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LIVING CORE OF THE FUTURE: PROPOSING NEW APPROACH FOR THE FUTURE OF RESIDENTIAL COMPLEX IN METROPOLITAN AREAS

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**LIVING CORE OF THE FUTURE: PROPOSING NEW APPROACH FOR THE
FUTURE OF RESIDENTIAL COMPLEX IN METROPOLITAN AREAS**

A Thesis Presented

by

MAHSA G. ZADEH

Submitted to the Graduate School of the
University of Massachusetts Amherst in partial fulfillment
of the requirements for the degree of

MASTER OF ARCHITECTURE

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Department of Architecture

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ABSTRACT

LIVING CORE OF THE FUTURE: PROPOSING NEW APPROACH FOR THE FUTURE OF RESIDENTIAL COMPLEX IN METROPOLITAN AREAS

FEBRUARY 2017

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Building that can adapt and change to become useful for not only today's society but for generations to come is one which elicits biological and evolutionary processes. In essence, the need for a transformative architecture that can sustain an active dialogue with its inhabitants, whose trend are in constant flux, results in a reunification between humanity and its time-sensitive, responsive natural habitat.

The aim of thesis is to explore what makes people satisfy and comfortable and what factors make their living space and city livable, especially focusing on future housing needs. We can respond to the question of how is the space of the future going to look through several aspects. Housing has been a major challenge for the rising population during last decades, especially in developing countries. My approach will focus on social and interactional space alongside technological aspects. "Architecture as part of life" is a concept that I always carried with me: Buildings that adjust to life, to our needs, to our moods. They should adapt to our space, our functionalities and our needs that change continuously – and even to our sense of beauty, itself in continuous motion.

Life satisfaction occurs most often when people are engaged in absorbing activities that cause them to forget themselves, lose track of time and stop worrying. "Flow" is the term that psychologist coined to describe this phenomenon. I believe that in age of technology and

information we can't ignore social interaction and communication. The concept of spaces of communication can be explained as in-between spaces in terms of architecture and semi-spaces in terms of urbanism. This thesis will argue that the spaces of communication, which are assumed to create social and environmental contact, can exist in any kind of urban environment.

Architecture is based on the past and built in the present to take care of the future. It also mirrors the various aspect of our lives- social, economic, spiritual. Building cannot be separate from history, culture, economy, community and environment. The answer to the question of what will future generation need to live a happy life will vary from place to place. Happiness and satisfaction have universal factors but when we go in depth and explore individual societies and cities in terms of history, background, culture and social necessity we will understand differences that need to be respected.

Generally, despite all differences in professional structures, economic conditions, geographical limitations, cultural, political and historical backgrounds suitable residential spaces in most developing countries face similar challenges. It appears that cities of today, and especially big cities all around the world, are all struggling with similar problems. Big cities should be built of communities which have a feature of small cores (neighborhoods) located in big city; that will benefit from the opportunities of big city. This concept is known as planetary perspective. My site, Tehran, was selected as a prototype city of a developing country. Developing countries are often more challenging because of their population growth that have huge impact on future environmental and economic issues. As urban reality shows, increasing population, demand for limited resources and depletion of natural environment strengthen this default that as urbanization gains pace, more people will find themselves living close together than ever before. The quality of urban living spaces will be even more significant in future. Architecture can change the way we think, we feel and embrace the future.

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CHAPTER 1

INTRODUCTION

Objective and Methods

The last two decades of the twentieth century have witnessed fundamental changes in our way of life. Also we will face radical changes in future. What makes people satisfied and what factors impact their living space is the main question that I've followed in thesis process, especially focusing on future housing needs.

Exploring the answer of this question that what are future housing needs in metropolitans is the main approach of this thesis. Based on this approach, thesis is divided to sections. Future of housing, urban context in metropolitan and livable cities, and residential communities are three major subjects that address interconnected vision of my project. These subjects will be review in background section. Future of housing, focuses on some predictions for years to come and measurements we have to take for next generation of residential design. Then, urban context of metropolitans and livable cities will be discussed to figure out criteria that big cities need to become more livable and sustainable. Last part of background will explore regional and smaller scale to find needs and necessities of residential and housing sectors. Background is a preliminary glance at urban context and planning theories, livable cities features, residential community and factors affecting residential areas. Next section will present more detail about housing sector. This section will discuss definition and typology of open spaces and residential spaces in particular area and review traditional Iranian house to find what characteristic can be use as concept in design process for new approach. This part will demonstrate the knowledge and understanding of the housing sector in Iran during the time to help developing design process to have sustainable society and residential space.

Design section is intended to complete answer to thesis question. After exploration and comparison, the subject in different category, I came to conclusion that I would follow four major criteria in my design process to cover all requirements for residential satisfaction and future living. Residential satisfaction is considered as one criteria of residential quality; neighborhood satisfaction is an important component of life satisfaction. In this thesis I tried to find the most influential criteria in residential environment increase our satisfaction. My design process is based on developing these features that include spatial, social, functional and contextual features.

After present the site, looking forward the programs in master plan that is decent for the individual core and then focus on residential space along with communication space in this master plan. And respond to all questions and concerns that are introduced aforementioned.

CHAPTER 2

BACKGROUND

Future and What It Will Bring

How will be the world in 2020?

There are some predictions that indicate future changes.

In 2020, world population will reach 7,675 million people, 11% more than 2010.

Life expectancy in the world will exceed 70 years.

In developed countries there will be more people older than 65 than people under 15 years.

By 2020, 52% of the world population will be middle class, 1,400 million more than in 2010.

54% of this middle class will live in Asia.

43.2% of the economic weight will be Asia.

The process of globalization will continue

Traditional boundaries will continue blurring

Oil consumption will double.

In Europe, 20% of the energy will be renewable.

Scarcity of resources will determine the economic model.

55% of the planet population will live in cities.

Knowledge will be offered and demanded in efficient markets.

Technology will be increasingly present in people's lives.

In 2020 there will be more than 50,000 million of devices connected to the internet.

Social relationships will be affected by the internet at all levels.

An inventory of the last half-decade's events might mystify even bona fide futurists. A recession that wiped out nearly 20 years of Americans' wealth, the urgency of global warming, the flood of social media, and an Internet that's accessible on a pocket-size touchscreen. What would Alvin Toffler, who popularized the term "information overload" in the 1970s, think about how we live and work today?

Toffler explains, "Society needs people who take care of the elderly and who know how to be compassionate and honest. Society needs people who work in hospitals. Society needs all kinds of skills that are not just cognitive; they're emotional, they're affectional. You can't run the society on data and computers alone."¹

In his book *The Third Wave* Toffler describes three types of societies, based on the concept of "waves"—each wave pushes the older societies and cultures aside.

First Wave is the society after agrarian revolution and replaced the first hunter-gatherer cultures.

Second Wave is the society during the Industrial Revolution. Toffler writes: "The Second Wave Society is industrial and based on mass production, mass distribution, mass consumption, mass education, mass media, mass recreation, mass entertainment, and weapons of mass destruction.

¹ Toffler, Alvin, and Toffler Alvin. *The third wave*. New York: Bantam books, 1981.

Third Wave is the post-industrial society. According to Toffler, in this post-industrial society, there is a wide diversity of lifestyles (“subcultures”). Adhocracies (fluid organizations) adapt quickly to changes.

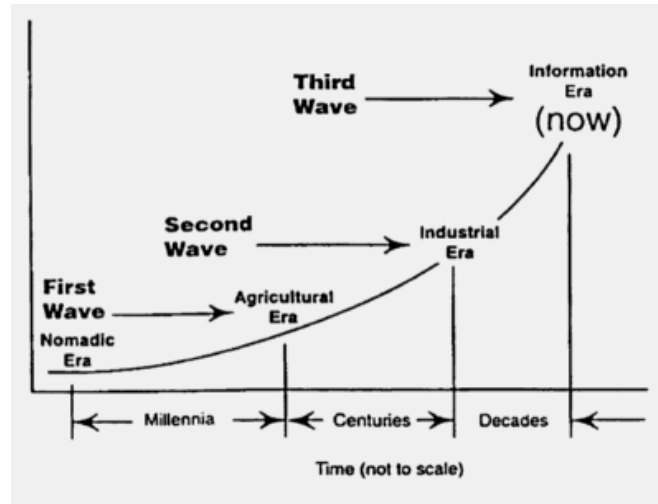


Figure 2.1: Third wave diagram, Toffler, Book

Times change, and the practice of architecture changes with them. In this moment poised between post-crash and comeback, it's a good time to pause, look around, and ask how we'll move forward. Will it be business as usual, or will the way we design and deliver housing look different? Global awareness is transformative, too. In a world where social and ecological systems seem increasingly tenuous, are we starting to rethink what home and shelter should mean? A compacted economy, climate change, and emerging technologies are the game-changers going forward, and that means the concerns of architecture have multiplied at all kinds of scales. What follows, then, is a roundup of best guesses from leading practitioners, pundits, academics, and research-and-development types about how architects might busy themselves with the challenges ahead.

Prognostications

The trend worth monitoring is the move away from large-lot single-family homes to more intentional communities—a relatively common pattern in Europe—where family members and friends buy adjacent units. This kind of living arrangement appeals both to retiring boomers and Millennials, the two largest demographic groups. “They have a lot in common,” Fisher says. “Retiring people don’t want the maintenance of a big yard, and they want access to conveniences and healthcare. Millennials, too, want to live with each other and are moving from suburbs into cities.”²

Live/work spaces are fairly common in urban enclaves nowadays, but the blending of domestic and work lives will eventually demand a different kind of house, Fisher says. Research suggests that by 2020, 40 percent of the U.S. workforce may be self-employed.³ What’s new is that people are turning their homes into mini-factories, using recent technologies such as 3D printing to fabricate products and then sell them online.

“Now the spare bedroom is turned into a production place, but over time this merging of living, working, and making will radically change what we think of as the house,”⁴ Fisher predicts. “This is how people lived in cities for thousands of years; fabrication happened in close quarters on every block. The industrial zone is a legacy of the 20th century and will gradually disappear in the new economy.”

² Hall, Peter, and Ulrich Pfeiffer. *Urban future 21: a global agenda for twenty-first century cities*. Routledge, 2013.

³ Maestas, Nicole, and Julie Zissimopoulos. "How longer work lives ease the crunch of population aging." *The Journal of Economic Perspectives* 24.1 (2010): 139-160.

⁴ Mayer-Schönberger, Viktor, and Kenneth Cukier. *Big data: A revolution that will transform how we live, work, and think*. Houghton Mifflin Harcourt, 2013.

Architects who are focused on the work that needs to be done in the world can see, if not the future, then at least a plausible version of it. New opportunities will arise, and housing eventually will be designed and delivered much more efficiently, perhaps in ways we can't yet imagine.

“This is a really interesting time,” Kam says. “Architects should come up with creative solutions that not only answer what owners are asking for, but new ideas to enlighten them. But it will require a holistic pursuit,”⁵ working with manufacturers, community members, and professional organizations to make our voices heard.

⁵ Next-Generation Design by Cheryl Weber, LEED AP, is a senior contributing editor to Custom Home and a frequent contributor to Builder.

Urbanism, Metropolitan and Livable Cities

It appears that big cities of today, are all struggling with similar problems. Metropolitan have developed huge territories during the twentieth century that cannot be properly understood by anyone in terms of their form. But now need to be recognized as something that truly exists, because it is a form that is in perpetual transformation and without limits.

What people want and how cities are responding?

Livability should be assessed in terms of citizen access to their city's services and culture

Balancing cities desirability and affordability is a key challenge for policymakers

Transportation and mobility issues govern several aspect of urban livability

The important factors which are most important to people in making a city an attractive place in which to live and work⁶:

- Job market and cost of living
- Public transportation, road links and parking
- Safety and security
- Culture, nightlife and sporting facility and events
- Access to decent childcare and education
- Parks and access to green/open spaces
- General environment and cleanliness
- Layout of the city, quality of its building and housing
- Access to quality healthcare
- Range of shops and stores.

⁶ Rogerson, Robert J. "Quality of life and city competitiveness." *Urban studies* 36.5/6 (1999): 969.

What makes a city livable? And, where are the best places to live?

What is the livable city criteria?

The Economic Intelligence Unit's (EIU) latest ranking of the World's most Livable Cities, the Global Livability report has been published, with the Australian sporting capital of Melbourne topping the list once again.⁷ According to EIU, the livability rating quantifies the challenges that might be presented to an individual's lifestyle in any given location, and allows for direct comparison between locations. Every city is assigned a rating of relative comfort for over 30 qualitative and quantitative factors across five broad categories: stability; healthcare; culture and environment; education; and infrastructure. The top 10 are:

- 1) Australia, Melbourne
- 2) Austria, Vienna
- 3) Canada, Vancouver
- 4) Canada, Toronto
- 5) Canada, Calgary
- 6) Australia, Adelaide
- 7) Australia, Sydney
- 8) Finland, Helsinki
- 9) Australia, Perth
- 10) New Zealand, Auckland.

⁷ <https://ourworld.unu.edu/en/>



Figure 2.2: View of 3 top cities in EIU ranking; Internet

Precedent studies about city of tomorrow and Planning strategy

Le Corbusier_ The City of Tomorrow and Its Planning

This book offers some very interesting clues as to the motivations for use-zoning. Le Corbusier seems to take this as evidence that people prefer to live in suburbs rather than in cities, and therefore bases his theory of urban planning on the idea that the center should be for commerce (and some public services), and that it should be surrounded by two belts of residential areas – one with “blocks of dwellings on the ‘cellular’ system”, and one outer garden city.

Le Corbusier doesn’t seem that far away from Jane Jacobs in what he wanted to achieve, but they are light years apart regarding their ideas about how cities best are transformed. Le Corbusier believed in knocking down entire districts and rebuilding them from scratch (and he actually makes a convincing case), for instance in his “Voisin” plan for rearranging the center of

Paris shown in the picture above. Jacobs, on the other hand, believes that change must be gradual and often affected through indirect measures, as neighborhoods in cities are delicate organisms which must be handled with care or they will be destroyed.

Le Corbusier's theories suggest that the center of a great city should consist mainly of skyscrapers – exclusively for commercial use – and that the area occupied by these should be no greater than 5 percent. The remaining 95% should be parks with trees. Also in the center there would be a train station, the “hub” of the city, and three-story buildings with “luxury shops, [...] restaurants and cafés.”⁸

Surrounding the center there would be a belt of residential buildings, in the form of those zigzag blocks with “set-backs” seen in the picture below. Each of these buildings are to be small communities in themselves, offering catering and domestic services.

But something that are not mentioned here are shops, cafés, and restaurants in this residential district (or in the garden city, for that matter). Did he really intend for all shopping, out of house dining, and visiting cafés to take place in the center of the city?



Figure 2.3: Le Corbusier Plan Voisin for Paris 1925; Internet

⁸ The city of tomorrow and it's planning By Le Corbusier, Frederick Etchells.

Jane Jacobs/ The Death and Life of Great American Cities

Jacobs argued that modernist urban planning rejects the city, because it rejects human beings living in a community characterized by layered complexity and seeming chaos. The modernist planners used deductive reasoning to find principles by which to plan cities. Among these policies she considered urban renewal the most violent, and separation of uses (i.e., residential, industrial, commercial) the most prevalent. These policies, she claimed, destroy communities and innovative economies by creating isolated, unnatural urban spaces.

In their place Jacobs advocated "four generators of diversity". "The necessity for these four conditions is the most important point this book has to make. In combination, these conditions create effective economic pools of use."⁹ The conditions are:

- Mixed uses, activating streets at different times of the day
- Short blocks, allowing high pedestrian permeability
- Buildings of various ages and states of repair
- Density.

Ebenezer Howard/ Garden cities for tomorrow

Ebenezer Howard offered a vision of towns free of slums and enjoying the benefits of both town (such as opportunity, amusement and high wages) and country (such as beauty, fresh air and low rents). Howard illustrated the idea with his "Three Magnets" ¹⁰diagram. His ideas were conceived for the context of a capitalist economic system, and sought to balance individual and community needs.

⁹ Jacobs, Jane. *The death and life of great American cities*. Vintage, 1961.

¹⁰ Howard, Ebenezer, and Frederic James Osborn. *Garden cities of to-morrow*. Vol. 23. Mit Press, 1965.

In Howard’s vision of a “well-structured and biologically sound urban body”, an emphasis was placed on system of circulation. Howard” stressed the need of scientific system of flows within and between his garden cities.

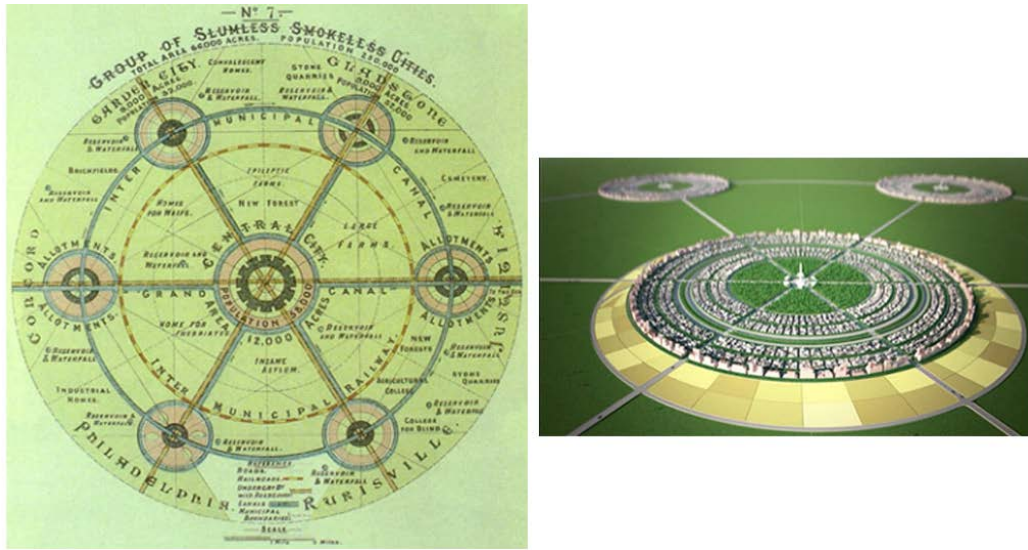


Figure 2.4: Garden City Concept by Howard; Internet

Archigram

Archigram was an avant-garde architectural group formed in the 1960s - based at the Architectural Association, London - that was futurist, anti-heroic and pro-consumerist, drawing inspiration from technology in order to create a new reality that was solely expressed through hypothetical projects.

An Archigram project attempts to provide a new agenda where nomadism is the dominant social force; where time, exchange and metamorphosis replace stasis; where consumption, lifestyle and transience become the programmer; and where the public realm is an electronic surface enclosing the globe —David Greene¹¹

¹¹ Sadler, Simon. *Archigram: architecture without architecture*. MIT Press, 2005.

Plug-in-City, Peter Cook, 1964

Plug-in-City is a mega-structure with no buildings, just a massive framework into which dwellings in the form of cells or standardised components could be slotted. The machine had taken over and people were the raw material being processed, the difference being that people are meant to enjoy the experience.¹²

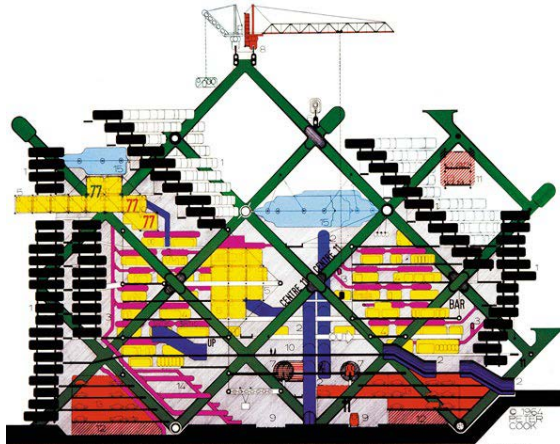


Figure 2.5: In 1964 Archigram envisioned the Plug-in City

The Walking City, Ron Herron, 1964

The Walking City is constituted by intelligent buildings or robots that are in the form of giant, self contained living pods that could roam the cities. The form derived from a combination of insect and machine and was a literal interpretation of Corbusier's aphorism of a house as a machine for living in. The pods were independent, yet parasitic as they could 'plug in' to way stations to exchange occupants or replenish resources. The citizen is therefore a serviced nomad not totally dissimilar from today's executive cars. The context was perceived as a future ruined world in the aftermath of a nuclear war.¹³

¹² Cook, Peter. Plug-in City. 2001.

¹³ Herron's, Ron. "Walking Cities in." Archigram: Magazine for New Ideas in Architecture (1961): 1961-1974.



Figure 2.6: Archigram’s Walking City: A 60’s Architectural Vision of the Future Instant City

Instant City is a mobile technological event that drifts into underdeveloped, drab towns via air (balloons) with provisional structures (performance spaces) in tow. The effect is a deliberate overstimulation to produce mass culture, with an embrace of advertising aesthetics. The whole endeavor is intended to eventually move on leaving behind advanced technology hook-ups. The group ignored contemporary notions of what could be built, and instead indulged itself with largely technocratic and completely unbuildable visions that drew inspiration from advances in technology and culture—like the launching of the first cosmonaut into space and the theories of Foucault and Barthes.¹⁴

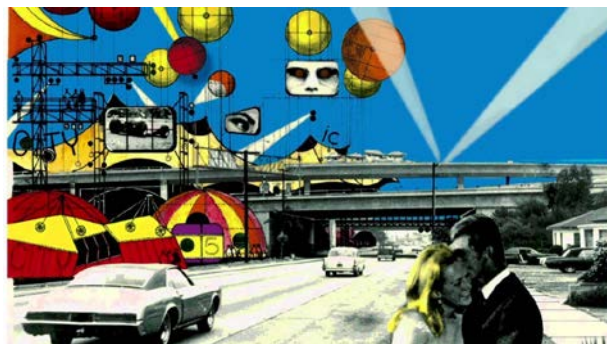


Figure 2.7: Archigram-Instant City Animation; Architizer

¹⁴ <http://architizer.com/blog/utopian-architecture>

Slice of life, Future Core, Residential Community

After you put these elements together (metropolitan, the region consisting of a densely populated urban core, livable cities and relation between population and livability with the happiness and satisfaction that we look forward for future living place, I reach into conclusion that we need to have multiple small cities (cores) inside the big cities that this colonies have features of small cities. Easy to manage and resource are not that limited. In this case connection between these networks and urban connectivity become more crucial than ever before. It depends on the location of core some features of this core can vary. But certainly they have many things in common.

The most important indicator in the future core is residential space that shapes inhabitant lifestyle and other community spaces. A house is a human product, and even with the most severe physical constraints and limited technology man has built in ways so diverse that they can be attributed only to choice, which involves cultural values. Moreover, house form is not simply the result of physical forces or any single casual forces, but is the consequences of a whole range of socio-cultural factors seen in their broadest term.

It can be assumed that future generation needs community spaces. This Communication would be either verbally or nonverbally, which could respond to many kinds of needs first to survive, then to produce and trade. Except these, it is thought that man has gained his “self” as a result of the face to-face communication. Significance of face-to-face communication in the formation of personality can be exemplified by a well-known and quasi-scientific and perhaps speculative story that provides mental development for humans structuring of face to face relationships with others. When humans are separated from the others, they become wild and do not have humane features anymore.

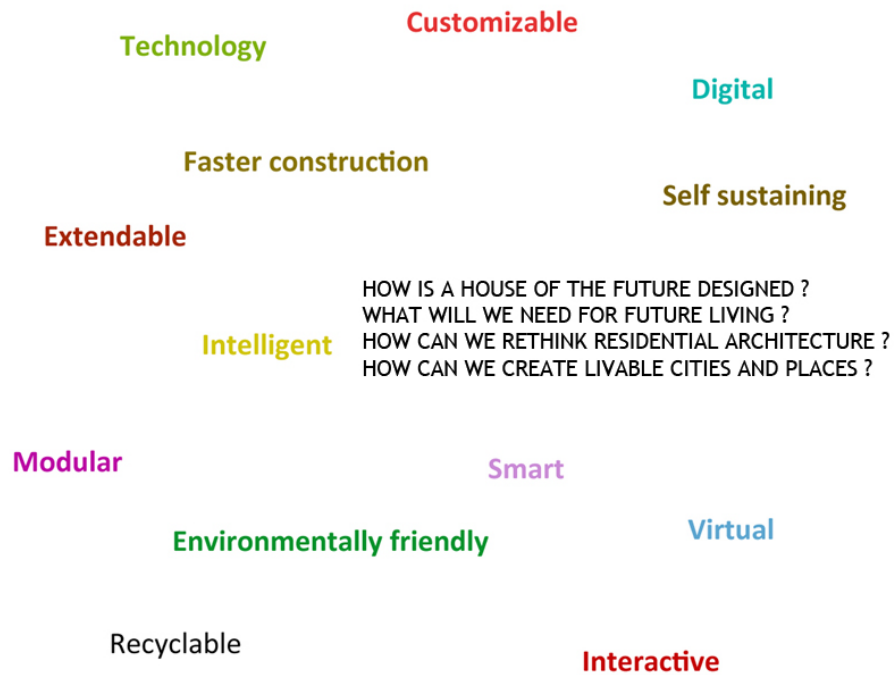


Figure 2.8: Different Concepts of Future Design; By Author

Factors Affecting Residential Areas and the Way of Life

The house is not just a structure but also an institution created for a complex set of purposes. Building a house is also a cultural phenomenon, and its form and organization are greatly influenced by social, physical and technological factors within the cultural milieu to which it belongs.

Thus, the function of a residential area is much more than a physical concept.

House cannot be seen in isolation from the settlement, but must be viewed as part of a total social and spatial system that relates to the way of life of a particular settlement. Men live in the whole residential spaces of which the house is only a part, and the way in which they use the

settlement affects house form. Kent (1990)¹⁵ pointed out that geography as well as architecture has usually separated the study of the house from the settlement, yet the need to look at the house as part of a larger system confirms that the house conveys little sense outside of its setting and context. Because the living pattern always extends beyond the house to some degree, the form of the house is affected by the extent to which one lives in it and range of activities that take place in it. So, the important characteristics of a settlement are that it will have the highest interaction in social and physical terms. The residential space and house form depend not only on one single factor.

As distinct cultural differences lead to variations in the way of life, the house form will also respond according to the people's needs, preferences and cultural values. Human behavior and action in any environment is evaluated by the individual's performance on space. The spatial interaction in any residential area can be understood in two steps;

First, the dwellers interaction within domestic space and secondly, the interaction outside the domestic space but within the neighborhood.

Altman and Chemers (1989) relate home as a reflection of cultural factors, environmental factors and technological. Therefore, a home reflects, simultaneously, many facets of culture in an environment, each of which is correct at some level of analysis but incomplete if some facet is missing.¹⁶

¹⁵ Kent, Susan. *Domestic architecture and the use of space: an interdisciplinary cross-cultural study*. Vol. 89035778. Cambridge University Press, 1993.

¹⁶ Altman, Irwin, and Martin M. Chemers. *Culture and environment*. No. 2. CUP Archive, 1984.

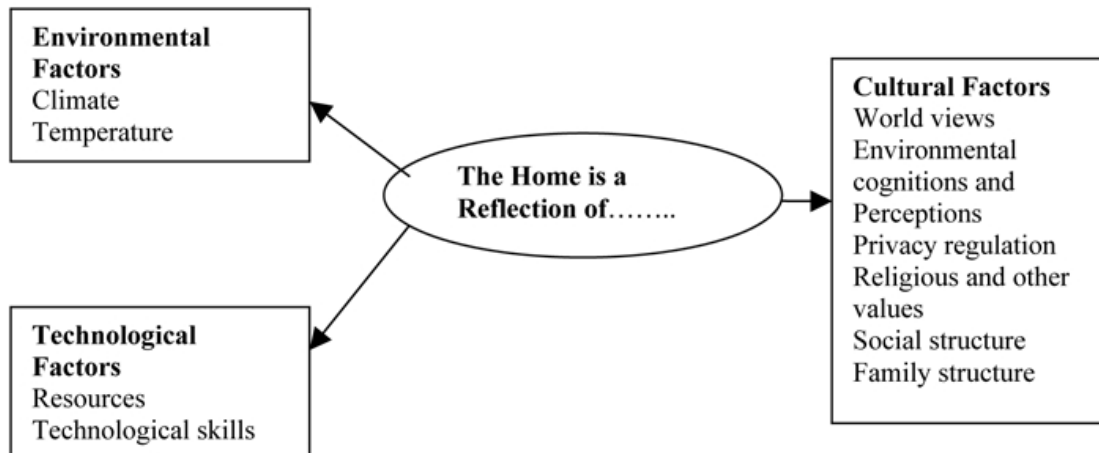


Figure 2.9: The home in relation to the other factors: Altman and Chemers, 1989:156

Here we may summarize theoretical approach for this thesis and organize major concepts around the specific questions:¹⁷

1. In what ways forms accommodate human behavior and adapt to human needs? How does the social group fit the form it occupies?
2. How do built form and design strategies express and represent aspects of cultures?
3. How is the spatial dimensions of human behavior related to mental processes and conceptions of the self?
4. How does society produce forms and forms produce society? What roles do history and social institutions play in generating the built environment?

¹⁷ Lawrence, Denise L., and Setha M. Low. "The built environment and spatial form." *Annual review of anthropology* 19 (1990): 453-505.

Aspects of Way of Life that Affect Residential Spaces

The overall concept of way of life does not help us to determine how it affects the form of dwellings or settlements. Perhaps it is necessary to understand the important components of the way of life, so that the changes in the physical structure can be understood. There are thousands of different ways in expressing the design of a single house where same objectives can be met. So, the way house takes certain forms should be more important than the shape it has.

Rapoport (1984)¹⁸ pointed out five important aspects of the way of life by which certain forms are take place in physical space. This conceptual framework, would help to think about the subject. Conceptual frameworks are neither models nor theories, models describe how things work, whereas theories explain phenomena and conceptual frameworks help to think about phenomena, to order material and revealing pattern and typically leads to models and theories. Although these important aspects were mentioned for traditional and vernacular settlements, it is valid for the understanding of the way of life for any culture in an urban areas¹⁹

- a) Basic needs
- b) Family structure
- c) Position of women
- d) The need for privacy
- e) Social action.

¹⁸ Rapoport, Amos. "Thinking about home environments." *Home environments*. Springer US, 1985. 255-286.

¹⁹ Rapoport, Amos. *Human aspects of urban form: towards a man—environment approach to urban form and design*. Elsevier, 2013.

Precedent studies about future of Residential community

In this section precedent studies about residential complexes in different cultures will be discussed to see how ideas and design concepts can be different and at the same time what aspects are in common regarding dwelling units.

Farmscraper-Vincent Callebaut-China

Belgian architect Vincent Callebaut has developed a concept to introduce natural ecosystems into cities with designs for "farmscrapers" made from piles of giant glass pebbles for a site in Shenzhen, China



Figure 2.10: Asian Cairns Farmscrapers-Vincent Callebaut; Inhabitat.com

As a response to the rapid urbanization going on in the country, Vincent Callebaut wanted to completely rethink the current structure of cities and do away with suburbs. "The more a city is dense, the less it consumes energy," he explains.²⁰

The architect proposes a new type of urban habitat based on the rules of the natural world, with stacks of giant pebbles housing entire communities. All energy would be sourced from the sun and wind, anything produced would be recyclable and local expertise would be capitalized wherever possible. Residents of each tower would also work there, reducing the need to travel. All food and commodities would be produced within the building, in suspended orchards and vegetables gardens, plus all waste would be fed back into the ecosystem. "The garden is no more placed side by side to the building; it is the building!" says Callebaut. "The architecture becomes cultivable, eatable and nutritive."



Figure 2.11: Perspectives of Farmscrapers; inhabitat.com

²⁰ www.dezeen.com/2013/03/21/asian-cairns-by-vincent-callebaut

La Folie Divine, Montpellier, Farshid Moussavi Architecture

The City of Montpellier intends to stimulate and encourage architectural innovation through the construction of twelve architectural "Follies" on its brownfield sites.

The site of the project, Lot M2, is located on the periphery of Montpellier surrounded by a green environment. To minimize impact on the landscape, the 11-storey residential complex is designed in the form of a tower with the smallest possible footprint. The tower's small floor plates, when compared to a residential slab or block, provide the residential units with the least possible internal shared circulation space, and therefore the maximum amount of privacy. Each floor divides into four residential units which are dual aspect and benefit from multiple views of the exterior and natural cross-ventilation. Instead of adopting a rectilinear geometry, which is restrictive as it prioritizes right angle orientations, the curvilinear floor plates provide multi-directional visual communication between the interior and the exterior. The exterior walls grow larger and smaller in relation to the size and proportion of each room, introducing convex and concave geometries in the different rooms as well as the external terraces, and bringing in different views and light.



Figure 2.12: La Folie Divine, Montpellier; farshidmoussavi.com

The curvilinear geometry also breaks down the traditional valence between interior and exterior because the visual experience of looking out of the building from inside is embedded with so much variety. Each floor plate is designed to accommodate four residential units around a central core. Five different unit typologies are distributed in a variety of orientations around the central core, providing the apartments with differentiated relationships to the exterior and therefore increasing the amount of choice residents are given in terms of the relationship of their unit to the external context. The irregular curvilinear design of the building has the extra advantage of self-shading parts of the exterior envelope against the strong Montpellier summer sun – whereas the curvature on the north side is more gradual, it is intentionally more acute on the southern exposure. Areas of the exterior not self-shaded by the building silhouette are provided with operable louvers which will add a sense of temporality and vitality to the building, akin to a piece of nature changing over time.



Figure 2.13: La Folie Divine, Montpellier; other views

Connecting Riads Residential Complex-Casablanca-AQSO Arquitectos

The project is located on the east side of Anfa district in Casablanca, a downtown historic area in the vicinity of an old airport to be demolished. The plot is situated between the Gran theatre boulevard and a residential area composed of low buildings and an urban park. The scheme is solved conceptually as a continuous block aligned to the surrounding streets and wrapping around two big 'riads'.

In this way, the building grows to offer an urban character towards the boulevard and reduces its scale to the opposite side. The upward volume allows the apartments to enjoy the view of the park. The building façade turns into two different strategies: the exterior skin facing the most public context becomes an introverted and formal element while the interior one facing the private courtyards becomes extrovert and domestic

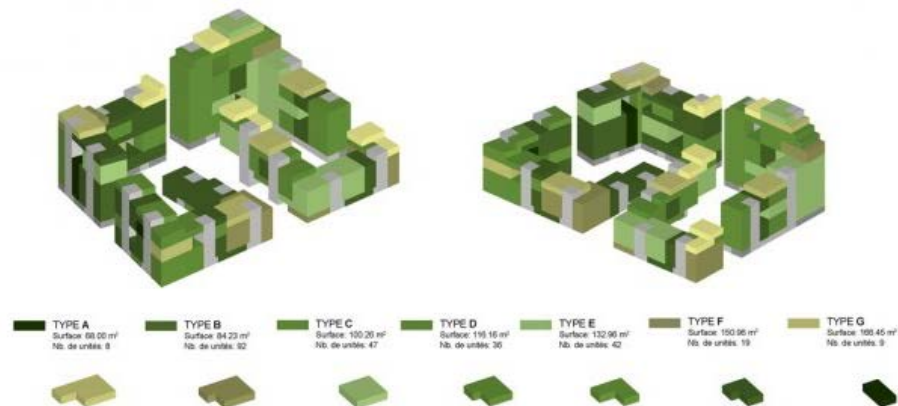


Figure 2.14: Arrangement of Different types; aqso.net

The first one is made by long balconies enclosed by sliding latticework panels and the second one is just a white and plain surface only interrupted by long windows and big protruding balconies. These elements are arranged in an irregular order, and hanged on the wall like flowerpots in an Andalusian patio. The building block is also perforated through big openings working as green terraces and allowing good ventilation and views.



Figure 2.15: Connecting Riads Residential Complex / AQSO Arquitectos, model

When the scheme goes to that phase. And even when the construction is completed, the built form goes through a transformation process when it is occupied. People always customize the environment around them. The most flexible architecture lasts the longest and has an expression that can be always reinterpreted. Architects predict, as seers, movements, needs, growths and emotions at social and individual level. They frame, organize and enclose them with Architecture. This is why, contrary to other art works and as Adolf Loos said, architecture must satisfy everyone, because we all are users of a space when we occupy it.²¹



Figure 2.16: Connecting Riads Residential Complex / AQSO Arquitectos

²¹ Crompton, Andrew. "The architecture of multifaith spaces: God leaves the building." *The Journal of Architecture* 18.4 (2013): 474-496.

Tehran Tower-Iran-CAAT Architecture Studio

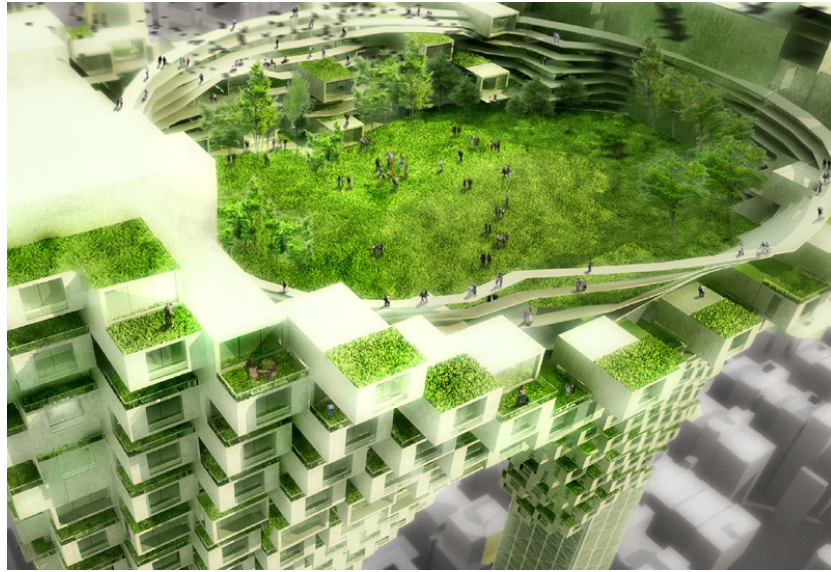


Figure 2.17: Courtesy of CAAT Architecture Studio

Tehran, Iran's largest city and its capital, is plagued by extreme air pollution, 80% of which is caused by auto traffic. Amongst its 8.5 million residents, it is estimated that 27 people die daily from pollution-related diseases, showing the tangible and deadly dangers that result from the traffic caused by urban sprawl. To combat this reality, the designers of the Tehran Tower propose building up, locating massive skyscrapers within Tehran to house masses of residents centrally.

The overall shape for the tower is inspired by *muqarnas*, traditional Iranian vault and cable systems. Like concave vaults between two pillars, the residential units will hang in masses from the two sturdy legs of this structure. The legs are composed of trusses with parking cores at the bottom. Cars park up the legs until the building convenes in the middle. This helps keep them lightweight, and the structure as a whole flexible in the case of earthquakes.

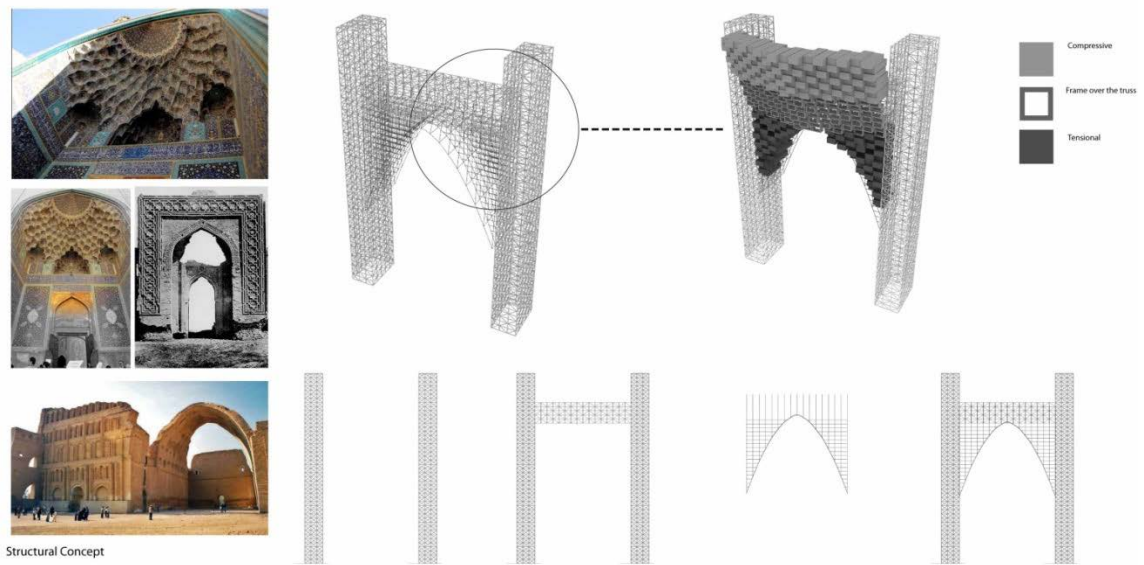


Figure 2.18: Tehran Tower / CAAT Architecture Studio- diagram; Archdaily.com



Figure 2.19: CAAT Architect Studio-Perspective of Tower

On the top of the structure, a solid floor is laid atop the hanging cells to create a green rooftop expanse to be enjoyed by residents. The tall height of the garden and the prefab residential cells help protect them from the noise pollution of the city, and subtle structural design elements provide shading to units in the summer to protect them from the harsh sun.

CHAPTER 3

RESEARCH IN PARTICULAR AREA

Housing Sector

Housing has been a major challenge for the rising population of countries during the last decades especially in developing countries. Besides, the need to high-density housing systems due to rising population has become a central issue to most urban design or renewal programs in the late 20th century. Therefore, residential complex has rapidly developed into one of the most important prototype of modern housing in urban and metropolitan areas especially in developing countries leading to unprecedented challenges from the sustainability point of view. On the other hand, despite existence of many sustainable principles of residential architecture in ancient era, diverse housing problems and issues have originated in modern housing patterns of urban areas due to consequences of the process of uncontrolled urbanization and industrialization. It is obvious that in most cases, ancient principles of sustainability which have stood the test of time have been ignored in modern housing strategies and plans leading to obstacles in achievement of sustainability in residential buildings. In this thesis, the intention is to introduce and analyze traditional strategies and consider residence satisfaction, needs and culture to develop a new and modern approach in housing strategies and policies in Tehran metropolitan for years to come.

The past three decades have witnessed the extraordinary growth of Iran's urban areas. Rapid expansion of cities in Iran has been caused by many factors including regional conflicts, industrialization, uneven distribution of health, education and infrastructure services in the country and many other detectable and hidden factors²². Iran is facing tremendous challenges: in

²² Majedi, H. et al., (2012). An Analysis to Challenges of Sustainable Urban Transport in Metropolitan Area, *Journal of Basic Applied Science & Research*. Res., 2(10).

the last 30 years, the country's population has doubled up to 73 million inhabitants in 2009. The median age is 23.5 years and in 2005, 25 % of Iran's population was in the age group of 15 to 24 years. Besides this natural demographic development, a massive rural-urban migration has led to an explosive urbanization since the 1960s, which is expected to continue in the next years²³

The main arena of these drastic challenges is the Tehran Metropolitan Region being one of the most rapidly growing agglomerations in West Asia and the Middle East. In 2016, approximately 14 million inhabitants were residing in the Metropolitan Region (i.e. Tehran Province; Statistical Center of Iran, 2016), converting Tehran into the political, economic, cultural and social center of the country.

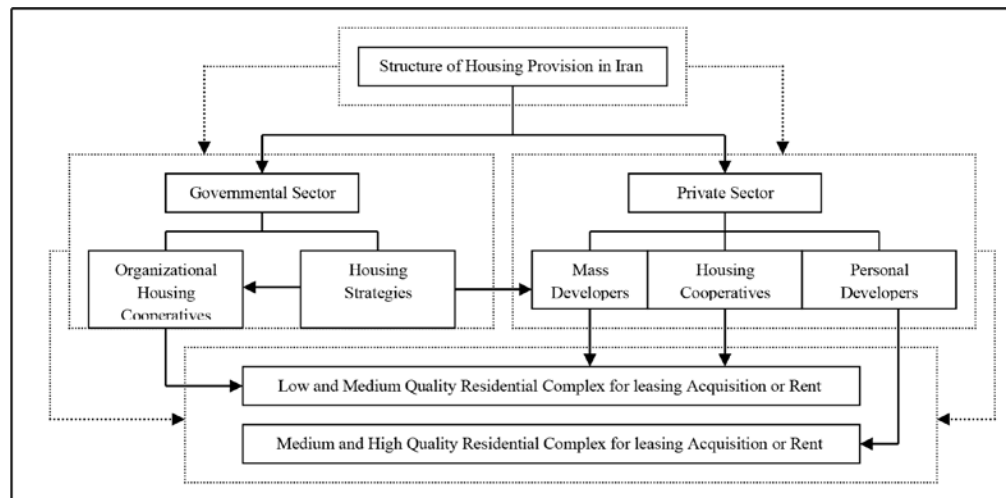


Figure 3.1: Structure of Housing provision in Iran²⁴

As it is shown in this figure structure of housing provision in Iran divided into private sector and governmental sector that private sector is more focus on medium and high quality residential complex and governmental sector was planning for low income group of the society.

²³ Seelig, Sebastian. "A master plan for low carbon and resilient housing: The 35ha area in Hashtgerd New Town, Iran." *Cities* 28.6 (2011): 545-556.

²⁴ Armanshahr Architecture & Urban Development, 5(10), 93-102, Spring Summer 2013

General obstacles of achieve suitable housing provision during last two decades in Iran can be explain as following categories:

- The introduction and implementation of national mass-housing regulations has failed to achieve the planned goals in most cases, especially for low and medium income households living in metropolitan areas.
- Most part of the planned affordable housing includes uniform and minimalistic apartments which are not suitable for cultural needs of low and medium income families leading to social and cultural problems.
- The size or the physical condition of the mass construction houses is not suitable for a crowded household which leads to psychological problems.
- Most of the mass constructed houses are apartment blocks which lack climatic and environmental characteristics of traditional houses. Lack of climatic approach leads to higher energy consumption and uncomfortable interior spaces

Modern housing pattern in Iran, like other developing counties, is also a victim of rapid increase in urban population as a result of very fast rise in its population – contributing to housing challenges extremely among the increasing young cohorts. Iran, in the past few decades has rapidly changed from a more traditional society into a modern society and from extended family system to nuclear family system in which the housing of the youth has become more acute and problematic. So with increasing population and changing family system the need to rethink and renew the residential projects are necessities.

Residential Satisfaction

Generally, residential satisfaction is considered as one of the criteria of residential quality, neighborhood satisfaction is an important component of life satisfaction.

Designers should take into account not only the needs but also the perceptions of the residents in order to create more harmonious residential environment, maximizing comfort with the resources at their disposal. Corresponding other researchers (Bonaiuto and colleagues) it is assumed that residences should not be isolated from their social and physical surroundings. Satisfaction needs a multi-faced structure, including (Architecture, Urban form) Social (people and social relationships) and functional features (services and facilities)

A main attempt to determine the residential satisfaction in Iran was the role of housewives residing in the neighborhood. Attributes such as security, cleanliness and sociability of neighbors are more effective on residence satisfaction than facilities, accessibility and physical features.

Residential satisfaction is considered as one of the criteria of residential quality, neighborhood satisfaction is an important component of life satisfaction. This thesis is tried to find the most influential criteria in residential environment increase our satisfaction. And base my design process based on developing these features including spatial, social, functional and contextual features. These are the most important criteria effect on resident satisfaction in different residential layout.

The spatial features were assessed from three main factors comprising privacy, naturalness and coherence. Coherence and naturalness are key for visual concepts for analyzing sight landscape features. And third factor, privacy, rooted in Iranian culture. Privacy is a general concept relating to controlling over intrusion of all kinds: unwanted callers, people looking in at the windows, neighbors listening to family conversations, or noise and traffic. The courtyard offered some measure of privacy. Perception of privacy are varied by people, considering their

background, implies on relativity of privacy. Compared to Iranian traditional life, the new residential open spaces are assumed as semi private and even public space. So, the meaning of privacy has lessened gradually to the condition where people can be there without interference by other.

Naturalness was perceived closeness to natural state. In an urban environment, the experience of nature within the city enhances well-being, supports health, increases a sense of safety and inspires Iranian traditional courtyard. Coherence describes the unity of scene which is the most-used concept in exterior landscape and interior spaces. Repeating patterns, colors, texture and correspondence between land use and natural condition enhance the coherence in spaces. Privacy and coherence have the same weight on spatial feature, followed by naturalness. The meaning of privacy has gradually changed and people expectation of privacy is not the same as before. But sense of privacy is still essential in people's satisfaction with their living spaces. Sense of privacy and hierarchy of space are factors behind privacy while location and dimension of green spaces and community are factors behind naturalness.

Contextual features have some latent variables which is the second considerable criteria that influence satisfaction. Safety and maintenance are two main criteria for contextual features which are considered in different part of open space. Social features were measured through three main questions: compatibility with neighbors, friendship between neighbors, and companion. Defining residents profile and combine these different types of family according to their social needs help us to increase the quality of social features.

Functional features, were asked through passive and active engagement with the environment. Active engagement refers to more direct experience with the place and people within it such as walking, playing, chatting, exercising while passive engagement can lead to a sense of relaxation. To develop this feature, livable cities criteria were explored and reached the

conclusion that in the big scale we need to add some functions that are not provided in the surrounding area in master plan, and consider some function for clusters that respond to their daily activities.

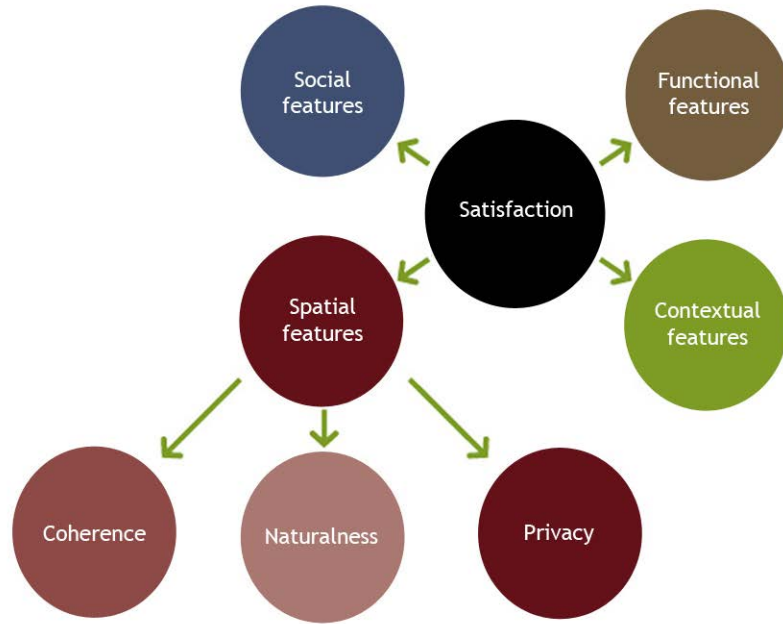


Figure 3.2: Conceptual model of evaluating residential satisfaction; by Author

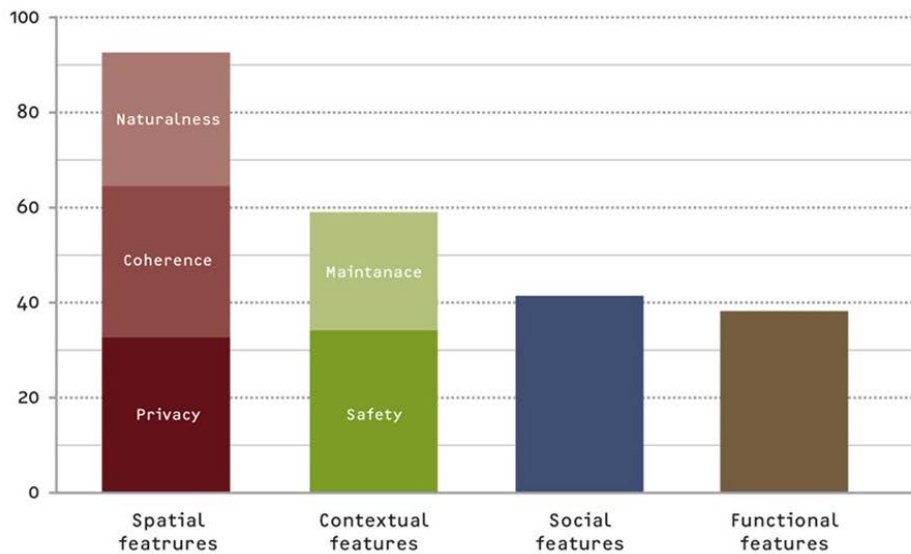


Figure 3.3: Comparing different criteria associated with overall satisfaction

Residential Open spaces

Spatial limitations of metropolitan cities encourage development of residential complexes instead of small houses but on the other hand, neglecting the importance of the private yard. In addition to providing accessibility to the sun light and natural ventilation, Open space affords an opportunity of direct connection to nature and creates a place for social interaction.

Open spaces as a complementary part of building mass, adjusting building and human density. In contemporary urbanism, homes inner spaces have been decreased and shared common spaces have been increased because of the land and economic limitations. Public space in the contemporary city is considered more as a secondary space. It should cover a huge part of everyday activities. So it should be considered in residential spaces design process.

We need to make the typology of residential open space that increase concentration to the space between building and notice architects to design interior and exterior place simultaneously. All residential complexes in the eight districts in the north of Tehran, allocated more than 65% of the site to the open space. But results show that in Tehran, designing open space do not have the priority in the design process, and main considerations are drawn toward interior space. In some cases open space is as a negative space between buildings.

Appropriate design of public open spaces, will change the living quality and consequently, residence perceptions of the total space of the complex.

Memarian (1993)²⁵ identified six main functions for courtyard, by references to variations of types in Iran, including demarcation of limits of property, definition of place of privacy for the family, unification of the space and elements, provision of circulation, creation of

²⁵ Memarian, Golamhossein: An introduction to house typology in Iran: Courtyard houses (in persian). Tehran: Iran University of Science and Technology (1993)

a garden or cool place and finally promotion of ventilation. Haeri (2010)²⁶ classified open spaces in traditional house in distinct levels, including courtyard, terrace, sharemi, mahtabi, and roof as shown in figure 3.4. In traditional courtyard houses, family spend much of their time in the semi-open spaces where inside and outside spaces combined together through medium spaces such as Ivan, Mahtabi.

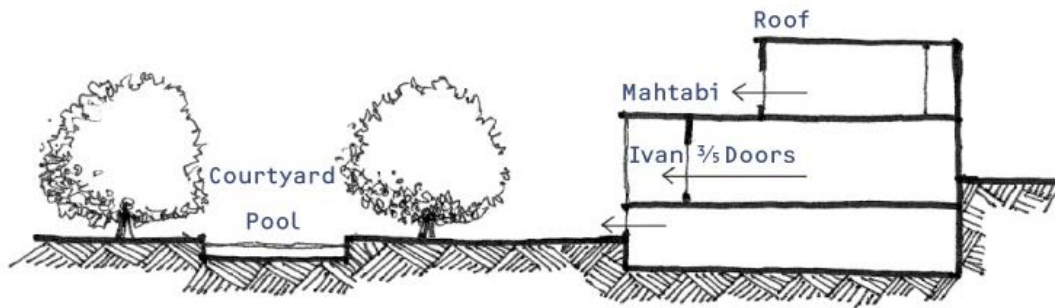


Figure 3.4: Different types of open space in Iranian traditional house

Pirnia (1988)²⁷ claimed that by increasing the main central part of buildings, it was built coverless and turned into the courtyard. Afterward, the structure of house was built based on the position of the courtyard, according to the figure 3.4. Some spaces of the house were named considering their openness to the courtyard such as Se-Dari (three doors) or panj-Dari (five doors) rooms. While more than a family lived in a house, sequential connected courtyards were built.

²⁶ Haeri, Mohammad Reza: House in culture and nature of iran (in persian). Tehran: Architecture and urban development research center (2010)

²⁷ Pirnia, Mohammad Karim: Become familiar with iranian islamic architecture (in persian). Tehran: University of Science and Technology Press (1988)

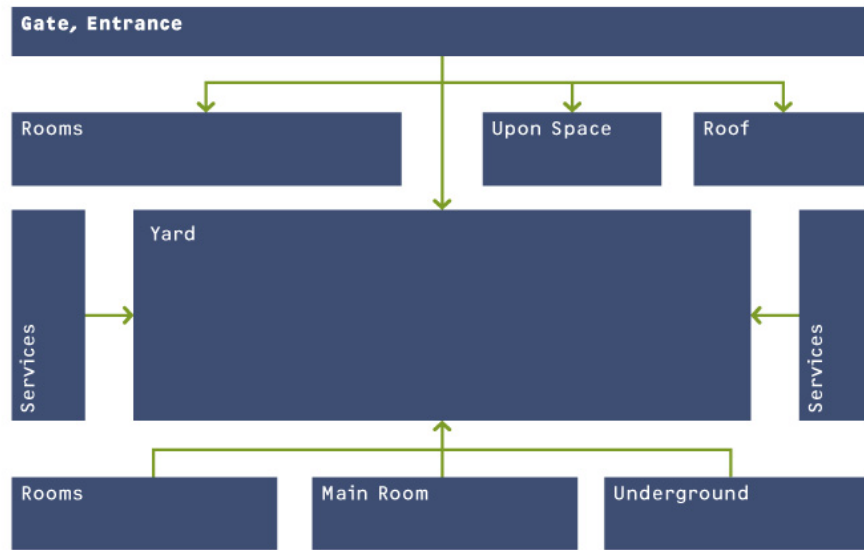


Figure 3.5: The structure of traditional house and sequence of space (Haeri 2010)

Nowadays, the location of the cars is so important. In the contemporary city, streets have found a significant position where buildings are following the patterns of streets.

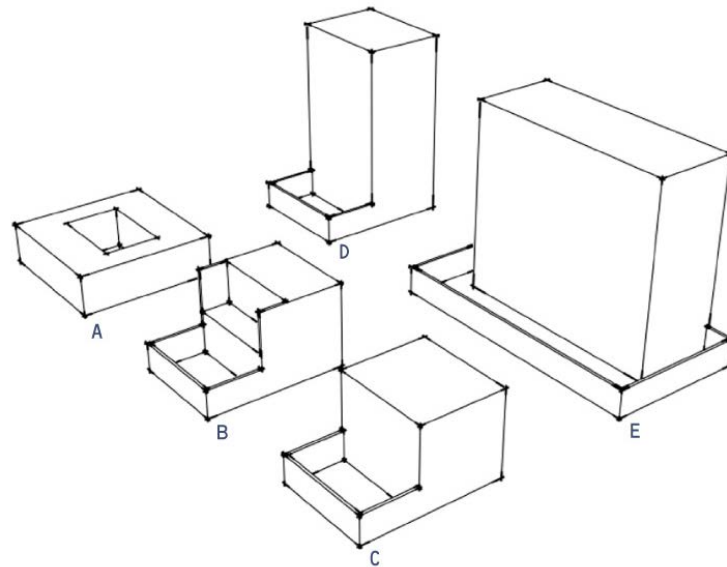


Figure 3.6: The changing pattern of the building from (A) Inward courtyard house (B) Outward medium-rise house with huge balcony (C) Outward medium-rise house (D) High-rise apartment buildings (E) Large scale apartment building

The position of open space in Iranian residence is introduced, followed by the influential criteria on residential satisfaction. Yard was one of the most important parts of Iranian traditional house. Lots of activities depending on the climate situation were occurring there. Open spaces as complementary parts of building mass, adjusting building and human density. In contemporary urbanism, according to the land and economic limitations, while the home's inner spaces have been decreased, shared common spaces have been increased. Thus, private courtyards for most of the families is not affordable. Appropriate design of public open space will change the living quality and consequently, residence's perceptions of the total space of the complex.

In the creation of green and open spaces, it is necessary to consider easy access, comfortable and quiet space of relaxation, reducing vulnerability, recreational facilities and optimization of communication networks are more important factors to improve.

Arrangement and Typology

Population composition within the residential environment is of particular importance. The variables determining the types of social interaction include economic, religious, educational and occupational factors. The coexistence of different levels in these variables will effect social interaction in varying patterns.

Analytical results indicate that four dominant types of arrangement are free standing, linear and centralized blocks and combination of two types. These categories are according to how access to buildings and interior spaces connections are and how open and closed spaces are located next to each other.

Centralized blocks: This arrangement is coincident with Iranian traditional internal yard house. Main unit elevation is faced to public domain. Private spaces face the backside of the building. This arrangement around main core cause to shape private open space that can be used by neighborhood units. Or can be divided into smaller private pieces.

Free standing blocks: These blocks are the common type in the Tehran macro scale residential complexes. This type allows designers to create different space quality, for instance, hierarchy of private and public space. In this typology high-rise blocks stand separately. In this case, possibility of natural ventilation and daylight are more than other arrangement types.

Linear: arrangement is a conservative method founded on the existing context of the city. And direction of these blocks follows climate measures and urban regulation and district.

Combination of these types

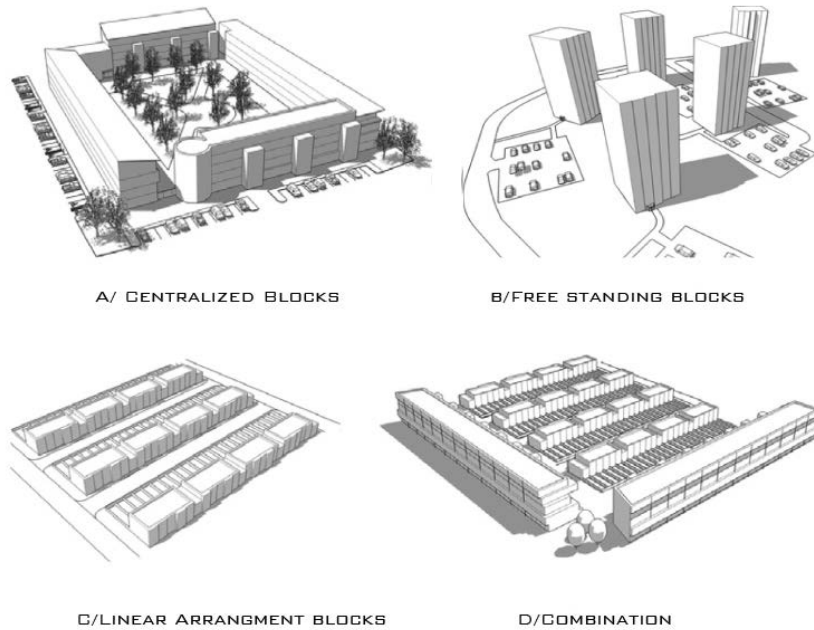


Figure 3.7: Types of Arrangements²⁸

Investigating the most important criteria in the dwelling environment influenced residents' satisfaction.

The studies implied that overall residents' satisfaction was associated intensively with spatial feature of complexes, sense of privacy, coherence and safety are the most important features affect residents' satisfaction.

²⁸ Biddulph, Mike. (2007) "Introduction to Residential Layout" ,Amsterdam, Architectural Press.

Iranian Traditional Houses

Iranian traditional houses have a kind of internal spaces structure on the basis of religious and traditional ideas of the Iranian families.

Spatial flexibility, legibility, introversion, spatial hierarchy and respecting family privacy have special position in architecture of Iranian houses which has been replaced by extravert architecture.

Living in contemporary houses has caused problems such as decrease of attachment feeling, tranquility and emergence of emotional and family problems.

This section compares architectural plans of Iranian traditional houses with the contemporary houses by studying them and emphasizing on their space quality and richness to take effective step for inclusion of these forgotten concepts in the single-dimension spaces of the contemporary houses while introducing spatial concepts of these houses.

It is evident that goal of this comparison is not to encourage to imitate the past architecture but is to recognize these valuable historical treasuries their spatial concepts and effort to use them in contemporary houses because it was not possible to use traditional models in our future concept of living

Today, some problems such as population growth, shortage of land, etc. threaten our societies now and even more dramatic ways in the future.

House is a stable and reliable place for meeting mental needs of the occupants. House is not only a private area, but also the main illustrator of private area of the human being. Domain of house and family is an institutionalized area of private life of the person (Madanipour 2003)



Figure 3.8: House of Tabatabai, Kashan; Internet

Spatial structure of the traditional houses: we can mostly see the following sections in residential houses:

1. Platform: a place in two sides of the entrance door for taking rest while waiting, for entrance, or for talking with the neighbors.

2. Entrance door: in most residential houses, entrance doors are paired and wooden and any pair has door knocker which has been installed on pairs of ring. The door knocker with low voice is used by the women and hammer knocker is used by men. This factor contributes to separation of genders and areas which start during entrance to the building.

3. Vestibule: immediately after entrance to the building, is the lobby space which is in the form of octagon or tetragon. The lobby has a short ceiling so that feeling of privacy is conveyed passing from the entrance space into the vestibule. The vestibule is a temporary waiting space and has sitting platforms which have been designed as two separate parts, one each for the use of men and women. In this semipublic place, gender privacy separation is emphasized.

4. Corridor: a space with a spiral design that directs the entrant from the lobby to the yard. Spire of the corridor is for respecting the family privacy so that no person can enter this privacy directly. Also, this corridor blocks the direct view into the private space.

5. Yard: yard in the old houses is located in center of the building and is regarded as the heart of the building. The yard with the patios around it was used as a place for holding the different religious and cultural ceremonies of the house residents.

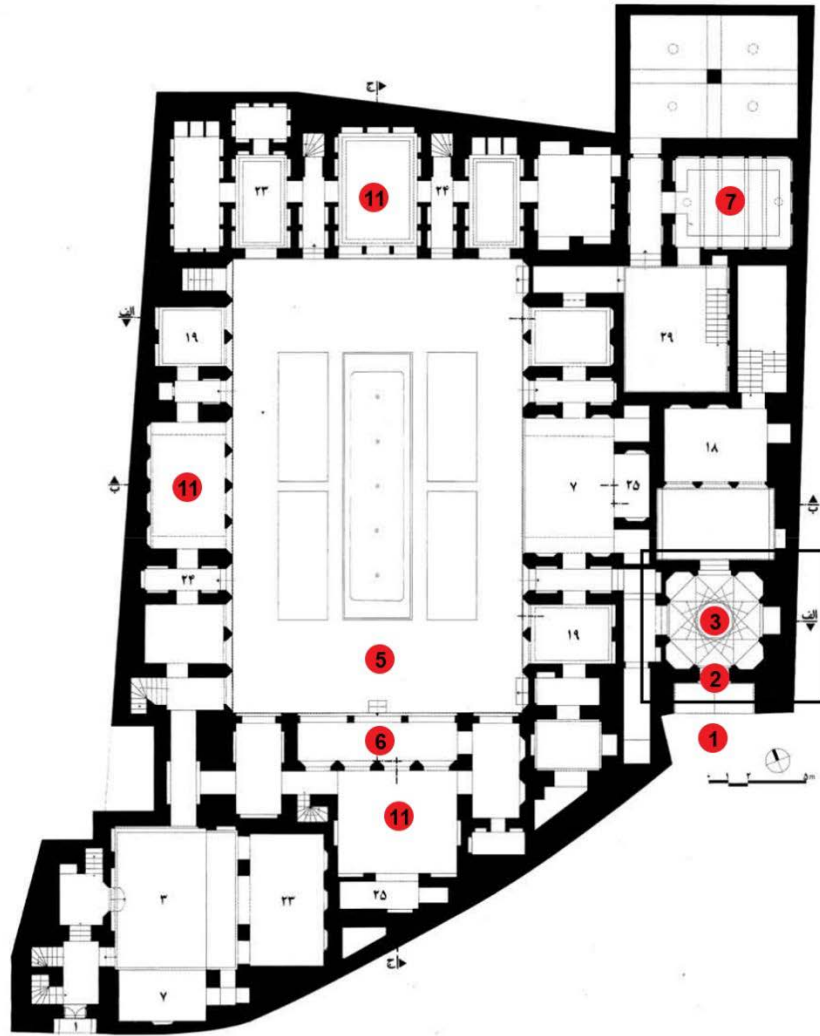


Figure 3.9: Plan of the first story of Akhavan Sigari Yazd house²⁹

6. Eivan: Eivan was a partially roofed space which surrounded the yard and was regarded as intermediate space between yard and building. Climate and hierarchy of space had important role in shaping this kind of space.

²⁹ Yazd Houses Treasure Book, 2004

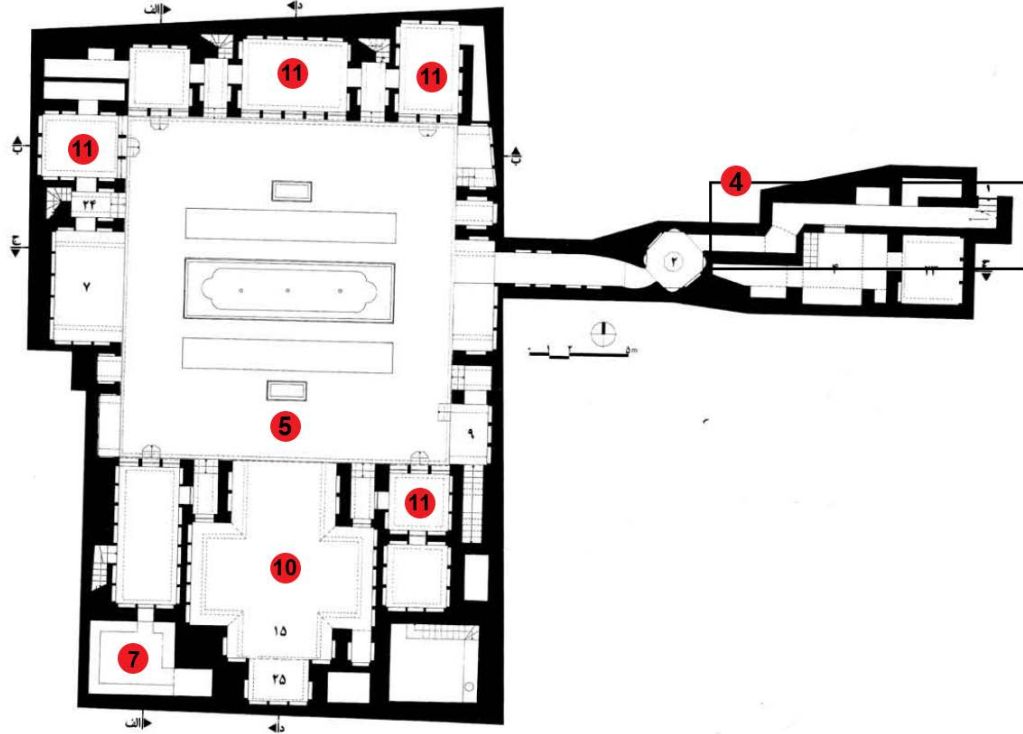


Figure 3.10: Plan of the first story of Semsar yazd House, Yazd Houses Treasure Book 2004

7. Kitchen: it is square or rectangular which had been designed in basement of the building with fuel store or was stuck or separated in corner of the building. Kitchen was not built in direction of the main axes of the building or beside important and main spaces.

8. WC and bathroom: they were located in lower surface of the house for two reasons: easy use of water and its drainage and its heat

9. Bathroom: bathroom was divided into two parts: one for changing dress and another one for washing which has been designed on basement.

10. Reception Hall: this element is a space with abundant decorations and designs which is very important beside simple rooms of the house. This space is linked to yard of the house with five-door and seven-door sashes and is used for hosting the respectful guests of the owner.

11. Room: The rooms were known by their morphology, the number of doors or windows: panjdari, as a room with five doors, sedari; as a room with three doors, the time of usage (winter room), and only rarely according to their function (kitchen). According to their functions, rooms in traditional houses had specific dimensions. Bedroom was designed according to human height. The depth of rooms in courtyard houses were matched with their function and considered the daylight. Light shafts of these rooms had different design according to the sun direction during the day. In summer zone some parts such as teser or tacher or summer room had these light shaft to control the sun light into space.

12. Summer room and winter room: One of the most important aspects of this kind of designing is daylighting and sun direction in different seasons. Light for home to give thermal, visual and psychological benefits to their users should be an important principle for designers. Light can change the quality of space and phenomenon. In most buildings which had been constructed in such way, summer room was very important and was designed in more than one story. Use of decorations and all kinds of plasterwork and tile in this place gave more beauty to this part of the building than other parts of the building.

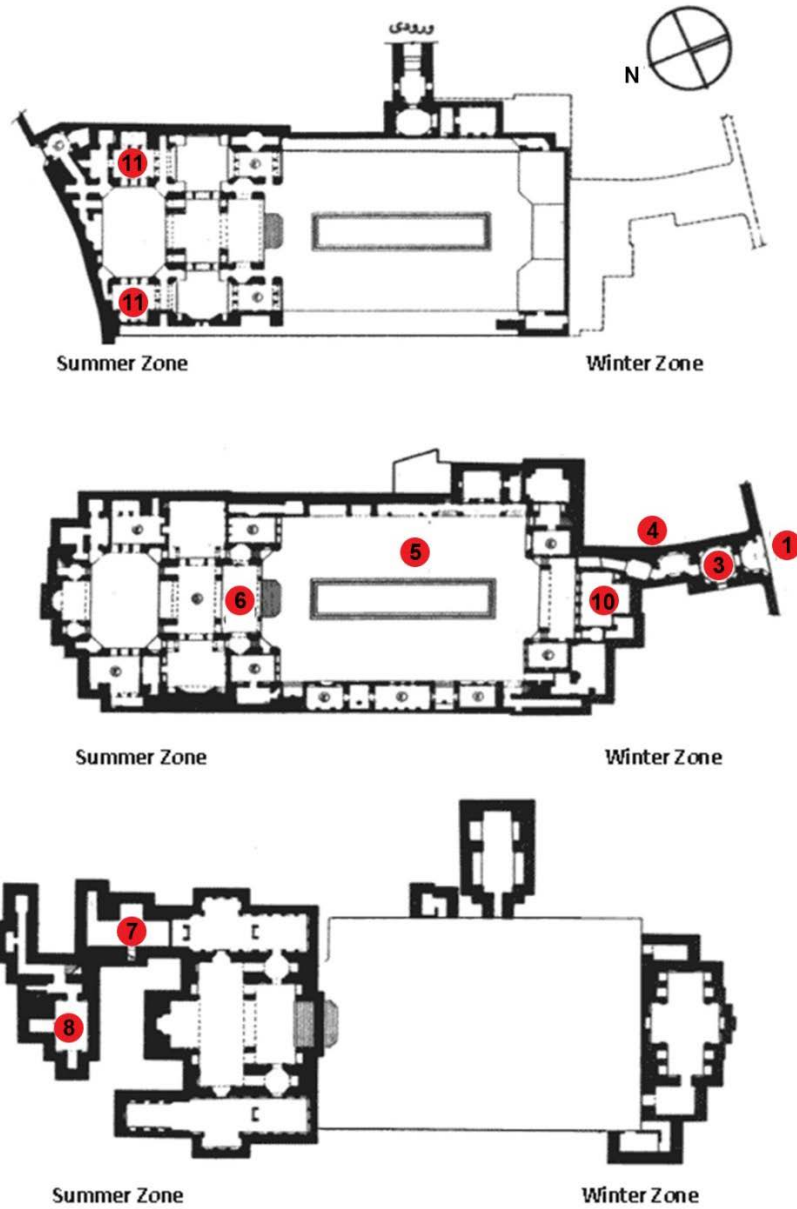


Figure 3.11: Plan of Broojerdiha kashan House, internet

Designing each of the full and empty spaces like the court yard with tall and shading walls, enclosed spaces, porches, rooms in different directions, corner rooms with wind-catcher and pond, basement and roof is for special hours of day and night of cold-average and hot season. And a person can change his/her living space in harmony with regional changes. The houses of court yards with indicators like thick walls, porches, underground, wind catcher, vault and dome, are clear examples of architect understanding of environmental conditions.

Concept of quality in traditional Iranian houses

Architecture of Iranian traditional houses was lively and joyful and had dynamic and mobile spaces.

1. Spatial legibility: traditional houses have spatial legibility. The legibility means that we can recognize all spaces and components of the house and link them in the mind as an interrelated form. Such quality in the Iranian house permits the person to go from one place to another place with clear image of environment. Physical realization of this concept in these houses can be found as soon as one enters the house.

This indicates the quality in house which creates a clear image in mind of each observer. Spaces in house not only are visible but also communicate to all human senses as a place for life. Legibility helps the person find himself in space and feel safe and be guided in that space (Naser Fakoohi)³⁰

2. Simple but varied: rooms are constructed in Iranian houses as Seh-dari, Panj-dari and Reception hall spaces each having its own specification. One of the interests of Iranian in construction of houses is to establish visual relation between room and external space

An Iranian house is a simple and plain but also varied with all kinds of different spaces. Plainness means that these houses are not decorated with additional and meaningless luxuries and appurtenances. In case that meaninglessness prevention is one of the Iranian architecture principles, variety of rooms (Seh-dari, Panj-dari adjoining room), variety of vault surfaces, lower house, upper house, variety of floor coating (water, tree flower and vegetables), all kinds of bricks and height variety and other features have made Iranian house spaces more interesting and mysterious. Variety of places and spaces allowed variety of routine actions. The roof provided an independent place for realization of functions as a defined place. Water in most houses, its flow

³⁰ Fakoohi , Naser, Urban Anthropology , Tehran , Nei Press, 2004

and spaces resulting from directing and storing. It adds varied spatial equipment to the spatial structure of the houses. Spatial structure of the Iranian houses with its varied surfaces and spaces allowed unlimited freedom and perception of many spatial experiences (Haeri)³¹.

This spatial variety which is caused by spatial enclosures, light quality and airflow made residents of these houses sensitive to spatial quality as their perceptions of the house space included all of these varieties and can be described and expressed (Haeri).

3. Domain: Iranian traditional houses are spatial units which create a domain and personal space.

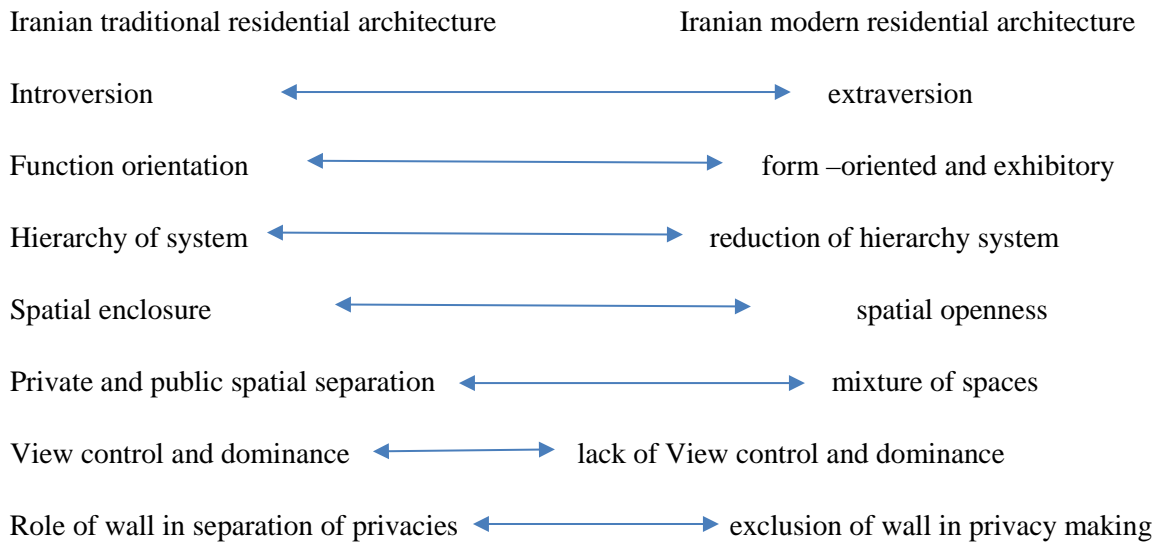
Public domain included some spaces such as alcove, five-door room and hall in which some activities can be performed such as hosting and holding different ceremonies. Family domain includes spaces such as yard, room and pool in which activities are performed such as gathering of the family members and some close friends and relatives and housework and personal works. Private spaces include spaces such as backroom, Do-dari room and Cellar or some activities are performed such as sleeping, taking rest, privacy, attendance of one or two persons in space. Domain border inside and outside the house is not a separating line, set of consecutive spaces of the portal, lobby and corridor distinguish between these two domains.

4. Introversion: introversion means a principle in architecture of Iran and can be understood and observed in different forms. In Iranian architectural culture, actual value is given to the essence and intrinsic core and apparent shell is a figurative shell which protects a reality and of which internal and closed space determines essence and existence of the building and is not comparable to external space and aspects. Introversion seeks to protect an environmental

³¹ Haeri Mazandarani, Mohammad Reza, on the basis of study project finding and application of architectural principles of traditional houses in design of modern house, Abadi Magazine, No. 23, Tehran, 1996

privacy in which physical conditions with thought, deliberation and worships have been turned into balanced and high order in order to reach its origin and relaxation (Habibi).

Physical differences in the past and present traditional architecture



CHAPTER 4

DESIGN PROCESS

Introduction of Tehran

Tehran is the capital of Iran and Tehran Province. With a population of around 8.3 million and surpassing 14 million in the wider metropolitan area, Tehran is Iran's largest city and urban area, and one of the largest cities in Western Asia. Tehran is ranked 29th in the world by the population of its metropolitan area.

Climate

Tehran features a semi-arid, continental climate. Tehran's climate is largely defined by its geographic location, with the towering Alborz Mountains to its north and the central desert to the south. It can be generally described as mild in the spring and autumn, hot and dry in the summer, and cold in the winter. Because the city is large with significant differences in elevation among various districts, the weather is often cooler in the hilly north than in the flat southern part of Tehran.

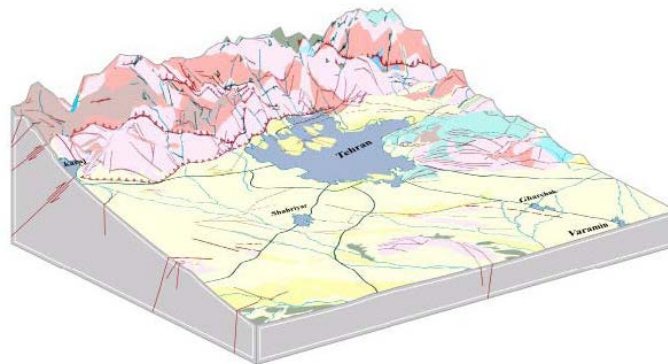


Figure 4.1: Block diagram of geomorphology within Tehran limits³²

³² <http://atlas.tehran.ir/>

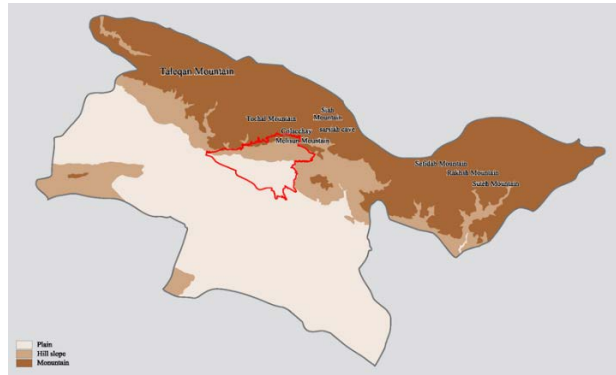


Figure 4.2: Topography of Tehran

Tehran is located at an altitude of about 1,100 meters above sea level. January is the coolest month (very cool) having an average temperature of 2.5 degrees Celsius.

During the winter daytime temperatures usually remain above freezing point. During the night subzero temperatures are not uncommon. Tehran is quite sunny and dry with about 3,065 hours of annual sunshine and 233 millimeters of annual precipitation. Most rain falls from November till April. . In June, July and August temperatures around 40 degrees Celsius (104 degrees Fahrenheit) can be recorded almost on a daily basis.

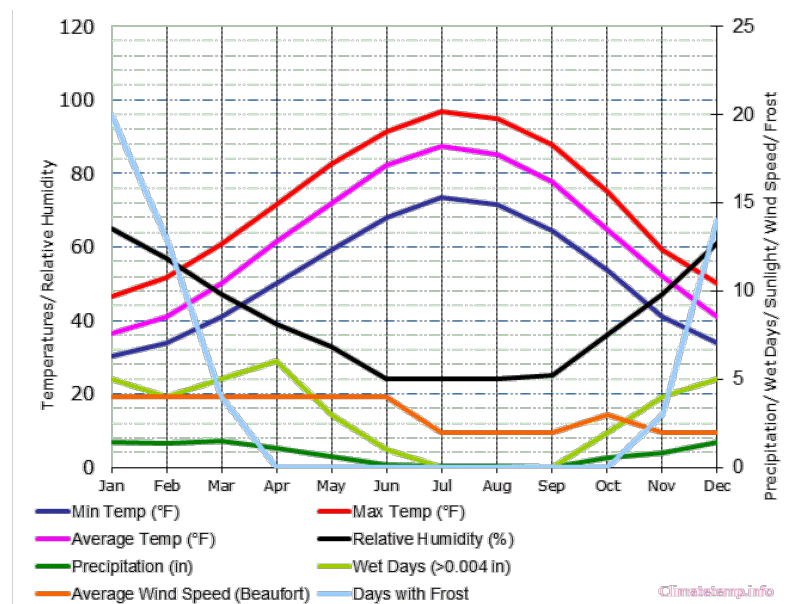


Figure 4.3: Tehran, Iran Climate Graph (Altitude: 3907 ft)

Neighborhoods and districts of Tehran

The city of Tehran is divided into 22 municipal districts, each with its own administrative centres.

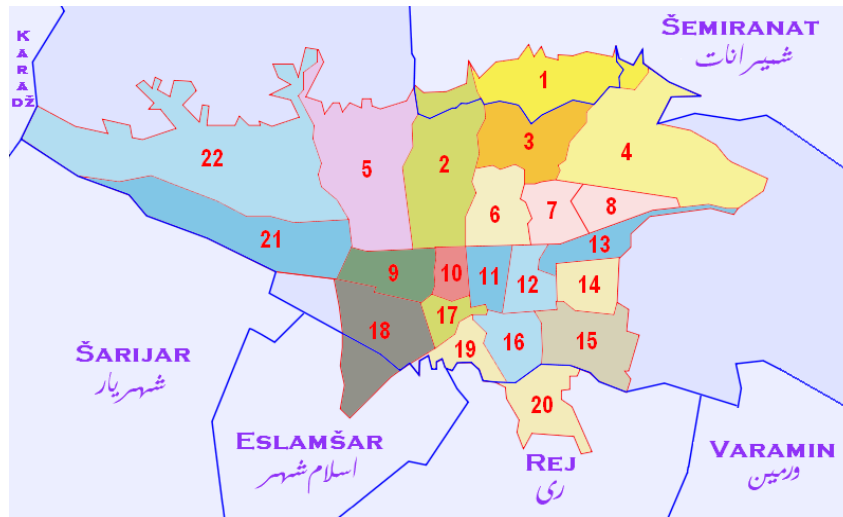


Figure 4.4: District of Tehran

Older neighborhoods

Tehran's old city fabric changed dramatically during the Pahlavi era. Some of the older remaining (Qajar era) districts of Tehran are: Oud-lajan, Sangelaj, Bazaar, Chaleh Meydan, Dowlat, Pamemar. Chaleh Meydan is the oldest neighbourhood of the aforementioned.

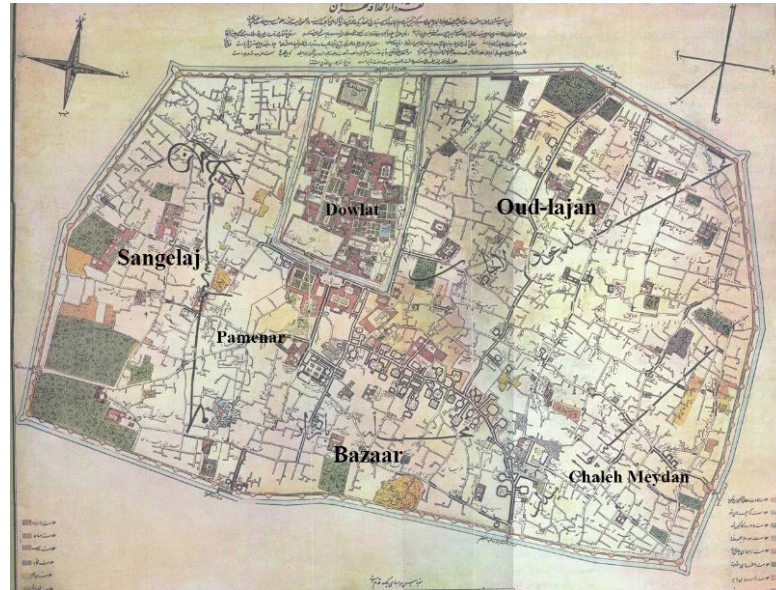


Figure 4.5: Map of Tehran dated to 1858 ³³

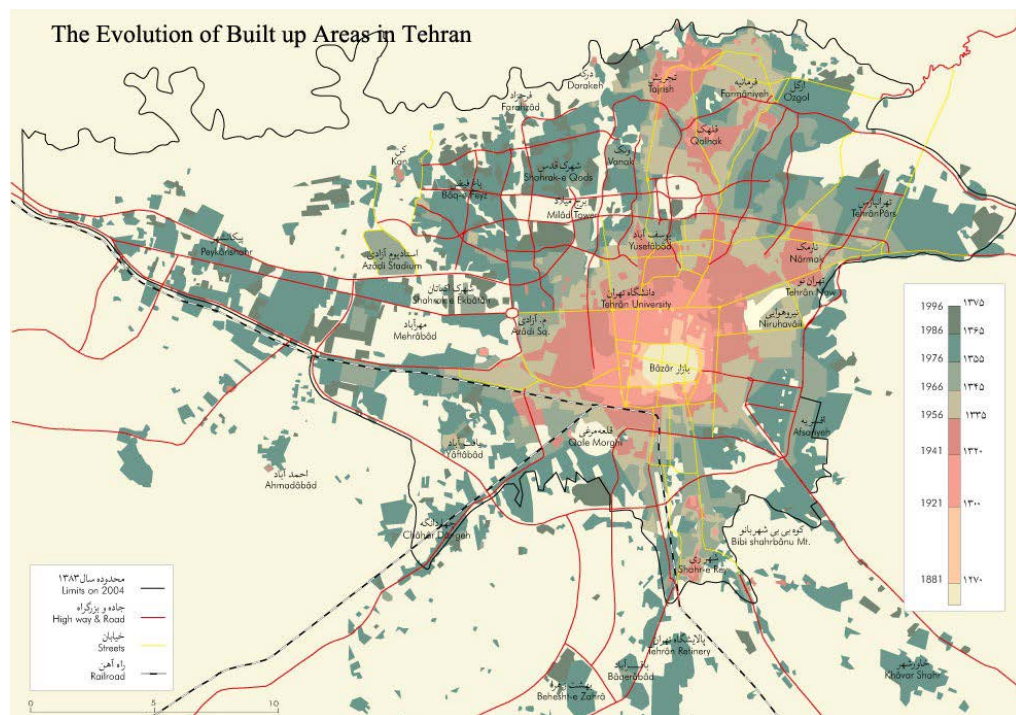


Figure 4.6: Tehran Evolution Map 1881-2004 ³⁴

³³ <http://kavehfarrokh.com/>

³⁴ <http://en.tehran.ir/>

Economy

Tehran is the economic center of Iran. About 30% of Iran's public-sector workforce and 45% of large industrial firms are located in Tehran and almost half of these workers work for the government. Most of the remainder of workers are factory workers, shopkeepers, laborers, and transport workers.

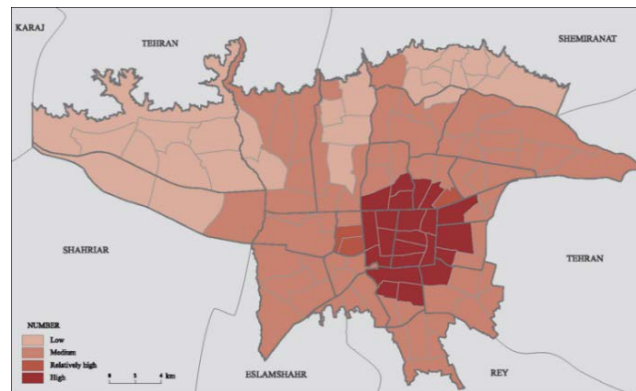


Figure 4.7: Economic Zones of Tehran

Transportation and Air pollution

According to the head of Tehran Municipality's Environment and Sustainable Development Office, Tehran has a capacity for 700,000 cars but currently more than 3 million cars are on the roads in the capital. The increasing number of private automobiles in Tehran has turned into a major problem for this metropolis. Public transportation are Bus, taxi and metro.

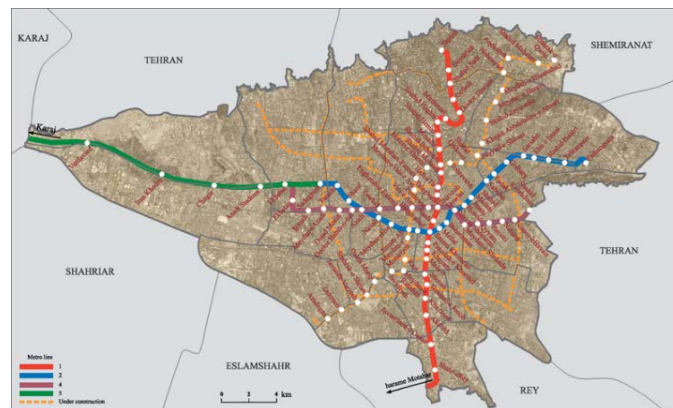


Figure 4.8: Metro network

Tehran suffers from severe air pollution and the city is often covered by smog making breathing difficult and causing widespread pulmonary illnesses. It is estimated that about 27 people die each day from pollution-related diseases.

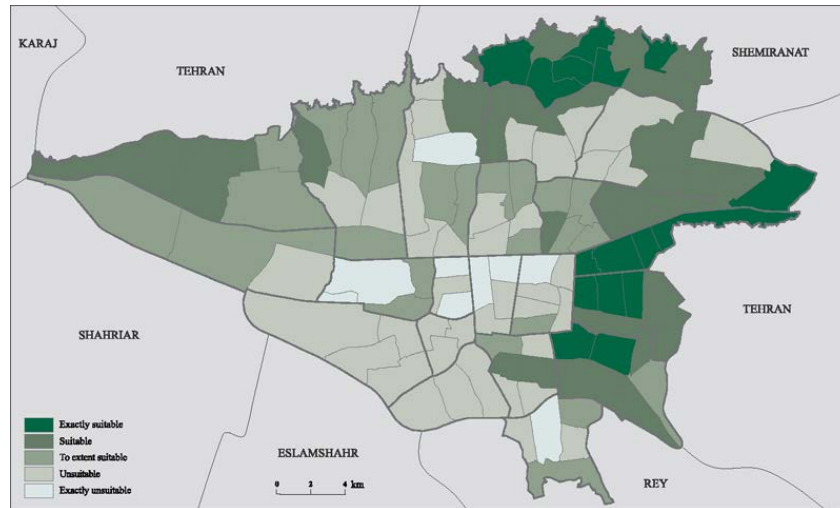


Figure 4.9: The Air quality and level of pollution

The air pollution is due to several different reasons:

- Economical: industrial zones are located on the outskirts of Tehran.
- The city is also overrun with old and aging cars
- Most people are then obliged to either use private cars or hire taxis. This has created severe traffic congestion;
- Geographical: Tehran is bound in the north by the massive Alborz mountain range that is stopping the flow of the humid Caspian wind.

Tehran is facing 4 major and significant problems that necessity of rethinking about these issues become more noticeable than past:

- 1/ Excessive Population density
- 2/ Severe Air pollution and heavy traffic load
- 3/ Problem of water supply for this metropolitan city
- 4/ Located in seismic zone

Observation site issues according to livable cities criteria categories

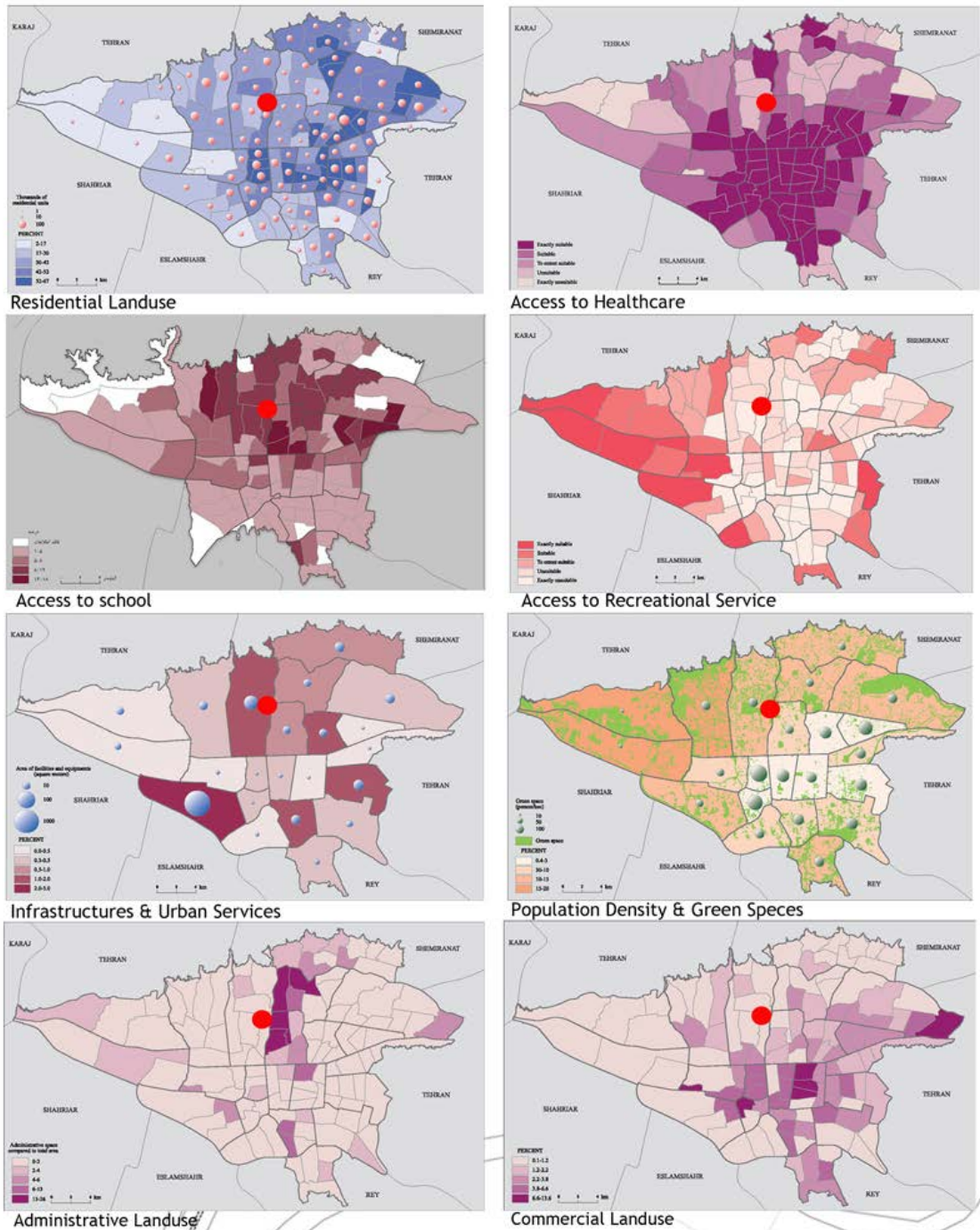


Figure 4.10: Tehran’s map showing livable cities criteria categories

Spatial structure and municipal objectives

Tehran Municipality Strategic Plan³⁵ – Tehran 80 – set 6 priority objectives to guide its strategy. These objectives are:

1. “Clean City: a city in which pollution is under control”
2. “Smoothly moving city: an efficient intra-city traffic and transportation”
3. “Green city: an expansion of green areas”
4. “A high cultured City: expansion of cultural and educational space in order to enhance the city’s culture”
5. “Dynamic city: the needs of citizens for administrative services are met as quickly as possible”
6. “Modern-Traditional texture: the realization of an intermixed urban fabric of traditions and modernism.”

All the above objectives have direct implications for the development of the spatial structure of Tehran Metropolitan Area (TMA). However, the first four priorities are particularly relevant to spatial development. It should be noted also that first two objectives are in fact a precondition to the economic prosperity of the TMA. It should also be noted that the fourth objective, “a high cultured city” has spatial implications which will be discussed below.

To achieve the municipal objectives, the current urban spatial structure presents both challenges and opportunities. I will review briefly the spatial characteristics of Tehran metropolitan area and will follow by discussing a number of spatial issues directly related to the objectives. Finally, I will recommend a course of action on specific topics which should allow the municipality to meet the municipal objectives.

³⁵ Tehran Urban Planing and Research center-<http://rpc.tehran.ir/>

Site Analysis

My project site is located in district 2 and surrounded by 4 main high-ways. The most important feature of this site is neighborhood with Milad tower which is the tallest building in Iran and actually it's known as significant land mark in Tehran. Milad Tower, have come to symbolise the city.

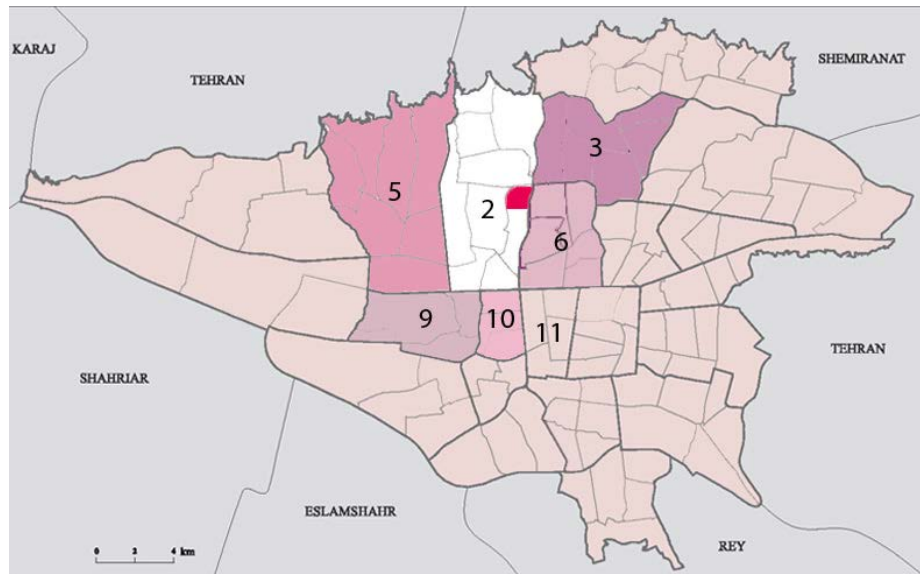


Figure 4.11: Site Location at the zones view

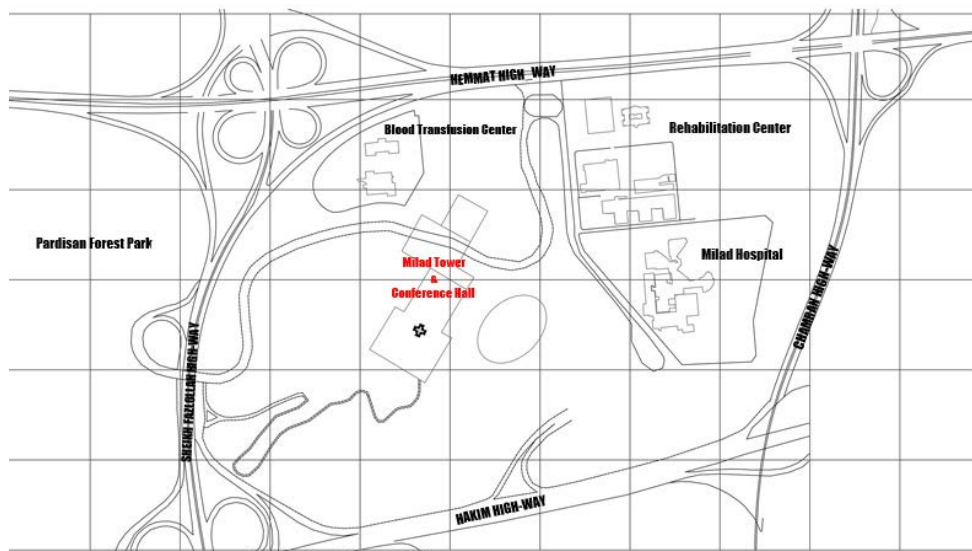


Figure 4.12: Site plan and Highways surrounded



Figure 4.13: The Site image during night with Milad tower land mark



Figure 4.14: The Site Topography model & Real

Program

Master plan and Program for the slice of life

Master plan and core that we can develop and repeat as a modular package in city and expand the concentrated form of urbanization to a regional scale.

Residential: Denser development -More high rise open space- Less single family houses

Culture & Environment: Community facility- Major Parks-Neighborhood parks center and facility

Education: School and kindergarten

Health Care: Health service center

Business: Small office (Business friendly)- non center type business

Hotel: Connection to Milad Tower

Infrastructure: The way we move/ system to more public, more efficient, minimize footprint, increase quality of life= Sustainable infrastructure

Program approach is to reach and design a human and family-oriented mixed use community within an environmentally friendly framework, new development and outdoor spaces

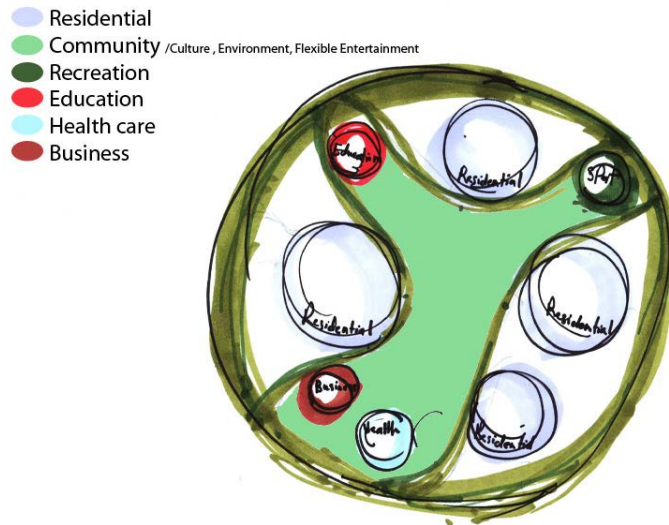


Figure 4.15: Conceptual program for design

- Community**
OPEN GREEN SPACES
- Residential**
- Flexible Entertainment**
Recreation
Education
- Health care**
Business
- Hotel**
CONNECTION TO MILAD TOWER FUNCTION

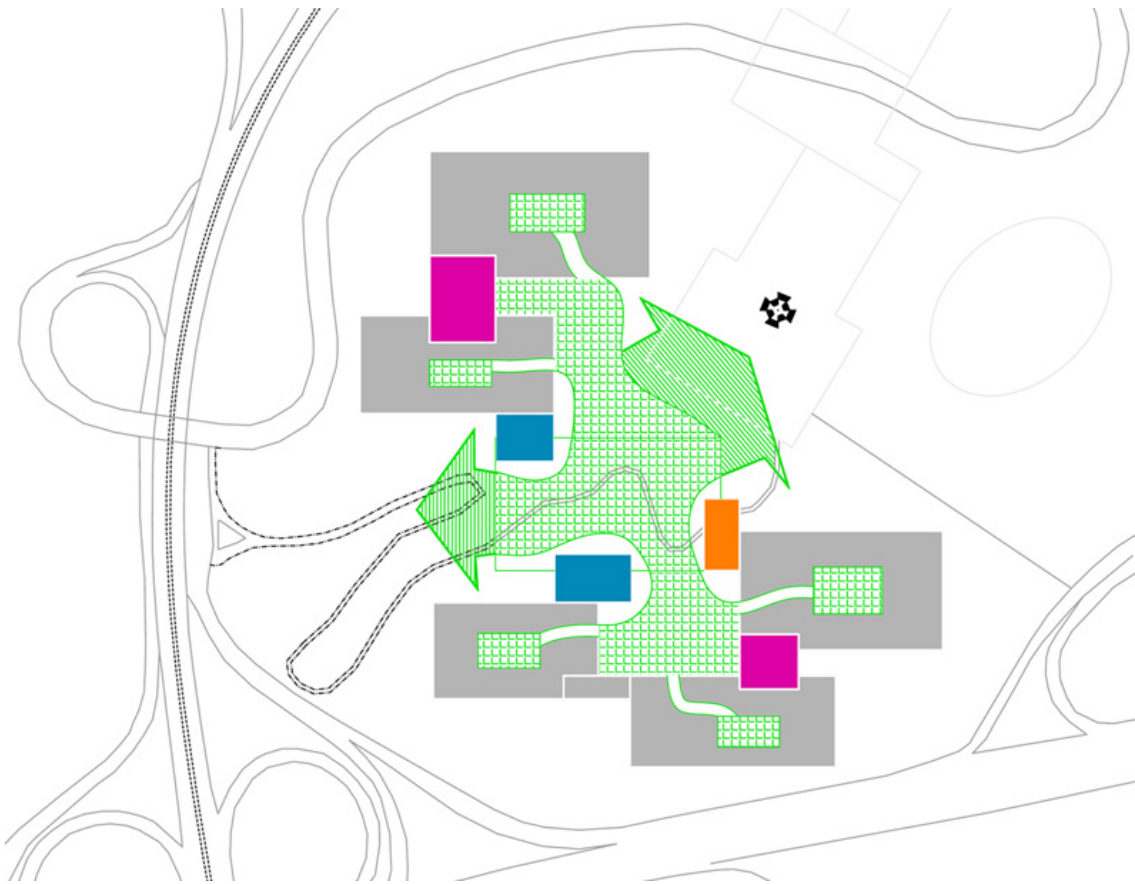


Figure 4.16: Master Plan development

Conceptual Design & Design Proposal

The aim of this design is to create future cores that will make people more satisfied, with factors that make their living space and city livable in to the future. We can respond to the question of what is the space of future trough several aspects. To design future livable cores in this individual site plan, I reached the conclusion that I need to have some major line to follow. I extracted the concept of traditional house and interpreted it to modern life. To meet the needs of future living. I've considered some major aspects to make my initial concept then develop my guide lines to design.

1-Hierarchy and Sequence: This feature is one of the major aspects of Iranian traditional design in small and big scale (city and house). In this way they define different level of privacy by the shape of the spaces. There are 3 main domains, public domain, semi-public domain and private domain.

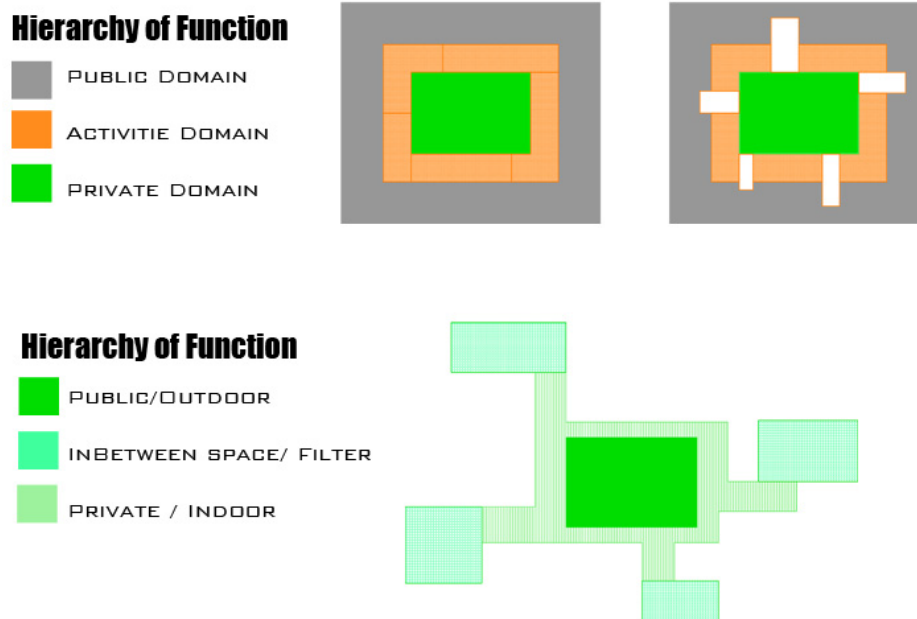


Figure 4.17: Concept of Hierarchy -Diagrams

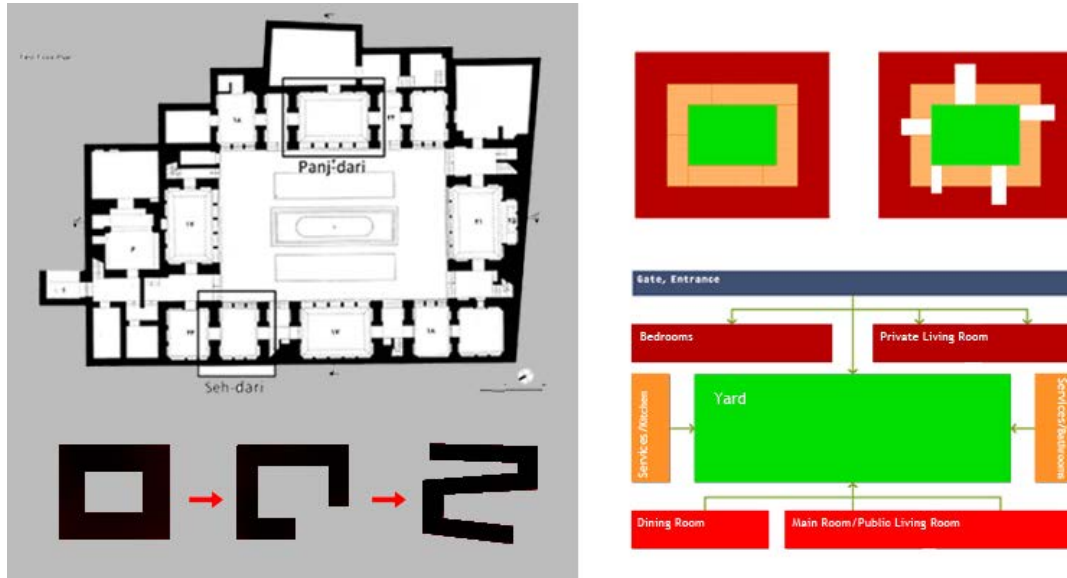


Figure 4.18: Development of Functions according to the Hierarchy Concept



Figure 4.19: Development and Detailed Plan according to the Concepts discussed above

In these figures, hierarchy is shown in different scales for both communities and open spaces, and also in private space.

2-Optimize Machines Footprint:

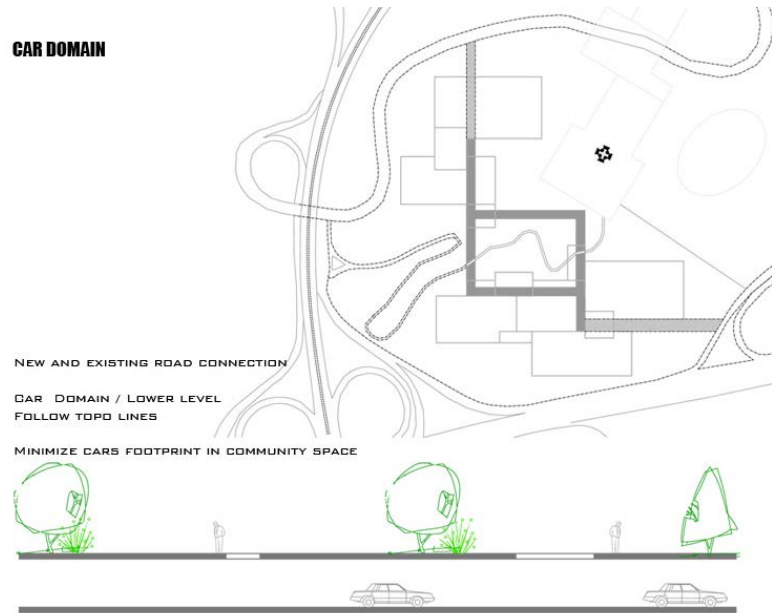


Figure 4.20: Car circulation & Machines Footprint

3-Flow: Transitional Area in terms of function and privacy

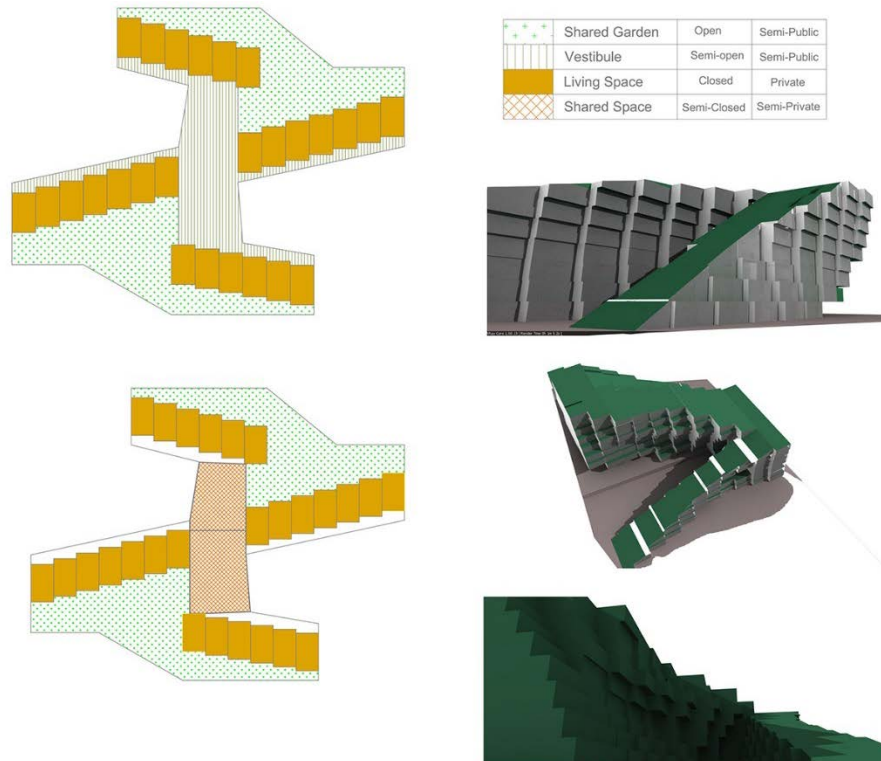


Figure 4.21: Mass formation according to the hierarchy of function and privacy

4-Mass Formation and Environmental Analysis: All traditional buildings of Iran, both in architectural and constructional fields, are planned in a way to have maximum of sun radiation during winter and maximum of shade during summer to use natural ventilation and to provide peace and comfort for the house residents. After shadow analysis and according to the climate building mass is formed as a continuous zigzag shape to create two courtyards with higher wing in middle which works as a linkage community and two sloped wings attached to it to control the view and sunlight.

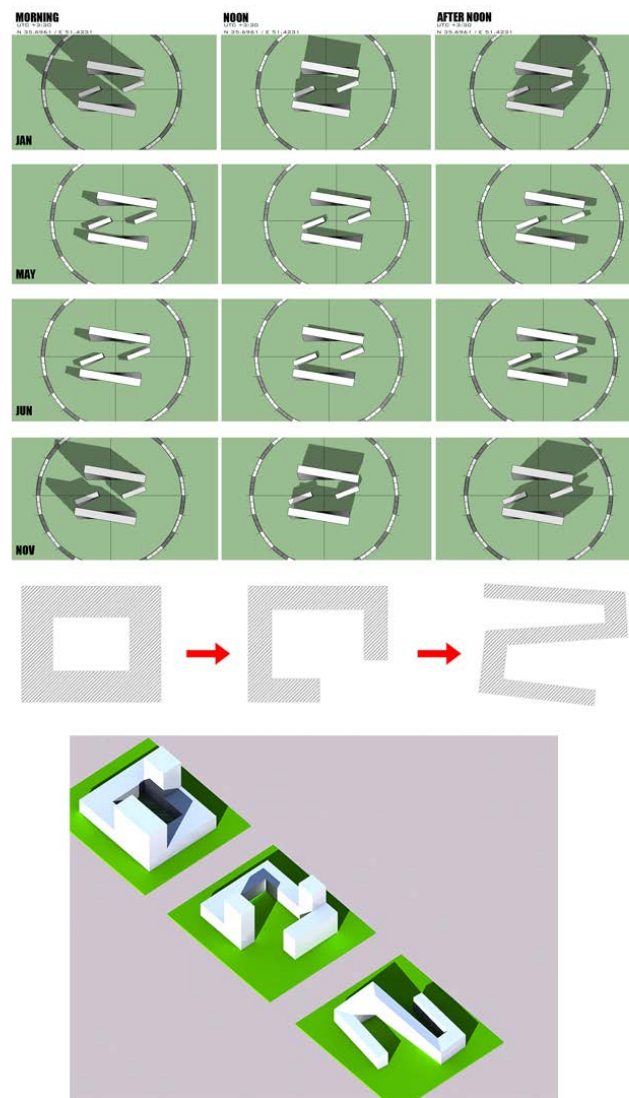


Figure 4.22: Shadow Analysis for building mass

5-Natural ventilation using a wind tower: In this design I highlighted the potential advantage of natural ventilation systems for occupancy comfort. Natural ventilation has become an attractive solution for not only reducing the energy usage and cost but also for providing good indoor air environment while sustaining a comfortable, healthy, and productive internal climate. Natural ventilation systems use the natural pressure differences surrounding a structure, caused by wind and temperature driven forces to direct the flow through buildings. Wind tower is one of the influential and functional system that were used in traditional Iranian architecture for cooling in hot climate.

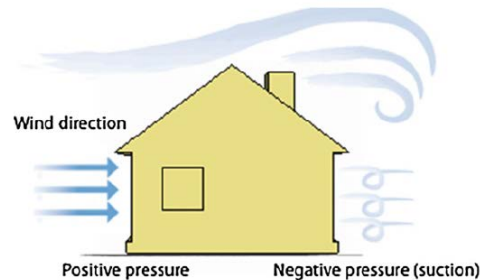


Figure 4.23: Wind creates a positive pressure on the windward side and negative pressure on the leeward side

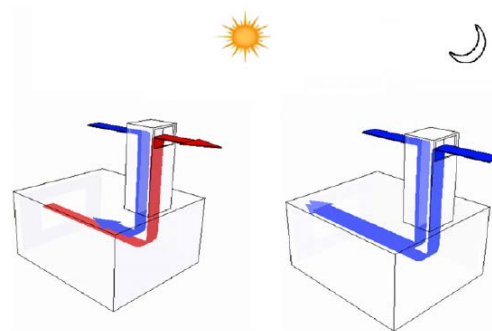


Figure 4.24: Function of Wind Tower system during daytime and nighttime³⁶

³⁶ Hughes, Ben Richard, John Kaiser Calautit, and Saud Abdul Ghani. "The development of commercial wind towers for natural ventilation: A review." *Applied Energy* 92 (2012): 606-627.

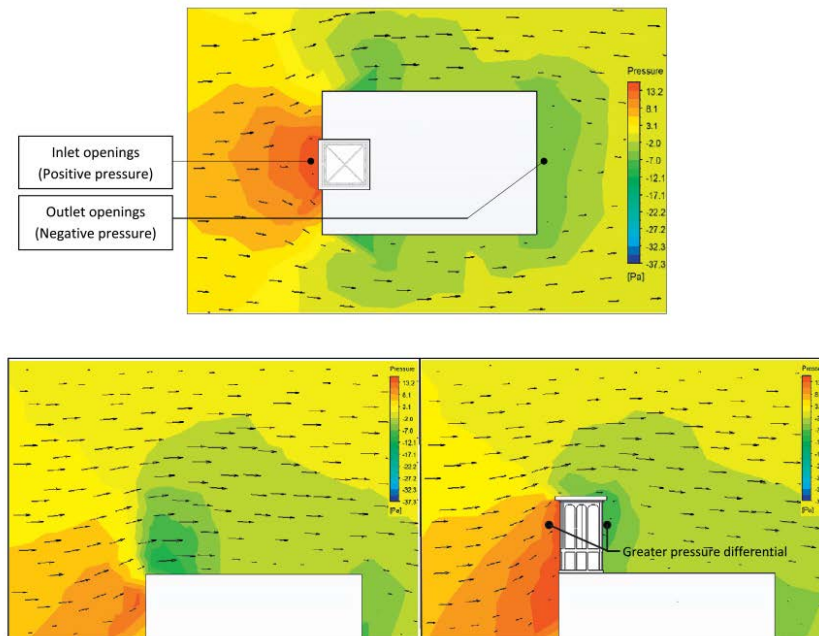


Figure 4.25: CFD analysis showing positive and negative pressure on windward and leeward; Hughes

The extrusion of the wind tower creates the same effect as the structure form by obstructing the wind current and generating a lower pressure over the opening. The wind tower must be high enough above the structure to prevent roof top turbulence. The height of the wind tower (distance from air entrance to discharge point) also affects the ventilation rate. Taller wind towers will have stronger wind passing over it, hence a greater negative pressure.

The passive device captures the prevailing wind at higher elevations and induces it into the building to maintain natural ventilation through the living spaces and provide cool air supply directly to the occupants. This would allow the stale and warm air to exit through window opening and doors with negative or lower values of pressure coefficients. Multi-directional wind towers can also lower the indoor temperature by removing the hot air stored inside the structure through its exhaust openings. This system is proposed to use semi-private (shared areas) with locating two wind tower at higher elevation to reduce energy demand and all residents use and take advantage of it.

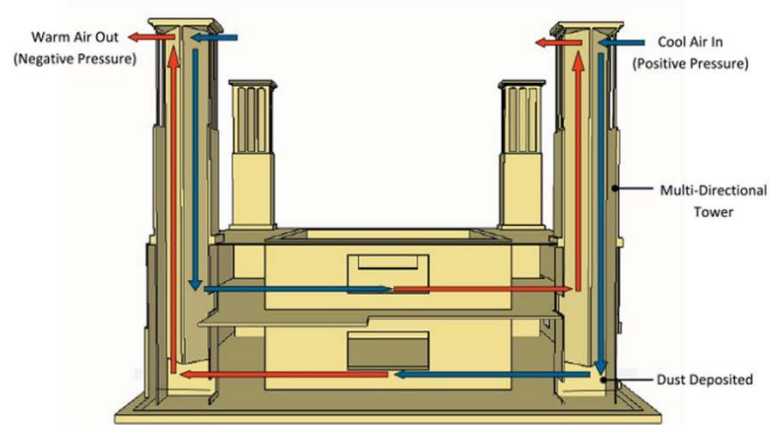
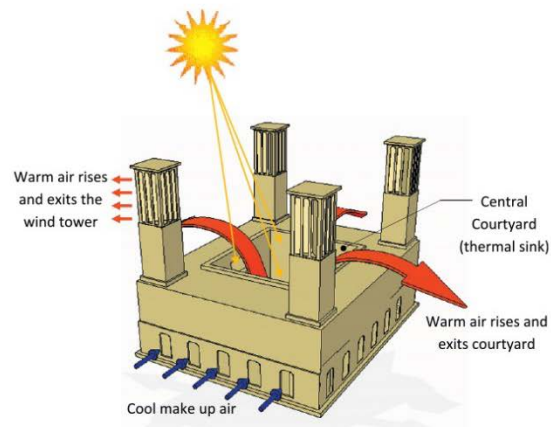


Figure 4.26: Diagram representing ventilation through a traditional wind tower structure incorporating courtyard

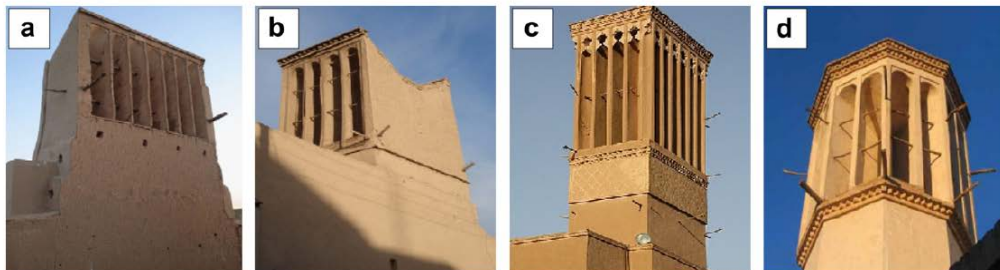


Figure 4.27: Traditional wind towers with different number of openings (a) one-sided, (b) two-sided, (c) four-sided, (d) octahedral

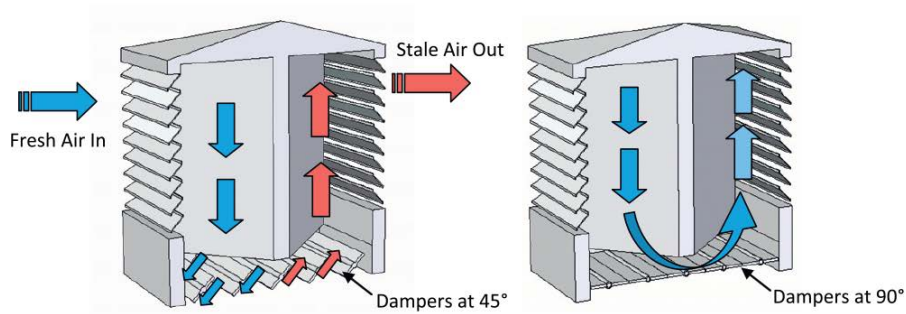


Figure 4.28: Modern wind tower devices with damper control system suggested by Hughes and Ghani³⁷

Modern wind catchers with automated volume control damper systems, constantly control the airflow into and out of the occupied space. This would allow the ventilation device to serve different conditions such as summer or winter and day-time or night-time cooling. In the hot summer month, the control dampers are programmed to fully open at night to maximize night-time cooling, allowing the fresh and cool air to enter the building and extract the stale air out. Occupants may override the control settings at any time using a wall-mounted override switch that will fully open or close the dampers.

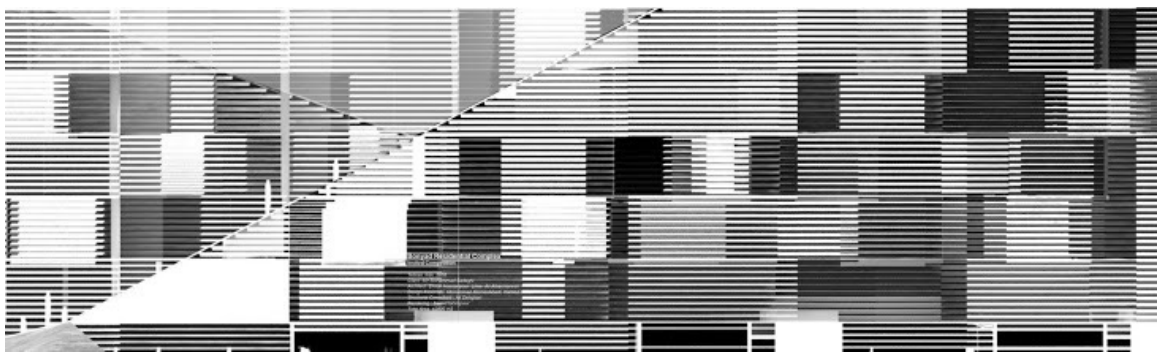


Figure 4.29: Elevation and sequences of open spaces to appropriate airflow integrated with wind tower

³⁷ Hughes BR, Ghani AS. A numerical investigation into the effect of Windvent louvre external angle. *Build Environ* 2010;45:1025–36.

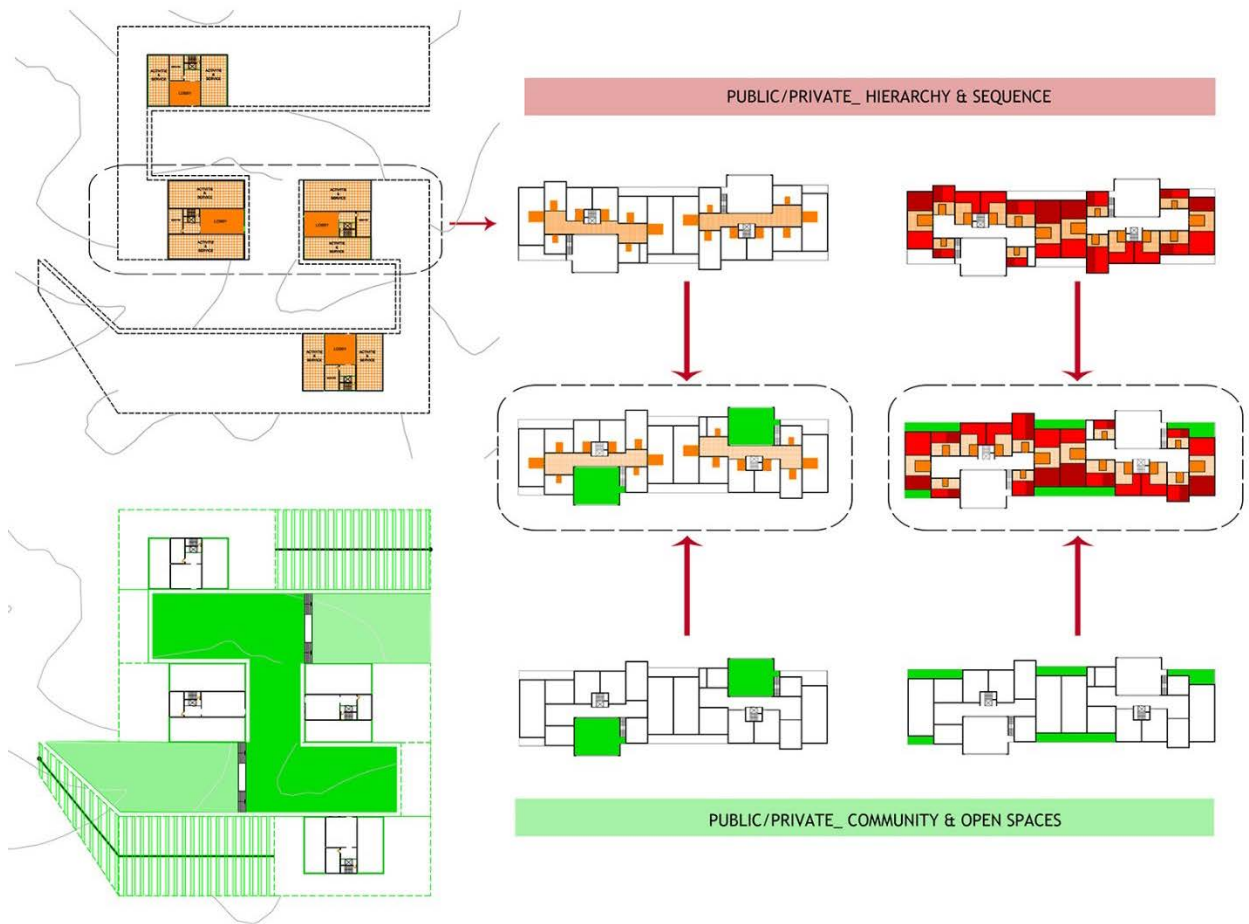


Figure 4.30: Modern interpretation of traditional house for both community and open spaces and private areas-On plan detail

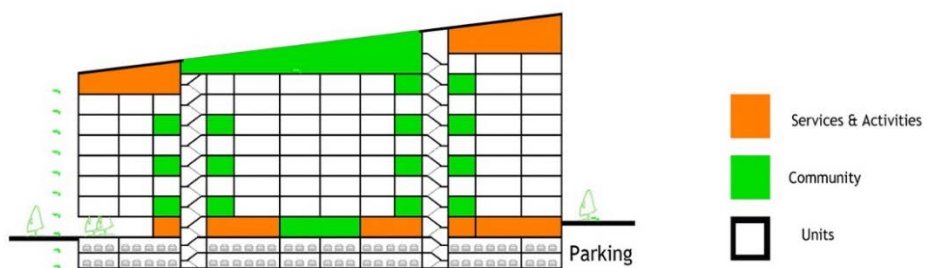


Figure 4.31: Schematic section to show private and public spaces



Figure 4.32: South west Perspective



Figure 4.33: Courtyard perspective

CHAPTER 5

CONCLUSION

This thesis tried to address satisfaction factors in housing sector with taking into account urban context of metropolitan and livable cities and also psychological and cultural aspects of Iranian background. With considering all of these aspects, future design criteria of residential sector in this specific region can be finalized as bellow.

Open spaces as complementary part of building mass, adjusting to building and human density. In contemporary urbanism, according to the land and economic limitation, whereas homes inner spaces have been decreased, shared common spaces have been increased. Public space in the contemporary city is considered more as a secondary space appropriate design of public open spaces will change the living quality and consequently, resident's perceptions of the total space of the complex.

Residential satisfaction is considered as one the criteria of residential quality, neighborhood satisfaction is an important component of life satisfaction. The main focus of this thesis is determining which criteria in residential environment increase our satisfaction, including spatial, social, functional and contextual features. This research confirms the importance of open space design on dwellers' satisfaction. Satisfaction of open space affords a generalized view into well-being of habitant. Although architects mostly consider inside of building as the main part of the design process, open space has considerable influence on residents' perception and satisfaction with their environment. A comprehensive environmental model of residential satisfaction needs to be established that comprising different scale of outside and inside of buildings.

Peoples life style, spiritual and physical needs are changed during the time. According to these changes planners and designers should consider these in design process. Reviewing Iranian traditional architecture and adapt them to contemporary needs will end in more appropriate outcomes in design process. Richness and ability of traditional houses increase feeling of attachment to the place and understanding of today's humans needs helps to create better and clear perception of new generation of design.

The reactions to modern architecture and planning have led to a new appreciation of the traditional spaces and its urban form. Sustainable development is more likely to occur when local communities take responsibility for their own particular environment, though to take such responsibilities seriously, effective power must return to local communities. This thesis was a study in trying to regain the values of an architecture well suited to this environment, and developing a language of appropriate design for modern life style with taking into account the traditional and cultural aspects.

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