out, people traverse neighborhoods for various purposes, working in one neighborhood, living in another, perhaps shopping in a third and visiting friends and family in a fourth. [5] For this reason, neighborhood definitions are varied and imprecise.

In practice, there is no one definition of neighborhoods and there is no description of a neighborhood that can sever it from the influences of the communities around it. That does not mean that neighborhoods are not significant. Neighborhoods remain the locus of our most frequent interactions and the physical and social influences that are most likely to influence us. But it does mean that in defining a neighborhood, the absence of any one right answer creates limitations in selecting a convenient and practical answer.



3-1 The American Garden City Clarence Perry's "neighborhood unit" (1929)

1 Gallion, 1950
2 Coulton 1998
3 Suttles 1972
4 Galster 2005
5 (Sampson 2003)

The societies encourage practitioners to be flexible about how strictly neighborhood boundaries are defined, and to follow convention and community direction in the definitions. [6] Because of community-indicators they have to reflect two things above all. First, they have to, as much as possible; reflect the actual networks of interaction that define the most likely constellations of social networks and social capital. Second, they have to reflect the practical considerations of data gathering and reflect the boundaries that correspond to those used by data sources.

Researchers have been concerned about neighborhoods. Beginning with research on the impacts of concentrations of poverty and neighborhood effects on children's learning and health outcomes, researchers have identified the neighborhood as one significant determinant of success for individuals and for families. United Way of Greater Toronto recognized these trends when developing its research on the emerging concentration of distress factors in its 2004 study Poverty by Postal Code. If our city is to remain strong, vibrant and competitive in the years to come, then its neighborhoods must be places where people want to live. Parents must feel that neighborhood streets are safe for their children to walk, and that local parks are safe places for their children to play. They must be assured that there are places for their teenagers to meet and get involved in sports and social events. They need to be confident that the shops and services that are a necessary part of daily life will be nearby and accessible. And they want to know that they will be welcomed and have a connection to their neighbors. Where we live matters to all of us. Neighborhoods are also one of the more promising units for programmatic intervention. City-wide, region wide and country-wide policies are often too broad and too generalized to be genuinely appropriate to the context of their intended clients. Policies and practices pursued more broadly also have less capacity to fully engage their clients. In contrast, neighborhood-scale organizations can root themselves with the people they serve and improve their sensitivity to clients and their capacity for sustainability. As a result, local programs have an added advantage in producing their intended results. In summary, neighborhoods are where life of the city, and the lives of its individual residents, plays themselves out. Because of this, strong neighborhoods truly do matter.

Cities may provide better infrastructure for people to move faster, a cleaner environment for healthier lives, more recreational opportunities to enjoy their lives, and advanced technologies to live conveniently than ancient cities did. People in modern society may advocate that the world is our neighborhood. However, the importance of close relationships between neighbors and neighborhood satisfaction has diminished [7] the neighborhood, as a focus for emotional and financial investments, and potential sources of friends for children and adults [8], may have become less important. People find their community elsewhere rather than the geographically bounded area near home. Even so, the importance of the residential environment remains the most fundamental base of life. People live in the environment, have day-to-day experiences in it, and share their sense of communities with their neighbors. Residential and neighborhood satisfaction often functions as a critical factor for their intention to move. High satisfaction among residents encourages people to stay on or attracts others to move in. Further, neighborhood satisfaction may affect people's quality of life and their health.

Research has repeatedly suggested that laypersons differ from experts in their perceptions and evaluations of the environment. To planners, designers, and decision makers, understanding the environmental factors that influence the laypersons evaluative appraisals is essential. Such knowledge can help communities plan, design, and manage environments to improve their quality. Resident's neighborhood satisfaction has a

6 Kingsley 1999
7 Caiazza & Putnam, 2005
8 Feld, 1981

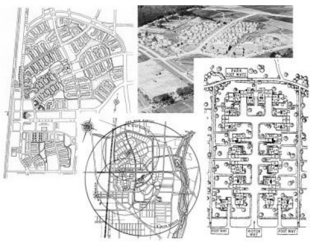
complex and multidimensional basis relating to the actual and perceived environmental characteristics [9] . Physical attributes of the environment are filtered through perception and evaluation to affect satisfaction. Researchers in many disciplines have studied *neighborhood satisfaction*. These studies vary in considering personal, social, and psychological aspects [10,] yet the research has often overlooked the attributes of the physical environment. Moreover, when studies examined attributes of the physical environment, they often relied on ratings of the attributes rather than physical measures of them [11] but designers and planners need to know about the physical characteristics, which they can control.

Health studies have suggested that changes in the physical environment promote health behaviors and health [12] and found the associations between. They have established a method that measures physical environmental characteristics with applications of satellite imagery analysis, geographic information analysis, and on-site assessments. Adapting those methods, this dissertation study brings a multi-disciplinary approach to the study of neighborhood satisfaction. It tests and builds a method for use by planners and designers.

The Neighborhood

The literature on neighborhoods defines neighborhood in many ways. Brower (1996) explains that its form is derived from a particular pattern of activities, the presence of a common visual motif, an area with continuous boundaries or a network of often traveled streets. Different definitions serve different interests, so that the neighborhood may be seen as a source of place-identity, an element of urban form, or a unit of decision making. It seems that research uses multiple definitions of a neighborhood simultaneously to reflect the fact that neighborhood is not a static concept but rather a dynamic one [13].

Neighborhood Settings, Physical Characteristics of Neighborhood Planners and designers have thought of the neighborhood setting as a fixed, controllable, and imaginable physical area. This view was consistent with the concepts in American planning history.



3-2 Radburn Proposal; Clarence Stein

Ebenezer Howard (1898) based his design of the Garden City on the neighborhood units, which were relatively self-sufficient units that merged. While Howard's idea focused in the suburbs, Clarence Perry (1929) attempted it in the city. His neighborhood unit was a self-contained residential area bounded by major streets, with shopping districts in periphery and community center and an elementary school located at the center of the neighborhood unit. In 1966, Clarence Stein altered Perry's ideal concept in Radburn's design. It had an elementary school at the center and park spaces flowed through the neighborhood, but it was larger than Perry's concept and introduced the residential street design with cul-de-sac to eliminate through traffic. The concepts of neighborhood as a basic land development unit was disused in the post-World War II era in the United States. At that time, the massive suburbs developed. Since 2000, New Urbanists have called for traditional neighborhood development and transit-oriented development models. They propose a neighborhood unit with a center and a balanced mix of activities; and they gave priority to the creation of public space.

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Researchers agree that a neighborhood should comprise a walkable distance. However, the actual walkable distance considered has varied from a quarter-mile to one mile from center to edge [14.] Black youths drew a much smaller neighborhood boundary (approximately 1 block or less). This is consistent with an alternative micro-neighborhood, which considered the neighborhood as an area that a resident could see from his/her front door, that is, the five or six homes nearest to their house [15]. The results showed that

9 Amerigo & Aragones, 1997
10 Alvi et al., 2001
11 Galster & Hesser, 1981
12 Stokols, 1996
13 Talen & Shah, 2007
14 Colabianchi et al., 2007
15 Ladd, 1970

residents drew their territorial boundaries to a maximum of a street block (between intersections with approximately 6-10 buildings each side), and to a minimum their own apartment building. Research showed that the micro-neighborhood deals more with social relationships among neighbors than the physical environment.

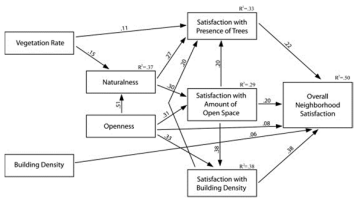
Neighborhood Satisfaction

Neighborhood satisfaction refers to residents. Overall evaluation of their neighborhood. Researchers from many disciplines have examined neighborhood satisfaction [16]. They have used a variety of terms such as, residential satisfaction, community satisfaction, or satisfaction with residential communities for it [16].The interchangeable use of these terms, in spite of correlations between them is a problem [17].

For example, Marans and Rodgers (1975) measured satisfaction with the community, the macro neighborhood, and the micro-neighborhood, and found that satisfaction with community related more to social factors while satisfaction with neighborhood related more to physical factors.

The residential environment includes physical dimensions other than the neighborhood, such as the dwelling and the neighbors and the community environment includes the social aspects as well as the physical ones [17]. Because the present study centers on the physical characteristics of the neighborhood associated with overall neighborhood satisfaction.

Research found different circumstances affecting *neighborhood satisfaction* depending on where the residents live [18] examined resident's neighborhood satisfaction in new towns and less planned areas. New town residents were more likely to mention attributes of the larger area, the physical factors; and the less planned town residents were focused on the micro-residential features with emphases on the social characteristic of the neighborhood.



3-3 model of neighborhood satisfaction by Misun Hur, , Jack L. Nasar, Bumseok Chun

Cook surveyed single-parent women who received Section 8 rental subsidies in 1985 and found group differences in overall neighborhood satisfaction as well as the components of it. The single-parent women in suburban areas were modestly satisfied with their neighborhood. They looked at the factors, such as good shopping, the school system, decent housings, and quiet environment, when making their overall evaluations. In contrast, the single-parent women in urban environment were less likely satisfied with their neighborhood and appeared to measure their neighborhood against criteria hardest to achieve in the city such as, quietness and good maintenance.

Hur and Morrow-Jones (2008) found differences in the factors related to neighborhood satisfaction between residents who are satisfied with their neighborhood and residents who are not. Physical attributes associated with aesthetics were significant influences in both neighborhood groups, but access to recreational opportunities and local government service were significant factors for the satisfied group and safety and social problems were significant factors for the unsatisfied group.

There were a number of studies that indicate the importance of sociodemographic characteristics on neighborhood satisfaction. They have found positive influences of longer tenure in the neighborhood [17], and homeownership. Young, educated, and wealthy urban residents were found to be more satisfied than others.

16 Amerigo, 2002
17 Lipsetz, 2001
18 Cook, 1988

Social and psychological ties to a place such as having friends or family living nearby [19] among residents as a positive influence on neighborhood satisfaction [20] i.e., communication, social support, informal social participation, and participation in formal neighborhood organizations. The findings agree that residents were satisfied when they considered their neighbors as friendly, trusting, and supportive. People reported satisfaction was higher when they reported talking to their neighbors often and supporting each other formally and informally, especially for the residents who have lived in the neighborhood longer and for the ones who are Black.

In addition to the positive social interactions factors, research has found several factors that decrease neighborhood satisfaction: crime rate, social incivilities such as harassing neighbors, teenagers hanging out, noise, fighting, and arguing and higher traffic volume in the neighborhood [17]

While much of the research has focused on personal, social, and psychological factors, urban designers and urban planners can more directly shape the neighborhood physical features and policy can apply the physical features effectively.

There are several physical environmental features that research has considered. Some relate *to* neighborhood satisfaction and the others have connections to the factors that may link to neighborhood satisfaction. I categorized them into three types: physical disorder ,defensible space features, and built or natural characteristics. Studies have found that physical disorder affects neighborhood satisfaction. It promotes fear of crime, makes people want to leave the area, and diminishes resident's overall neighborhood satisfaction [10]. Physical incivilities can be grouped into three kinds: the fixed feature elements such as, a vacant house and dilapidated building, the semi-fixed feature elements such as, graffiti and broken feature on public property and non-fixed elements such as, litter and abandoned cars. [21]

3-4 Defensible Space Program

Research has also suggested the defensible space features as effects on neighborhood satisfaction. Defensible Space is a program that .restructures the physical layout of communities to allow residents to control the areas around their homes .This supports an action to foster territoriality, natural surveillance, a safe image, and a protected milieu.

The defensible spaces are clearly bounded spaces that appear to belong to someone so that a visitor is likely to recognize them as someone's territory. Design features may allow residents to identify and observe strangers, providing natural surveillance. The safe image conveys an impression of a safe and invulnerable neighborhood. If the image is negative, .the project will be stigmatized and its residents castigated and victimized [22]. A safe milieu is a neighborhood situated in the middle of a wider crime-free area, which is thus insulated from the outside world by a moat of safety. Natural surveillance involves windows facing the streets, and place to sit outside. If provide eyes on the street, give residents opportunities to have informal contacts with their neighbors to help formation of local and affects nonverbal messages of monitoring . Research reported that a less visible street from neighboring houses had more crime indicating the importance of surveillance system in neighborhood. Despite of its significance, was the only study looking at natural surveillance as an influence on neighborhood satisfaction. The study showed how public housing residents in Diggs town have become known to each other, restored the sense of belongingness, and built strong neighborhood satisfaction by front porches. Territoriality, another defensible feature, involves territorial symbols such as yard barriers [23], block watch signs, security alarm stickers, and evidence of dogs. Although they may reduce crime and fear of crime, research has not looked at the connection to resident's neighborhood satisfaction. Litter and graffiti, which are also incivilities, affect image and milieu.

19 Lipsetz, 2001
20 Galster, 1987
21 Roach & O.Brien, 1982
22 Newman, 1972
23 G. Brown et al., 2004

The third type of physical environmental features includes the degree to which a place looks built or natural. Studies have measured residential density (Lansing et al., 1970), land use and vegetation [24]. Lansing was the only study to look at density-related characteristics (e.g., frequency of hearing neighbors, and privacy in yard from neighbors) on neighborhood satisfaction. But those elements were more social than physical, and thus may only get at physical density in the neighborhood indirectly. While the amount of nearby retail land use has a negative correlation with *neighborhood satisfaction*, they found that the amount of trees moderated the negative effect Perceived and evaluative physical environmental characteristics Studies repeatedly find aesthetics as one of the most important factors in neighborhood satisfaction [25] . However, these findings simply relate one evaluation (perceived aesthetic quality) to another (neighborhood satisfaction).

They do not tell planners how to achieve the desired aesthetics. In relation to aesthetics, Nasar's (1988) survey of residents and visitors found that their visual preferences related to five likable features: naturalness, upkeep/civilities, openness, historic significance, and order. People liked the visual quality of areas that had those attributes and they disliked the visual quality of areas that did not have them. Other research has also found these attributes related to aesthetic appraisals and research found some of them related to neighborhood satisfaction [26]

In sum, residential satisfaction may relate to physical, perceived, and evaluative environmental characteristics in the neighborhood. Although inclusive, there may be other factors that affect neighborhood satisfaction. Historic significance−a mix of order, variety, and popular styles− would be one of the visual aspects that relates to aesthetic preference (Nasar, 1998). High perceived values associated with historic significance would relate to neighborhood satisfaction.

Neighborhoods, Neighbors and Neighboring

Sense of Community and neighboring are two important concepts that have received research attention in community psychology [27]. Sarason's seminal work on sense of community defined the concept as .the sense that one was part of a readily supportive network of relationships upon which one could depend. Individuals can experience sense of community in geographical terms such as with neighbors or in relational terms such as with other sharing similar interests (e.g., professions, political organizations) [28]. Neighboring has been defined as the exchange of social support between persons living in close proximity. Although senses of community and neighboring have been shown to be related closely, researchers usually have differentiated them as two different aspects of an individual's relationship to his/her neighborhood and neighbors. Sense of community is a psychological variable referring to beliefs and attitudes about neighbors and the neighborhood. In contrast, neighboring is a behavioral variable involving social interaction and the exchange of support between neighbors [29].

There are four elements as being central to sense of community: membership, influence, integration and fulfillment of needs, and shared emotional connection. [30] Therefore the neighborhood remains a significant contributor to the development and maintenance of sense of community and then it becomes important to consider elements of the neighborhood that contribute to the development and maintenance of sense of community.

24 Lansing, 1970
25 Kearney, 2006
26 Jorgensen, 2007
27 Sarason, 1974
28 Gusfield, 1975
29 Wandersman, 1985
30 MacMillan and Chavis, 1986

Research to date has identified only a few neighborhood-level variables that are associated with sense of community in residents. It was found that residents of high-rise residential neighborhoods had a lower sense of community than residents in low-rise neighborhoods. A plausible explanation for this finding is that living in high-rise buildings fosters greater privacy, anonymity, and fewer opportunities for social interactions with neighbors than single-family dwellings.

Wilson and Baldassare (1996) examined sense of community for residents of a suburban region and found that privacy in the home is an important factor contributing to the personal well-being of residents. They observed an overwhelming preference for single-family detached homes that offered residents the ability to regulate privacy and unwanted interactions while creating opportunities for residents to engage in local interactions with less stress. They further suggested that .larger, denser, and more socially diverse urban communities are supposed to create more personal stress and social conflict, which result in personal unhappiness and a decline in community. Although the dimensions of privacy (as provided by type of housing) and density of housing have been considered, there has been no examination of how other neighborhood-level characteristics such as the composition of the neighborhood contributes to sense of community. Instead, most research has investigated the relationship between sense of community and different types of neighborhood participation.

Participation in a variety of community organizations has been shown to be related to sense of community. The greater sense of community was related to more participation in block associations, increased neighborhood satisfaction, more positive social relations with neighbors, and increasing perceived control over one's immediate environment. The findings are as indicative of the importance of sense of community in the promotion of neighborhood development efforts. Glynn (1981) found several characteristics of individuals that held positive relationships with sense of community. These included the number of years married, number of children living at home, stability in the community, number of neighbors one is able to identify, and satisfaction with the community.

Some empirical findings have shown that psychological benefits may accrue from experiencing a higher sense of community. Riger and Lavrakas (1981) indicated that sense of community can be an explanatory tool for individual well-being. In studying the town of Seaside, Florida, feelings of membership, need fulfillment, and shared emotional connections with neighbors were shown to be associated with individual health. A link between sense of community and sense of well-being makes intuitive sense, yet few studies have addressed such a relationship. Findings revealed that a stronger sense of community led to increased problem-focused coping, which in turn contributed significantly to the degree of individual's community involvement. Davidson and Cotter (1991) demonstrated a link between sense of community and general happiness.

Prezza and Constantini (1998) examined sense of community, self-esteem, life satisfaction, and perceived social support of residents living in three Italian localities: a small town in Viterbo, Italy (1693 inhabitants), a small seaside city in Aquila, Italy (21,101 inhabitants) and in a larger city, Naples (52,434 inhabitants). They found that senses of community and life satisfaction were higher for residents of the small town than in the small or large cities, and that sense of community was related only to life satisfaction for residents of the small town and the small city. A later study comparing a large town, a small town, and a city found sense of community related to life satisfaction and loneliness in all three locales. [31]

31 Prezza, Amicci, Roberti, & Tedeschi, 2001

Review of the relatively few empirical studies to date shows that sense of community is an important variable for consideration in investigations focusing on neighborhood issues. Psychological sense of community is an aggregate variable, and is most useful when studied at the community level of measurement. It is also a positive resource for individuals and neighborhoods, stimulating community development efforts and positive relations between neighbors and promoting personal well-being.

The exchange of social support between neighbors that is commonly referred to as .neighboring, can involve offering personal emotional, functional instrumental, or informational forms of support. This support can involve such things as borrowing or lending tools, informal visiting, asking for help in an emergency, etc. Royal and Rossi (1996) noted that there are negative consequences of increasing urbanization on the quality of neighborhood community life, including neighboring behavior. Research has found that neighboring varies across different types of neighborhoods.

Homogeneous neighborhoods with regard to socio-economic status have shown higher levels of neighboring than heterogeneous neighborhoods. In contrast, level of socio-economic status has not been found to be related to neighboring behavior. Other neighborhood-level correlates shown to be related positively to neighboring have included mean income of residents and the proportion of Caucasians, Catholics, and homeowners living in the same neighborhood [32]. Areas with homogeneous populations i.e., socioeconomic status, race, religion are more likely to have residents who share similar values and interests. As a result, greater interaction between neighbors is facilitated. Homeowners tend to have a greater investment in the neighborhood, thereby encouraging them to have more involvement with their neighbors.

"Communities are dynamic and historically determined"

Wiesenfeld

The physical features of the neighborhood - such as the proximity of homes, placement of doors of homes and location of recreational facilities- also have been found to be related to neighboring. Such features may serve to facilitate social interaction between neighbors by decreasing the distance between them. A limitation of the research on neighborhood-level correlates of neighboring is that they are investigated at the census-track level, using large areas as the unit of analysis, often including several distinct neighborhoods within a census tract. The problem with this approach is that the heterogeneity of the constituent neighborhoods often is lost in the classification of the larger areas. Wiesenfeld (1996) argued that in studying communities, large definitions of neighborhoods such as those used in census track data and therefore ignore the stages of the process of neighborhood development through which both neighborhoods and their members pass. What would be of more value in the investigation of the impact of the types of neighborhoods on neighboring behaviors would be to have smaller homogeneous neighborhoods as units for analysis, and compare the units according to a specified criterion. The coding of census data has only recently allowed for more fine-grained analysis involving smaller areas as the units of analysis [33]

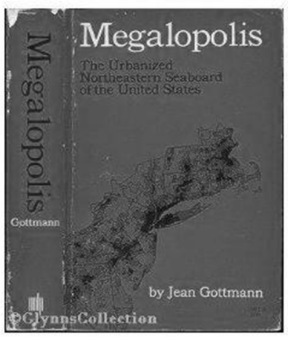
Neighboring has been found to be related to various types of community involvement and feelings of attachment to, loyalty to, and satisfaction with the neighborhood. Neighboring relations are stronger for women, members of large families, and those with less education who had lived in the community for many years and were members of groups or associations. They also noted that the strongest predictor of sense of community was neighborhood relations. In addition, social support derived through social interaction between neighbors likely contributes to a greater sense of well-being. Furthermore, a sense of personal well-being may facilitate an individual's interest in neighboring activities.

32 Ahlbrandt, 1984
33 Currie, 1989

Review of the relevant studies suggests that neighboring behavior is an important variable for consideration in investigating neighborhood issues. It is associated with both neighborhood characteristics and personal well-being.

Neighborhoods and the Future of Small Towns

That is to say that, between 1988 and 1996, central cities as a whole suffered a net emigration of between 2.4 and 2.9 million people. During the same period, suburbs experienced a net gain of between 2.1 and 3.1 million people each year. This expansion, though much more rapid than ever before, is not a new phenomenon. Fringe cities have always occurred as a result of new towns incorporating on the periphery of a larger metropolis and expanding slowly. What is commonly overlooked, however, is that these smaller cities adjacent to the central city used to be incorporated through annexation.



3-5 Megalopolis; Jean Gottman

Unlike New Urbanism, which believes that suburban and urban entities are vastly dissimilar, it is the contention of this thesis that the two will coalesce into multiple areas of similar densities. The inner city areas were left behind by a massive relocation to the suburbs, which began in the late nineteenth century but accelerated in the 1920's with the spread of the automobile. The introduction of freeway construction after World War II opened up even larger areas of suburban land, which were quickly filled by people fleeing central city decline. Today, more people live in suburbs than in cities proper. Manufacturers have also moved their production facilities to suburban locations which have freeway and rail accessibility. Indeed, we have reached a new stage of urbanization where the metropolis is the new scale of the city. Most major cities are no longer focused exclusively on the traditional downtown. The growth that occurs outside in suburbs has accrued to a level of density sufficient for city centers, though less dense than traditional cities, creating validity for the term .metropolitan density. Every year in we have become more and more metropolitan and less and less compactly urban. The proportion of Americans living in places defined as "metropolitan" has increased from two thirds in 1960 to 80% today. Yet, the new development is not as dense as the city; rather, it has affected the center city and begins to dispense its components throughout the region, as traditional downtown elements such corporations, sports stadiums, and occasionally government centers have left the core. It is made up almost exclusively of low density suburban sprawl and edge cities. New sub cities have risen around the periphery, and these sub centers supply most of the daily needs of their adjacent populations. The old metropolis has become a multi-centered urban region. In turn, many of these urban regions have expanded to the point where they have coalesced into vast belts of growth what the geographer Jean Gottman termed "megalopolis"

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Chapter 4:

The concept of Green Buildings

Chapter 4

The concept of green buildings and all related subjects around it are being discussed here. Sustainable design and green design are hot topics in the architectural world today. However, they seem too broad and sweeping to really mean anything. Within these topics are ideas about efficiency, urbanism, ecology, economy, ethics and many more areas of discussion. However, the underlying, main theme of sustainability is an understanding that the earth's resources are limited and that current trends and patterns are destructive and will ultimately destroy the earth and humanity in an integrated research this chapter covers all the above subjects.

During the cycle of life buildings have a major impact on our environment. Today, there are approximately more than 76 million residential buildings in just the US. Together, these structures consume nearly one third of America's energy. According to the Rincones (2000) report much of it is wasted by inefficient design. Accounting for 10 percent of particulate emissions, 25 percent of nitrous oxide emissions, 35 percent of carbon dioxide emissions and 49 percent of sulfur dioxide emissions, buildings are a principal source of pollutants that damage urban air quality and cause global climate change. Furthermore, human exposure studies indicate that indoor air pollutant levels may be even higher, 2-5 times and occasionally more than 100 times, than outdoor levels.[1] It shows an exciting opportunity for creative design and innovative construction methods that recognize the limitations on land, resources and materials, and the costs imposed on communities from urban sprawl and poorly planned development. Traditionally, building practices have ignored the interrelationships between a building, its components, its surroundings and its occupants. Our challenge will be to develop and implement improved building techniques that reduce waste, costs and use of nonrenewable resources, while increasing occupant health, safety and comfort. Sustainable or Green Building is an integrated approach to the design, construction and operation of a building that minimizes negative environmental effects. Rincones mentioned that the main precepts of green building are based on tenets of sustainability such as the CERES and Hannover Principles. As a result, green buildings are a model of resource conservation, most notably in their treatment of water and energy efficiency and renewable energy use. A green building minimizes waste and prevents pollution while reducing operation and maintenance costs. In addition to protecting occupant health and improving productivity, green building design addresses issues such as land restoration, historical preservation and access to transportation and other community infrastructure systems.[1]

4-1 Hannover Principles in general

1 Rincones; The Green Building Resource Guide (2000)

Green building is not just a design on a paper. It is a proven method currently being practiced all over the world. In many countries it is a requirement for all buildings; many states and communities around the country are also implementing sustainable building policies. Some parts of the building industry might have concerns about the increased spending requirements of resource-efficient buildings. “By employing integrated, whole building Design strategies early in the process, sustainability is maximized without a considerable increase in cost. Often, there is a net reduction in first cost of green buildings. Even in cases when there is a cost increase, it often pays for itself during the first few years of occupancy and operation. Furthermore, the savings from lower operating costs accrue over the life of the building. Even with a tight budget, many green building features can be incorporated for minimal or zero increased up-front costs, and generate extraordinary savings as a result.” Rincones (2000)

The activities related to green building have been increasing recently. As urban designers and architects shift toward energy-efficiency and greater use of responsible materials in housing, the benefits of these shifts are also influencing affordable housing. “Green building and affordable housing priorities intersect strongly around desires to reduce operating costs for building occupants, and they can also create synergies for supporting local needs and values, utilizing responsible materials, and designing self-sustaining sites with minimal environmental impacts” Lindburg (2007)

This section of my thesis provides an overview of the concept of affordable housing and identifies significant opportunities for adoption of green building innovations within the affordable housing sector. Testing examples are included to illustrate the relation between green and affordable worldwide.

since facing the green building issues and the need for affordable housing continue to vast internationally, building bridges between the two areas is likely to increase the impact of both.

4-2 Green High-Rise Residential Building

It should be considered that the eco-affordable is not just about the house. It may serve as a way to increase community involvement in defining housing needs and identifying local environmental priorities, and can even create opportunities for economic development and local self-reliance as people develop new skills related to green building practices.

based on the Lindburg (2000) report; the recognizable difference gap can be seen in Eco affordable housing efforts due to both the relative newness of the formal concept and the need to be flexible in addressing diverse green building goals and specific community housing needs. This variability can create confusion and even conflict over competing definitions of what constitutes an affordable green building program. However, the various approaches also offer a range of models for communities and organizations to learn from as they initiate their own eco affordable housing project.

Lindburg mentions that the common space between the green building and affordable housing includes shared interests in energy-efficiency, reduced house size and associated needs for maintenance, prefabricated construction techniques, the use of responsible materials, and self-sustaining sites. By incorporating energy-efficient appliances, high efficiency heating and cooling systems, well-insulated windows and doors, and other energy saving practices, homeowners can substantially reduce their energy use without necessarily increasing construction costs. Homes built in .Prairie Crossing, a conservation development in Grayslake, Illinois, reportedly need 50% less energy to operate than a traditional home in the area, and yet cost the same to build. Despite the many opportunities for increased home energy-efficiency, since 1970, total household energy use has risen, even as energy use per square foot has declined. This trend leads to the next topic of reduced home size as a tool to increase affordability and reduce environmental impacts. The following green building checklists are only decision-making tools in use today.

LEED [2]

4-3 Leadership in Energy and Environmental Design (LEED)

The Leadership in Energy and Environmental Design (LEED) building rating system is a priority program of the U.S. Green Building Council. It is a voluntary, consensus-based, market-driven rating system based on existing proven technology. It evaluates environmental performance from a "whole building" perspective over a building's life cycle, providing a definitive standard for what constitutes a "green building". LEED is designed for rating new and existing commercial, institutional and high-rise residential buildings. It is intended to be used by commercial building project stakeholders and project teams as a guide for green and sustainable design. Based on accepted energy and environmental principles, it strikes a balance between known effective practices and emerging concepts. It is a self-assessing, feature-oriented system where credits are earned for satisfying each criteria. Different levels of green building certification are awarded based on the total credits earned. The system is designed to be comprehensive in scope, yet simple in operation.

BEES [3]

The Building for Environmental and Economic Sustainability (BEES) software was developed under a federal interagency agreement by the National Institute of Standards and Technology with funding from EPA.s Environmentally Preferable Purchasing program. Version 2.0 of the decision support software is aimed at designers, builders and product manufacturers. Based on consensus standards, it identifies products that reduce energy use, improve air quality and otherwise improve the environmental performance of buildings. Designed to be practical, flexible and transparent, BEES is a powerful technique for balancing the environmental and economic performance of building products. BEES measures the environmental performance of building products by using the environmental life-cycle assessment approach specified in ISO 14000 standards. Economic performance is measured using the ASTM standard life-cycle cost method.

2 new.usgbc.org/leed
3 nist.gov/el/economics/BEESSoftware.cfm

Energy Star [4]

The Energy Star Label for Buildings is a voluntary partnership between the U.S. Department of Energy, the U.S. Environmental Protection Agency and building owners and managers. Energy Star benchmarking compares buildings. Energy performance to that of similar buildings throughout the US. Buildings that are among the top 25 percent nationwide in terms of energy performance and maintain a healthy and productive indoor environment can qualify to receive the Energy Star Label for Buildings.

4-4 Energy Star

Self-Sustaining building

This Local kind of standard is a self-sustaining building is a home or development that is designed to meet its own energy needs on-site, for example by utilizing solar, geothermal, hydro, or wind power. This type of self-sufficiency can greatly reduce operating costs and be highly compatible with affordable housing interests so long as the upfront construction costs are manageable. The aim of this thesis is to set a framework for green high-rise buildings with examining the theory of Ken Yeang about high rise buildings eco design.

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SOLARA in San Diego is a mixed-use affordable housing project for the first time powered by solar, that was certified under California Energy Commission's Zero Energy New Homes Program. Then along with it, in Boston, MAVERICK LANDING, a mixed income housing project, uses solar panels on its roofs as well. These two samples are the pioneers in using self-sustain standard by the builders and developers locally.

4-5 SOLARA in San Diego

4-6 MAVERICK LANDING in Boston

4 energystar.gov

4-7. Ironhorse Sustainably-Built Affordable Housing in Oakland

It should be considered that not every green building trend is a good fit for affordable housing. Technologies that have unproven benefit or significantly higher upfront costs are unlikely to make sense for an affordable housing project manager. Specific techniques such as green roofs may also be inappropriate due to the non-traditional maintenance requirements.

The specific green building innovations that make sense for a project are likely to vary depending on the project design, goals and location. Sometimes the green building standards themselves are not an easy fit for affordable housing projects. To date, green building programs tend to be focused on urban areas and translating their requirements to rural communities and their affordable housing needs can be challenging. In April 2006, the Housing Assistance Council convened a roundtable of green building and rural housing organizations.

The goal was to find the specific challenges regarding incorporating green considerations into affordable housing projects in rural areas. Participants identified the green techniques they were most commonly making use of in rural projects as well as those that presented the greatest barriers.

Considering the common issues of general interests between affordable housing and green building is fairly clear, it is less clear how affordable housing is or isn't served by the formal and rigorous green building standards and certification process.

The usage of green checklist charts during the design and planning stages can aid affordable housing developers in identifying design alternatives and opportunities for affordable innovations. Most green building standards are fairly comprehensive in offering guidance throughout the construction process and for a wide range of building components. The standards can help structure a project and ensure that diverse concerns and considerations are not overlooked. The use of the standards may help a project manager identify opportunities for greater energy-efficiency that will reduce operating costs for the future home owners, possibilities to minimize or recycle construction wastes that reduce costs, or space utilization techniques that allow the overall home size to be reduced. Even without including the certification process, green building standards provide a useful tool for broadening the vision of an affordable housing project team and there is no reason for project developers to limit themselves to only one standard as reference. Despite the costs, affordable housing projects may still seek green building certification for several reasons. Certification may be a requirement for a specific program or funding source and certification offers the benefit of independent verification that claims and commitments have been accomplished.

Healthy High-Rise Building

Unfortunately our environment is designed to consume new products and waste the old products. People consuming items that are called food, for lack of a better word. They sit on the couch absorbing generalized thoughts and fantasies about the world through a situation comedy dreamed up by some executive who has decided what the world should be through market studies. Similarly, big business rakes our earth of its natural resources at an alarming rate with no regard for using them responsibly. Fossil fuels are burned in such a way that they could never be used again for any purpose and so that they destroy the delicate balances of the earth that we were born from. We drain our lakes and oceans of water so that anyone is guaranteed a hot shower or clean clothes and dishes when they want them. We then return the water to our earth ruined and unable to generate the life that it is designed to give. We are creatures of excess, but there are ways to battle and change our patterns of destruction. The man who sits on the couch can one day get up, stop watching the television, start running, eat healthier food and turn his life into a different one that consumes things that are better for him, works to make himself healthy and reduces his need of excess. Similarly, a building can be designed is such a way that it does not rely on the use of fossil fuels and does not create water that cannot feed the earth. However, healthier humans and healthier buildings must be married to create a healthier planet.

4-8. Treetops; Singapore

To design a building like The Belaire residence in NY as a healthy building' it will require that its users also change the way they live to not be destructive. If a building collects its own water, its users must be sensitive to how much water they use and what they use it for. Buildings can be designed to use the free sources of potential energy and nourishment of the earth in a responsible way. The sun, wind, rain, gravity - all these things are constants that if used responsibly will continue to provide the earth and humans with life. Sustainable design and green design are hot topics in the architectural world today. However, they seem too broad and sweeping to really mean anything. Within these topics are ideas about urbanism and ecology. However, the underlying, main theme of sustainability is an understanding that the earth's resources are limited and that current trends and patterns are destructive and will ultimately destroy the earth and humanity. Therefore, sustainability is a call to establish healthier trends that will take a more responsible look at their way we inhabit this planet. The sun, rain water, and wind are three natural resources that will remain indefinitely if used in a responsible manner. That is to say, if these three resources are used properly, they can be recycled and used again. This suggests that the form of a building, specifically its shape, organization, and material properties, can be manipulated in an approach that utilizes these resources as they are available in a specific site in a responsible fashion. This idea is similar to that of evolution as established by Darwin. A species, in this instance the building, takes the shape that allows it to survive within its environment, in this instance the site. A building can take a shape that can exist without relying on the established infrastructure of excess. Attention to design can get a building off the destructive grid. However, a building's form cannot deny its content. The content of a building is its program, its function, its use. Very often this content is expressed in the form of a building. Louis Sullivan gave a name to this idea. "Form ever follows function" This is to say that the form of a building takes on a shape that is a direct result of its program. It is also important to realize that certain contents of buildings can also contribute to the destructive infrastructure that has been established on

4-9 Belaire residence in NY

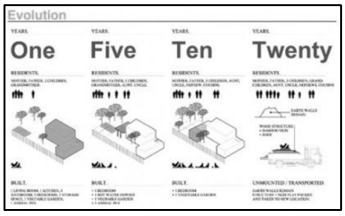
this planet. Therefore, a healthy building not only has a healthy form but also takes on a healthy content.

One could take a human's content to be his mind. If a man is in peak physical condition but he is schizophrenic, then he certainly cannot be labeled as healthy. Similarly if a building is built to use natural resources healthily but has an unhealthy program it cannot be seen as healthy. A building could take a shape that utilizes resources in a healthy fashion, but if within it is the offices of an oil company that drills and devastates the planet, the building is not healthy. However, if the form of a building becomes healthy, this could spark a change in the program within. Perhaps a healthy form can help lead to a healthier content. Whichever direction the desire for a healthy building is sparked from, healthy form or healthy content, a building must marry the two to be truly considered healthy. The ability of a building to take on a healthy form and a healthy content may be limited by its site. However, this does not mean that a difficult site gives a designer the excuse to opt out of dealing with environmental issues. In fact, the opposite is true. With a difficult site it is even more important to consider the impact a building will have on natural processes. If a building can respond to the environment in a healthy, life giving manner on the most challenging site then designers will be forced to realize that every building must be rethought. If a healthy building can be designed in the most difficult of places then all buildings must be built healthy.

A healthy building is a building that uses resources for feeding in a manner similar to that of an animal. It does not ravage the earth of its life-generating forces. Rather, it uses these forces in a way that allows them to be reused by other forms of life. Through an understanding of passive solar heating, photovoltaic energy generation, rain water harvesting, solar heated water usage, grey water re-usage, black water elimination, wind harvesting, and importantly reworking building usage to consume resources differently, a building can be created, in any site, that does not rely on wasteful, destructive infrastructure.

High-rise building and Dense Urban Fabric

In Manhattan, A well-designed building that does not depend on infrastructure that uses the earth's resources in excess can be created. This building, through its design and program, can respond to the culture of the city and help to make that culture healthy without destroying it. Most of the system principles outlined in the preceding text were developed for rural sites and for small-scale projects. However, work is being done currently to apply the underlying principles of a healthy building to high-rise buildings in largely urban sites. For the purpose of this thesis it is important to demonstrate that the concepts of a healthy building need not be limited to small-scale buildings on remote sites. The specific site and program of the proposed building are detailed later but this section takes up the challenges and potential within the thesis project of a high-rise building located in a dense urban fabric.



4-10. Eco Efficient and Affordable-housing- Model

There are several general challenges that any high-rise building, healthy or not, must face. One theory of the evolution of the high-rise building, the high-rise building, contends that it was born out of an economic ideal. By designing a building vertically an architect gains more and more rentable space, and therein more revenue. Therefore, most high-rise building proposals are not considered viable if they cannot be proven to be economically advantageous. Additionally, any high-rise building must accomplish the difficult task of being structurally sound and overcoming the challenges of vertical circulation of people and services. There are, however, tried and true methods of solving these problems. There are more poignant issues that have to do with the environmental challenges a high-rise building poses. High-rise buildings are inherently large structures. They therefore traditionally consume great amounts of energy and place a great deal of inorganic material in one place.

The amount of sun which can be entering to illuminate the inner space can be measured by the depth of the floor plate and the shading of lower levels. The upper levels will be exposed to a great deal of sunlight that must be carefully managed. The higher levels of a high-rise building are also exposed to high velocity winds that may be difficult to manage. There is limited surface area on a high-rise building that can collect rainwater. There are also large amounts of solid waste, black and grey water to be handled. However, within these challenges there is also a great deal of potential for creating a healthy building. By its sheer scale, a healthy high-rise building lends itself to becoming an icon for healthy building. Because the upper levels of a high-rise building are exposed to large amounts of sun and wind, it holds the potential to create considerable amounts of photovoltaic and wind turbine electricity. The sun at these upper levels also can provide a means of heating these floors and heating water for the building. The height of a high-rise building lends itself a large-scale natural ventilation system, both by harnessing wind-driven ventilation and by using the stack effect. The large amounts of grey water produced, coupled with the amount of space created, can allow for planting on the exterior and interior of the building. This can provide food for the building and helps to offset the amount of non-organic material used in its construction. If rethought, the non-organic material can also be used as technical nutrients and stay within industrial cycles.

There is also potential within a high-rise building to create spaces that can store rainwater, grey water, biological material, and energy produced by the building itself. The high-rise building need not be seen as an obstacle to healthy building. Rather it is here viewed as a challenge with great potential. It is a building that can help reverse the destruction of the earth. The words sustainable, green and environmentally friendly are used by many to promote their buildings. All buildings, high-rise and low-rise deep plan, could be more sustainable in terms of their design, the construction process, their operation and the impact on the community.

The definitions of sustainable development are wide spread; but the most popular is from the Brundtland Report (1987): "Meeting the needs of the present without compromising the ability of future generations to meet their own needs." Tall buildings are often regarded as being greater than 20 stores. However, a tall building is really defined with respect to the height of the surrounding buildings. If the majority of the buildings in a city are 3 or 4 stores, then a 12 story building would be considered tall. In locations such as New York or Hong Kong, a tall building is 40 plus stores high. This paper examines primarily tall buildings in the UK, i.e buildings of 20 stores or more.

The tall buildings considered in this research are assumed to be residential buildings with a requirement for building services, not industrial processes or multistory car parks. A sustainable building is one in which the design team have struck a balance between environmental, economic and social issues at all stage, Design, construction, operation and change of use of life. This may involve greater emphasis on different aspects at different stages in the building's life, for example energy for building services and transport of building users and occupants and associated CO2 emissions are key to sustainable operation. A purist's definition of a sustainable tall building is one which emits no pollution to air, land and water, and can be economically occupied throughout its design life, whilst contributing positively to the local community. So the challenge is to achieve sustainability and build high-rise buildings. There are specific aspects where tall buildings are less sustainable than low rise, e.g. in their requirement for energy for vertical transportation, but there are others where they undoubtedly have advantages e.g. utility of land in densely populated urban areas. So the advantages need to be capitalized on, and the disadvantages minimized or mitigated.

Design teams should work with their clients to develop a vision, and challenge the reasons why that vision can't be realized (there are bound to be some good commercial and practical reasons) rather than start with a conventional design and apply small tweaks. In this way, our journey towards buildings that are more sustainable will be quicker.

Measuring the Sustainability of High-rise Buildings

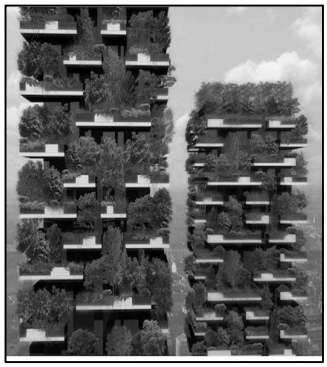
Recently research on designing and developing the capable tools for measuring the green and suitability aspects of the residential and commercial buildings have begun. Based on the official reports there are a number of environmental assessment processes, design tools and key performance indicators for sustainability, although none of them are specifically intended for high-rise construction. These include the Building Research Establishment Environmental Assessment Method (BREEAM) , the Civil Engineering Environmental Quality and Assessment Award (CEEQUAL), ARUP's Sustainable Project Appraisal Routine (SPeAR), the DTI's Movement for Innovation (M4i)8 indicators, and DETR's (now DEFRA) Quality of Life Counts indicators.

These schemes set different weightings to the specific points of issues, and therefore the same building will score differently depending on which system you use. For example, a design that has a very low operational energy may result in a high score in one scheme, whereas in another scheme this factor might be given less weighting, and so result in a lower overall score.

By research it is accepted to say that sustainable development has at least three components: The impact of location on economic issues; The impact of location on environmental issues and The impact of location on social issues like health & safety; quality of indoor environment; degree of control over the indoor environment, neighbors and community which this research addresses this part narrowly.

A downtown of a city is often a brownfield site and therefore regarded as more sustainable than using a Greenfield site. One of the main drivers for tall buildings is to minimize the use of land. If a city center developer wants to minimize the impact on land use, the only way to expand is upwards. Therefore, high-rise buildings are likely to be the preferred option in dense urban areas. There is a generally held view that if a site is a brownfield site, developing it will improve it, whereas developing a Greenfield site will be detrimental however sympathetic the development is to the surrounding landscape. Nevertheless, if there are good commercial reasons for developing on Greenfield sites, the important issue is to capitalize on the advantages provided. These include the opportunity to build mixed-use developments of housing and business parks better prospects for use of renewable energy and day lighting, opportunities for rainwater collection and on-site reed beds for water filtration, and planting to encourage indigenous species.

Tall buildings in an urban context can suffer more from problems with over shading and rights to light, can cause or be the cause of glare, and can create wind tunnels. However it should be possible to overcome all of these issues through good design.



4-11. 27-story Bosco Verticale in Milan Stefano Boeri

In spite of a common mistake energy consumption is not the major issue within a sustainable building; it is how this energy has been generated. The main government wiliness is to reducing greenhouse gas emissions and in the short term any reduction in building energy demand contributes to this aim. Hours of occupation impact on the suitability of different HVAC strategies, so that Combined Heat and Power may be well suited for a 24-hour operation building, but such occupancy may prohibit natural ventilation with nighttime purging. Indeed, natural ventilation of offices will be harder to achieve in the taller high-rise buildings, due to increased wind speeds and noise associated with open able windows at height. The need to install lifts in tall buildings will increase energy demands, but the day lighting potential is better than in low-rise deep plan buildings. There are always trade-offs between different environmental considerations associated with supplying the energy used within a building, but low energy use is a fundamental key to sustainable development.

Buildings consume energy. The architectural, engineering and construction industries are also advocating reconstruction. The movement for innovation has many demonstration projects looking at rethinking the construction process, and the use of electronics to aid information flows would advocate that more and more buildings require electrical energy. If a building is then to be truly sustainable that energy should be generated on site tapping into natural energy sources.

In many countries like windy countries of north and west part of EU are suited to capture a huge wind resource, either for offshore wind generated grid electricity or locally generated electricity from on-site wind turbines. Wind turbines can exploit higher wind speeds around tall buildings or at the top and can be designed for low noise emissions Different types are suitable such as the ducted wind turbines used on the Lighthouse project in Glasgow and the H-Darrieus vertical turbines.[5] The recently published report on Wind Energy for the Built Environment funded by the European Commission looks at the integration of wind turbines into tall buildings. A tall building can take advantage of renewable energy sources in the same way that a low-rise structure can, but the choice of source might be different. There are likely to be more opportunities to use wind energy in high-rise buildings, and there may be unrestricted solar access depending on the proximity of neighboring buildings, but there will be less space to install a rooftop solar array.

5 Alison Crompton, Ant Wilson; Sustainable Tall Buildings – Fact or Fiction? (2004)

Sustainable Communities

On sustainable development, dealing with the suitable community is upmost, and sustainability has an inevitable. According to the Alison Crompton, Ant Wilson (2004) during any building procurement process, the social needs of the building's neighbors will be high on the agenda, even if this is just a means to an end in getting planning permission. [5]

4-12. Sustainable Community's Wheel

mentioned earlier any progress brings an opportunity to provide facilities for the surrounding community, and it can be an opportunity to employ and, if necessary, train the local workforce, to contribute both in the construction phase, and in delivering the building's primary work function. There are also opportunities for engagement with the local community from school children painting hoardings, to educational trips and work placement opportunities. What specifically can high-rise buildings contribute? For those working in and visiting them, there can be the advantages of a prime location in terms of establishing a center of excellence, transport links, and amenity. There is also the opportunity to sustain in-house catering, banking and sporting facilities as a result of the number of people in one building.

While building up the project, the high-rise building erection phase may take longer, increasing the disturbance to neighbors. A number of health and safety issues can also be raised, relevant both to occupants and visitors, and to neighbors. The majority of construction accidents occur as a result of falls both from a building and onto someone. Clearly there is a bigger risk of this associated with building taller buildings.

An important issued necessary not to be forgotten, are issues associated with means of escape following the threat of or actual fire and earthquake. Not only is it an issue of the height of the building, but also the number of people in one place at one time. Perception of danger, even if misplaced, can be an important factor impacting on well-being. After September 2001 incidents in New York and other attacks on tall buildings, their vulnerability to this sort of attack has been highlighted. As a result, workers and visitors may feel unsafe in high-rise buildings, which is a new issue for designers to face. Insurance premiums may also reflect this, another factor to be taken into consideration when determining the economic viability.

Positive attitudes relating to a sense of well-being associated with all building types are the availability of daylight, connection with the outside world, and the view. The ability to control the immediate environment also improves overall satisfaction. In high-rise buildings, whilst there may be advantages in terms of day lighting and views out, open able windows may not be possible on safety grounds or due to wind effects.

The Height and Green Community

So many high-rise buildings seem to have been designed as stand-alone pieces of urban form. Their only relationship with the urban setting is a visual one, with the tall building dominating. They appear to be designed for dramatic effect, gleaming air conditioned glass office towers, a design idea that is readily transportable anywhere around the world, regardless of climate and neighboring relationships. Facing a flat of parking and

separated from the urban transport, repetitive multiplying of floors, these mono-culture gas guzzlers must represent much of what is bad about tall building's expensive to build and to occupy, alienating their elite occupants from their surroundings and these are sometimes linked to their obverse, a vast hinterland of low rise suburbs and grey inner city areas, connected by road, with commuters driving huge distances each day.

To be in adoption with climate changes in a society, the planners should develop an integrated approach to sustainability. All buildings have a maximum energy cost, but ones with bioclimatic design and micro generation have perhaps a higher embodied cost which makes it harder to earn back that cost, and it makes our job harder to convince developers to accept that maximum cost. Therefore it is necessary to set a long term view.

According to Ken Yeang, and forming the philosophy of this design project, Tall Buildings can be part of a sustainability strategy if the density is high enough, and the land cost, the building's program and its bioclimatic design benefits can produce quantifiable benefits and outweigh the embodied energy cost of building tall.

Green Neighborhoods

More than every time, the cities throughout the world are trying to reduce their carbon emissions and their impacts on the environment by initiating green neighborhood development programs as the concern over an energy crisis, global warming and climate changes increases. In the United States, the dominant pattern of development consists of large houses, sprawling and auto-dependent suburban neighborhoods which contribute to catastrophic climate change. Cities are generally considered more sustainable than suburban areas as they accommodate more people on less land and offer a variety of transportation modes including mass transit, biking and walking. However, they still are not less to blame. According to the Congress for New Urbanism, more than one-third of greenhouse gas emissions are produced by buildings, primarily for heating and cooling; and another third are transportation emissions which are growing much faster. In U.S. approximately 38% of CO_2 emissions are produced by buildings. Therefore, it is important to consider the impacts of different human settlement patterns on energy efficiency, global warming and climate change.

The concept of green neighborhoods has become a main part of green environmental movement since 1960's. Several programs and organizations have been established to encourage the development of environment friendly and sustainable buildings and neighborhoods. The movement began to come together more formally in the 1990's. The first local green building program was introduced in Austin, Texas in 1992. With the introduction of LEED by the U.S. Green Building Council in 1993, a new era started in building green buildings and neighborhoods.[6]

6 usgbc.org/leed

As it was already explained LEED is a third-party certification program and the nationally accepted benchmark for the design, construction and operation of high performance green buildings. It provides building owners and operators a concise framework for identifying and implementing practical and measurable green building design, construction, operations and maintenance solutions.

Esthetically, several cities and countries have developed their own point systems using guidelines with a similar approach to LEED Green Points Rated Program focuses on residential development and provide different guidelines for single-family and multifamily buildings. While majority of the cities require the use of LEED for commercial and public project, most local ordinances require Green Points Rated for residential development projects in California.[5]

The LEED for Neighborhood collects the basics of smart growth, urbanism and green building into the first national system for neighborhood design. A neighborhood harmoniously connects its residents and can be defined as imprecisely defined area of a community with characteristics that distinguish it from other areas. Its size usually varies and its identity is often focused around schools, housing types, ethnic or economic bases, parks or some other feature.

Green neighborhoods are more compact, livable, diverse, mixed-use communities with green features and network [5]. A green neighborhood ensures a high quality of life and meets the needs of its residents. As part of the LEED-ND program what comprises a neighborhood is not strictly defined. One of the biggest issues especially in the last 50 years in major U.S. cities has been (sub) urban sprawling which increased the footprint significantly and created auto-dependent communities. This has led to a shift from only green buildings to green neighborhoods taking into account the fact that a green building cannot be considered truly green unless it has a positive impact on the environment and the local community. That explains why the focus has been on decreasing auto-dependence, creating mixed used, mixed income neighborhoods that are planned in a way to encourage people walk and use bicycles. This also leads to a healthy society by decreasing health problems especially respiratory and cardiovascular health, fatal and non-fatal injuries, physical activity, social capital and mental health. As a response to the one of the major criticisms LEED has attracted was its failure to address this issue. [5]

4-13. LEED-ND Logo

In 2003 in US, the combination of the response of USGBC together with the efforts of, Congress for the New Urbanism, and Natural Resources Defense Council (NRDC) a national standard for neighborhood design integrates the principles of green building and smart growth. Whereas other LEED products focus primarily on green building practices, with only a few credits regarding site selection, LEED for Neighborhood Developments emphasizes smart growth aspects of development while still incorporating a selection of the most important green building practices. LEED-ND rating system is a combination of prerequisites and points.

Currently, horizontally oriented, it makes neighborhood development that protects and enhances the overall health, natural environment, and quality of life of communities and promotes the location and design of neighborhoods.

LEED has not become a complete system and it is not meant to be, it is an ongoing process each local and even other countries try to develop their own standards based on Leed's format. As it becomes more widely used, increased involvement of non-profit organizations, local, state, and federal governments, developers, tenants, material suppliers, contractors, consultants, and the local communities is expected. LEED will be improving by taking into account the input provided by these parties. It will also be modified by considering the improvements in the technology and will adjust locally based on the varying local needs. With the increased demand for the LEED certificates, a future threat is becoming more apparent. The outsourcing of the certification to the private third parties by a non-profit organization (USGBC) eliminates the chance of disputing the decisions that are available to property owners through the normal channels of due process when made by the government authorities.

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(Alphabetically)

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Chapter 5:

Case studies on green vertical Neighborhoods in Residential High-Rise Buildings

Chapter 5

Case studies on green vertical neighborhoods in residential skyscrapers come to discuss in this chapter. They are categorized based on their locations and different aspects of Green +Vertical+ Neighborhood characteristics upon the literature review provided in previous chapters are being discussed. These case studies mainly spread worldwide as masterpiece in green building design and include ASIA.US, EU and Milan

The green movement of high-rise buildings construction is on the path. Architects, urban designers, engineers are pioneering this shift towards eco-towers. These towers are shaping the future of tall buildings, and utilizing green technologies on an entirely new scale. This greater scale might mean greater positive effects, but can a high-rise building be considered "green" at all. In some ways green high-rise building holds different meanings at the same time. High-rise buildings in general mean more materials, more money, more time, and more risk. According to a report on green cities, "The vastness of these buildings goes against many of the minimalist environmental ideas of late. Nonetheless, if building up is a necessity, these high-rise buildings certainly are respectable and awe-inspiring".[1]

Here and in this part of the thesis, regionally the case studies are being discussed and the main points have been projected.US and Manhattan as the first ground which modern high-rise buildings were erected there has been carried many similar case studies as well. It is the greenest place in America, if measured by energy use per inhabitant. The first green high-rise buildings in the United States were built in New York City. The high-rise buildings are generally high-profile corporate buildings. These buildings offer a model for an urban future with these "intelligent machines" that contribute to a cleaner city and global environment. In terms of governmental guidelines in the US, a LEED rating is considered a marketing asset. Corporations tend to look at LEED, or any publically-recognized example of "green washing", as a source for brownie points [1]. Those projects have had great progresses thanks to the main efforts of the supported companies.

1 Narie Foster; Samuel Luff; Danielle Visco; Green Skyscrapers; What is being built, and why? 2008

As it is mentioned already the LEED proposes main incentives, sets goals, and gives distinctions, but doesn't have any minimum standards. According to the Foster report (2008) the Battery Park City Authority's green guidelines (2000) are an example of localized minimum standards. In Battery Park, both residential and commercial-institutional buildings are required to meet environmental guidelines. In Ground Zero redevelopment as well, there is focus on environmentally-friendly building. Manhattan offers a great example of the movements toward green high-rise building within the United States.

5-1 Battery Park City; NY

The Hearst Tower

Another main Manhattan example surely is Hearst Tower which is considered as the first "Green" high-rise building in Manhattan. Holding LEED Gold, it set the standard for new high-rise building being erected. It is designed by Norman Foster in NY. Foster report describes it as a building with the "diagrid" triangular framing pattern provides superior stability with less material than a typical steel frame. In the atrium, escalators run diagonally through a 3-story waterfall built with thousands of glass panels. The water comes from rainwater, and cools and humidifies the lobby air. Communal spaces called "sky gardens" offer a respite from work, in naturally lit and ventilated comfortable areas. When workers leave their offices to work in these gardens, sensors turn off their office lights. The last item of interest is the smart elevator system, which retains memory and optimizes paths based on previous data, headcounts, and floor requests.

5-2 The Hearst Tower; NY

The Bank of America Building

The Bank of America Tower constructed in 2009 under the supervision of Rick Cook as its architect. It is located on the edge of Bryant Park and can be considered as the "Greenest High-Rise Building in Manhattan". Foster report considers it as an interesting building since it acts as a giant air filter for Midtown Manhattan, with its two-way air filtering system. It also has an onsite cogeneration plant that produces two-thirds of the building's energy requirement. One feature of this plant is its use of ice batteries, meaning it creates ice in the cool temperatures of the evening, then releases the coolness during the day as the ice melts. Additionally, the tower has an extensive gray-water and water-saving system, including waterless urinals that save 3 million gallons of water per year. Finally, the structure of this building also accommodates surrounding pedestrian and transit circulation in a way that greatly compliments the culture and bustle of Manhattan.

5-3 The Pearl River Tower

The Pearl River Tower

The construction of this building finished in 2011 in Guangzhou, a province in southern China. It is known for its NetZero- energy goal, meaning that it will conserve and generate enough power to meet its energy demands. The most interesting and unique aspect is the building's structure that pushes rapid wind into the wind turbines in the two openings, thus producing energy and alleviating some structural forces based on Foster report (2008). Gordon Gill designed this modern building with American SOM firm

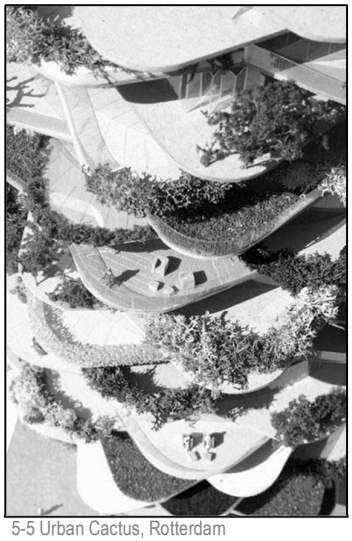
The Lighthouse Tower

5-4 The Lighthouse Tower, Dubai

This green-office tower designed by the Atkins Group and standing at an astonishing 400 meters with 66 floors, The Lighthouse Tower is an extremely tall high-rise building located in Dubai. The building is designed to produce the smallest carbon footprint possible. It is structured as two separate towers connected by a bridge at level 10, this structure will also be home to numerous sky gardens. The green high-rise building will house three large wind turbines, which are 29 meters in diameter, located on the south facing side of the structure. It is still under construction but holds the green principals as its design guidelines.[1]

Bahrain World Trade Center Towers

In Manama, the World Trade Center with a twin complex tower is located; it is the second tallest building in Bahrain. Despite being the second tallest in Manama, according to the Foster report, the Bahrain World Trade Center is first high-rise building in the world to integrate wind turbines into its design. Three different bridges, all of which house a 29-meter turbine, connect two separate towers. These towers face north to capture the winds from the Persian Gulf. The building assumes a sail shape so as to maximize the amount of wind funneled through the towers. The "S" shape flow is ideal because it ensures that any wind coming within a 45 degree angle to either side will create a wind stream that is perpendicular to the turbines. It was also designed and erected by Atkins Group.



5-5 Urban Cactus, Rotterdam

Commerzbank Building

Designed by British architect Norman Foster and cooperated with the Frankfurt government in efforts to provide the city with an ecologically sustainable alternative to the standard "boxy" high-rise building prevalent throughout the world. Starting construction in 1994 and finishing in 1997, the 56 story building brought different landscapes into the urban work environment through its use of "winter gardens" placed strategically throughout the building. These gardens combined elements of sustainable design with aspects of environmental justice.[1]

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The Urban Cactus, Rotterdam

Designed by UCX Architects but not occupied yet; the Urban Cactus is a residential project in the Netherlands that will offers residential units on 19 floors. Thanks to the staggered design of the curvy balconies, each unit's outdoor space will get plenty of light from the sun. That means that this Greenscraper really will be green when all the residents' gardens are in bloom. While this tower may lack in the technology department, its carbonmitigation potential still looms high thanks to all the photosynthesis happening on the porch. Plus, its white color will help to mitigate the urban heat island effect based on Foster report (2008).

5-6 The CIS Tower, Manchester

The CIS Tower, Manchester England

The CIS Tower renovation in 2004 brought the green attribute for this tall building. Weighing in with over 7,000 panels on the façade and 24 wind turbines on the roof. By its own, CIS Tower will be able to produce 10% of its energy needs all on its own.

Urban Forest [2]
MAD

MAD group completed the concept design of a metropolitan cultural complex in the city center of Chongqing - The Urban Forest in 2009. This is the third high-rise building designed by MAD following the Absolute Towers in Toronto and the Sinosteel International Plaza in Tianjin, China.

It was designed to be an architectural concept for the Chinese urban development to actualize a sustainable multidimensional high-rise within China's youngest municipality, where nature reincorporates into the high-density urban environment in the near future, to evoke the affection for nature once lost in the oriental ancient world and bring to the modern city dwellers.

This kind of urban design not only pushes economic growth and material prosperity, but also fosters the evolution of the city's cultural issues. The cities of china have gone through the process of once starting from nothing, to following contemporary Western civilization urban pattern. Now, the overall economic infrastructure has oriented the direction of future development towards inland China.

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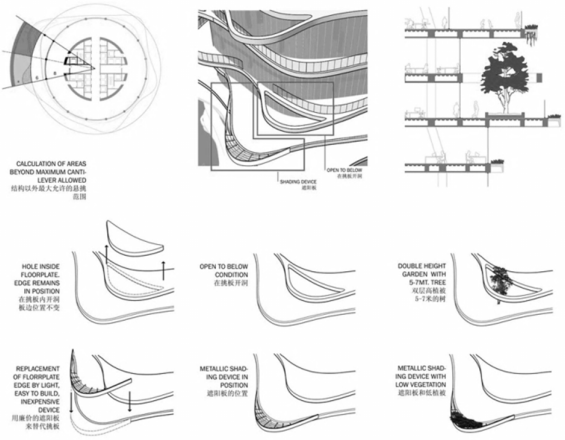
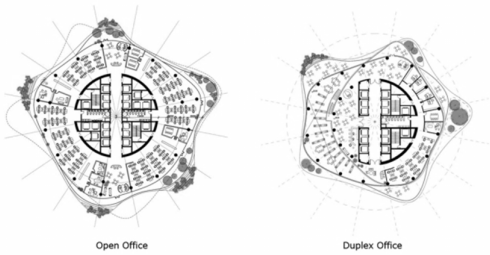
The form of this building is similar to mountain range, shifting in a dynamic and yet holistic rhythm, and becomes a continuation of nature. Unlike its preceding counterparts, The Urban Forest no longer emphasizes on vertical force, instead it concentrates on the multidimensional relationships within complex anthropomorphic spaces: multilayer sky gardens, floating patios and minimal and yet well-lit nesting spaces, the architectural form dissolves into the fluid spatial movements between air, wind, and light. In this environment, people encounter nature filled with unexpected surprises.[3]

5-7 Urban Forest, MAD





5-8 Urban Forest, Diagrams

Project Information:
Urban Forest, MAD

Director in Charge: Ma Yansong, Dang Qun
Design Team: Yu Kui, Diego Perez, Zhao Wei, Chie Fuyuki, Fu Changrui, Jtravis B Russett, Dai Pu, Irmgard Reiter, Rasmus Palmqvist, Qin Lichao, Xie Xinyu

Location: Chongqing, China
Typology: Commercial, Office, Hotel
Site Area: 7,700 sqm
Building Area: 216,000 sqm
Building Height: 385 m
Architectural Design: MAD Ltd
Structural Design: ARUP Group Ltd

2 i-mad.com
3 dezeen.com

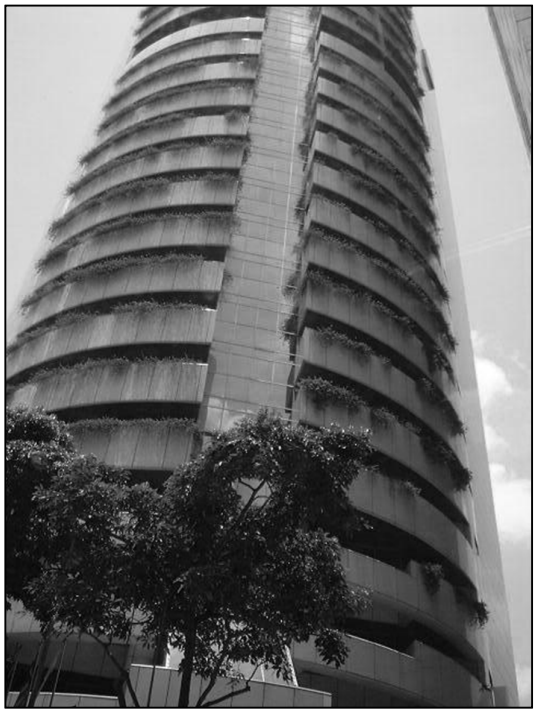
In addition to the previous case studies, main research case studies which fundamentally I based my thesis hypothesis on them are as following; they will help to bring out the final outcomes and lead to prove the Ken Yeang theory of vertical neighborhood consequently.

1.
Menara Boustead (1983-87) [4]

Along with IBM Plaza, Menara Boustead is a 32 story office high-rise building connected by an overhead bridge to 12 story car-parking annex. The site is located in Kuala Lumpur's Golden Triangle, not from the Plaza Atrium. Structurally, it uses pre-stressed beams to provide clear spans and column-free office floor spaces. There are banking halls on the ground and first floors, a helipad on the thirty-second floor and in the annex there are spaces for four hundred cars, a food court and sports facilities.

Finished in 1987, the cladding system uses a double-ventilated heat-sink shield to reduce the heat load on the cooling fins, first introduced by Ken Yeang in a smaller, low-rise project, the Wisma Hong Lenong Yamaha (1983), which drew inspiration from the cooling fins on the engine of Yamaha motorcycle. The overall concept of the building significantly advances Yeang's exploration of the high-rise prototype. All glazing recessed unless facing exactly north or south. The cladding of the building uses a ventilated lightweight composite aluminum material that enables the heat to be dissipated before it can be transmitted to the structure. In this building, instead of a peripheral atrium, the sky-courts are given greater emphasis. It develops the idea of tropical building language being soft edged, ambiguous and multi-layered, as opposed to the Corbusier language of Plaza Atrium and thus it goes some way to answering Tay Kheng Soon's criticism in 1985. The key idea here is the positioning of the loft-cores and escape-stair-cores on the east and west sides to serve as passive low-energy solar thermal buffers. Secondary ideas explored are the location of wellvegetated corner balconies or "sky-terraces" at the edges of the building and the incorporation of vertical landscaping of the façade.

The edges of the balconies in Menara Boustead have planter-boxes fed by an automatic fertilizing and watering system, a substantial improvement on the manual watering required in the Plaza Atrium Project. The impact of the planting on the elevation is a "hairiness" that gives a soft edge to the façade, Menara Boustead does not interact with the public domain as well as the IBM building, but in other ways the planting the shrouds the elevations conveys a strong message about the "Green Vertical Neighborhood".



5-9 Menara Boustead (1983-87)

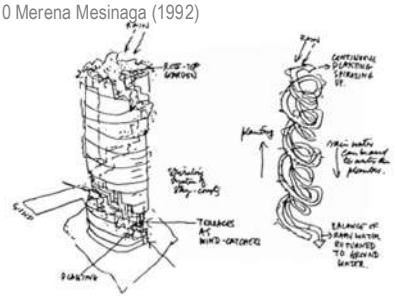
Project information:
MARENA BOUSTEAD (1983-87)

Location:
69 Jalan Raja Chulan
Kuala Lumpur Malaysia
Principal: Dr Ken Yeang
Project Architect: Yeah Soon Teck
Design Architect: Chee Soo Teng
Project Team: Mark Meng Fook, Mun Khai Yip, Joe Khoo
Civil Engineer: Khanafiah YL Sdn Bhd
Structural Engineer: Khanafiah YL Sdn Bhd
M.and E. Engineer: Khanafiah YL Sdn Bhd
Quantity surveyor: Baharuddin Ali and Low Sdn
Landscape Architect: Lip Leow and Associats
Client: Boustead Holdings Bhd
No.of Storeys: 32
Gross floor Area: 45,470 m²
Plot Ratio: 1:6.97
Completion Date: 1987

4 Tatjana Anholts; Architectural History Thesis; 2012

2.
Merena Mesinaga (1992) [5]

5-10 Merena Mesinaga (1992)



5-11 Merena Mesinaga , Diagram

Project information:
Merena Mesinaga (1992)

Location:
Subang Jaya, near Kuala Lumpur Malaysia
Principal: Dr Ken Yeang
Project Architect: Too Ka Hoe
Design Architect: Seow Ji Nee
Project Team: Don Allan Ismail
Project Manager: Client In-House
Civil Engineer: Reka Perunding Sdn Bhd
Landscape Architect: Lap Consultancy
General Contractors: Siah Brothers Sdn Bhd
Steelwork: Sediabena Sdn Bhd
Client: Mesiniaga Sdn Bhd
No.of Storeys: 15
Gross floor Area: 12,345.69 m²
Plot Ratio: 1:1.6
Completion Date: 1992

Merena Mesinaga is the main high-rise building located in Subang Jaya, near Kuala Lumpur. It was aimed to build a high-rise tech cooperate building. A site with high visibility was selected and buildings plans and neighborhood design were approved in 1989. The 15 story tower, modest by recent standards in Kula Lumpur, nevertheless stands out from its immediate context. It has become a landmark on the road from the Subang domestic airport to the city. The circular building has a tripartite structure that consists of sloping landscape base, a spiraling body with landscaped sky-courts and external louvers that shade the neighborhood units; and an upper floor (on fifth façade) that houses recreational facilities, a swimming pool and a sun-roof. The structure of the building is exposed and tubular-steel structure that crowns the tower is intended for the future installation of solar panels to further reduce energy consumption. Building automation system. An active "intelligent building" feature are used in the building for saving energy.

The interstitial spaces in the Menera Mesiniaga high-rise tower are a dramatic improvement on Yeang's earlier projects. The greening the sky-courts and terraces are well established and receive regular maintenance. The idea of green spiraling up the outside of the tower and linking with the sloping base creates physical continuity and encourages species diversity. The sky-courts provide visual relief for the inhabitants and are used by some for brief respite from the stress of staring at computer screen, though the numbers are disappointingly few. Perhaps others will come to recognize these benefits in time- the architect has provided the opportunity.

Menara Mesiniaga is a seminal building that integrates all of Yeang's previous research into the principals of the design of green high-rise buildings.

Jenks recommended on this project that it recalls the climatic architecture of the 1950's and Frank Lloyd Wright's high-rise building projects, in a move towards a new architecture for the 1990's. It is a striking alternative to the reigning mode of corporate high-rise buildings and a new synthesis for contemporary architecture that is responsive to the climate of a particular place and finds inspiration for a new architectural language from forces that are ultimately cosmic. Peter Eisenmann mentioned that Menara Mesiniaga is one of the few projects that contribute new thinking to the general culture of the architecture.

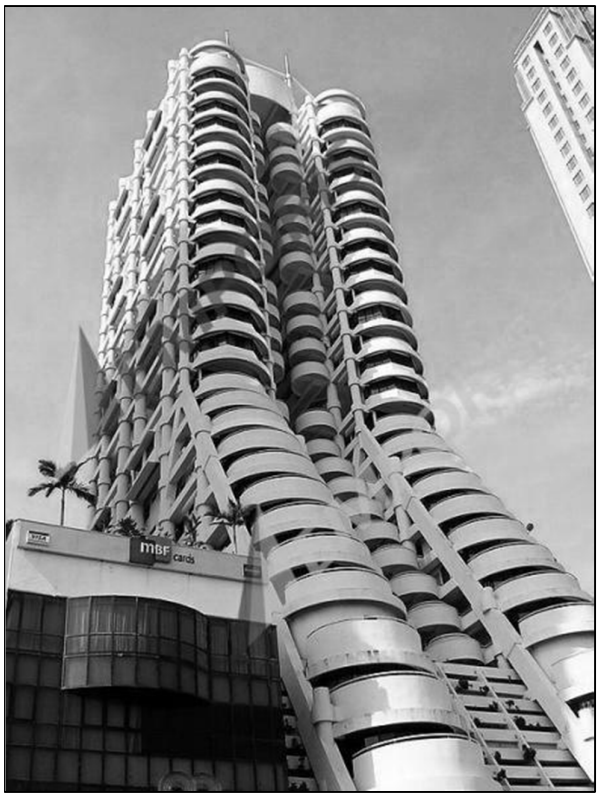
5 Erica Leigh Walczak; Structure Innovations; Menara Mesiniaga; 2010

3.
MBF High-rise building (1994) [6]

The MBF High-rise building had a different history. Originally known as the Northam City Tower, the building was shelved in the 1986-9 recession, revived in the early 1990's it has a Metabolist image with overtones of the sprite of Archigram. It forms the bridge between the Corbusien language of Yeang's early high-rise buildings and the new generation of High-rise buildings. It also looks ahead to schemes undertaken in the late 1990's. MBF high-rise building is a thirty-one story building that comprises a six-story podium containing offices, retail spaces and banking hall, above which are sixty eight residential apartment units. The reinforced concrete frame is in the form of two separate rectangular towers with curved ends; each is one apartment wide and two deep' linked together by a central, open-air circulation core. The towers flank shared, double-eight sky courts that provide natural ventilation and "places-in-the-sky" for greening. The lift lobbies are naturally ventilated with bridge like walkways leading to the neighborhood units. Floors are designed to be column-free; the tower columns are located at the periphery of the apartment units and the load being transferred via transfer beams at the podium. The office floors are cooled with central water-cooled package air-conditioning units with variable air-volume control.

The MBF project examined the insertion of transitional spaces in the upper parts of the building the placement of residential neighborhood units into the structure as "detached bungalows" in the sky. Penang enjoys prevailing winds from the north-east and south-west and the orientation of the tower is ideal to maximize their effectiveness. Each neighborhood unit is designed to have maximum external wall surface to increase its natural-and-cross-ventilation opportunities but the apartments do have the option of air-conditioning. There are panoramic views from the balconies of the apartments and the bridges the connection to the central lift lobby. Regrettably, once again, as in Plaza atrium, the greening is inadequate. The balconies were conceptualized as planted gardens in the sky but very few of the building's residents have provided the symbolic greenery to accompany the ecologically responsive features of the high-rise building.

In spite of this, the MBF high-rise building is impressive. It is a building with "attitude" which, though smaller than the tow high-rise towers that flank it, stands out. It is a muscular, tough and assertive advocate of Yeang's green ecological agenda.



5-12 MBF High-rise building (1994)

Project Information:
MBF High-Rise Building (1994)

Principal: Dr Ken Yeang
Project Architect: Yap Lip Pien, Laurent Lim
Design Architect:Haslina Ali, Normala Ariffin,
Project Team: Haslinda Hashim, Rahima Lasim
Project Manager: MBF propert Services Sdn Bhd
Quantity surveyor: Baharuddin Ali and Low Sdn
Landscape Architect: Malik Lip and Associates
Client: MBF holding Bhd
No.of Storeys: 31
Gross floor Area: 17,553.18 m²
Plot Ratio: 1:2.34
Completion Date: 1994

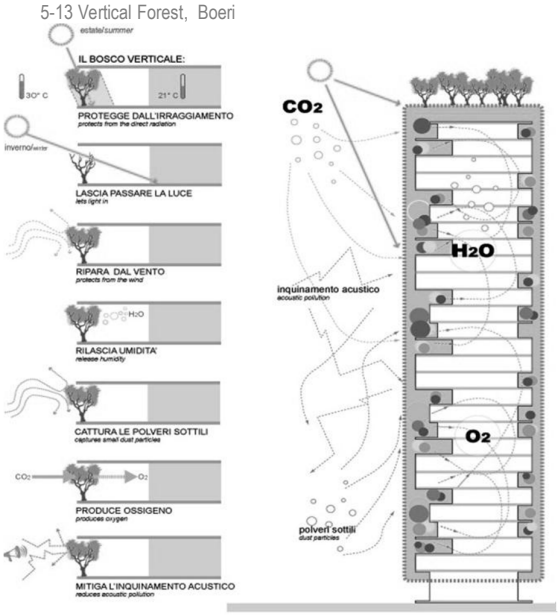
6 Tatjana Anholts; Architectural History Thesis; 2012

4

Vertical Forest [7]

BOERISTUDIO

5-13 Vertical Forest, Boeri



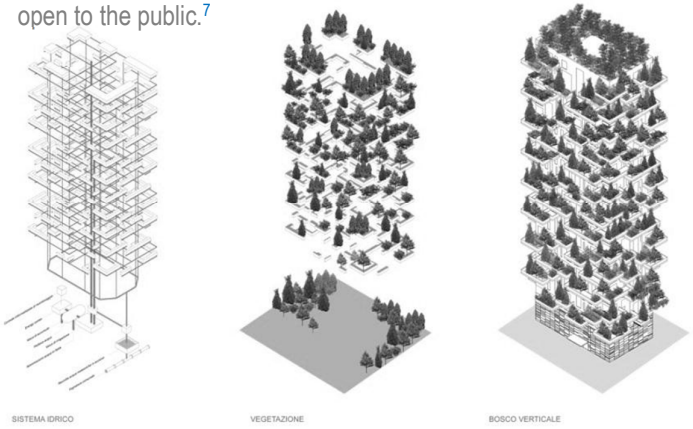
5-14 Vertical Forest, Diagram

Project information

Location: Milano, Italy
commission:
year: 2007 (on going)
client: Hines Italia
built area: 40.000 sqm
budget: 65.000.000,00€

Architectural Design:
BOERISTUDIO (Stefano Boeri, Gianandrea Barreca, Giovanni La Varra)
Team:
Phase 1 – Urban plan and preliminary design
Frederic de Smet (coordinator), Daniele Barillari, Julien Boitard, Matilde Cassani, Andrea Casetto, Francesca Cesa Bianchi, Inge Lengwenus, Corrado Longa, Eleanna Kotsikou, Matteo Marzi, Emanuela Messina, Andrea Sellanes.
Phase 2 – Final design and working plan
Gianni Bertoldi (coordinator), Alessandro Agosti, Andrea Casetto, Matteo Colognese, Angela Parrozzani, Stefano Onnis.
Consultant for the vegetation project:
Emanuela Borio, Laura Gatti

This project has been defined to rehabilitate and restore the metropolitan of Milan and wisely deals with the regeneration of Milan urban biodiversity without the implication of expanding the city upon the territory. It is a model of vertical remapping of nature within the city. It is a model that operates correlated to the policies for reforestation and naturalization of the large urban and metropolitan borders. It could be also considered as a device for the environmental survival of contemporary European cities. Boeri mentioned that these two buildings create two modes of building links between nature and city within the territory and within the cities of contemporary Europe. It is composed of two residential towers of 110 and 76 meters height, going to be realized in Porta Nuova Complex of Milan, on the edge of the Isolate neighborhood, and will host 900 trees apart from a wide range of shrubs and floral plants. On flat land, each Vertical Forest equals, in amount of trees, an area equal to 10.000 sq. of forest. In terms of urban densification the equivalent of an area of single family dwellings of nearly 50.000 sq [7]. The Vertical Forest Project is a system that optimizes, recuperates and produces energy. The Vertical Forest aids in the creation of a microclimate and in filtering the dust particles contained in the urban environment. The diversity of the plants and their characteristics produce humidity, absorb CO2 and dust particles, producing oxygen and protect from radiation and acoustic pollution, improving the quality of living spaces and saving energy [7]. Plant irrigation will be produced to great extent through the filtering and reuse of the grey waters produced by the building. Additionally Aeolian and photovoltaic energy systems will contribute, together with the aforementioned microclimate to increase the degree of energetic self sufficiency of the two buildings. The management and maintenance of the Vertical Forest's vegetation will be centralized and entrusted to an agency with an office counter open to the public.[7]



5-15 Vertical Forest, Diagram

7 stefanoboeri.net

High-rise buildings also are under pressure of messy policies into their plans for use. Mixed-use is important because it accomplishes two important tasks, one of which is to enable the most efficient use of building space. An often countered problem with high-rise building is eliminating vacancies – there is no way to accomplish green design with large plots of idle space. Rather than limiting use for commercial purposes, planners are allowing individuals to purchase smaller spaces for residential use – these residential buyers can then fill in the holes left after the commercial space has been allocated. Allowing residential use also enables developers to shore up funds for the discouragingly high initial costs associated with large-scale green projects

For last decade Europe has had a leading role for the other continents to set a framework for green living throughout many facets of the built environment. Europe has many positive examples of balancing social needs with economic incentives through green space, biking initiatives and justice programs. Green high-rise building has been no different.

These green high-rise buildings are a popular procedure. For one thing, a single efficient high-rise building among several wasteful ones doesn't solve our problems, and we may be reaching for easy solution to difficult problem. For another, building green is becoming a minimum, and a necessary part of the pitch from developers. People aren't doing it to actually make change, but rather because they feel they need to and want to build up their image.

Accordingly based on these case studies the next chapter will summarize the discussions and literatures which were done during this thesis and then the proposal frameworks will be offered considering the hypothesis and also case study outcomes.

Chapter 6:

Conclusion and Discussion

Chapter 6

Offering the proposed guideline framework based on literature review and case studies for designing a Green Vertical Neighborhood as a main goal of this research is included in the last part of the thesis. I bring in brief the overall thesis literature and the conclusion of each part to set a clear path to the final conclusion discussions around the green vertical neighborhood concept. Finally this part can be recognized as the essence of the thesis which could be eventually helpful for the architects and urban designers who aim to respect greening in vertical residential communities.

This research is carried out to find an integrated response for designing a sustainable green vertical community. It is undoubtedly useful for readers interested in tall buildings, to architects, urban designers and engineers seeking a new approach for their designs and to investors and developers seeking to create more marketable and habitable high rise dwellings and skyscraper commercial spaces. It puts forward Ken Yeang's new idea for the reinvention of the skyscraper as a city-in-the-sky, in a novel design approach that resembles urban design and planning as against the design of conventional building in high rise structure.

This thesis research proposes a new approach to the high—rise design as a vertical theory of urban design and discusses Yeang's theoretical propositions and design concepts that include those for de-compartmenting the skyscraper's built form, for urban analysis as a three-dimensional matrix and for a strategy to map the land use of the skyscraper. It also suggests for the diversification of vertical land uses, the creation of public realms and places in the sky, vertical landscaping, creating high-rise neighborhoods, vertical townscape, vertical transportation and accessibility, the skyscraper as an ecosystem and other related topics.

The ideas and theoretical approach, radically change the current design approach to tall buildings to make them more human environments and to be more satisfying to its inhabitants in its endeavor to create the ideal conditions at the ground now up in the sky. Contemporary lifestyles and the increasing combined pressures of urbanism and population growth our cities demand a redefining of our conventional perceptions of working and living in high-rise structures. the city Today, many of the world's predominantly low and medium-rise cities such as London are in the process of transforming into high-density, high-rise living and working environments. The question now confronting designers of these high-rise buildings is whether the current approaches for high-rise design adequately provide the occupiers of those buildings with

The concept that high rise building in the context of urban design must be as an integration of socio-economic-political environment and physical problems with the concerns of the architectural design of buildings. The multidisciplinary care economics, ecology, sociology, environmental psychology, technology, urban geography, cultural theory and property, all of which will be seen as the design of the new high rise building influence.

6-1 vertical urban design a proposal for Los Angeles

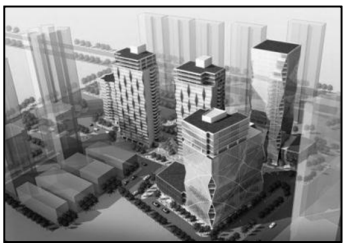
Urban design also determines the shape of the streets and public spaces as part of our urban areas. It affects how easy and enjoyable it can be to move from one area to another, how much daylight, landscape and beauty we enjoy. All these aspects should be part of the influence on the design of the new high-rise are.

What is significant now is a theory for high-rise design that is another view to a vertical theory of urban design that would radically our existing spatially and socially humiliating approaches to revise the establishment of the construction of high-rise building form. The imperative need for theory is driven by its own high-rise building reason for its existence, the huge population and spatial intensity. The intensity is inevitable. The world is intensive because urban towers and cities offer significant advantages over other forms of settlement. The benefits that people derive form dense aggregate together are greater that if they establish and spread.

As an urban design approach, the communal concerns of the high-rise generally are better addressed. In this case, urban design propositions are equally applicable to high rise building design. The key difference is that the urban spaces and features at the ground plane need to be reinterpreted within the high-rise vertically built form.

“The dreaded spatial homogeneity and design facileness in many of the high-rise built today already suggest the need for an urgent rethink of current approaches to the design of tall buildings. This need must now be all the more crucial since large numbers of these building types are being built worldwide and these numbers are increasingly likely to increase”. [1]

Such a vertical theory is, of course noticeably nonexistent currently. That it should exist becomes vitally important for not just high-rise designers but also for investors. For it will provide them with the basis for the design of a more humane, more socially and physically acceptable tall building. It will enable the reformulation of the changing urbanites role of the high rise building and its definition as being simply just a building. It should be better perceived as a precinct-in-the-sky. Designing the high rise building as urban design offers a greater set of opportunities for reforming its built form and in effect for rediscovering the many hidden opportunities in its built form.



6-2 Shanghai High-Rise Buildings; EXH Design

As it begins to critically rethink the design of the tall building, it is clear that this has to depart radically from the current modernist concept of what is high-rise building. The one-linier obviousness of its design as a series of repeated floors, with the predictable provision of vertical connections by elevator shafts and staircases and its built form wrapped by an external skin has to be reconstructed. It must now see the high-rise building more organically as a built form that requires a greater level of spatial articulation and reassembling. It should be designed as an urban design exercise, as though its built spaces had been flattened out on the ground plane and then reassembled in the sky into a high-rise built form, with critical attention paid to all aspects of its urbanity and darkness’s and within it the provision and shaping of its internal common spaces and

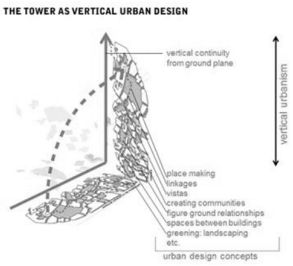
1 Reinventing the Skyscraper: A Vertical Theory of Urban Design; Ken Yeang, 2002

those people and inhabitants unhappy with high-rises and those others who rail against the high-rise built form are often those who find their own experiences of life and work in the high-rise unbearable because of the poor comparison with the pleasant or ideal conditions fund when inhabiting low and medium-rise buildings. In this regard the design endeavor to make the high-rise habitable must passes similar ideals and favorable conditions similar to those enjoyed by these people at the ground plane. By re-examining the existing concepts of horizontal urban design and planning and then reapplying these to new vertical contexts and conditions. We have the vertical superimposition of preferred urban design ideals from the ground plane onto the high-rise's vertical built form. By doing this we will find emerging before us the concept of a new high-rise built form and the development of a new approach to its design. Starting as an urban design endeavor at the onset, high-rise buildings can become more human more communally focused and more salubriously acceptable and habitable environments for new denser urban communities within our cities.

Concept of Green in vertical neighborhoods

In an accepted definition the green design is about linkage, interdependence and creative adaption as opposed to compartmentalized causality [1]. Green design therefore can be seen as a holistic connection, entailing the prudent management of energy and materials in the built system alongside the ecosystems n the biosphere; it will include both those design endeavors that reduce the detrimental impacts of this management on the ecosystem and those that try to integrate positively with the natural environment.

In the long term it must be considered that at the global and national level, changes in the economic, social and political systems based on the holistic green design principals are crucial if the objectives of a sustainable future for the mankind are to be met.

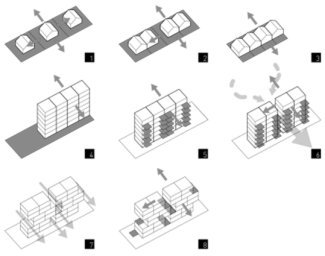


6-3 Vertical Urban Design Theory, Yeang 1995

Besides understand the principles of the ecosystem concept, it is crucial for the designer to understand some of fundamental promises of the design approach; the objectives of the green design are as follows [2]:

- Green design considers the reliance of the natural environment and its limit.
- Green design acknowledges the importance of biodiversity.
- Green design has to take into account the connectivity of ecological systems
- Green design must seek to repair and restore ecosystems.
- Green design seeks a symbiosis between manmade systems and natural systems.
- Green design takes into account entropy in natural systems.
- Green design considers that the environments the final context for all design.
- Green design acknowledges that the built environment is dependent upon the earth
- Green design considers that all design has a global impact because of ecosystem.
- Green design involves the management of outputs from the built environment into the ecosystem.
- Green design principles require all design to be regarded in the context of its physical cycle.
- Green design acknowledges that all building activity involves ecosystem spatial displacement
- Green design must be environmentally holistic.
- Green design must be anticipator design approach.
- Green design is multi-disciplinary.

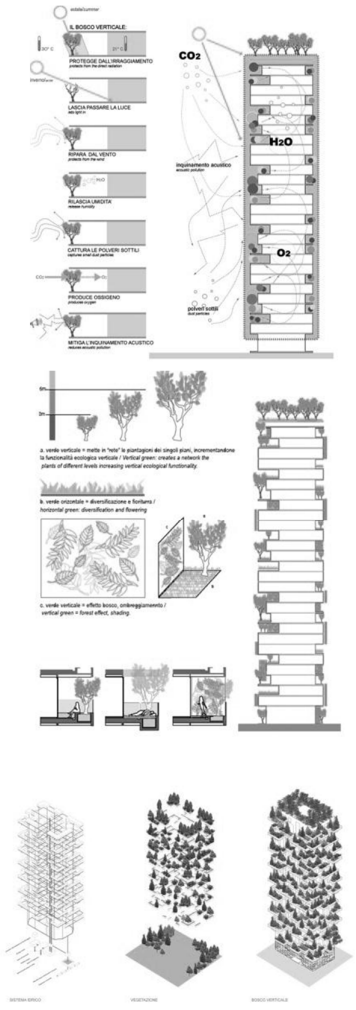
As the conclusion part of the thesis dealt with some of the key aspects of the environmental properties and processes that are crucial to understand green design.



6-4 Vertical Neighborhood Creation

2 Yean.ken; 1995

Green Hypothesis



6-5 Vertical Forest, Boeri Proposal

The main assumptions can be summarized that underline our green approach to design as follows:

- Sustainable future agenda is the knowledge that it is in the interest of humanity to maintain local and global ecology in functioning and viable condition. This implies limiting as far as possible the destructive effects of human systems and designs on ecosystems.

- People are destroying global ecosystems is non-viable-which is why human actions have to become ecosystem-sensitive.

- Natural resources is not easily recycled. Design must be regarded as conservation of resources.

- People are part of a closed cycle in the biosphere and the process of the natural environment, being unitary, must be considered holistically as part of the design and planning process in the creation of the built environment.

- There are interrelationships and interconnections between the manmade environment and the natural environment both locally and globally. Hence, any changes to any part of any one of these systems affect the entire system. Design must be regarded in terms of connectivity of global and local ecological processes and resources.

The key points to note here are that green design is a augmented discussion and that design should in effect be a form of applied ecology, where a proper and thorough understanding of the ecosystem of the project site for our proposed building and its relationships with the biospheric functions and global resources are essential. To be environmentally holistic, the designer has to regard his built system as a set of connected interrelationships and interactions with the natural systems in the environment.

this idea that the high-rise buildings or Intensive and high-density urban contexts can be designed to be ecologically responsible may be regarded by some with great suspicion. Green or ecological design here means building with minimal environmental impacts and where possible, building to achieve the opposite effect; this means creating buildings with positive, reparative and productive consequences for the natural environment, while at the same time integrating the built structure with all aspects of the ecological systems of the biosphere over its life cycle.

Green design procedure, when followed comprehensively, demands certain kinds of data which will have to be developed and quantified where not available. This kind of design framework offers a benchmark which can be used by architects and designers to evaluate on a consistent and quantitative basis any proposed design or to compare one design with another.

The real test of environmental commitment and principles is on the level of human action and this model by offering a comprehensive framework for understanding the interrelations of built systems and ecosystems allow people in various fields to act in concert and contribute to ecological design philosophy.

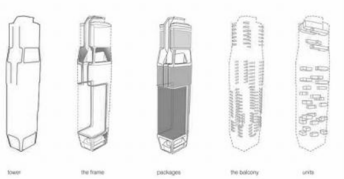
High-Rise Built Form

Necessary to say that tall buildings are an instant condition of special segregation. For instance, all their floor plates are spatially noncontiguous and are physically segmented-off one form the other. Their spaces are no longer linked or interactive, but are isolated, homogeneous enclaves devoid of the diversity and richness of life that exists at the ground plane. This isolation exacerbates feelings of social alienation in its inhabitants. The desire for engineering expediency in the high rise building's design and construction has undermined the potential for the diversity and richness of urban life in the building. It is this compartmentalization and confinement of spaces that make the high rise building such an unsatisfactory built form and unpleasant environment for users.

These spaces become zones of containment, spaces without any physical context other that through the views from the windows.

In the mirror situation to the inhabitants of high rise buildings, the occupants of medium-rise buildings and lower are able to move about freely through their spaces without the need for elevators and without the rigid compartmentalization or with, at least, a minimal sense of spatial segregation. It was found that the movements between spaces and floors in most-and medium-rise buildings are in most instances by visually evident routes; by passageways or bridges or stairs or even ramps. Such multiplicities of accessibility of accessibility (and generally often good visual coherence and way-finding) are either nonexistence restrictive in the case of the high-rise. In many low-rise and medium rise buildings there will very often also be traditional spaces to enable users to experience a contiguous organic spatial relationship between the varieties of spaces. Users in these conditions also enjoy a greater and freer sense of access as they are generally able to move more easily through one space to another, whether through open stairs, ramps, bridges or corridors. As fire-protection conditions in low-rise and medium-rise buildings are less stringent, the stairs and passageways are not often fire-compartmentalized.

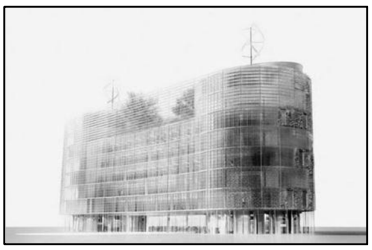
By designing to fade and dissect the borders and edges and boundaries between these spaces we can create pleasurable crossings across the spatial borders as one of the decompartmentailse ways to the rigid stratification of the conventional high-rise. The intention is to derive less spatially confining high rise building architecture.



6-6 Scotts tower Singapore by UNSTUDIO

"It might be seen that the design of the high-rise's currently vertically segmented floors now as "folded spaces", to deny the very idea of framing and rigid compartmentalizing in favor of temporal modulation. The idea of spatial folding in the high-rise's internal and transitional spaces holds out the promise of generating field organizations within its built form that can both negotiate between the constructing tyrannies of vertical grid (existence by virtue of the high-rise built form) and depart from the hierarchical heterogeneity of finite geometrical patterns of plan and section." [1]

This attempt leads to creation of more flexible and more unpredictable local connections within the high-rise's built form. This transmission within the high rise building's built form might be designed to be capable of spatially blending rather than breaking and separating. Designing the spaces to break away from the excitant segmented compartments within its built form can also be achieved by inserting secondary spaces. In doing so, we will find that within the borders and in the junctions between the spaces there exist design opportunities for creative cultural production and refutation of the traditional high-rise form.



6-7 idea of vertical farming in urban centers NY

The inverted set-back profile could also be used to break down the regularity of the form. All these enable us to break away from the tyranny of the horizontal stratification and enable new concepts for internal environments that would more greatly resemble the spatial and other conditions pleasurably experienced at the ground plane. We therefore need to depart from the current inhibiting state of spatial compartmentalization. What is clear hear is that we need a high-rise design with greater spatial and environmental diversity for its occupants one that better resembles the high level of spatial and environmental contiguity and diversity existent in the more familiar habitable conditions that we find at the ground.

On the other hand, the diversity of uses within the high-rise must be spatially distributed over the upper levels of the built form and not be concentrated on the lower floors of the built configuration. Other components of urban life that make it tenable, such as leisure, entertainment, shopping, banking and government services must all be factored into the mix of uses within the high rise building built form and placed in relation to the intensity within it.

Including diverse functionalities in the high-rise should serve to strengthen social interaction and civic life. Achieving this requires concentrating a range of public and commercial facilities in neighborhoods. In any habitable suburban setting the community or cluster of residences will have within walking distance the local pub and etc., all of which should be incorporated in the new high-rise. In the most high-rise developments all these amenities tend to be located at the ground plane or at the lower podium floors. The inhabitants of the high-rise must get to the ground floor or to the lower levels in order to have access to them. What is needed is to consider the spaces and units in the high-rise as neighborhoods and to disperse the enmities in the upper parts of the high-rise built form, mush as they would be located at critical locations and high-activity areas at the ground plane. In this way the high rise building's built form is no longer one of homogenous spaces stacked in the tower with the amenities located at the lower floors but is more of an integrated mix aided by multiple access and secondary circulation systems that enable the articulation of the spatial differentiation in the high-rise built form.

the vast diversity of land use implementations within the high rise building will lead to the enabling of a life style were home, work and leisure are vertically interwoven within a single neighborhood. So through diversification of land uses in the high-rise, closer

links can be put between the different components of city life within one single high-rise precinct. Residential, commercial and leisure uses can be combined or placed in close proximity within a given area, allowing a new synergy to develop between users and uses.

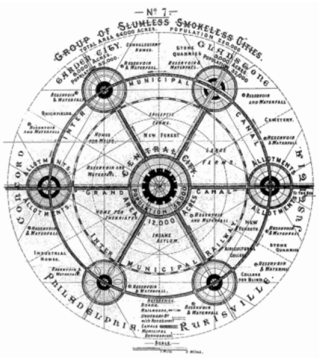
By its own the system of a city must become more oriented towards leisure pursuits and recreational use. Another special aspect is the number of young people who now use the city. It is only the recent decades that they have had the opportunity and money to spend time there. However, the city center is used widely by all age groups.

Surely there are more young people today; there is still a reasonable balance between the various user groups of the city. The city special character and charm are closely linked to the existence of several important balances. Whereas some city centers might feature specific user groups-business people or smartly dresses shoppers or young people- the public life in most city centers is highly diverse. There are people from all age groups, income groups and educational backgrounds whose needs must be taken into account. This wide variety must be reflected in the dense inner-core design. There are residents, students, customers and visitors. People live, work, shop and enjoy them in the city. This mix is decisive for the city's vitality because activities are constantly blended and woven together. The balance, mixture and integration of various user groups and activities are keys to making the city attractive and must be designed into the new high-rise built form.

Clearly that the existing urban design and planning strategies are not ideal to deal with urban precincts of significantly high density and intensity within today's cities. Their concept tends to be outdated propositions that were adopted when the city's precincts were essentially still sites of low plot ratios and low densities. They remain in sharp contrast to what is prevalent today.

Urban design existing theories and planning have not anticipated the implosion of high-rise construction and the sudden huge intensification of our cities. Basically, their inadequacy lies in their not regarding high rise buildings as high-rise precincts within the city or as high-rise suburbs within the city, but simply as just another built form as one building typology out of many in the morphology of the built environment. In many of today's significantly denser CBDs and other precincts in the major cities in the world the new and plot ratios and residential densities make traditional urban design and planning concepts totally outmoded and invalid.

"Landscaping is a key concept of any city's urban design and the provision of urban spaces in the city is similarly important. Urban parks serve a respiratory function in cities but, in addition, provide spaces for public recreation, relaxation and health. They are also important for environmentally sustainable and ecological reasons. Landscaping serves to balance the inorganic hard quality of the man-made built environment with greenery and the full complement of ecosystem components. It also has aesthetic benefits that soften and make less artificial the intensity of the high-rise built form. In aggregate, the introduction of vertical landscaping can serve to produce ecologically, socially and aesthetically a fusion of rural and urban existence in life-in-the-sky as well as the fusion of outdoor and indoor spaces." (Yean.ken; 1995)



6-8 Ebenezer Haward's garden city

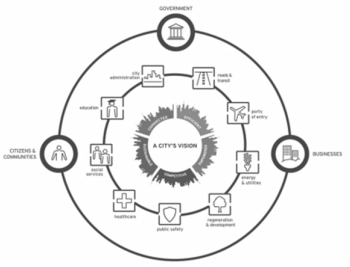
Ebenezer Haward's garden city concept draw a city encircled by an inalienable green belt. His ideal city is projected as 6000 acres with 1000 acres for city use, a ratio of city to green at 1:6. The World Health Organization, however, recommends the provision of 25 SQ. meter of greenery per resident in urban development. This same standard must be applied to the high-rise with provisions of greenery located not only at the ground plane but distributed throughout the tower's built form. Using a standard of 130 square meters per occupant to calculate the population in an office tower, the consequence of providing of 25 square meters of greenery per resident, is that 20 percent total gross floor area should be added to any office tower for landscaped sky courts. This is commensurate with the general town planning standards for master in the provision of 10-15 percent of gross planning area for parks. However, as built systems are mostly inorganic, it is preferred that the organic mass be equivalent to, or more than, the organic and a more desirable ratio of between inorganic areas to organic landscaped area might be 1:1.

Vertical Neighborhood as an Urban Ecosystem

To face the need for the sustainable future, the urban design for the new high-rise must address the limitation and constrains of our ecological environment. Buildings will need to be designed not as high-energy polluting open systems but as mimetic urban ecosystems that relates their inputs, outputs and operations within the context and carrying capacities of the ecosystems in the biosphere.

Yeang discusses that "Greening" the high rise means going beyond the conventional "set-asides" of open spaces in the urban area, beyond the provision of sky parks. Applying the idea of suitability requires that we demonstrate and manage the regenerative capacity of the renewable elements in the new high-rise and in the city. This, ultimately, will mean utilizing the discharges or residuals from the urban system, converting them through recycling to inputs that sustain local subsystems useful to the city as a whole.

What gives the cities the livability is the basis of surplus products, whether food supplies, which were of critical significance in antiquity or manufactured goods and services which are the principal items of modern economic exchange. The ways in which such flows focus upon individual centers are primary determinants of the structure and organization of natural hierarchies and the arrangement of centers in a worlds system of cities.

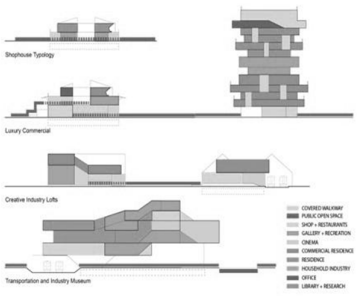


6-9 Urban Ecosystem Circle

Now near 25 percent of the world's population lives in the highly urbanized countries of the developed world but they account for 70 percent of the world's energy consumption, 75 percent of metals and 85 percent of the wood.

As it was discussed during the case studies chapter the concern for suitability of our urban environment can be expressed at two levels; the first is global and involves a wide range of issues surrounding the long-term stability of the earth's resources and environment and the implications for cities. It is clear that the world's cities cannot remain prosperous if the aggregate impact of their economies' production and their inhabitants' consumption draws on global resources at unsustainable rates, and their wastes are deposited in global sinks at levels which lead to the destruction of the biosphere processes and climatic change. The second is local and involves the possibility that urban life could be undermined from within because of congestion, pollution and waste generation and their accompanying social and economic consequences.

Creating Neighborhood Unit Vertically



6-10 Creating Neighborhood Unit Vertically

Like designing the residential development at the ground plane, the design of the residential high-rise must seek to create communities as neighborhoods in the towers. Within its built form the new high-rise must provide opportunities to create a sense of community, of neighborhood and eventually the development of an internalized local townscape. The design of the relationship between these and building's circulation systems should enable inhabitants of a high-rise community to move and circulate within the boundaries of their neighborhood realms.

The main issues facing the high-rises are isolation and the increasing alienation of inhabitants from each other. The layout of the individual floors and the relationship between floors must provide adequate opportunities for inhabitants to interact socially. In ameliorating the quality of residential life in the high-rise, the design must seek to recreate (as far as possible) the ideal neighborhood residential unity that we find effective at the ground plane.

During the design trend, the creation of total environment in the high rise building, integrating recreation, commercial function, employment opportunities and educational facilities with the housing provision are in priorities. Suited designed urban zones and neighborhoods succeed because they recognize the primary importance of the public realm-the network of spaces between buildings that determines the layout, from of the area and eventually of the city. As with conditions at the ground, the shape of public spaces in the high-rise and the way they link together are essential to the cohesion of urban neighborhoods and communities. Design should also permit a multiplicity of different forms of housing and, more importantly, avoid the negativeness of vertical social separation of communities.

6-11 EDITT Tower by TR Hamzah and Yeang

The social interaction generally takes place in the lift lobbies of high-rises, elevators, entrance halls, and passage ways. It is those zones that must be expanded to facilitate social interaction. For example, lift lobbies should be large enough to accommodate street furniture, food and drink dispensers and so on.

It is important to have mixed and inclusive communities that offer a choice of housing and lifestyles during the neighborhood designing. Different types of housing and tenures do not make bad neighbors. The creation of successful residential communities is about much more than visually attractive design. It is in essence about providing opportunities for dwelling units that respond to people's needs and providing a framework within which communities can become established and grow.

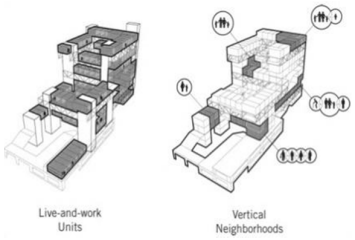
designing the mixed neighborhoods in the high-rise, with people of different ages and economic statues, different lifestyles and different level of mobility and independence can have a number of important community benefits; for example they can [2]:

- Find the better equivalence of demand for community services and facilities such as schools, recreation facilities and care for elderly people.
- Find the opportunities for "lifetime communities" here people can change dwellings without leaving a neighborhood.
- Find neighborhood more robust by avoiding large concentrations of dwelling units of the same type.

2 Yean.ken; 1995

The new Green Vertical Neighborhood Perspective

As it was discussed frequently in the literature of this thesis our cities will become highly specialized places almost totally dependent on the information industries, on high-end services. People will still occupy physical space although their work may become increasingly electronic, and they will continue to become gregarious and seek communities as work environments. Electronic location tracking will allow inhabitants to build new kinds of relationships because they will be able to permit others to follow their travel.



6-12 Green Vertical Neighborhood; Chicago suburb proposal by Studio Gang Architects.

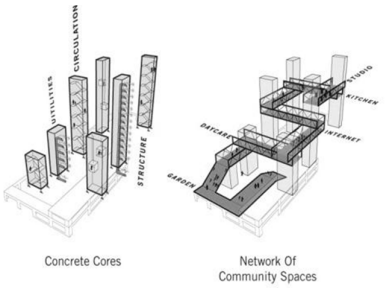
The persistance on this fact that telecommunications create and enhance rather than erode our urban functions is significant. Although they enable interaction to take place without participants travelling to central meeting places, they are not appropriate media through which to conduct the types of "orientation" meeting that take place in world cities.

The aim is to evaluate options, to negotiate deals and to take decisions. They typically involve top-level personnel and their advisers. It is essential for participants to be present in person since the aim is to float ideas, gauge reactions, cajole, persuade and decide. None of these activities can adequately be performed remotely. The face to face activities that take place in the boardrooms and on the dealing floors in major financial centers have not been, and are unlikely to be made absolute by new technology ; rather ,technology has extended the global reach of those ho transact such business and so has reinforced the statue of world cities.

The city centers and sub urban districts are likely to be maintained and enhanced by the way in which new communications technologies are introduced. These environments benefit most from advances in telecommunications because, as established locations for global business, they are the places which first received and derived the advantages of new services and applications. Telecommunications, in common with many innovations, diffuse hierarchically through urban systems.

Consequently, it should be pointed out that the high-rise might be as a consequence of adopting the vertical theory of urban design. How the theoretical ideas and concepts will discussed here impact, not just on the built form of the high-rise building type but also on the city.

Creature the new high-rise as urban design phenomenon should encourage and attract more people to return to living in the city centers. Urban environments with attractive spaces and places and plenty of shops and coffee shops providing lively street-life-in-the-sky, will delight those relish the bustle and the anatomy of living in a crowd. The picnics in-the-sky ill become even more attractive as they become safer it wider use of electronic surveillance. They will also thrive as centers of entertainment and culture; places to which people travel for a safety in hotel, for a museum or gallery visit or a restaurant meal, or to hear a concert or band.



6-13 Green Vertical Neighborhood; Chicago suburb proposal by Studio Gang Architects.

Probably the future high-rise's built form will have greater composition with myriad building programs, construction methods and details. These will enable the greater romantic expression of individual situations and communities. We will see the rejection of a

"Green design in most instances might be better regarded as an act of rapid-prototyping; such solutions are the best that can be achieved now, but with consideration of the ecological component and while acknowledging that subsequent improvements are essential in the next prototype."

Ken Yeang, 2005

mindless and strict adherence to functionalism as a primary determinant of a high-rise built form because of its denial of the complexity of life at the ground and because of the its inability to explain the persistence of certain forms once their function has changed or become obsolete.

Upon the literature reviews and also considering the case studies narrowly finally we came up to the redefine the general characteristic which should be considered in our design phase The new green high-rise buildings in our world's major cities must now adapt to the new functions proposed in this thesis.

Offering the proposed framework based on literature review and case studies for designing a Green Vertical Neighborhood is included in the last part of this research. They are categorized in 3 parts as guidelines for:

1- Green Design Approach
2- Urban Planning Considerations
3- Urban Design Considerations

It is significant to remind that the current theories of urban design and planning have perhaps not anticipated the implosion of high-rise construction and the sudden huge intensification of our cities. So basically their inadequacy lies in their not regarding tall buildings as high-rise precincts within the city or as high-rise suburbs within the city, but simply as just another built form as one building typology out of many in the morphology of the built environment.

Therefore, the main criteria derived from the many theories discussed and also the Ken Yeang hypothesis which took into account and examined by case studies are categorized here in three parts as follows:

Table 1: Proposed Chart in three parts of (Green Design, Urban Planning and Urban Design Considerations)

Green Design Approach:
- Considerations on eco-design and eco-friendly-systems in high-rise residential buildings design.
- Considerations on nature-relationship-design regarding the environment limits in intensive residential districts.
- Considerations on typological bio-differences in vertical neighborhood design.
- Considerations on maintenance and restoration of eco-environment facilities in high-rise building design.
- Considerations on making a balance between human systems and vertical bio-systems.
- Considerations on entropy in vertical-bio-systems.
- Considerations on environmental target design in high-rise building planning form the beginning.
- Considerations on Earth the supplier of energy and material resources
- Considerations on priorities in design approach which firstly put the renewable resources ideally at rates less than the natural rate at which they regenerate; and lastly optimizes the efficiency with which non-renewable resources are used.
- Considerations on global impact of design that all design has an effect on ecosystem relatively.
- Considerations on the management of outputs from the high-rise building environment into the ecosystem.
- Considerations on the principles of recycling required to be regarded in the context of its physical cycle.

Urban Planning Considerations:
- Considerations on planning a high-density mixed-used zones in urban planning or master planning design
- Considerations on vertical urban sprawl vs horizontal urban sprawl.
- Considerations on putting urban body forms within high-rise building design.
- Considerations on the idea of: "Think Globally, act Locally".
- Considerations on 3d concept creation-3d developing the ideas and then 3d Design.
- Considerations on generally information and service oriented to access to the high-rise residential buildings.
- Considerations on strategic planning to put industries in eco-parks or rural towns far from the residential zone.
- Considerations on use green belts in high density urban areas
- Considerations on preserve agricultural land and natural landscape at the high-rise residential urban area.
- Considerations on Increase amount of green spaces and landscape design priorities in residential zones.
- Considerations on preference of urban redevelopment to new development or improve the quality of life.
- Considerations on Increase the number of specially zoned transit corridors surround the residential buildings.
- Considerations on public health for children and elderly in the mid or high level of residence building.
- Considerations on pedestrians, cycling and elevators, transit, physical disabilities of a residential inhabitants
- Considerations on reduce car use per capita in a vertical neighborhood community zone.
- Considerations on Increase transit, walk/bike, elevators, local electric vehicles in a vertical residence.
- Considerations on reduce average commute to and from work in a neighborhood unit vertically or horizontally.
- Considerations on increase average speed of transit relative to the cars of residential building inhabitants.
- Considerations on Increase service kilometers of transit relative to the path which a high-rise resident takes.
- Considerations on increase cost recovery on transit from fares to reach from a high-rise community unit.
- Considerations on Decrease parking spaces in central business districts with intensive vertical neighborhood communities
Urban Design Considerations:
- Considerations on relationship between the high-rise and its context in the 3d planning matrix.
- Considerations on vertical urban structure and access to the street and public routs in the sky.
- Considerations on the concept of dwelling, Identity and the sense of place within high-rise built form.
- Considerations on design, shape and scale of major public spaces within high-rise built form.
- Considerations on variety of built spaces and urban structure in the high-rise buildings.
- Considerations on entrances along sky streets and public spaces.
- Considerations on distribution of residential community facilities within the high-rise built form.
- Considerations on setting the public realms and proximity.
- Considerations on landmarks and public buildings unique characteristics.
- Considerations on use of natural features including trees, planting and water.
- Considerations on design and materials of hard and soft landscaped areas.
- Considerations on pavements and street furniture design in the high-rise built form.
- Considerations on lighting design and safety zones in high-rise building community zones.
- Considerations on Integration with existing pedestrian, mechanical, communal transport routs and elevators.
- Considerations on communal transport facilities locations and stops.
- Considerations on integration between different movement modes
- Considerations on accessibility of facilities within ten minute walking distances (neighborhood distance).
- Considerations on parking standards and location of parking spaces within high-rise.
- Considerations on traffic measures.
- Considerations on built form layouts and orientation in space
- Considerations on variety of materials and architectural expression within high-rise built form.
- Considerations on flexibility of internal layouts.
- Considerations on Work/live and lifetime dwellings.
- Considerations on disabled access, materials and maintenance.

Final words;

Today urban designers, architects and urban planners have a significant role to respond the main question of the city. Going vertically and improving the life quality by designing green vertical neighborhood would be considered as a responsive answer. Although there were many opponent discussion that the necessity of going upward is not acceptable, but the architects and planners now believe that the emergence of these kind of built forms are inevitable. Now it has been proved that economically and physically to face the land use problems in urban growth and also solve the economic problems of high-density parts in the city simply it is wise and logic to use tall buildings instead of horizontal urban growth.

Presented here is a new approach to the high-rise residential buildings, where its design and planning are perceived as a form of urban design which takes precedence over its architectural form-making. The consequence of this approach is a built creature which is more physically and socially adoptable; a high-rise built environment that is more human and more habitable; a built environment that should be a replication of and where possible significantly improve on the ideal and pleasurable life that currently enjoy and have always enjoyed at the ground plane.

The framework proposed here will lead to a more livable intensive urban environment, if taken to their logical conclusion; they should eventually become the fundamental bases for planning and building agenda or design guidelines which influencing the design of future high-rise buildings and the development of our cities.

Appendix

Green Glossary

Bibliography

Appendix

Green Glossary [1]

This Glossary defines the often-daunting terminology associated with green vertical building aspects.

Green is a term now widely used to describe buildings designed and constructed with minimal negative impact to the environment and with an emphasis on conservation of resources, energy efficiency, and healthful interior spaces.

Sustainability refers to the concept that new development must meet the needs of the present without compromising those of the future. Sustainability is measured in three interdependent dimensions: the environment, economics, and society—often referred to as the triple bottom line.

Active Solar - A solar application, which uses electrical or mechanical equipment (typically pumps and/or fans) to assist in the collection and storage of solar energy for the purpose of heating, cooling (buildings, liquids, or gases), or making electricity.

Agenda 21 - A comprehensive plan of action to be taken globally, nationally, and locally by organizations of the United Nations System, Governments, and Major Groups in every area in which humans have an impact on the environment. The Program for Further Implementation of Agenda 21 was strongly reaffirmed at the World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa in 2002.

Bakeout - A process used to remove volatile organic compounds (VOC's) in a building by operating a building's HVAC systems at elevated temperatures using 100 percent outside air after all the furniture and finishes (carpeting, ceiling tiles, etc.) have been installed.

Biomass - An energy resource derived from organic matter such as wood, agricultural waste and other living cell material.

Bioremediation - The use of natural biological processes (microbes, bacteria, plants, etc.) to break down contaminants and restore contaminated land back to productive use.

Black Water - Water containing human waste from toilets and urinals. Black water contains pathogens that must be neutralized before the water can be safely reused. Typically black water, after neutralization, is used for non-potable uses such as flushing or irrigation.

1: Resource: Raiji, Ashok, P.E; Big & Green: Toward Sustainable Architecture in the 21st Century, (2002); Princeton Architectural Press

BREEAM - Building Research Establishment Environmental Assessment Method (BREEAM) is a comprehensive tool for analyzing and improving the environmental performance of buildings through design and operations. This methodology has been developed by the UK based Building Research Establishment.

Building Envelope - Elements (walls, windows, roofs, skylights, etc.) and materials (insulation, vapor barriers, siding, etc.) that enclose a building. The building envelope is a thermal barrier between the indoor and outdoor environment and is a key factor in the "sustainability" of a building. A well-designed building envelope will minimize energy consumption for cooling and heating as well as promote the influx of natural light.

Carbon Dioxide (CO2) - Carbon Dioxide is a colorless, odorless gas that naturally exists in the earth's atmosphere. The major source of man-made CO2 emissions is from the combustion of fossil fuels. Carbon dioxide is the primary greenhouse gas and is known to contribute to global warming and climate change. Atmospheric concentrations of CO2 have been increasing at a rate of about 0.5 percent per year and are now approximately 30 percent above pre-industrial levels.

Carbon Neutral - A scenario where the net discharge of carbon dioxide into the atmosphere is zero. Carbon neutrality can be achieved by planting enough trees so that CO2 emissions as a result of combustion would be offset by CO2 absorption by the plants. In the presence of water and light, trees convert CO2 into sugar and oxygen thru the process of photosynthesis. The average tree absorbs 10 kg (22 lbs) of CO2 per year. Carbon neutral is also referred to as "net zero carbon".

Carbon Footprint - A measure of the amount of carbon dioxide emitted through the combustion of fossil fuels. A carbon footprint is often expressed as tons of carbon dioxide or tons of carbon emitted, usually on an annual basis.

Climate Neutral - No net production of greenhouse gases (see also Carbon Neutral).

Cogeneration - A process in which power is produced by a gas-fired engine and generator set. Heat produced as part of this process is used as heating and/or cooling media. A cogeneration plant is often referred to as a combined heat and power plant.

Commissioning - A process that occurs prior to building occupancy during which the performance of the building systems are checked and adjusted if necessary, in order to ensure that they are operating as intended by the design and that the owner's operational needs are met.

Daylighting - The use of natural light to supplement or replace artificial lighting. Displacement

Ventilation - A method of space conditioning where conditioned air is supplied at or near the floor. Since the air is supplied at very low velocities, a cool layer of air collects in the occupied zone resulting in comfortable conditions for the occupants. Buoyant forces

remove heat generated by occupants and equipment, as well as odors and pollutants, all of which stratify under the ceiling and are extracted from the space by return or exhaust fans. Displacement ventilation systems were originally used in industrial facilities and subsequently in office buildings, auditoria, performing arts centers and spaces with large interior volumes. These systems are effective in improving indoor air quality as well as providing energy savings when compared to a conventional fully mixed system.

Eco-friendly - Little or no impact on the native eco-system.

Ecological Footprint - The area of land and water needed to produce the resources to entirely sustain a human population and absorb its waste products with prevailing technology. The concept of an ecological footprint is used as a resource management and community-planning tool.

Embodied Energy - Total energy used to create a product, including the energy used in mining or harvesting, processing, fabricating, and transporting the product.

Energy Efficiency - Ratio of energy output of a conversion process or of a system to its energy input.

First Cost - The total cost of acquiring and installing the item in question. In the context of a building first cost would include land acquisition costs in addition to the cost of construction.

Fly Ash - The fine ash waste collected from flue gases from coal burning power plants, smelters, and waste incinerators. Fly ash can be used as a cement substitute in concrete, thereby reducing embodied energy of the concrete.

Fossil Fuels - Fuels found in the earths strata that are derived from the fossilized remains of animal and plant matter over millions of years. Fossil fuels include oil, natural gas, shale, and coal. Fossil fuels are considered to be non-renewable since they are consumed faster than their natural production.

Fritted Glass - A special type of glass that utilizes ceramic-enamel coatings in a visible pattern (dots, lines, etc.) to control solar heat gain. The pattern is created by opaque or transparent glass fused to the substrate glass material under high temperatures. The substrate is heat strengthened or tempered to prevent breakage due to thermal stresses.

Fuel Cell - An electrochemical device in which hydrogen is combined with oxygen to produce electricity with heat and water vapor as by products. Natural gas is often used as the source of hydrogen with air as the source of oxygen. Since electricity is produced by a chemical reaction and not by combustion, fuel cells are considered to be green power producers. Fuel cell technology is quite old, dating back to the early days of the space program. Commercial use of fuel cells has been sporadic, however, the use of fuel cells in automobiles and buildings is expected to increase in the next decade.

Gas-Fired Absorption Chiller - Mechanical equipment that is used to generate chilled water for cooling of buildings. Conventional chillers use electricity as the energy source, whereas gas-fired absorption chillers use clean burning natural gas. While conventional chillers have a compressor and use refrigerants to produce cooling, absorption chillers contain an absorber, generator, pump and heat exchanger, and do not use ozone-depleting substances. The absorption cycle utilizes environmentally friendly working fluids, namely water (refrigerant) and lithium bromide (absorbent). Some absorption chillers use ammonia as the refrigerant and water as the absorbent.

Global Warming - An increase in the global mean temperature of the Earth that is (or is thought to be) a result of increased emissions of greenhouse gases that are trapped within the earth's atmosphere. Global warming is believed to have adverse consequences such as climate change and a rise in sea levels. The scientific community is in general agreement that the Earth's surface has warmed by about 1°F in the past 140 years.

Gray Water - Wastewater from sinks, showers, kitchens, washers, etc. Unlike black water, gray water does not contain human waste. Typically gray water, after purification, is used for nonpotable uses such as flushing, irrigation, etc.

Green - A term that is widely used to describe a building and site that is designed in an environmentally sensitive manner, i.e. with minimal impact to the environment.

Green Building - A building that minimizes impact on the environment through resource (energy, water, etc.) conservation and contributes to the health of its occupants. Comfortable, aesthetically pleasing and healthful environments characterize green buildings.

Greenhouse Effect - Greenhouse gases in the earth's atmosphere permit solar radiation to pass through but prevent most of the reflected infrared radiation from the earth's surface and lower atmosphere from escaping into outer space. This process occurs naturally and has kept the earth's average surface temperature at approximately 60°F. Life on earth would not be possible without the natural greenhouse effect, but environmental scientists are concerned about the increased emissions of greenhouse gases from human activities, leading to climate change and its consequential adverse effects.

Greenhouse Gases - Any gas that absorbs infrared radiation in the earth's atmosphere. Common greenhouse gases include water vapor, carbon dioxide (CO_2), methane (CH_4), nitrogen oxides (NO_x), ozone (O_3), chlorofluorocarbons (CFCs), halogenated fluorocarbons (HCFCs), perfluorinated carbons (PFCs), hydrofluoro-carbons (HFCs) and Sulfur Hexafluoride (SF_6). Carbon dioxide, methane and nitrogen oxides are of particular concern due to their long residence time in the atmosphere.

Green Power - Electricity generated from renewable energy sources (solar, wind, biomass, geothermal, and hydroelectric).

Grid - A network of power transmission and distribution facilities used to provide electricity to users (homes, businesses, industry). Large power plants, wind power generating facilities as well as small power producers (such as photovoltaic farms) feed electrical power into the grid for distribution to users. Electrical grids in the USA are both publicly and privately owned.

Heat Island Effect - A phenomenon that occurs in developed areas where the replacement of natural land cover with paving, buildings, roads, parking lots, etc. result in an increase in outdoor temperatures. The heat island effect can be mitigated by vegetation, green roofs and light colored materials that reflect heat. Urban heat islands can be as much as 10°F hotter than the surrounding undeveloped areas.

Indoor Air Quality (IAQ) - Indoor air that contains no known contaminants at harmful concentrations and with which a substantial majority of the people exposed to the air do not express dissatisfaction. Good indoor air quality inside a building results from:

- Introducing an appropriate amount of outside air into the building through the HVAC systems
- locating outside air intakes so that the outside air introduced into the HVAC systems is of the best possible quality
- proper filtration
- proper air distribution
- proper removal of indoor pollutants
- proper commissioning of the building and its building systems.

Insolation - The amount of sunlight (direct, diffuse and reflected) reaching an area exposed to the sky.

Intelligent Materials - Materials that are able to adapt to their environment by altering their properties. Example of intelligent materials include liquid crystal glass which changes from transparent to opaque upon application of a current, and thermochromic glazing that changes transparency in response to ambient temperatures.

Kyoto Protocol - In December 1997, the United Nations Framework Convention on Climate Change was held in Kyoto, Japan and was attended by delegates from 160 countries. A legally binding agreement, the Kyoto Protocol, was adopted by the countries in attendance, under which the industrialized nations agreed to reduce their greenhouse gas emissions by an average of 5.2 percent below 1990 emissions levels by 2010. The USA pledged a 7 percent reduction. Subsequent to the Kyoto meetings, the US Congress did not ratify the agreement.

LEED - An acronym for Leadership in Energy and Environmental Design. LEED is a pointbased rating system developed by the US Green Building Council that evaluates the environmental performance from a “whole building” perspective over its life cycle, providing a definitive standard for what constitutes a green building according to six categories: Sustainable Sites Water Efficiency Energy and Atmosphere Material

Resources Indoor Environmental Quality Innovation and Design Process Buildings evaluated by LEED are rated as certified, silver, gold, or platinum. There are a total of 69 LEED credits available in the six categories: 26 credits are required to attain the most basic level of LEED certification; 33 to 38 credits are needed for Silver; 39 to 51 credits for Gold; 52 to 69 credits for the Platinum rating.

Life-Cycle Cost (LCC) - The total cost of acquiring, owning, operating and disposing of a building or building system over its entire useful life. LCC includes the cost of land acquisition, construction costs, energy costs, the cost to maintain, service and repair the building and its systems, costs of system replacement, financing costs, and residual or salvage value at the end of the building's useful life.

Light Shelf - A horizontal device positioned (usually above eye level) to reflect daylight onto the ceiling and beyond. The light shelf may project into the room, beyond the exterior wall plane, or both. The upper surface of the shelf is highly reflective, i.e. having 80 percent or greater reflectance. Light shelves are also effective shading devices for windows located below them.

Low-e Glass - Low-e (Low emissivity) glass has an invisible thin-film metallic or oxide coating which allows the passage of short wave solar energy into a building but prevents long-wave energy produced by heating systems and lighting from escaping outside.

Microclimate - Localized climate conditions within an urban area or building.

Net-Zero - Requiring no additional energy input from outside sources.

Nitrogen Oxides (NOx) - Gases consisting of one molecule of nitrogen and varying numbers of oxygen molecules. Nitrogen oxides are by-products of combustion processes and are commonly found in the automobile exhaust and emissions from fossil fuel-fired power plants. NOx is a greenhouse gas and is an ingredient of acid rain and smog.

Non-renewable Energy Resources - Energy resources that cannot be restored or replenished by natural processes and therefore are depleted through use. Commonly used non-renewable energy resources include coal, oil, natural gas, and uranium.

Orientation - The position of a building relative to the points of a compass. Energy consumption in a building can be reduced by proper orientation of the building's window areas.

Ozone (O3) - Ozone is a greenhouse gas present in the stratosphere and the troposphere. In the stratosphere, ozone provides a protective layer shielding the earth from harmful ultraviolet radiation. In the lower atmosphere ozone is a pollutant that causes respiratory problems and is an ingredient of smog.

Passive Solar - The use of natural heat transfer processes to collect, distribute, and store useable heat without the help of mechanical devices (pumps or fans). Passive

solar systems have few moving parts. Trombe Walls and the use of the thermal mass of building structure to store energy are examples of passive solar systems.

Photovoltaic Cell - A device that converts sunlight directly into electricity. Photovoltaic (PV) cells are silicon-based semiconductors and are often referred to as solar cells. PV cells were developed in the mid-1950's and have become cost effective where it is difficult to extend conventional power lines. PV cells are often used for remote motorist call aid boxes, irrigation systems and navigational lights.

R-Value - A unit of thermal resistance. A material's R-value is a measure of the effectiveness of the material in stopping the flow of heat through it. The higher a material's R-value, the greater its insulating properties and the slower the heat flow through it.

Rainwater Harvesting - The collection, storage, and reuse of rainwater.

Recycling - A series of processes that include collection, separation, and processing by which products and raw materials are recovered and reused in lieu of disposal as solid or liquid wastes. Commonly recycled items include cans and bottles, paper and industrial solvents. Recycling can also apply to construction materials, and even to buildings themselves.

Regeneration - Renewal of sites or habitats that have become unfit for human, animal, or plant habitation, bringing them back into productive use. The term most commonly refers to urban and industrial land.

Renewable Energy Sources - Energy sources that replenish themselves naturally within a short period of time. Sources of renewable energy include solar energy, hydroelectric power, geothermal energy, wind power, ocean thermal energy, wave power, wind power and fuel wood.

Return On Investment (ROI) - An economic indicator that is used to evaluate the effectiveness of an investment. It is calculated as the ratio of the amount gained or lost relative to the amount invested. Simple ROI analyses do not take the time value of money into account. On the other hand, dynamic ROI analyses recognize that the value of money does change over time.

Shading Coefficient - The ratio of solar heat gain through a glazing system to the solar heat gain through a single layer of clear glass.

Sick Building Syndrome - According to the Environmental Protection Agency and National Institute of Occupational Safety and Health, Sick Building Syndrome is defined as "situations in which building occupants experience acute health and/or comfort effects that appear to be linked to time spent in a particular building, but where no specific illness or cause can be identified. The complaints may be localized in a particular room or zone, or may be spread throughout the building."

Solar Collector - A device used to absorb heat from the sun. In the context of buildings, the absorbed energy typically heats water, which is then used for space heating and/or domestic hot water.

Spectrally Selective Glazing – Glazing that has a high transmittance of visible light but low transmittance of solar heat gain.

Superwindow - A window with a very low U-value achieved through the use of multiple glazings, low-e coatings, and gas fills. A gas fill is the use of an inert gas, usually Argon or Krypton, placed between sealed panes of glazing in order to provide resistance to heat flow.

Sustainability - The concept of sustainability can be traced back to President Theodore Roosevelt who stated in 1910, " I recognize the right and duty of this generation to develop and use the natural resources of our land; but I do not recognize the right to waste them, or to rob, by wasteful use, the generations that come after us. " In 1987 the United Nations World Commission on Environment and Development (The Brundtland Commission) defined a sustainable development as one that "meets the needs of the present without compromising the ability of future generations to meet their own needs". Sustainability has three interdependent dimensions relating to the environment, economics and society—often referred to as the triple bottom line.

Thermal Mass - A material used to store heat, thereby slowing the temperature variation within a space. Typical thermal mass materials include concrete, brick, masonry, tile and mortar, water and rock.

Triple Bottom Line - According to the World Business Council for Sustainable Development, "Sustainable development involves the simultaneous pursuit of economic prosperity, environmental quality and social equity. Companies aiming for sustainability need to perform not against a single, financial bottom line, but against [this] triple bottom line."

Value Engineering - An organized activity in which building systems, equipment, design features and materials are analyzed in order to attain the lowest building life cycle cost while maintaining the stated functional and performance goals including quality, reliability, and safety.

Ventilated Façade - A special type of curtain wall consisting of two glazed facades separated by gap through which ambient air is allowed to flow. The flow of air removes a large amount of solar heat gain that would ordinarily enter the building, resulting in a reduction in space cooling needs and energy consumption. These facades are also known as double facades, double-skin facades and ventilated cavity curtain walls.

Appendix

Green Glossary

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