Sustainable new towns in Iran

Reflections on problems and practices of urban planning and design using case studies

ABDOL AZIZ SHAHRAKI
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Abstract

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This investigation of urban planning and design is the first problem-oriented study in this subject in the southeastern part of Iran. As demands for new town developments increase, the intensity and efficiency of urban planning and design must be improved. This in turn requires an increase in the professional knowledge and systematic nature of the analyses and syntheses. The discussions in the thesis include: ideological schools, socioeconomic analyses, natural resource utilization, and sustainable infrastructures. In the thesis, a set of related subjects are analyzed and evaluated with the aid of new academic and experimental methods aimed to recommend enhanced theoretical and working solutions and to prepare for sustainable urban planning and design in the southern Iran region.
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Preface
After having worked for about eight years on the urban and regional development projects in Iran, I had the chance to enjoy the academic environment at the Royal Institute of Technology, KTH. My background in housing and town building and the encouraging research milieu of the KTH led me to focus on the problems related to sustainable urban planning and design in Iran.

An almost continuous chain of ideas, innovations, and implementation methods of housing and town buildings has marked the history of humankind generally and in Iran as well. By this thesis research I purpose to contribute to the continuous chain of the ideas both theoretically and experimentally. To perform research of this dissertation and to find ways for sustainable urban planning and design in Iran and similar regions I worked as an academic researcher and a practitioner. As a result of the works I have written this thesis which is a brief report of my findings on breaking out of the current urban planning and design crises.

Actually, this thesis sets out to understand the nature of the manners of the planning, design and buildings in the light of recent increasing speed of urban changes. It attempts to catalogue, analyze and discuss the challenges in the process of planning, design, and building of the homes and the new towns. The study aims to suggest a conceptual framework for the urban planning and design when the global and regional changes require new methods for the urban planning process.

At the same time the thesis highlights the role that sustainable planning, design and building of new towns can play in the management of the population's distribution in the crowded regions while contributing to the continuous historical chain of ideas and innovations of humankind to build better homes and towns.

This doctoral thesis is in eleven chapters. After the introductory chapter which introduces challenges, aims and methods of this thesis, the second chapter is to discuss the twelve problem groups in the urban planning and design in Iran. Chapter three is a theoretical study of the problems to progress sustainable development in the region. The fourth chapter is on experimental studies. It includes two case studies and performs an investigation across the two case studies. This chapter is also intended to progress the sustainable urban planning and design.

Chapters five, six, seven, eight, nine and ten are suggesting theoretical and applicable solutions for the problems which have been discussed. Chapter five suggests a regional knowledge network to edify the knowledge body in urban planning and design system. Chapter six plans traffic and transportation
network for new towns. Chapter seven addresses the urban water supply and management in the new towns. The eighth chapter will supply natural energies with the help of ancient architecture and new technologies. Chapter nine addresses the problem of unauthorized neighborhoods and suggests a renewal program. The tenth chapter will suggest to plan, design and build new towns based on the culture, livelihood and real needs of people.

Chapter eleven as the final chapter analyzes the theoretical and experimental contribution of this research to the sustainable urban planning and design. Finally the references and sources of the thesis’s researches will be introduced.

I am grateful to the people who supported this thesis. Foremost, I would like to thank my supervisor Professor Folke Snickars as an international philosopher, scientist, and a pioneer in intercontinental regional/urban planning, and developer, who made the research possible. Without him, I would not have been able to explore the crucial relations of sustainability, planning, physical design, and building. I am much indebted to him because he taught me the art of implementation of multi-disciplinary research projects. I am grateful to my supervisor professor Göran Cars, previous head of the Department of Urban Planning and Environment at the Royal Institute of Technology, who introduced me to modeling of regional and urban analyses, taught me the Swedish planning methodologies and encouraged the continuation of this thesis work.

I thank Professor Hans Lind at the Department of Real Estate and Building Economics, Professor Jan Erik Gustafsson at the Department of Land and Water Engineering for their useful contributions to this study. I also thank Dr. Nils Viking and Dr. Tigran Haas at the Department of Urban Planning and Environment for their friendly contributions to my research activities. I would like to state my thankfulness to Associate Professor Hans Tranberg in the Department of Mathematics for his teachings on the applied mathematics and to Associate Professor Jonny Sandahl because of his advices during the time I was studying my pre-required applied hardware computer engineering at the School of Information and Communications Technology in Södertälje. I wish to express my gratitude to people in Sweden who through the Royal Institute of Technology, the Research Foundation of the Swedish Savings Banks, and Haninge municipality provided funding to write this thesis.

During the period of this study, I received encouragements, critiques, and assignments from several colleagues in Iran and Sweden, and I am very thankful for those.

Stockholm in April 2014
Abdol Aziz Shahraki
1 Introduction

1.1 Background

Metropolitan areas and big cities in Iran became larger by the time passing. The population grew and the urban development crises increased. People from eastern, western, and the southern border areas fled to the big cities far from war fields. According to the 2011 population census Iran has 75 million inhabitants, a fourfold increase since 1956.

Table 1.1 shows that urban population increased from 31.4% of around 19 billion to 71.4% of a total of 75 billion in 2011. It means a big increase in urban population.

Table 1.1 Urban population growth

<table>
<thead>
<tr>
<th>Census date</th>
<th>Population</th>
<th>Average annual growth (%)</th>
<th>Proportion urban (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01-11-1956</td>
<td>18,954,704</td>
<td></td>
<td>31.4</td>
</tr>
<tr>
<td>01-11-1966</td>
<td>25,785,210</td>
<td>3.1</td>
<td>37.0</td>
</tr>
<tr>
<td>01-11-1976</td>
<td>33,708,744</td>
<td>2.7</td>
<td>47.0</td>
</tr>
<tr>
<td>22-11-1986</td>
<td>49,445,010</td>
<td>3.9</td>
<td>54.0</td>
</tr>
<tr>
<td>01-11-1996</td>
<td>60,055,488</td>
<td>2.0</td>
<td>61.0</td>
</tr>
<tr>
<td>01-11-2006</td>
<td>70,495,782</td>
<td>1.6</td>
<td>68.5</td>
</tr>
<tr>
<td>01-11-2011</td>
<td>75,149,669</td>
<td>1.3</td>
<td>71.4</td>
</tr>
</tbody>
</table>

Source: (Statistical center of Iran, 2011, figures for 1966, 1986 and 1996 are estimates)

Failures of macro plans, war, and social conflicts damaged the rural agricultural livelihoods of people and they rushed to the bigger cities. At the same time, the cities do not have the adequate infrastructure and urban spaces to welcome the people arriving (Moosavi, 2012). Chauncy and Ullman believed that a city is the place of mutual relationships between humans and the city “Cities are the focal points in the occupation and use of the earth by man” (Chauncey and Ullman, 1945). As a general idea Fistola believes that a city should be a suitable place for intellectual and material functions and relationships of its inhabitants (Fistola, 2011), but the present urban areas in Iran are not as Chauncey, Ullman and Fistola pictured.

The urban areas in Iran suffer from many problems that damaged natural resources. The high density of people, lack of water resources, degraded soil, the absence of vegetated surfaces, and the need of urban infrastructure made unsustainable cities with acute problems. It is why the need for new methods of planning and design have emerged and the urban planners in Iran recognize the need.
Since five decades, the decision makers planned to place the surplus inhabitants in new towns. While development projects in populated big cities were costly and problematic, new towns were an optimal solution to settle people in new urban communities.

Iran planned more than 20 new towns. The new towns have been developed or are under construction, mostly around Iran's main metropolitan areas such as Tehran, Isfahan, Shiraz, Tabriz, Zahedan, and Mashhad. These new cities are built for special purposes such as:

- Pardis is a scientific city.
- Poolad Shahr is an industrial city for housing of Isfahan's steel industry workers.
- Shirin Shar is to offer homes for the sugar industry people.
- Tehranpars is to house the Tehran's majority population.
- Shahrake Gharb was a massive project of modern apartment buildings.
- Parand intended for housing the staff of Tehran’s international airport.
• Shushtar new town homes the employees of a sugar cane processing plant.
• The new town of Ramshar purposed to remedy the water and sewage infrastructure problems of the Zabol big city.

Some 576,000 people are planned to be settled in Iran’s new towns by the year 2005” (Ministry of housing and town building, 2003).

New town development could be less problematic compared to the redevelopment of the existed big cities. Smith and Mark defined the fewer challenges with planning of new towns as follows:

“A new town is a planned community that we plan carefully from its start and is typically constructed in a vacant land. This contrasts with settlements that evolve in an urban critical fashion. Land use conflicts are less frequent in new towns since they are planned carefully” (Smith and Mark, 2011).

It is a fact that the new town projects have not solved the urban problems in Iran as wished and targeted. Several scholars agree with this statement. For example, Shirazi in his newly published book, New towns, promises towards sustainable urban form, has observed and analyzed the results of the new towns and recommended strategies to overcome the failures (Shirazi, 2012).

So, considering the critical problems and the fact that the urban landscapes are going through fast and multifaceted demographic, economic, technical, and political changes, the need for cross-collaborative planning and design methods have been accelerated. We recognize the call for planning and design interventions on a systematic process when the urban problems are frightening. Many scholars agree that our urban planning and design system shall be improved from various sides amongst from a qualitative point of view. Urban development shall confirm the overall abilities to give a better-built environment.

Beattie suggests on the need as follows:

“We need to combine the best from each profession and understand what it brings to the table. Will this need a culture modification, and do we have the ability sets required to deliver”, (Beattie, 2010, p 740).

In fact, Beattie supposes that urban planning requires a combination of different professions such physical design. He also thinks that if necessary, we should use an active strategy to change the cultural environment. This strategy includes education, training, new work styles, and public intervention. Recently, Uttke has studied the role of learning in a better urban planning and design system and described the result as follows:
"They show ways, to qualify the existing practice of public participation in architecture and urban planning. Research that is based on positive experiences in practice shows short, intermediate and long-term changes and effects on participants, schools, the community and society at large while effects on the environment itself are missing" (Uttke, 2012, p 3).

Uttke understood that the educational program of urban planning and design should fill a growing demand for shaping, managing, and improving of the urban environment quality. Urban planning and design are ultimately a strategic and systematic way of meeting the challenges of sustainable development through a collaborative and multi-disciplinary process. Importance is on exploring the links that urban planning and design builds among social, cultural, economic, political, and ecological variables. Therefore the developers aim at integrating the professional customs of urban planning and urban design in many institutes, practice centers, and engineering consulting businesses.

Acknowledging the different traditions in urban planning and design, the urban planning and design idea is used here to argue for sustainable planning of new towns in this thesis. After the failures of housing and town building and the emergence of the urban problems, the urban planning and design system analyzes the natural, environmental, knowledge, technical, planning, skeletal, physical, infrastructure, and management deficiencies among professions. Thus, the current study is needed to understand the nature and the complexity of planning and design of new towns in the light of recent population growth and environmental anxieties.

1.2 Aim of the study
This investigation of urban planning and design is the first problem-oriented study in this subject in the southeastern part of Iran. As demands for new town developments increase, the intensity and efficiency of urban planning and design must be improved. This in turn requires an increase in the professional knowledge and systematic nature of the analyses and syntheses. The discussions in the thesis include; ideological schools, socioeconomic analyses, natural resource utilization, and sustainable infrastructures. In the thesis, a set of related subjects are analyzed and evaluated with the aid of new academic and experimental methods aimed to recommend enhanced theoretical and working solutions and to prepare for sustainable urban planning and design in the southern Iran region.

The thesis aims to explore the problem of non-sustainability of the urban development in a region of Iran. It attempts to make a theoretical and experimental sustainable urban planning and design framework with a multi-disciplinary and systematic method.
Furthermore the aim is to contribute to increasing the knowledge body concerning the saving of natural water resources, protecting the environmental components, planning of urban infrastructures, and improving of the methods of current urban planning and design.

The thesis intends also to confront the theoretical outcomes with the real life situations with the help of direct field observation in a particular region in Iran. Finally, the thesis will recommend feasible sustainable urban planning and design procedures to overcome the existing planning failures.

1.3 The challenge of urban sustainability in Iran
The foremost problem addressed by this study is to know how the urban planners, designers and developers could contribute towards the overall knowledge about resolving the urban development crisis. The planning of new towns, design of required infrastructure, managing of the water resources, and the degradation of environmental components are the main problems of the regional and urban developments. Do we need a knowledge infrastructure network? If the answer is positive, how shall we build the regional knowledge infrastructure?

The study will seek an answer for the questions related to saving the water resources when without water we cannot speak about new developments. Then the study shall seek to answer to many questions, which arise about the various required urban infrastructures. What specific urban infrastructures are needed? How shall the regional managers plan and design them? How shall they carry out the projects while there are not enough investments in urban development projects? The significant challenge is the fact that the developments are currently non-sustainable.

Therefore, this research will discuss the following research questions:

- What role does knowledge and technology play in the process of planning, design, and building of new towns? What new lights do research and development projects shine on planning and building of new towns with respect to the growing population?
- How will the developers remedy the problem of non-existing of water resources needed for new town projects? Which possible methods are needed to give, save, and distribute the required water? What are the suitable ways to plan design and build the new towns environmentally?
- The research tackles the problem of sustainable development of new towns. It will explore the sustainability from diverse views. It will understand the relationship between natural resources, urban infrastructure, and appropriate spatial planning in the new town projects. In other words, it will
attempt to explore to understand in which way the developers could build the new towns better to answer the immediate needs of people.

- At the same time the research will address the question why are the cities not beautiful and attractive.

The study is going to explore why the new town development efforts in Iran fail badly. Thus, the overall problem that this thesis discusses is the non-sustainability of the cities being constructed.

1.4 The research methods

This research uses both theoretical exploration and field observation. It explores theories on the perspectives of sustainable new town planning and design. Its literature review looks at the relevant theories and hypotheses on the subject of sustainable urban planning and design. The purpose of the literature review is to provide a conjectural agenda for the regional urban planning and design. Since the question of planning and design of a new town is multi-disciplinary, the methodological approaches shall include major perspectives in the planning and design.

Rijsberman and Van de Ven (2000) consider the sustainable development as a complex problem for which a specific solution usually is the result of a planning process in which people from various backgrounds are involved. I agree with the idea of Rijsberman and Van de Ven and will use a problem-oriented methodology to perform this research. The problem-oriented methodology applied by this thesis has a system of 12 basic problem groups as the major perspectives of the sustainable urban planning and design. This system, based on the literature review, the field observation, practical experiences and the regional opinions has thus 12 groups of problems that represent the overall obstacles on the way of the developers. The system of the problem-oriented methodology can facilitate the process leading to a workable consensus on sustainable urban planning and design.

Michael Pasione checked the helpfulness of the problem-oriented method to achieve the sustainable development results, see as a sample (Pacione, 2003).

The problem-oriented methodology of this thesis as a systematic research way has the following 12 dimensions:

1. Cities are non-sustainable
2. Dimension of knowledge and new technologies
3. Natural resources particularly lack of water resources
4. Environmental degradation
5. Planning perspectives
The current research pursues the method of exploring the past, present and future (Past → Present → Future). The thesis adopts a time perspective related to the time scale of the new town strategy having its roots in the latest twenty years and looking forward into the next twenty years. At the same time, the thesis critically reviews the ability of the policy makers to actually start the new town program.

The case studies of this thesis examine the problems of sustainable urban planning and design in the region. The on ground observation highlights subjects such as used site techniques, housing and town building, water abstraction and management, infrastructure provision, regulation and deregulation ways to combat the anarchic developments, and assessing the results of the new town projects. The case studies purpose to understand the current problems in the cities and mitigate the harms in future development and rebuilding. The case studies provide necessary information on urban planning and design in Iran and check the theories on the sustainable new town planning and design.

Since the author of this thesis has studied the urban planning and design of Sweden, particularly Stockholm, a benchmarking method has been used to compare Iran’s outcomes of urban planning and design to the pattern of Stockholm. So, the benchmarking method of this thesis is the process of comparing Iran’s urban planning and design processes and performance to the pattern of Stockholm as the best practice. The dimension of the comparisons is more the quality of the town building rather than quantity and metric measures.

Introducing of the problems related to sustainable urban planning and design.
Describe the scope and dimensions of the challenges
↓↓↓↓↓↓↓↓
Case studies conducted to see the problems in the real life and check the validity of the hypotheses and the theories
↓↓↓↓↓↓↓↓
Suggesting theoretical frameworks and practical patterns for sustainable new town planning and design
Additionally classical methodologies of market analysis, graphical methods, flood routing technique, hydro-social change balance, linear programming and mathematical modeling have been used to implement the case studies and suggest a way to address the challenges of the sustainable urban planning and design. The studies of this thesis pursue the following logical order:

### 1.5 The analyzed practices

This thesis selected practices of new town planning and design in Iran, as its case studies, for in-depth explorations and observation. The experiences have been made after 1980.

One case study in Chabahar is due to the importance of knowledge and expertise in new town building and regional developments. This project recommends establishment of a regional knowledge network to use the public participation and wisdom in the urban planning and design projects.

The proposed pattern of Aftab new town is to reduce the critical urban problems of Zahedan and to introduce a suitable outline for sustainable urban planning and design in the region.

The thesis suggests a systematic program for sustainable urban planning and design in Bonar city. The program is a step by step procedure to transform an earlier non-sustainable built environment in a desirable sustainable new town.

The new built town of Ramshar faced different challenges in terms of building types, productions absorption, water provision, infrastructure establishment and natural and social problems. The new town of Ramshar has been studied and analyzed to show the relation between housing types and the people’s preferences. This case study suggests a program for rational planning and building of homes and urban spaces. The case studies of Ramshar new town will also help to understand the best ways to supply water resources and traffic and transportation networks for the inhabitants too.

The project of renewal of informal neighborhoods in Chabahar is to see the reasons of the unauthorized urban districts and to suggest feasible building and urban infrastructures in Chabahar. Lastly, the case study of the ancient architecture is to suggest environmental and green new town projects, to use natural energies and to build beautiful and attractive environments. These projects will be discussed and analyzed in the thesis with a starting point in the 12 groups of challenging problems introduced above.
2 Problems of sustainable urban planning and design

2.1 Scope and dimension of the problems
The major responsibility of the urban planners and designers in Iran is to plan new sustainable towns and lodge the increasing population successfully. The sustainable development requires good placing and setting of the new towns regarding the necessary natural resources, particularly the water resources and provision of urban infrastructures. I agree with several scholars for example Ning and Hoon who believe that sustainable new town planning and design has many difficulties and dimensions (Ning and Hoon, 2011). In Iran the sustainable urban planning and design has dimensions originated from the particular regional characteristics. To list those dimensions for the case of Iran I shall name knowledge, planning, physical design, architecture and aesthetic, infrastructure, natural resources, environmental components, climatic hardness, and socioeconomic conflicts. Table 2.1 categorizes the regionally experienced and observed problems in different groups as follow:

Table 2.1 Different problems to meet sustainable new town planning and design

<table>
<thead>
<tr>
<th>Categories of problems to meet sustainable urban development</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Non-sustainable</td>
</tr>
<tr>
<td>2 Knowledge and new technologies</td>
</tr>
<tr>
<td>3 Natural resources</td>
</tr>
<tr>
<td>4 Environment</td>
</tr>
<tr>
<td>5 Planning</td>
</tr>
<tr>
<td>6 Physical and skeletal design</td>
</tr>
<tr>
<td>7 Firmness, resistance and duration</td>
</tr>
<tr>
<td>8 Infrastructures</td>
</tr>
<tr>
<td>9 Functionality</td>
</tr>
<tr>
<td>10 Architecture and aesthetics</td>
</tr>
<tr>
<td>11 Culture and traditions</td>
</tr>
<tr>
<td>12 Poverty, fairness and rationality</td>
</tr>
</tbody>
</table>

2.2 The cities are not sustainable
Planning of sustainable new towns plays a significant role in the human communities. Wheeler on his article defines sustainable urban development "Sustainable urban development improves the long-term social and ecological health of cities and towns" (Wheeler, 1998, p 434).

Generally, sustainable development refers to a city’s ability to meet its needs. Michael Kinsley writes on the meaning of the sustainability. "A sustainable development means stewardship; careful, economical, and long term management of land, community, and resources" (Kinsley, 1997, p 7). In the case
of Iran the rapid urbanization threatens the health and productivity of cities. There are intimate links between poverty, economic development, natural resources assets, adequate infrastructure, and sustainability both in theory and in practice. In the process of urbanization, it is impossible to consider one problem independently from the whole obstacles. The need for adequate and sustainable human settlement leads planners and designers directly to many questions. Where does the potable water come from? Where do household wastes go? Who does pay for the services? There are still important questions about the social rights, combating poverty and the provision of urban infrastructure that are linked to the sustainability of a city. In discussing the outlook for the sustainable city, principles and regulations are needed. The regulations and acts shall respect local particular situation as well. Therefore, the sustainable city does not have a one definitive form and every new town parallel to the international agreed standards is related to its particular natural and social conditions. So, the scientists highlight some dimensions of the sustainability depended to the region. As a sample Orrskog believes that a city is sustainable when it obeys the ecosystem: “The city, understood here as a built environment in the landscape, should obey the following necessary rules: save ground, leave the ecosystem as gene banks and build with a regard for the carrying capacity of the locality” (Orrskog, 1993, p 116).

To save the ecosystem the city’s technical support systems should keep natural resources while it is robust, flexible, and versatile. Several scholars believe that we will meet a sustainable city when the inhabitants participate in the process of planning. For instance, Mahdavinejad and Abedi applied the quality function deployment, QFD, as a new method used to provide the public participation. “QFD technique creates a specific link between customer preferences and design guidelines. It uses the demands of the citizens as the major determining factor in the process to plan and design sustainably” (Mahdavinejad and Abedi, 2011, p 337). Clearly, the urban planners and designers must solve the all said problems and other incoming problems to meet sustainable results.

2.3 Sustainable new town planning requires new knowledge and technologies
One problem in sustainable new town planning is non-existence of new knowledge, information, technologies, experts and modern work styles. The regional developers need new knowledge, technologies, and skilled engineers to solve the increasing urban critical problems. There are many technologies in the world that could contribute to better works and better outcomes, but the region does not access to them. Trying out of new knowledge and the use of advanced technologies in urban planning and design is almost a new
phenomenon. Therefore I understand well when Seto and Christensen suggest to the developers everywhere using new technologies for better results.

"Satellite remote sensing is not only useful for consistent aggregation across scales; it lends itself to the development of consistent datasets that can be examined as a large statistical sample of urban areas" (Seto and Christensen, 2013, p 2).

Several scholars discussed on the issues related to use of knowledge and new technologies and creativity to improve the outcomes. I accept that the lack of knowledge and the technology causes many unsuccessful urban planning and design. Thus, the regional planners need to boost the infrastructure network for knowledge provision. I believe that many urban crises are emerging because of the absences of knowledge bodies while planning and designing new towns. I think that the knowledge infrastructure network provides information to optimal urban planning and possible the exchange of knowledge between regions to use their experiences. I believe strongly that making a knowledge infrastructure network will result in sustainable development and will decline the current urban crises. By knowledge, I mean all software and hardware facilities, which contribute to faster, better, less costly and rational new town planning and design. To focus more precisely on the meaning of knowledge let us see the definition of Kobayashi.

“Knowledge has the three concepts:

1. **Scientific knowledge as basic scientific principles that can form a basis for the development of technological and entrepreneurial knowledge.**
2. **Technological knowledge is implicit and explicit blueprints as inventions (or technical solutions) that either materializes in new products or is readily used in the production of goods and services.**
3. **Entrepreneurial knowledge comprises business-relevant knowledge about products, business concepts, markets, customers, and so on**
   
   (Kobayashi, 1995, p 127)

As Kobayashi suggests knowledge is a catalyzed tool in practical use for planning, designing, and building of new towns.

**2.4 Shortage of natural resources**

One major problem in Iran is degradation of natural resources and disappearing of the little water resources by the time passing and raising of population density. So, the problem stops the regional new town projects. While the new town building requires adequate water resources, the planners concern on water resources. Iranian planners may recognize well when Merret becomes concerned over the global problem of water assets. Merret reflects the concern
as “In addition to the increase in the world’s population in the early years of the new millennium there is a second source of anxiety on the future availability of global water resources for people” (Merret, 2002, p 1).

Generally, the degradation of natural resources happens because of drought. Drought is caused by the lack of rainfalls and precipitation. From the other side in the arid and semi-arid regions of Iran the sun shining and high degree of temperature produces water vapors. Worse, water vapor and strong regional winds make soil erosion. Thus, both water and land become degraded. While these combined factors do not support precipitation volumes enough to reach the surface of lands, the result is a drought. Again as a loop, this can be triggered by high levels of reflected sunlight and above average prevalence of high-pressure systems and winds. This loop repeatedly happens with different frequencies. The regional developers shall overcome the cycle and try to prevent the drought and desertification periods. To overcome they shall give necessary natural resources to plan and build new towns. I see the correlation between the problem of unplanned sharp rising of the population and the need for water resources to build new towns in the region. As Sergio and Cuadrat believed commonly “Humans can directly trigger exacerbating factors. The issues of over farming, excessive irrigation, deforestation, and erosion adversely impact the ability of the land to capture and hold water”, (Sergio and Cuadrat, 2007).

When regional drought persists, the lack of water resources is worsening not only gradually but with a high speed, and the undesirable impact increases. The result is a drought worse than the agricultural drought, a hydro drought. (Hogan, 1973) defines the hydro drought as “Hydro drought is brought about when the water reserves available in aquifers, lakes, and reservoirs fall below the statistical average. Hydro drought tends to show up more slowly because it involves storing water that is used, but not replenished”. Planning, designing, and constructing of the new towns require adequate water resources which is a real problem in Iran.

2.5 Environmental crises

Damaging of the environment is another sensitive problem in Iran. Compacted mass population harms both social components of the built environment and natural components of the living environment. The ultimate responsibility is environmental protection. The regional planners shall try to mitigate the impact of development projects on the society and decrease the overall effects of development on the local and global environment. Protection of environmental components will be possible with the help of the climatic architecture. (Vadiati and Kashkooli, 2011) suggest ways for the institutions to get to grips with the environmental sustainability:
"Environmental sustainability is established on the following aspects:

- Conserving of the earth’s vitality and diversity
- Conserving of life support systems
- Use renewable resources
- Minimizing non-renewable resources
- Minimizing of pollution and damage to the environment and the health of living creatures
- And conserving of the cultural and historical environment" (Vadiati and Kashkooli, 2011, p 829)

Transportation and traffic will continually produce much noise and poisonous gases. Hogan considers noise as an urban pollution source. “In urban planning, sound is usually measured as a source of pollution” (Hogan, 1973). Since noise pollution and toxic contaminations are at a high degree in Iran’s cities, the urban planners shall have to mitigate the problems as well.

2.6 Planning difficulties of sustainable new town building

It is strange that many new town projects do not follow the academic and classical ways to conduct feasibility studies first. Social pressures of demands for homes and urban spaces force the decision makers to address the demands when they build a new town. This is a self-automated development without ex ante and ex post analysis. In Iran, there is a game between power, planning, and people. People produce social pressures and power bodies invest less in public and new town projects. From the other side experts and scientist urban planners insist on working with knowledge and new technologies to meet their targets. The urban planning process in Iran does not include a suitable relation among the authorities, the knowledge bodies, and the people (Ziari, 2006). I think that the planning ideas of Sager cause public participation when stated “It makes sense to let the various interests have their say before the developer’s ideas about the project become set in stone” (Sager, 2001, p 197).

Amongst the various ideologies on the planning process, the region does not have the communicative model of planning, while more useful for the new town development projects. The currently used model of planning does not focus on communication to help different interests in the process of planning and designing. The region needs public participation to include a range of voices in the process of plan making. As Lane suggested the inhabitants shall be the core of the model of planning. “In this model of urban planning, participation is fundamental to the planning process happening. Without the involvement of concerned interests there is no planning” (Lane, 2005). Several scholars discuss whether the communicative model of planning is a rational method or not. During the recent decades, the rational models of planning have been the most widely
accepted models. The aim of the rational planning model is to make planning coherent and systematic as possible. However, the struggles among power, knowledge, scientific planning, and communicative drafting of urban planning are still unsolved in Iran.

2.7 Physical and skeletal design
Since the majority of people are poor and the state does not invest in the urban development projects, skeletal and physical shapes of the cities are usually undesirable and unhealthy. Particularly, the informal urban districts, which have been built by self-automated forces, suffer the skeletal problems.

Since the plazas, streets, and passages had not been planned with the help of architectural design, the geometrical shapes of urban places are problematic. The areas lack the needed urban infrastructure and services and when people try to supply the infrastructure, their attempts cause uncommon, irregular and twisted urban cityscapes.

2.8 Resistance and duration
Natural disasters of floods and earthquakes are major sources that threaten the cities in Iran. Unfortunately, the cities cannot be protected against the threats and cannot tolerate the earthquakes either. Table 2.2 reports the frequency of the most powerful earthquakes in Iran.

<table>
<thead>
<tr>
<th>Cycle of return (Richter scale)</th>
<th>Magnitude of earthquake</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every 2-4 weeks</td>
<td>4-5</td>
</tr>
<tr>
<td>Every 2 years</td>
<td>≈6.5</td>
</tr>
<tr>
<td>Every 5-10 years</td>
<td>7</td>
</tr>
</tbody>
</table>

Source: (Tasnimi, 2001)

The table states that Iran is home for repetitive strong tremors which are very often so powerful that they kill many people. Table 2.3 shows a list of the recent earthquakes with their human and physical damages.

The table reports the mortality outcomes of major earthquakes during the last century. It shows the importance of the problem, but the figures could be higher since the statistical data may fail to report the reality.

Therefore, the developers must plan and design the cities to be resistant against the problem of natural disaster attacks. This problem urges the urban planners and designers to find logic and rational answers to the following questions:
Table 2.3 Fatal earthquakes in Iran during the last century

<table>
<thead>
<tr>
<th>Year of earthquake</th>
<th>Place of earthquake</th>
<th>Magnitude</th>
<th>Description of losses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1909</td>
<td>Silakhor</td>
<td>7.4</td>
<td>Killed 8000 people, damaged 64 villages</td>
</tr>
<tr>
<td>1911</td>
<td>Ravar</td>
<td>6.7</td>
<td>Killed 700 people, damaged 4 villages</td>
</tr>
<tr>
<td>1923</td>
<td>Torbat</td>
<td>5.6</td>
<td>Killed 770 people, damaged 5 villages</td>
</tr>
<tr>
<td>1923</td>
<td>Bojnord</td>
<td>6.5</td>
<td>Killed 157 people, damaged 10 villages</td>
</tr>
<tr>
<td>1923</td>
<td>Kerman</td>
<td>6.9</td>
<td>Killed 200 people, damaged 5 villages</td>
</tr>
<tr>
<td>1927</td>
<td>Baluchistan</td>
<td>6.5</td>
<td>Unknown</td>
</tr>
<tr>
<td>1929</td>
<td>Koppe dagh</td>
<td>7.1</td>
<td>Killed 2200 people, damaged 88 villages</td>
</tr>
<tr>
<td>1930</td>
<td>Salmas</td>
<td>7.2</td>
<td>Killed 2514 people, damaged 60 villages</td>
</tr>
<tr>
<td>1931</td>
<td>Zangzor</td>
<td>6.5</td>
<td>Unknown</td>
</tr>
<tr>
<td>1934</td>
<td>Baluchistan</td>
<td>7</td>
<td>Unknown</td>
</tr>
<tr>
<td>1935</td>
<td>Mazendaran</td>
<td>6.3</td>
<td>Killed 480 people, damaged 26 villages</td>
</tr>
<tr>
<td>1941</td>
<td>Birjand</td>
<td>6.4</td>
<td>Killed 680 people, damaged many towns</td>
</tr>
<tr>
<td>1945</td>
<td>Chabahar</td>
<td>8.2</td>
<td>Killed 4000 people, damaged 12 villages</td>
</tr>
<tr>
<td>1947</td>
<td>Doostabad</td>
<td>8.2</td>
<td>Killed 400 people, damaged 5 villages</td>
</tr>
<tr>
<td>1952</td>
<td>Semnan</td>
<td>?</td>
<td>Killed 183 people, damaged 200 villages</td>
</tr>
<tr>
<td>1956</td>
<td>Gode</td>
<td>6.3</td>
<td>Unknown</td>
</tr>
<tr>
<td>1957</td>
<td>Mazendaran</td>
<td>7.4</td>
<td>Killed 1500 people, damaged 120 villages</td>
</tr>
<tr>
<td>1957</td>
<td>Bakhtaran</td>
<td>7.3</td>
<td>Killed 1130 people, damaged 200 villages</td>
</tr>
<tr>
<td>1958</td>
<td>Nahavand</td>
<td>6.7</td>
<td>Killed 191 people, damaged 110 villages</td>
</tr>
<tr>
<td>1960</td>
<td>Lar</td>
<td>6.1</td>
<td>Killed 400 people, damaged 75% of the city</td>
</tr>
<tr>
<td>1961</td>
<td>Dehkoye</td>
<td>6.8</td>
<td>Killed unknown numbers, damaged 40%</td>
</tr>
<tr>
<td>1962</td>
<td>Boein Zahra</td>
<td>7.2</td>
<td>Killed 12200 people, damaged 300 villages</td>
</tr>
<tr>
<td>1968</td>
<td>Dashtie byaz</td>
<td>7.2</td>
<td>Killed 10000 people, damaged 61 villages</td>
</tr>
<tr>
<td>1968</td>
<td>Ferdos</td>
<td>6.4</td>
<td>Killed 750 people, damaged many villages</td>
</tr>
<tr>
<td>1969</td>
<td>Bamoor</td>
<td>6.7</td>
<td>Unknown</td>
</tr>
<tr>
<td>1970</td>
<td>Marave tape</td>
<td>6.7</td>
<td>Killed 200 people, many physical damages</td>
</tr>
<tr>
<td>1972</td>
<td>Gheer</td>
<td>7.3</td>
<td>Killed 5010 people, damaged 50 villages</td>
</tr>
<tr>
<td>1974</td>
<td>Bandar Abbas</td>
<td>6</td>
<td>Killed 6000 people, damaged 2655 homes</td>
</tr>
<tr>
<td>1976</td>
<td>Makoo</td>
<td>7.3</td>
<td>Unknown</td>
</tr>
<tr>
<td>1977</td>
<td>Bandar Abbas</td>
<td>7</td>
<td>Killed 128 people, many damages</td>
</tr>
<tr>
<td>1979</td>
<td>Tabas</td>
<td>7.7</td>
<td>Killed 18220 people, damaged 85 villages</td>
</tr>
<tr>
<td>1980</td>
<td>Khat</td>
<td>6.6</td>
<td>Killed 420 people, damaged 4 villages</td>
</tr>
<tr>
<td>1980</td>
<td>Bonyabad</td>
<td>7.1</td>
<td>Killed 130 people, damaged 150 villages</td>
</tr>
<tr>
<td>1982</td>
<td>Golbaf</td>
<td>6.7</td>
<td>Killed 1100 people, damaged many villages</td>
</tr>
<tr>
<td>1982</td>
<td>Sirj</td>
<td>7.3</td>
<td>Killed 1300 people, damaged many villages</td>
</tr>
<tr>
<td>1991</td>
<td>Rooodbar</td>
<td>7.4</td>
<td>Killed 35000 people, damaged many towns</td>
</tr>
<tr>
<td>1994</td>
<td>Sefidabe</td>
<td>6.6</td>
<td>Killed 6 people, damaged 300 homes</td>
</tr>
<tr>
<td>1997</td>
<td>Bojnord</td>
<td>6.8</td>
<td>Killed 100 people, damaged 10 villages</td>
</tr>
<tr>
<td>1997</td>
<td>Ardabil</td>
<td>6.1</td>
<td>Killed 965 people, damaged 3 villages</td>
</tr>
<tr>
<td>1998</td>
<td>Ghaen</td>
<td>7.3</td>
<td>Killed 1560 people, damaged 100 villages</td>
</tr>
<tr>
<td>2012</td>
<td>Abhar</td>
<td>6.5</td>
<td>Killed 200 people, damaged 189 villages</td>
</tr>
<tr>
<td>2013</td>
<td>Saravan</td>
<td>6</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

Source: (Abolhasanzadeh, 2013)

- Where and on which landscapes shall people build their homes and other urban spaces to face less damage when an earthquake happens?
- In what form shall people build their buildings to stand against earthquakes?
Which structural system must they apply to produce tolerant buildings?
What building material shall people use to produce light and safe buildings?

The general way is to urge people to accept the earthquakes as naturally recurrent events and live with them, but with a new look at urban planning, design, and construction.

2.9 Lack of infrastructures
Snickars et al (2013) believe that a sustainable development links to suitable urban and regional infrastructure networks. Also, Asian development bank sets planning for sustainable cities and transportation as its target. It announced the goal as "Urban planning is being integrated with new modes of transport, emphasizing accessibility and affordability. Asian development bank promotes efficient transportation networks", (ADB home page, 2013).

In Iran's populated regions, the main obstacle on the way of new town planning and every urban development project is the lack of adequate infrastructure and urban services (Azizi, 1995). Traditionally the regional managers promote the use of the land for its commercial values and for homes. They do not usually care for the public urban spaces and do not allocate land for urban infrastructure either. As said, since the development of the region goes on without pre-provided plans and without land-use policies the regional planner does not respect the need for urban infrastructure. The demand for infrastructure is much higher than the managers perceive. There are severe constraints on the provision of infrastructure in the region. The infrastructure-financing gap between what is invested and what is needed is big. The observation on the ground proves that people ask to satisfy the demand for urban and regional infrastructure urgently. American heritage dictionary defines the Infrastructure as "Infrastructure word is a combination of the Latin prefix "infra", meaning "below", and "structure". The term typically refers to the technical structures that support a society, such as roads, water supply, sewers, electrical grids, telecommunications, etc."

Infrastructure presents the physical components of interrelated systems providing commodities and services essential to enable, sustain, or enhance societal living conditions. Sheffrin described the job of urban infrastructure as "Urban infrastructure works with the efficient planning, designing, placement, building, financing, managing, and maintaining of required infrastructure across an individual neighborhood, settlement district of a city, town, or a city"( Sheffrin, 2003 ). The cities lack hard infrastructure and soft infrastructure in terms of transport, energy, power, sewage, and communication. Today, two major categories of urban traffic infrastructure are needed to make the cities livable. First, well-planned streets, passages for car traffic, second, necessary spaces, and lines for walkers and cyclists. Planning, designing, financing, constructing
and managing the urban infrastructure is an acute problem in the cities of Iran.

2.10 The cities are not functional
Cities in Iran are built and expanded without strategic economic plans and working programs. The cities do not have the possible spaces for works and different economic sectors. The majority of people are unemployed and only 10% of them are the employees of the state offices and military and paramilitary forces. Almost one-half of an Iranian year is religious and traditional holidays officially (see the Iranian calendar for this year, 1392). The cities are usually dormitories in Iran and they are not planned for functions in production, working and services, as they normally should be in an urban area (Shahraki et al, 2010).

2.11 The problems of architecture and aesthetics
There are massive problems about the aesthetic and architectural views of the cities in Iran. The new towns have been constructed without pre studies and logical considerations so that you may visit many neighborhoods in the bed of seasonal rivers and on the dead soil lands. You can visit urban districts with inharmonic height and a skyline of buildings and wavy streets and avenues. Other headaches that generate strong anxiety for the urban planners are the tensions between peripheral growth, housing density, and new settlements. The difficulties of unauthorized districts exist as well. There are also problems of the mixed urban places and lack of adequate urban public spaces that make the cities ugly. The observation shows that problems in this category relate to the increasing of population and very poor people who do not pay attention on the beauty of their homes and the cities. As Christopher wrote about the beautiful cities “Historically, many of the cities thought the most beautiful are the result of dense, long lasting systems of prohibitions and guidance about building sizes, uses, and features. These allowed substantial freedoms, yet enforce styles, safety, and often materials in practical ways” (Christopher, 2001, p 359). The architectural and aesthetic problems damaged the attractiveness of the cities and resulted in an unsuccessful tourism industry and difficult economic prospects.

2.12 Cultural and traditional conflicts
Although Iran had a famous ancient and traditional homing and town heritage, the current urban planning and design conflict with the architectural culture. The development projects have drowned in chaos and comic imitation and far from the culture and lifestyle of the society. After the decline of the agricultural sector and integration of the peripheral villages to the cities, the architecture has stood against the traditional climatic building. People ignored the culture of ancient and traditional environmental building so that homes and town building styles relied on fighting the traditional natural schools. The architecture style detached
from nature by help of knowledge and technology will create outcomes mistakenly. Particularly, the discovery of oil resources in Iran separated Iranians from nature with a higher speed compared to neighboring countries. Tofigh writes about the speed as "Urbanization in Iran had accelerated by the discovery of the oil and its extraction in the earlier century. The new revenues collapsed the traditional society and economy" (Tofigh, 1990, p 4). When people left the customary lifestyle they built their homes mimicking each other, expensively and harmful to nature. People did not have relationships with traditional culture and nature since they did not need nature. Urban inhabitants could be supplied with fresh air, light, and energy with the help of new mechanical and electrical devices, despite the costs. Therefore, we live in a transitional era and the urban planning and design shall be revised culturally aiming to use the advantages of the heritage approaches in architecture and building.

2.13 Poverty, fairness and rationality
Social conflicts, dishonesty, and unfair distributing of the financial resources as well as national incomes are obstacles on the way of new town planning, designing, and building. Regional conflicts and disputes cause many immigrations and unauthorized settlements. Iran has been home for millions of immigrants. Up to one third of residents of the border cities were refugees and immigrants (Research group, 2010). The numbers of the immigrants raise the inherent problems of the cities in Iran. Economic crisis, unemployment, and social discriminations resulted poorness. Poor citizens are not able to pay attention to the urban planning and design negotiations and they lose their legal rights. So people in massive numbers only try to build by primary building materials and produce awful neighborhoods.

2.14 Connected effects of the interwoven problems
Table 2.1 in this chapter presented a matrix of 12 problems that prevent a sustainable urban planning and designing in Iran. Several presumptions are drawn about the effects of the problems in the sustainability of the cities.

The presumptions are important for both present understandings of urban planning and design policies in Iran as well as a pattern for future cities. The chapter discussed the 12 problems separately, but in the real work of urban planning and design, they affect as an interwoven web and interactively. Every problem has a wider context within the regional plans and you shall not see the problems only locally. Sustainable urban development requires continued well planned development works. Capacity building is important in making the cities sustainable. Sustainability is possible by public participation, knowledge and modern technologies and international cooperation.
This introduction of the problems listed in Table 2.1 will be used later to discuss the problems in theory and practice in the next chapters.
3 Theoretical studies to progress urban planning and design

3.1 Introduction
The problem-orienting method for urban planning and design in micro, middle, and macro scales acts on several academic theoretical frameworks. The problem-oriented method discusses the techniques of site studies, landscape architecture, urban spatial planning, urban skeleton and physical design and building codes and regulations. The method includes the sustainable urban planning theories on ecological town building and infrastructure provision as well. Research on new towns needs global scientific, technological, and financial contributions. Douglas Farr interprets this need as follows: "We humans are now a super species, making personal and national choices that together will build the fate of the world’s other species" (Farr, 2008).

Patrik Geddes who was a pioneer in urban planning wrote on the issue of thinking globally and acting locally as follows: "Urban management and development highly influences the surrounding environment. Corporations need to be aware of global communities when expanding their companies to new locations. To improve urban livability through urban environmental strategies takes the stock of the existing problems, their comparative analysis, and prioritization. Then, set out targets and show various measures to meet the targets" (Geddes, 1915, p 397). As scholars Geddes earlier and Farr recently, believed the planners should use global knowledge and experience, and collaborate to plan and design sustainable new towns.

This chapter reviews the literature on global change of cities, the ideological reasons of the changes, and the socioeconomic perspectives of the changes in the urban planning. Planning perspectives of urban development, physical forms of urban development and infrastructure are other subjects that this chapter will discuss.

3.2 Changes of cities on a global scale
A first idea of this theoretical study is to understand each city dynamically and to look at every city as a living systemic organization. Multifaceted changes of cities are in climate, natural environment, society, economy, urban physical form, and skeleton. One century ago, many parts of the world were extremely poor and many cities had bad sanitation so death rates were high. Since the nineteenth century, the industrial revolution caused growing urbanization. Around 1900 half of the population lived in European cities with improved housing and sanitation. Later the prosperous period started. An excellent economic position emerged and welfare states were established. The states looked at urban planning as an apparatus for offering urban services, organizing the cities, providing
transportation networks and giving a decent life to people. Recently, cities have been transformed so that former industrial areas and harbors become new housing and service areas. Today, post-industrial towns are more dependent on the economy, services, and information, (Anderson and Poon, 2001). The cities house 80% of the population and urban planning is in collaboration with private enterprises.

Urban planning, design, and constructing methods become more automated. Cities in the developing countries have been under the same changes, even ancient cities with amazing old urbanization changed. Tavassoli wrote about the excellent ancient cities as “An unbelievable ancient technology advanced urban culture has been in the Indus Valley made famous as the Indus Valley civilization. The quality of the remaining city proves that they had urban planning knowledge. They built their city with an adequate water infrastructure network for the provision and distribution of water to consumers in their homes. They had the sewage network and baths and equipped kitchens. The city had well planned public spaces” (Tavassoli, 1988, p 29).

There were other examples of well-planned cities in China, Egypt, and Iran in old times as well. However, most of the ancient cities have been transformed to critical and polluted neighborhoods. The socioeconomic composition of the ancient cities changed and many of those regions have fallen into regional long-standing conflicts. In the present, the cities in developing countries are faced with a number of critical urban problems. One is the emergence of unplanned urban regions and polluted suburbs and cities (Brockerhoff and Brennan, 1998). To analyze the changes of the cities in the world this chapter sees the city as a creature composed of organs that together make a livable city. Every limb of the creature/city provides services and at the same time consumes natural resources and uses energy. It means that the city as a whole uses energy and produces services and pollutions. The processes of consumption and production depend on lasting changes on the geography and climate of the city, urban socioeconomic ordering, and lifestyles of the inhabitants. The cities are under permanent changes during their lifetime, from planning and design to building up to its long working lifetime. Lars Orskog was concerned with the exchanges between people and nature in cities. “Cities react on different interests and try to balance between them. The exchange of matter and energy between society and nature is handled best by centralizing communal works, and environmental policies guarantee that emissions from society lie within permitted limits”(Orskog, 1993). There is a balance between the exchange of materials that the city produces and energy received from the nature. Chavez and Ramaswami believed that the exchange between nature and the city requires mitigating strategies. “Understanding the nature of communities as highly producing and high net-consuming, after allocating out basic infrastructures, is essential for an
improved scientific understanding of their trans-boundary impacts and better prioritization of mitigation strategies" (Chavez and Ramaswami, 2013, p 376).

The other prioritization is the climatic changes as Broo and Bulkeley note, "Cities are key sites there they discuss climate change" (Broo and Bulkeley, 2012, p 92).

### 3.3 Ideological foundation of urban planning

Ideologies are basis of urban planning and design. Ideologies, cultures, and lifestyles create social regimes and urban decision systems. In democratic countries, an urban management system establishes the required institutes to pursue the housing and town building programs according to the demands of the society. In fact, the ideology of city development reflects the needs of the cities. Since the needs vary during over time, the suitable ideology to plan and design the cities can differ as well. One significant event that happened in Europe was the separation between the power of the church and the power of the state (Wallerstein, 2011). Dynamic changes of the beliefs and life styles contributed to empowering of the planning ideas to include peoples’ interest in the plans. In earlier times, the ideas of philosophers Friedrich Hegel, Ludwig Feuerbach and Karl Marx influenced the urban planners and developers. The latter philosopher believed that the ideologies were reflections of the needs of specific groups of the society. His followers still argue the difficulties caused by the ideas of the capitalism for the cities. Brenner et al write about these problems: "Urban issues, such as; uneven development between the center and the periphery, gentrification, urban redevelopment, depression of housing markets, the spatial polarization, and other problems have unfolded steadily" (Brenner et al, 2012, p 42).

In contrast, pragmatic town planners have relied on the doctrine of rationality. Recently market forces have pursued public interest in a rational way. In this regard, Eva Asplund noted that:

“What renders planning so attractive in this view is its conception as a field for practical social reform, for widening the scope of rationality and order in society, and for sharing in the exercise of power. The doctrine of rationality appeals to both utopians and reformers in planning as the criterion of the means by which their ends may be achieved" (Asplund, 1993, p 382).

Lately many urban planners argued for neoliberal ideologies. Sager defines the concept as: "A neoliberal policy is one that is promoted by neoliberal regimes and implies a shift from government to private strategies, or a conversion from publicly planned solutions to competitive and market-oriented ones, or at least
the serving of business companies and their favored customer groups” (Sager, 2011, p 629).

There is always a need for an ideology for urban planning. From classical cities, that Geddes and his group described the Greek city (Alston, 2012), and up to the present the need has been existed. It looked that the ideological foundation proper for the urban planning and design in the developing countries shall be functional and constructive. The functional and constructive ideas offer suitable planning ways, principle codes and legal acts to plan, design and develop the cities. Constructivism is an architectural movement that attempted to apply a three-dimensional cubist vision to abstracted non-objective constructions with a kinetic element (Grütter, 1987). Cubism made movement in perspectives from one point’s viewer to many points’ viewers. It made buildings alive and dynamics. The idea was to make the construction of towns functional and suitable to everyday uses of people as Jörg Kurt Grütter stated: “Constructivism is a public active ideology and a reflection of our understanding of the world at any given moment. Its formal order both reflects and promotes plausible ideas of social, philosophical, and urban order. Constructive architecture is a social art, an urban art since we teach what we believe. We design projects not to explore style, but to discover the best for towns” (Grütter, 1987, p 432).

Later, constructivism separated first into two schools, urbanists and garden city planners. We think that the constructivism is helpful to plan and solve the urban problems in Iran. One famous scholar in this field is Reyner Banham. He argues the usefulness of the idea as “Many hoped to see their ambitions realized during the five-year plans. They make notice of infrastructure and public urban services with a constructor eye” (Banham, 1971).

Developing countries with their increasing urban difficulties will benefit of problem-oriented and constructive ideological foundations in their planning. The ideological foundation will illustrate three questions. First, shall the developers solve the urban problems centrally or locally? The second question is the holistic institution of urban planning. In other words, which organization is responsible? Third, who will handle the allocation problems, the market forces, or the politicians?

The urban planning ideologies are mainly affected by social and collective solutions, liberal democratic ideas and neoliberal ideology that rely on market solutions and the commercial developers (Hackworth, 2007). The ideologies on urban planning are usually to be understood in terms of people and economics. Sager found the relationship between people and the economy in neoliberal urban planning: “An important aspect of neoliberal housing policy ensures subsections; for example, gentrification and privately governed and secured neighborhoods (gated communities). The main themes are the founding of
housing markets and the transition to private ownership of the before public lodging stock” (Sager, 2011).

However based on the particular local and regional situations the urban planners shall work with one planning ideology or a mixture of some schools to achieve successful development results. In Iran with many urban problems, the ideological foundation of urban planning shall understand the links between nature, economy, and people.

3.4 Socioeconomic views of urban planning and design

Urban planning and design in every city is a reflection of its socioeconomic situation. One major socioeconomic driving factor in Iran is the mass population movement so that everywhere you feel lack of urban spaces. In a crowded city communications of the inhabitants depend on the degree of mutual cultural understanding. Edward Hall and Mildred Hall analyzed the social communications as follows: “It is possible to say that the term of communication can be divided into three parts: words, material things, and behavior. Words are the medium of business, politics, and diplomacy. Material things are usually indicators of status and power. The behaviors give feedbacks on how other people include techniques for avoiding confrontation”, (Hall and Hall, 1990, p 93).

Regional social conflicts and disputes force people to abandon small communities and try to gather compactly in high-density regions. In border cities in Iran there settled different racial and religious groups of people, and therefore social conflicts might emerge in the cities. It seems that John Sinclair and Jim Robson saw a similar conflict in the northwestern region of Canada due to the ancient native groups of people there and tried for common ground among different races with the help of urban land policy, "All levels of government in Canada are coming to grips with the economic, demographic and moral imperative to fix the country's troubled 500-year relationship with aboriginals", (Sinclair and Robson, 2012).

Urban planning and design work with socioeconomic features of the city to keep the quality of community health in the cities (Ubaidur and Noorunnabi, 2012). Further, Vojnovic et al particularly understands the public health as a view of urban planning and design as follows: "While public health is a concern in cities a new stress emerged across the American urban landscape" (Vojnovic et al, 2013).

Urban planning and design save the natural resources and the natural environment. The high density of people accelerates the natural problems. Natural disasters of droughts and floods force people to live in dense urban areas. High rate of population reproduction made rapid urbanization.
To understand the socioeconomic features of town planning it is first necessary to develop three views in an urban planning process as follows:

i. A theoretical framework for understanding the nature of the social interactions among urban spaces, population density, infrastructure facilities and welfare standards of an acceptable urban life.

ii. A theoretical framework to make sure that the urban planning and design system will make the town working economically and socially.

iii. A systematic auditing and assessing machine to make sure the efficiency of the urban planning and design. In other words the planning system shall include an ex post assessment as well.

These three perspectives are interwoven to give both a framework for the analysis of contemporary planning and to figure the likely outcomes of alternative policies in the light of experience. Urban planning procedures will have a strong relationship with the social behaviors of inhabitants. Town planners and spatial designers are able to form the social behavior by the models of their urban spaces. Alice Coleman is famous because of her urban plans that reduced social crime and conflict as follows: "Types of houses affect social behavior. Youths disputes, fighting of gang groups, throwing wastes and social crimes happen more in particular tall buildings or special geometric urban squares and public spaces" (Coleman, 1985).

Coleman proved the relation between urban spatial planning with socioeconomic variables. Robert Potter believed that urban planning and designing might be in favor of better social behaviors (Potter, 2011). The socioeconomic perspective of the urban planning system is better identified if we see the socioeconomic variables from earlier until the present and predict the future.

The planning process provides a way of continuously interpreting the reality that is not dependent on the implicit assumptions. In fact, in this way the urban planners can understand the elements and urban spaces that shall be included in a general spatial plan of the city. Economic plans will pay roles in the process of planning. The regional planners shall measure energy consumption by the city and services produced. They shall use the real socioeconomic variables to plan, design, and build a sustainable city. The political system as a result of the socioeconomic and ideological ordering of the city must state its concern with the sustainable city as for instance in the newly published book, Governing the present, written by Peter Miller and Nikolas Rose (2013). There they discuss the socioeconomic features of urban planning and design.

3.5 Planning perspectives of urban development

Although humans used urban planning to build homes and towns in ancient times, but the major urban planning jobs refers to the post world war era. For
example Cullingworth stated the fact as: “It is now fifty years since the first instalments of the post-war planning legislation were passed” (Cullingworth et al, 1994). Also about the urban planning in Sweden Göran Cars suggested that urban planning began after ending of the world wars, “In terms of planning history, the post-war years were revolutionary. Several new areas and central and local government planning were established” (Cars, 1991).

Developing countries built traditionally and self-automated without pre-planning. Newly, they recognized that urban planning systems, codes, and acts are significant in the process of urban development. Today without planning, we are not able to overcome the increasing urban difficulties. Disputes among dissimilar levels of powers and authorities, different private and public interests, and unauthorized anarchic expansions of cities are examples. Marco Pütz suggested the problem-solving roles of planning in the process of development as: "It works with urban sprawl and land use planning to check the role of scale and power for regional environmental governance processes. Urban sprawl is chosen as a field of study because it is an environmental difficulty; and land use planning is regarded as the political intervention to solve the problem" (Pütz, 2011, p 177).

Although planning is the rule in many countries across the globe, the differences between urban planning methods are considerable depending on the conditions on which the planning styles and regulations are based. Iran has a central planning body and its plans do not explicitly include public interests (Tinbergen, 1964, p 67-91). Conversely, in representative democracies, regional and local planning bodies come from elections. Tore Sager discussed on the urban planning bodies and suggested necessary involved actors in agreement with a market-oriented development (Sager, 2011). Göran Cars described the scope of regional and municipal urban planning bodies: “Regional plans enable several municipalities to coordinate their planning in larger areas” (Cars, 1991, p 55).

In Sweden urban planning is for dialogue between the municipalities and regional actors. In addition, the comprehensive plan that each municipality must have is only an adviser. Comprehensive plans are the sum of and compromise between different goals. There are also deepened comprehensive plans for parts of municipalities. Cars defined the plan for a municipality, “A compulsory comprehensive plan covers the municipality and shows the main features of land use and the development of the municipality” (Cars, 1991, p 60). Finally, detailed plans regulate relationships between common goals and private goals and land policies in preparation for construction. Cars defined the latter plans as follows, “Detailed plans or development plans regulate land and water use. They are legally binding, for subsequent decisions” (Cars, 1991).

Regulation is a significant phase in the urban planning process. Sweden provided town building and housing regulations and acts to develop its cities. The aim of
the regulations was to improve living conditions in the cities. Various reform programs, under the umbrella of the regulations, were carried out particularly within education, medical care and housing.

Building in the welfare state is governed by rules, and often supported through subsidies. When the urban planning methodologies must be efficient and possible as Ratcliffe et al suggested reforms in urban planning system is necessary: "The current system was considered to be complex, remote, hard to understand and difficult to reach" (Ratcliffe et al, 2004, p 10). Ratcliffe et al urged the need for reform in England and Wales, but more urgently due to many reasons, planning in Iran must be reformed and alerted. UNEP recognized the need and believed that the urban planning system may stay nonfunctional and unsuccessful. Iran worked with urban planning, but unsuccessfully. Evaluation of the outcomes of the new town projects by comparing the results to the strategic goals of the plans proved the claim (Fanni, 2006). There is a need for education, increasing of managerial capacities and establishment of technical offices in the county and stronger municipality levers to enforce the plans (UNEP, 2002).

We understand now that an urban planning system has both a problem solving function and a legitimizing function. Those who stress the latter tend to see planning as a matter of exercising power. Then, planning becomes a negotiation between private and public interests. Those who lean towards the idea of planning as problem solving tend to look on planning as a knowledge process. They wish to plan in an open forum in which laypersons and professionals meet to discuss the future of the cities. Urban planning in Iran is seen as a problem solving opportunity. The developers in Iran will apply knowledge, new technology, the art of negotiation, regulations and acts, and transparency and rationality.

Environmental, natural and infrastructure questions are new in Iran and enough knowledge in the regions has not yet been amassed. Further, involvement of people is the way that a sustainable society will come. Urban planning in favor of a better relationship between society and nature has not been a common feature of urban planning yet, (Gonniri, 2004). Recently, Nikos Karadimitriou suggested that urban planning has become much more active in the sustainable development: "The emergence of the sustainability agenda during the last three decades brought to the fore considerations of balancing economic growth with environmental and social concerns. One of the effects it had on urban policy in a UK context was a renewed try to bring development back into the cities, to promote compaction, mixed uses, urban living and sustainable communities" (Karadimitriou, 2013, p 41).

The above observations suggest that urban planning in Iran is concerned with three questions, the natural environment, the built environment, and the
socioeconomic arrangement. If planning is to regain status in Iran, it must stress the three questions.

3.6 Physical forms of cities
Physical skeleton and forms of cities concern the arrangement, appearance, and functionality of towns and in particular the shaping and uses of urban public space. Rolleston and Awatere define urban physical design as follows: "Urban design is the practice and process of shaping physical environments in which modern societies and people can live", (Rolleston and Awatere, 2009).

The physical design is a part of urban planning and there are different theories on the topic. For example, see here what Carmona and Tiesdell believed that "Urban design sorely lacks cohesive theoretical foundations. Much writing takes the form of guidebooks or manuals, which rely on rules of thumb, analytical techniques, and architectural ideas. Their theoretical justifications are unclear", (Carmona and Tiesdell, 2007). Although what Carmona and Tiesdell wrote, the physical design has found its way in practice and into the urban realities gradually. Today, everywhere, the physical design has common principles that we include in the urban planning process. The design principles are important for sustainable urban development. The principles include the city values, the preservation of cultural resources and landscapes, building homes and spaces, providing urban infrastructure, and strengthening the social cohesion. Nevertheless, the scholars may suggest different principles for the physical designing in various climates and social environments. Barnett formulated a set of physical design principles that seem to be commonly used as follows:

“Urban physical designing considers:

- Urban structure, how a place is put together, and how its parts are related.
- Urban typology, density and sustainability, spatial types and morphologies related.
- To intensity of use, consumption of resources and production and maintenance of working communities.
- Accessibility, providing for ease, safety and choice when moving to and through places.
- Function and fit, shaping places to support their varied intended uses.
- Complementary mixed uses, locating activities to allow constructive interaction between them.
- Character and meaning, recognizing and valuing the differences between one and one other place.
- Order and incident, balancing consistency and variety in the urban environment in the interests of appreciating both.
- Continuity and change, locating people in time and place, including respect for heritage and support for contemporary culture.
Civil society, making places where people are free to meet one another as civic equals, an important part in building social capital" (Barnett, 1982, p 112).

We may design a new town or redesign an earlier old city. In the latter case, we face many social, economic, legal, and technical difficulties. If we plan a new town in a vacant land we will have an easier task. The first question in the physical design of cities is their localization. It is important to find a suitable place for every new town project. Localization of a new town has a geographical and topological aspect first and then its climate, natural resources, technology, and economy are important. The German geographer Walter Christaller provided a practical theory called for central place theory. The theory has its roots in geography and natural sciences and it suggests the number, size, and place of urban settlements. Later, Openshaw and Veneris developed the theory and described it as follows, “Central place theory distributes regional population evenly and all settlements are equidistant and in a triangular lattice pattern. The local resource shall be distributed evenly. The place shall have a distance decay mechanism. Consumers visit the nearest central places that give the function that they demand. They reduce the distance of travels” (Openshaw and Veneris, 2003, p 1394). The theory of central place is helpful when planning and designing urban traffic infrastructures. Urban traffic networks shape the geometrical form and the skeleton of the towns particularly in the case of street-axial towns (Shahraki, 2009).

After finding the geographical place of the new town, we have to understand the site. The planners must know what subjects compose the site understanding. Site understanding and site analysis include the following subjects:

- Knowing the land situation, neighborhoods, vast, shape, size, general slope and topography. Further, the built environments around the site, existing installations on the place, visual natural events, and ecological features shall be studied.
- Understanding the place of the general plan, having knowledge of the building regulations and codes of the area.
- Gathering information about the area’s possibilities to supply required infrastructure such as; traffic network, water supply and sewage infrastructure, gas pipelines and telecommunications installations.
- Exploring the land on the site including geology, seismology, situation of faults, soil mechanics, underground water, surface water, the degree of soil penetration.
- Studying of climatic and geographic characteristics of the area. The study includes situation and types of winds, the volume of precipitation and
changes of humidity. The state of sunshine in different seasons and changes in the temperature will also be studied.

When the site has been understood well, the planners shall study the future of sight to understand the needed urban spaces with the help of academic forecasting methodologies. The physical design uses site-designing technique after it understood the present and future needs well. The bodily designing aims to arrange the urban spaces and put them together. The site designing technique considers the shape, size, slope, built environment, natural environment, and type of soil. It also thinks about climate of the place, accessibilities, neighborhoods, and suitable and unsuitable views. The site designing technique locates the buildings in proper places, designs connecting passages, and orients the buildings toward direction suitable for less energy consumption. It distributes open and closed spaces in buildings and simplifies the circulation among the urban spaces. The physical design of a city as Butler and Steiner understand addresses the subjects of water, land, hazards, building types, development types and beauty (Butler and Steiner, 2007).

In physical design, the work in urban structure is a basic question. It forms the shape and the geometry of the city. The form and shape of the city as Antti Vasanen in a research publication titled *Examining the metropolitan spatial structure* stated is important in functions and actions of a city, (Vasanen, 2012). The physical structure is important in terms of climate, ecology and nature of the cities as well as Franck et al explored (Franck et al, 2013). Therefore, urban structure is the arrangement of land use. It explains that using different models and the skeleton design can proceed after one of the following possible models, the zone model, the sector model, the multiple nuclei model, and the ring model.

Dabbaghian et al studied the zone model and illustrated it as a new symmetric boundary zoned urban formation. This model was the first to explain the distribution of social groups within urban areas. According to this model, a city grows outwards a central point in a series of rings. The innermost ring is the central business zone that is surrounded by a second ring. The zone of transition has industry and poorer-quality housing. The third ring has homes for the working-class. The fourth ring has newer and larger houses usually occupied by the middle-class. The outermost ring is called the commuter zone and represents people who choose to live in residential suburbs and take a daily commute to work.

The sector model in the urban physical shape emerged while accepting the existence of a central business district and zones expanded out from the city centre along railroads and highways. (Smith, 1962) studied the Chicago as an example of the sector model. The sector model, proposed that a city develops in sectors instead of rings. A certain area of a city is more attractive for various
actions, whether by chance or geographic and environmental reasons. As the city grows and these activities flourish and expand out, they become a sector of the city. If a district is set up for high-income housing, for example, any new development in that district expands from the outer edge (Yi and Tian, 2011).

Mehaffy et al explained the multiple nuclei model and an extracted of the discussion shows that in this model, a city has more than one centre. Some activities are attracted to particular nodes while others try to avoid them. For example, a university node may attract well-educated residents, pizzerias, and bookstores while an airport may attract hotels and warehouses. Incompatible land use activities will avoid clustering in the same area, explaining why heavy industry and high-income housing rarely exist in the same neighborhoods.

A ring web is typically found in European cities (Scott, 2013). Medieval European towns were typically constructed around a church or cathedral. Cities founded before Christian influence were built around temples and other structures of cultural significance. The street-axial model arranges the streets and large thoroughfares in cities as the first priority in urban skeletal design. Roads and avenues divide the city into various regions. Martin Tomko and Stephan Winter provided a formal, computable method for the estimation of the image of the city. They grounded the model in accessibility and a well analyzed road structure form (Tomko and Stephan, 2013). The formation of the roads themselves is usually representative of the dominant culture of the region too.

The irregular model in urban skeleton is a model that we see in developing countries. This model is a result of social conflicts and unauthorized developments (Allard and Small, 2013). Urban planners and designers normally attempt to avoid this model.

3.7 Infrastructure and technology in urban planning

Urban planning and design in Iran with its natural disasters and social pressures shall give energy, communication, water, power, and transport with the help of new knowledge and advanced technologies. Firzli and Bazi define “Infrastructure as basic physical and organizational structures needed for the operation of a society or enterprise, or the services and facilities necessary for an economy to work” (Firzli and Bazi, 2013, p 67). Urban infrastructures are known in two groups, soft and hard infrastructure (Portugal-Perez and Wilson, 2012). Hard infrastructure means the large physical networks necessary for the functioning of a modern industrial city. Soft infrastructure refers to all the institutions that are required to support and manage the infrastructures and standards. Hard infrastructure comprises physical water supply and distribution installations, sewage networks, transport networks, energy and power networks,
and communication networks that give bases and touchable possibilities for urban functions and life, (Hosono, 2013).

Water is a major concern in Iran and urban planners and designers must plan for the supply of water resources for every city. As Elizabeth Shaw suggested water supply, distribution and management has the following activities:

“Generally water infrastructure includes the following parts:

i. Water supply coming from underground reserves, surface resources, and precipitation
ii. Distribution networks for handing out the water between drinking, agricultural, and industrial consumers.
iii. Necessary infrastructures and installations to supply, depot, distribute, consume, and manage the waters.
iv. Financial, logistic, and human recourses for example the needed professional software and knowledge” (Shaw, 1988, p 431).

The hydro-social change balance as Merret defined is a soft infrastructure to manage the water supply and distribution network. “A set of accounts for hydro-social water flows in an area in the balance between two periods” (Merret, 2002). Merret's definition of a hydro-social change balance describes the volume of water supply and uses in a given city at a certain time. The balance purposes to manage the water resources optimally.

Transportation and traffic infrastructure is vital in every city and region. Some parts of a traffic network are included in hardware infrastructure and others are software. In this discussion as Fulmer suggests we propose three significant parts of a generic traffic and transportation network.

i. “Networks. They are basic necessary installations for movements. They would be streets, roads, freeways, railroads, airlines, water lines, canals, pipelines, terminals, airports, train stations, bus stations, cargo storage, truck terminals, fuel stations, and harbors.

ii. Transport instruments. They are machines, automobiles, cars, trucks, airplane, helicopters, trains, ships, bicycles, humans, and other tools that travel on the infrastructures.

iii. Operations refer to the actions, which cause functioning of machines and services. It refers to methods which offer precise and continuous functions of infrastructures and machines as well like financing, regulations and police” (Fulmer, 2009, p 30).

To plan and design traffic infrastructure of the cities we need to supply the three parts that Fulmer suggested. Planning must include urban traffic engineering as well. As Homburger and Perkins outlined the fundamentals of traffic engineering are:
“The method of traffic engineering uses engineering techniques to meet the safe and efficient movement of people and goods on roadways. It focuses on studying and construction of the infrastructure necessary for safe and efficient traffic flow. These are road geometry, pedestrian lines, cycling lines and facilities, streets, highways, traffic signs and terminals”, (Homburger and Perkins, 1992, p 214).

New technologies and advanced digital devices are needed to solve the urban traffic and transportation problems in the cities. Electronic and digital communications infrastructure is a part of urban planning and design. Planning and building of electronic town is functional economically and with less pollution and traffic, suggesting that the electronic new towns are better places for living and working. Cohen and Elimicke define an electronic new town as:

“An electronic city is a place there, every inhabitant accesses to municipal services, banking services, educational services, medical and other services every day round clock securely, safely and secretly”, (Cohen and Elimicke, 2001, p 95)

The urban planners shall supply required infrastructure to build an electronic city. Jalai listed the communication facilities to plan an electronic new town as:

“Communications services are bases to project a new electronic town. The following Actions shall be made to give foundations to an electronic new town:

- Postal services including sorting and distribution facilities
- Telephone and mobile phone networks
- Television and radio transmission stations and cable television physical networks
- The internet including the internet backbone, core routers, servers and undersea cables
- Communication systems including satellites and transmitter stations.
- Major private/ government/ dedicated telecommunications networks such as those used for internal communication and monitoring by major infrastructure companies, by governments, by the military or by emergency services. (Jalai, 2003, pages 17-18).

The urban plan shall provide access to communication services for all people in the city. Burchell, et al in their research on infrastructure needs in the United States in the interval time of 2010-2030 with forecasting methodologies found that every city needs natural gas pipelines, petroleum pipelines, associated tanks, and distributional terminals. Every city needs also electrical power networks including generation plants and distribution grids, and possible clean
and renewable natural energies. In Iran energy infrastructure like transportation and water shall be made of three main components as follows:

- Resources that give needed energy for the functions and services of the city.
- Abstracting energy from the resources and distributing them to different nodes of the urban life and activities.
- Planning, designing, building, controlling, managing, and monitoring of the energy infrastructure.

Peter Droege in his newly published book focuses on the urban energy transition. He discusses the novel trend in Australia for using new technologies in renewable clean natural energies instead of traditional fuel energy. When Scandinavian countries like Sweden and Denmark take benefit of a diversity of resources to supply urban energy infrastructures Iran’s cities have more possible sun and other natural resources to supply energies. However, Iran counts almost totally on underground fossil/oil resources. Denmark has well managed institutions in research and design, and produce new technological machines to produce energy from earth, seawater, wind, and sun. Sweden outlined its present energy policy in the late 1990s. The government wanted to promote efficient and sustainable energy use and a cost-effective energy supply. The Swedish energy policy rests on the following cornerstones:

- Large amount of renewable energy
- High power consumption and low emissions
- Biofuel provides heat and power
- Renewable electricity
- Fast growing energy source
- Alternative fuels
- Cleaner transportation
- Using rechargeable cars
- Conserving energy in industry
- End to energy-wasting products

Sweden has built new plants to generate and combine heat and power for a further 12% of the electricity output mainly by bio-fuels. Urban planners and designers in Iran need to learn the new programs and technologies on different urban and regional infrastructures and must use them for better urban planning and design outcomes.
3.8 Concluding observations
This chapter applied a problem-oriented method to explore theories related to the challenges of urban planning and design in Iran. The problem-oriented method of urban planning and design is a suitable technique in the regions with urban development problems. The technique helps the planners and designers to understand the real urban needs and to plan for sustainable development based on the demands of the people. The problem-oriented method is especially required for cities under the dynamic changes.

While this chapter had an international eye and exposed some theories of scholars related to the sustainable urban development it discussed also the various perspectives of the urban planning and design in the case study region in Iran. This chapter also discussed the ideologies that drive the work styles of the urban planners and found dynamic, constructivism, ecologic and public communicative ideas helpful ideologies for Iran's urban planning and design. The chapter furthermore studied the theories on the major problems of the urban planning and design to outline helpful hypotheses and theories about sustainable urban development in the southeast region of Iran. With the help of theoretical exploration we highlighted the need for planning and understood that by urban planning the cities will develop in a desirable direction and avoid unauthorized and self-automated expansions.

The chapter found social conflicts as obstacles on the way towards sustainable development in the cities. It recognized strategic urban planning, fairness, transparency, and economic growth as ways to address the current increasing urban socioeconomic problems.

The chapter found theoretical links of physical and skeletal formation and shape of the cities with the climate, nature, environment, economy, and lifestyle of the city. After reviewing the possible physical design of the cities the street-axial model was proposed as a suitable planning tool for many cities in Iran. The chapter discussed the lack of urban infrastructure in Iran and after defining elements of different hard and soft infrastructures suggested suitable theories for provision of the urban infrastructures. In this way, the chapter contributed to the theoretical foundation for a better urban planning and design system in the case study region and suggested suitable and context-adjusted theories to develop sustainable cities in Iran and similar regions.
4 Field research to improve urban planning and design

4.1 Case studies of Zahedan city
This chapter will study the hypotheses and theories discussed in the previous chapter to see their validity in real life. The chapter introduces two case studies. The first case is about the new town of Aftab near Zahedan, the capital of the province of Sistan and Baluchistan. The second case is on Bonjar town near Zabol city in the north of the province. Then, the chapter will analyze the impacts of the new towns in terms of progressing sustainable urban planning and design in the region.

4.1.1 Introduction
This case is about planning and design of the new town of Aftab near Zahedan city. Aftab has been planned with the help of the problem-oriented method (POM). Then, the field research analyzes the outcomes of the new town by the benchmarking method (BM) to check the contribution of Aftab in solving of Zahedan’s urban problems. Zahedan has an international perspective situated along the Zahedan to Kuite road and rail line. Since Aftab has only a 30 kilometer distance from Zahedan the features of Zahedan that are informative for planning and design can be illustrated by studying the new town of Aftab. The POM method of this case study contributed in understanding of the problems in Zahedan thus providing an introduction to further case studies on the problems and planned a new town as an optimal pattern for urban developments. Zahedan is near Pakistan and Afghanistan, only 40 kilometers south of the intersection point of the borders of the three countries (Figure 4.1). Zahedan is at an altitude of 1352 meters above sea level. Zahedan connects the southern region facing the Oman Sea to the Iranian capital of Tehran at 1605 kilometers distance.

The Köppen climate classification understands Zahedan as having a hot desert climate with hot summers and cool winters. Precipitation is very low, and mostly falls in winter (Peel, et al, 2007). The US National Oceanic and Atmospheric Administration states the main climatic characteristics of Zahedan during the time of 1961-1990. The analysis shows that the temperature in Zahedan goes up to 43 degrees centigrade during the summer and down to 27 degrees in the winter. The average number of rainy days during a one year time is only 26 with a total of 82 mm in precipitation. The climate is hard indeed. Zahedan has a hot and dry climate. The population in Zahedan city increases more rapidly compared to the average growth in Iran.
4.1.2 Zahedan's urban problems

In this part the problems that have been introduced and discussed earlier in are analysed for Zahedan to understand them in detail for planning and design of a new town near in the vicinity. The problems are related to the planning issues mentioned in the earlier chapters.
1 Zahedan is not a sustainable city
Colonel Jahanbani built Zahedan on the place of an earlier village where there was a military town (Municipality of Zahedan). Zahedan had an Indian architecture as Indian railway workers were the first bricklayers of Zahedan. The town was for military staff with their families. As time developed traders, office staff, and other people settled in Zahedan more than the city could tolerate. Zahedan did not have enough livelihood possibilities and natural water resources to home many people. It was unstable because of social problems and vulnerable if natural disasters, drought, flood and earthquakes would occur. Generally, Zahedan suffers from the sharp increasing population, lack of adequate urban infrastructure, and investments to tackle the urban problems.

2 Zahedan needs new knowledge and technologies
Before 1979, the decision makers were aware of the water problem, limited the expansion of the city and did not let new buildings be constructed. Since 1979, more managers had not had the knowledge in planning practice so they canceled the limitations, implying that the city has developed without knowledge and technologies. The general plan of Zahedan including its land policies and priorities are not based on academic knowledge, practical experiences, and new technologies to overcome the urban difficulties.

3 Natural resources are not enough for the population
A shortage of drinking water has been a historic problem in Zahedan. Underground water resources are only for 70000 people (Parsconsult, 1976), but one million people live in Zahedan now. 36 wells supply the water for Zahedan but 34 of them are contaminated with urban sewage. The most terrible news is that the level of the underground water declined from 10 meters below the ground surface down to -50 meters (Regional water organization, 2006). Warner describes the quality of the underground unusable as follows:

"The city has a serious problem such that if the abstracted groundwater is economic, water is not available for long periods because the demand far exceeds the supply. The heavy impact of urbanization on the groundwater quality is shown through the observed high nitrate and high phosphorus values" (Warner, et al, 2004, p 178).

At present, a 200-kilometer long water pipeline carries water from Afghanistan to Zahedan and gives water to parts of the city. Nevertheless the water is not drinkable and people buy water from certain water stations expensively.

4 Degradation of the environment continues in Zahedan
Zahedan homes one million residents plus many immigrants from neighboring countries. So, there are tremendous pressures on the environment of the city. We categorize the environmental problems in Zahedan into five groups:
- Sound pollution made by traffic and heavy industrial manufacturing.
- Air pollution caused by sand storms, traffic, and burning of urban and household rubbish in the municipality.
- Contamination produced by traditional sewage and surface waters.
- Solids and plastic materials remain in the streets and suburbs.
- Ongoing disappearance of green surfaces in the city and around it.

5 Planning
The planning of Zahedan city has not been done as scientifically as it could and has not been based on the necessary pre-studies as it should be. Initially when Zahedan was a small military town people have built new homes and urban spaces by time passing. Only recently, the municipality of Zahedan issued a comprehensive plan for Zahedan. The plan was drafted without academic knowledge and presence of creditable urban planners and engineers. The plan did not put emphasis on the climatic conditions and the natural limitations. By the help of desk studies and field observations changes can be recommend in the general plan of Zahedan and the detailed plans in following areas, urban land policy considering demographic and socioeconomic changes, zoning of the city according to the urban functional needs, regulating land use for the largest number of residents, and, provision of infrastructures and urban services.

6 Physical and skeletal design
Skeletal problems of Zahedan are depreciation of more buildings, the irregular geometrical shape of avenues and streets and tight urban spaces for crowded people. According to the methodology of this thesis we see the physical and skeletal problems in three dimensions; micro scale or an individual building, middle scale or an urban district and macro dimension or the whole of Zahedan. The scale of the city is ambiguous, inharmonious, disproportional and ill structured physically. See a view of the skeletal difficulties in Figure 4.2.

Figure 4.2 Picture showing some views of the physical problems in Zahedan. Source: (Shahraki, 2013)
In the middle dimension, the urban districts have narrow and tight passages with bad geometrical forms and sewage and hygiene difficulties. Figure 4.3 shows some of these serious physical and skeletal difficulties.

Figure 4.3 a photo of a typical urban district in Zahedan. Source: (Shahraki, 2013)

In the micro dimension many buildings are physically poor. Figure 4.4 is a picture of traditional Zahedan’s old homes which exhibit some of the difficulties.

Figure 4.4 a picture of a rusty house in Zahedan. Source: (Shahraki, 2013)
7 Resistance and durability
Zahedan like many other cities in Iran witnesses many earthquakes and anxiety spreads everywhere. Earlier Table 1.2 stated clearly that every 2-4 weeks the danger of earthquake exists. Earthquakes with more than six in Richter scale values are mortal in Zahedan with old and non-standard buildings. Design of buildings and their components in Zahedan are thus not resistant against earthquakes. The city is vulnerable when these rare floods happen. The texture of the city is tight and necessary ambulances, firefighters and police are hard to access. Figure 4.5 shows the crowded, compacted, and tight texture of Zahedan without necessary urban spaces and flow traffic network.

8 Infrastructures
The lack of adequate infrastructure is a huge problem in Zahedan city. Mainly the sharp increase of the number of inhabitants causes the trouble. Simultaneously the decision makers do not invest adequately in required infrastructure. Traditionally the urban managers in Zahedan promote to use the land for its commercial values and enough for residential areas. They do not care for the public spaces and do not allocate land for urban infrastructure either. Zahedan needs a transportation network, water supply and distribution infrastructure, and sewage and water surplus infrastructure. It needs energy infrastructure, gas pipelines and electricity and communication infrastructure as well. Zahedan
needs the said infrastructures in all three parts of provision, distribution, and management to give a better life for its residents. Figure 4.6 shows the problem in Karimabad district of the city.

![Image]

Figure 4.6 Lack of household sewage infrastructure in Zahedan city.
Source: (Shahraki, 2013)

9 Functionality
Initially, as we have remarked; Zahedan as the capital of the Sistan and Baluchistan province was a military border town. There has been a transformation of mainly military to an administrative and commercial city. This transformation is inextricably interrelated with changes in the population, family, and economic institutions. One can apply the classical zoning model for functional patterns to allocate the different zones to urban functions. Zahedan has an old district in the core of the city. Universities are in the south of the city and official buildings are in the center and west of the city. Residential areas are in the north of the city and manufacturing areas around it. The zoning emerged mostly by the self-motivated expansion of the city. Several revisions, changes and re-workings in the functional features of the city can be proposed to plan for its future based on the recent socioeconomic changes and the new knowledge.

10 Architecture and aesthetics
Poverty, a hard dry climate, and simple building materials like clay blocks caused undesirable architecture in Zahedan. Apart from the buildings of some individuals who have been supported by the state, most the rest of the city is plain ugly. The
new buildings are not in harmony with the poor environment around. So, they result in strange perspectives of which we see an example the following figure.

Figure 4.7 An ugly perspective of a new building in a poor neighborhood in Zahedan Source: (Shahraki, 2013)

In the micro dimension scale the poor people are not able to pay attention to the architectural and aesthetic aspects of their homes. They only try to build them by primary building materials. In the district dimension, the urban residential areas in Zahedan are composed of poorly designed lodges and huts with tight avenues and polluted environments. In the macro scale Zahedan does not have any particular attractive urban square, city hall, recreation space and neither any landmark building.

11 Culture and tradition

It is a commonly used argument in countries like Sweden that cultural urban activities make a city alive. Several scholars recommend its importance. As a sample Cars et al understand culture as a system of values and life in a city: "Here culture is understood as the social and humanitarian activities that create consciousness, meaning, and identity; culture as a system of values and patterns of life", (Cars, et al, 2005, p 4).

The groups of people who live in Zahedan represent various cultures and traditions. Despite the fact that Zahedan is a multicultural city apart official religious ceremonies people are inactive in this field. The necessary infrastructure and funding for cultural activities are simply not present in the city.
12 Fairness and rationality
Fairness and rationality were not included as arguments in the first building of Zahedan and has not been contained in later developments. Bartke and Shinn made a critical survey in land use planning in the big cities of Iran (Tehran, Shiraz, Bandar Abbas, Bushehr, Ahvaz, Rasht, Mashhad, Isfahan, Rezaiyeh and Zahedan. They found the expansion of the cities unfair and irrational. For example they wrote “Urban problems, e.g., urban sprawl, traffic congestion, air pollution, housing shortages, the demand for additional or expanded municipal services and many others. It is trite to say that the best land use plan is valueless if there is no adequate enforcement machinery” (Bartke and Shinn 1973, p 87)

Deep corruption in the authorities prevents fairness and rationality in the process of the urban planning and design. Inhabitants of Zahedan are poor and cannot afford to invest in a better home. The following figure shows a traditional possible home for normal people in Zahedan.

![Image](image_url)

Figure 4.8 a typical home of normal people in Zahedan. Source: (Shahraki, 2013)

Only certain individuals can afford to renew their homes or to build new homes. When the majority of people do not have access to suitable homes and buildings the lives of those individuals are not in harmony with the whole of the city and the result is segregation.

4.1.3 Planning and design of the Aftab new town
1 The site of Aftab new town
With a 30-kilometer distance from Zahedan city in the southeastern direction of the city of Zahedan-Quite road, the author of the current thesis planned and designed a new neighborhood. According to the resulting plan this new neighborhood is the first phase of the Aftab new town which will involve the
planning and building of necessary urban spaces and services in the new city. At the same time it is a new urban district which will be benefitting from the advantages of Zahedan. The name of the new district is Aftab (Sun). We think that the name presents the identity of the new town when the sun is a characterization of this region and its architectural and building style shall be affected by sunshine. Figure 4.9 shows the place of the new neighborhood.

Figure 4.9 Place of the Aftab new town on the way and railroad. Source: Google map

The first phase of Aftab is in a 45 hectare area. We hope Aftab as a pattern of sustainable planning and design will mitigate some of the existing problems in Zahedan.

2 Spatial planning of the site, planning in macro dimension
In spatial planning we worked within the macro dimension of planning and design of Aftab. The size, slope, natural environment, type of soil, possible connecting means and climate features of the site were effective factors to plan the new town. Based on the studies and the regional needs we designed a land use plan and allocated land for various residential, educational, commercial, recreational and infrastructures spaces. Figure 4.10 shows the result of the spatial planning.
During this step of the planning of Aftab the objective was to sketch a general plan for arranging the main elements (apartment blocks, villas, schools, supermarket, green spaces, streets, etc.)

3 Planning and design at district scale in Aftab
In this step of planning and design, the objective was to define, plan, and draw up necessary sub-projects (homes, offices, trade centers, schools, mosques, local parks, and avenues) under the umbrella of the main project of the new town. In particular we suggested a modern pattern of architectural design, green buildings, and traffic networks. Figure 4.11 shows a district in Aftab new town.

4 Planning and design at micro scale with user dimension
The new town of Aftab promotes green and climatic architecture in building homes for future residents. The buildings use natural energy and light with natural cooling systems and suitable trees and other crucial assets to green
yards of villas. The homes are a mixture of modern architecture and traditional desert architecture, see Figure 4.12.

![Figure 4.12 A modern planned and designed home in Aftab. Source: (Shahraki, 2013)](image)

As can be observed from the duplex house, attempts were made to cut the land use and save the environment with better planning and design in a micro scale.

### 4.1.4 Findings of this case study

Aftab as a new town will have both traditional desert Zahedan architecture and modern design following the climatic architectural school. Aftab planning is based on modern academic knowledge, green building concepts, new technologies in combination with Swedish planning standards. Zahedan as a multicultural city has the capacity to be a trade center and an active city in the region. The current urban problems in Zahedan that destabilize the city will be solved with the help of new knowledge, technology, and suitable climatic and green arrangements, achieving sustainable development at city, district, and user levels. The case study provided a chance to examine the different categories of urban problems in Zahedan.

### 4.2 Case study of Bonjar town

#### 4.2.1 Introduction

This case study applies the hypotheses and theories of this thesis to urban planning and design in Bonjar town. Bonjar is a laboratory to see the urban problems listed and discussed in chapter two. Bonjar is near Zabol and the most northern city of the Sistan and Baluchistan provinces close to the Afghanistan border. Note the placement of Bonjar in the regional map in Figure
4.1. In the left map of that figure you see the Sistan and Baluchistan provinces in Iran and on the right side Bonjar in the Sistan plain in the northern part of the province. Bonjar has a plateau-like topography and its lands are the sediments of the Helmand River with a slight slope towards the lake of Hamoon. The average temperature is 21 centigrades (Shahraki, 2009). Bonjar has an arid climate and the temperature ranges between -8 and 49 degrees. Observations suggest that the region has the one of the least amounts of rain in the country. The rains are sudden, destructive and sharp and usually the precipitation makes floods and destroys the soil and lands. Bonjar is a windy town and the winds are usually stormy. Bonjar has enough wind and sun energy potentials to use (Shahraki, 2009).

4.2.2 Methodology of this case study

Here we pursue the method of past, present and future studies to study the city development. Similar to major of cities in Iran we can identify the twelve groups of problems discussed in earlier chapters in Bonjar as well. The lack of new knowledge, technology, skilled management, infrastructure, natural resources, public participation and funding are the major reasons of unsustainable development in Bonjar. After studying the past, present and future of Bonjar improvements in the general and spatial plans of the town have been suggested. The revisions is purposed to use new smart land use policies based on the particular necessities of the region. Then, we suggested a systematic practical model to rebuild and expand the Bonjar town in a sustainable fashion.

4.2.3 Field observations in Bonjar

The rate of population growth is high in the Sistan plain and in Bonjar amounting to 4.9% per year. The growth has religious, ideological, cultural and lifestyle reasons. According to the national statistical office the population number of Bonjar was 34800 in the year of 2006 and 49800 in 2011. Major employment in Bonjar consists of farmers, but the number of official and military staffs has increased during the recent years. An unknown number of people are smuggling traders.

We studied the comprehensive plan of Bonjar town to see its land policy and the quality of buildings. Figure 4.13 shows the shape and skeleton of Bonjar.
Figure 4.13 Skeleton plan of Bonjar Source: General plan of Bonjar

The area of Bonjar seen in the map is 43 hectares. The distribution of land uses in percent of the total area is as Figure 4.14 shows.

Figure 4.14 Land policy of Bonjar. Source: Climatic town design
The figure reveals a surprising situation on the land use policy in Bonjar. Major parts of the lands are used in the military, 45%, and residential purposes, 40%, while culture or medical care uses less than one percent of the land. Figure 4.13 categorized the quality of Bonjar’s buildings in groups of new, old, demolished and under construction. As you see on that plan, much rebuilding/renewing jobs shall be done in the town. More than 67% of the Bonjar’s urban texture is old and 10% are under constructing. Only 5% of the buildings are under regulation and control of the municipality. The accelerated population growth causes poorness and poorness causes badly-looking perspectives. People in Bonjar do not care for aesthetic features of their built environment either. Outdoor walls are not in harmony with height, material used, color and general layouts.

Bonjar needs urban infrastructures, educational spaces, work places in different economic sectors, sport spaces and green and recreational areas. The analysis suggests increasing attention to various urban spaces in the future. Earlier the classic methodology of forecasting to determine the future needs for different urban spaces was used. We also used the Delphi scenario writing method and wrote three scenarios (Shahraki, 2012). The results of that study are shown in the chart below. Figure 4.15 reports the rising demands for every type of urban spaces compared to the present area for every need per percent.

![Figure 4.15 Types of future needed urban spaces](image)

Figure 4.15 Types of future needed urban spaces Source: (Shahraki, 2012).
As you see on the chart, the major demand is for infrastructure. A 100% increase compared to the present area used for urban infrastructure. The next level is the demand for medical and recreational spaces, more than 60% for each. Bonjar needs to establish a formal commercial area to transfer the current smuggling trades in the border town of Bonjar into urban and regional economies. According to the forecast made the area shall increase at least 30% compared to now.

4.2.4 A systematic program for urban planning and design in Bonjar

The field observations in Bonjar contributed to recognizing the nonexistence of a systematic program for sustainable planning and design. The program which was the result of these studies included the following six systematic steps.

The first step was to decide the geographical domain of Bonjar and to study its features. For this reason we studied the general plan of Bonjar, plans of every district individually, and relevant reports and documents on Bonjar to discover the likely weaknesses and failures. This part of the package was performed in a desk study way with the help of the comprehensive and detailed plans and the official documents and related literature. In this step we also used the method of direct field observation, visiting all districts, streets and problematic built environments in Bonjar several times. Particular attention was given to the neighborhoods with physical and skeletal difficulties to prepare photos, drafts, footnotes and explanations related to the places which should be rebuilt or renewed. These activities provided the bases for formulating of future strategic development policies in Bonjar.

The second step of the program required determination of a number of complementary perspectives of urban planning and design in Bonjar. They included the capabilities of natural resources, socioeconomic strategies, physical and skeletal views of Bonjar, infrastructure and working characteristics, and environmental perspectives. The work also included defining ideological perspectives and theoretical framework of planning for the rebuilding and development in Bonjar.

During the third step of the program we prepared a spatial plan with a descriptive general plan to how should the future planners and developers should set together the main parts and elements of Bonjar. It described how the planners should formulate the land-use policies. In addition, questions such as how should the developers plan urban spaces in different scales were addressed. This part of the program discussed also in what direction should the new town go ahead?
In the previous chapter we explained the technique of the site study. Every site should be studied carefully before performance of any development. In fact a general plan should contain all necessary plan information about the city generally. In this classic reason the general plan of Bonjar should include the following plan elements: A plan about the land-use policies and future possible areas for expansion of Bonjar should be drawn up including also a plan for vacant and unused urban lands. A plan of the places of different urban spaces such as residential, educational, commercial, cultural, tourism, recreational, Infrastructure, hygienic centers, military, industrial, offices, traffic stations, airport and protected areas should be designed. A plan on the hydrology of Bonjar should be designed including a climatic plan of Bonjar which reports wind direction, weather temperature and precipitation. There should be a new plan for streets, avenues and passages of Bonjar after revisions on earlier sizes and geometrical trims. Further, during third step the status of housing and town building codes and standards’ influence has been studied.

Step four recommended the establishment of a technical unit in the municipality of Bonjar as an apparatus tool to educate and train involved staff. The technical unit would watch the standard codes, recommendations and guidance of this systematic program in Bonjar. The technical unit would take on the responsibility for controlling the knowledge and technical quality of the involved staff in the planning and design process of Bonjar and provide educational and training programs for planners and developers in the city. It would be monitoring clearly the process of a building license from application up to the awarding as well as issuing the building licenses for private and official developers. It would be ensuring that the constructions are climatic, green, well designed, and solidly built, and guaranteeing that development is planned based on the needs and culture of the regional people. The unit would further be monitoring and assessing the development of Bonjar from qualification and quantification points of views and encouraging the public participation and communicative planning and design.

The fifth step described, outlined, defined and sketched necessary sub-projects under the umbrella of the newly changed general plan of Bonjar. This step interpreted the definitions and rebuilding policies into two and three dimensional building maps. Then, the local urban planners and developers would use the maps in the rebuilding projects. The urban planning program focused on the sustainability of Bonjar city and maintained the water canals, designed green spaces and built green houses. For example, it rebuilt one demolished water canal to deposit potential rains in it. In this step new green homes around the new built water canal had been planned. The following figure exhibits a new built urban district around the water canal.
The sixth step involved assessing and monitoring of the results of the systematically suggested program and measured the degree of its usefulness in the context of Bonjar’s development and rebuilding projects.

4.2.5 Results
The case study of Bonjar observed directly the present urban problems of the town aiming to program a better redesign and rebuilding for future Bonjar, assuming that the non-existence of new knowledge and technology and competent management, including water resources, urban infrastructure and funding resources made the Bonjar city unsustainable. The direct field observation proved the validity of the hypotheses. Bonjar like other cities in the region suffers sharp increase of population, social conflicts and problems of less competent urban planning and design. The thesis thus formulated new strategies to develop and rebuild an ecological, beautiful and functional Bonjar.

The result of the case study in Bonjar is a systematic urban planning program. The program is helpful for practitioners, urban planners, engineers and other involved actors to resolve or mitigate the urban problems and to plan and design sustainable new towns.

4.3 A comparison across the two cities

4.3.1 Methods of evaluation
We have studied the towns of Aftab and Bonjar with the help of the problem-oriented method, POM, at three scales. Classically, engineers and designers used to plan and design new urban developments in three different perspectives (Dieleman, et al, 2002). They plan on the micro level for an individual user or only one building. They plan on a middle level for one urban district. They work in a macro dimension to plan and design/redesign a town or
a city. This thesis argues that the 12 groups of the problems which have been observed and experienced in the region include all likely urban problems which will emerge. Let us now assume the 12 problems as indicators of progress in sustainable urban planning and design. So, hereafter we will call them indicators of sustainability, IS. The purpose is to see in what degree the suggested pattern of Aftab new town or the systematic program of Bonjar would resolve the problems and produce sustainable urban planning and design. To evaluate and measure the urban problems quantitatively requires good local knowledge and experience both in theory and practice. This thesis benefitted from the ideas and points of the local scientists, practitioners and planners to understand the importance of problematic obstacles in the urban development. We discussed and debated several times with people who were involved in the urban development subjects and systematically documented their points of view in written form. With the help of such techniques first we could measure the importance of the problems and then evaluate the outcomes of the suggested patterns and systematic programs to meet the sustainable urban development, SUD, in Zahedan and Bonjar quantitatively.

The thesis used benchmarking method, BM, to compare the intensity of the urban problems before Aftab new town building and the redevelopment of Bonjar, and after the programs. The BM looked at the urban planning and design in Sweden as the best fixed pattern to lead the urban planning and design. The BM with 12 IS made judgments about the degree of progress in terms of urban planning and design. With the help of the POM, BM we determined the scores for IS. The ex-ante and ex-post analyses examined how the IS changed after using the pattern planning of the Aftab new town and after applying the systematic program for the redevelopment of Bonjar town.

We assessed the indicators of sustainability, IS, in an interval from -10 up to +10. BM in this work considered two alternatives in each of the two towns:

**Zero alternative:** This alternative reports the situation before planning of the Aftab new town and before applying the systematic program in Bonjar.

**SUD alternative:** This alternative reports the situation after the planning of the Aftab new town and after applying the systematic program in Bonjar.

We found the score numbers according to the importance and influence of every IS in the urban development projects. The degrees of progress in SUD have been determined as well. Urban planners sometimes meet situations there they shall interpret qualitative values in measurable quantitative values or numbers. The evaluation was done with the help of my own local experiences and the social wisdom found in the region.
4.3.2 Progress of SUD with building of Aftab near Zahedan

We have observed and experienced the Zahedan city environment and discussed the IS in it. The IS presents the groups of problems that threaten the SUD in the city. In Table 4.2 you see the scores of IS in both alternatives.

Table 4.2 Different scores of SI in both alternatives for Zahedan

<table>
<thead>
<tr>
<th>IS</th>
<th>Alternative Zero</th>
<th>Alternative SUD</th>
</tr>
</thead>
<tbody>
<tr>
<td>None-sustainable</td>
<td>-10</td>
<td>+9</td>
</tr>
<tr>
<td>Knowledge and new technologies</td>
<td>+3</td>
<td>+4</td>
</tr>
<tr>
<td>Natural resources</td>
<td>0</td>
<td>+2</td>
</tr>
<tr>
<td>Environment</td>
<td>-2</td>
<td>+9</td>
</tr>
<tr>
<td>Planning</td>
<td>+1</td>
<td>+10</td>
</tr>
<tr>
<td>Physical and skeletal design</td>
<td>+2</td>
<td>+10</td>
</tr>
<tr>
<td>Firmness, resistance and duration</td>
<td>+1</td>
<td>+9</td>
</tr>
<tr>
<td>Infrastructures</td>
<td>+4</td>
<td>+9</td>
</tr>
<tr>
<td>Functionality</td>
<td>0</td>
<td>+10</td>
</tr>
<tr>
<td>Architecture and aesthetics</td>
<td>+2</td>
<td>+8</td>
</tr>
<tr>
<td>Culture and tradition</td>
<td>+1</td>
<td>+5</td>
</tr>
<tr>
<td>Poverty, fairness and rationality</td>
<td>-6</td>
<td>0</td>
</tr>
<tr>
<td>Total scores</td>
<td>-4</td>
<td>+85</td>
</tr>
</tbody>
</table>

Source: (Shahraki, 2013)

Summing the scores of IS in every alternative you get - 4 in the Zero alternative and +85 for the SUD alternative. Figure 4.17 below shows the large difference between the two alternatives. We think this big improvement in the SUD was because of using the pattern planning of the Aftab new town.

Figure 4.17 Improvements of SUD with the pattern of Aftab. Source: (Shahraki, 2013)
4.3.3 Progress of SUD with systematic program for rebuilding Bonjar

In Bonjar this thesis worked with an existing city to alert the IS revising the general plan and establishing a technical unit in the municipality. In Bonjar the planning and design had problems in terms of property rights, legal and social cautions and risks due to destructions when changes should happen while in Aftab the thesis worked only with vacant land. In practice, rebuilding work is more complicated compared to new building projects. Using the previous technique the following table shows the numeric scores for IS in the alternatives.

Table 4.3 Different scores of IS in both alternatives for Bonjar

<table>
<thead>
<tr>
<th>IS</th>
<th>Alternative Zero</th>
<th>Alternative SUD</th>
</tr>
</thead>
<tbody>
<tr>
<td>None-sustainable</td>
<td>-10</td>
<td>+7</td>
</tr>
<tr>
<td>Knowledge and new technologies</td>
<td>0</td>
<td>+1</td>
</tr>
<tr>
<td>Natural resources</td>
<td>+1</td>
<td>+3</td>
</tr>
<tr>
<td>Environment</td>
<td>-4</td>
<td>+4</td>
</tr>
<tr>
<td>Planning</td>
<td>0</td>
<td>+7</td>
</tr>
<tr>
<td>Physical and skeletal design</td>
<td>0</td>
<td>+4</td>
</tr>
<tr>
<td>Firmness, resistance and duration</td>
<td>0</td>
<td>+7</td>
</tr>
<tr>
<td>Infrastructures</td>
<td>0</td>
<td>+6</td>
</tr>
<tr>
<td>Functionality</td>
<td>+5</td>
<td>+8</td>
</tr>
<tr>
<td>Architecture and aesthetics</td>
<td>+1</td>
<td>+5</td>
</tr>
<tr>
<td>Culture and tradition</td>
<td>+5</td>
<td>+5</td>
</tr>
<tr>
<td>Poverty, fairness and rationality</td>
<td>-10</td>
<td>+3</td>
</tr>
<tr>
<td>Total scores</td>
<td>-12</td>
<td>+60</td>
</tr>
</tbody>
</table>

Source: (Shahraki, 2012)

Again summing the scores of IS in every alternative you have -12 for the Zero alternative and +60 for the SUD alternative. Figure 4.18 shows the improvement of the SUD after application of the systematic program for rebuilding of Bonjar town. In this case, you also see significant positive changes in the IS. This big progress in the SUD would be a consequence of using the systematic program for the rebuilding of Bonjar.
The results of both case studies showed a positive correlation between the problem-oriented method, POM, for understanding the real situation of the past and present situations of the cities and the level of success in sustainable urban development, SUD. The benchmarking method, BM, as an aid tool compared the earlier situations of Zahedan city and Bonjar is reflected in the SUD indicator. The two case studies indicated that the meeting of the sustainability required sizable changes in the present urban planning and design procedures.

4.4 Conclusions
The two case studies showed that the increase of population numbers influence the demands for new homes and towns everywhere in Iran. They also suggested that works to plan and design sustainable new towns have failed dramatically. The thesis suggests suitable theoretical recommendations and practical useful experiences for progressing in urban planning and design in Iran in general and the southeastern region in particular. The selected methodology of the problem-oriented method, POM, was helpful in the regions with the critical problems to understand the features of the difficulties and to work directly with the real problems and planners. The benchmarking method, BM, proved to be a useful tool in the regions showing the need to learn about the general principles and standards from the advanced regions. BM facilitated the comparisons between the two alternatives in each town.
After introducing of the 12 indicators of the sustainability, IS, we discussed the scope and influence of these indicators in the process of SUD. We explored the ideas of national and international scholars and discussed them to understand the realities of the urban planning and design in the cities studied. The two case studies have been done with the help of POM and BM to check the validity and accuracy of the theories and ideas on the subjects concerning SUD. The schools of constructivism, natural architecture and rationalism seemed to contribute to better results of SUD in the cities of Iran. While we could have intuitively felt the progress qualitatively, the method of evaluation applied gauged the facts in numbers.

The thesis has suggested new developments instead of rebuilding of existing metropolitan crowded cities in Iran. The decision makers in Iran have the possibilities in the new vacant lands to make new towns less costly and with less social problems. If the developers must rebuild an old and crowded city, we would recommend them to work with the systematic program suggested by the thesis. Further, the studies of the thesis proved that the SUD method should include knowledgeable and competent planners and managers. It also found that the provision of adequate natural resources and building of urban infrastructures are key elements in SUD.
5 Knowledge networks for urban planning and design

5.1 Introduction
In previous chapters the need for a pertinent ideological base and theoretical foundation for progress in urban planning and design has been noticed. This chapter sees the link between sustainable development and knowledge. The chapter explores the accuracy of the presumptions of the pre-required ideology and theory to meet better urban planning and design with the help of conducting a case study in the region of Chabahar. This chapter studies the possibilities to establish a knowledge network composed of the scientists, engineers, planners, scholars and citizens who are involved in the urban and regional developments. The goal of a regional knowledge network establishment is to encourage collaboration between institutes that produce knowledge goods in the region, particularly knowledge goods related to urban planning and design. The regional knowledge network aims to make sure the sustainable development of the region. The goals are possible to achieve by the help of scanning the knowledge activities and the knowledge institutions in the region to understand their past and present perspectives and to predict the future trends of the relation between knowledge network and development of the region.

We should tell that the targets mentioned above are based on two important hypotheses. The first hypothesis is that the successful management of knowledge centers and their gathering influence sharply the economic growth and sustainable urban planning and design of the region. The second hypothesis is that the connection and interaction between new technologies and people in the region will be enhanced.

5.2 Emergence of knowledge based institutions in the region
The rapid current globalization caused socioeconomic and lifestyle changes in southeastern part of Iran specially the region of Chabahar. During the recent decades, the state planned macroeconomic programs affected the regional traditional economic activities, lifestyle, and culture. The programs resulted many graduated people. Demand to set up a regional knowledge infrastructure network has been voiced by these people as knowledge workers in the region of Chabahar. Exploring the existing literature suggests that the subject of the regional knowledge network has not been discussed in this region earlier. Since the discussion is new and many relevant actors of urban planning do not pay attention to the significance of this question it is needed to develop a deeper discussion related to the knowledge network of Chabahar particularly when there are some universities and knowledge based institutions in the region. The
Asian Development Bank in a report entitled "Moving towards knowledge based economies" names four factors as pre-signs of knowledge based regions:

"The four pillars of a knowledge-based economy are:
1) Education and a skilled workforce
2) National innovation systems
3) Building networks
4) Setting the policy and regulatory environment" (Asian Development Bank, 2007)

As the report suggests building a knowledge network is a necessity when you propose to plan the cities scientifically. We aim to conduct a case study in Chabahar to see the validation of the presumption that the sustainable development of the region requires collaboration between the universities and the developers. Chabahar is in the southeast of Iran closed to the Oman Sea and Indian Ocean. See the map of the region below, Figure 5.1:

Figure 5.1 Place of Chabahar at the Oman Sea. Source: Google maps

The region has geopolitical and natural advantages. It has human resources and knowledge institutions. There is an international university in the free trade economic zone of Chabahar, a marine university, a state university, an open university, a technical university and a variety of consulting and engineering firms. Therefore, it deserves a suitable knowledge network model to develop the region.
Theories on the regional knowledge network are new in this context. Although many scholars focused on the issues related to the management of knowledge production and creativity to improve the regional economy, the discussions about the link between the knowledge industry and regional development is new. Recently, regional managers consider the phenomenon from the regional development point of view.

The nature of factors that affect the regional economy has been changed sharply in the recent decades. The world has seen the emergence of global knowledge economic hubs. Knowledge workers and their products are attributes of these new economies. The regions are increasingly being looked on as independent dynamic market places connected to other regions via knowledge based production. Every such region has its own scientific, technological, and entrepreneurial institutions. The past era economy considered only capital and labor as variables to formulate the production function. The economy of the new era considers the variety of knowledge workers as well. The term of knowledge worker encompasses professors, researchers, engineers, lawyers and other thinkers who produce knowledge.

The knowledge workers have some invaluable characteristics that increase their productivity and so the result of their work increases the quality and quantity of the regional production. By the time passing, more and more regions recognize that if they organize the knowledge workers in regional networks their region will gain and will develop optimally.

5.3 Regional knowledge network in the mirror of literature

5.3.1 Terminology
The literature review focuses on some independent and dependent variables associated with the establishment of the regional knowledge network. We studied six subjects as six independent variables related to the knowledge network in the region of Chabahar. The attributes or these independent variables that influence the regional knowledge networks are listed below:

- Who are knowledge workers? How did they emerge? What is their role in a production function? Moreover, what are their economic, social, and intellectual expectations?
- What types of organizations are occupied by knowledge workers?
- What kinds of knowledge production functions are there? What sorts of knowledge shall be produced by our regional knowledge network?
- What impacts stem from a regional knowledge network on the development of the region?
How do we manage a regional knowledge network?
What supporting infrastructure does a regional knowledge network need?

There is a lot of supportive and invaluable academic work and literature on the regional knowledge networks, industry knowledge and management of knowledge infrastructure. We will extract a number of hypotheses and assumptions of this analysis after reviewing of the literature and the ideas of the scholars. Then we will test the validity of the hypothesis during the field observation.

5.3.2 Knowledge workers
First, the term of knowledge shall be defined. Karlsson and Johansson introduce the following three knowledge concepts:

“1- Scientific knowledge as basic scientific principles is that which can form a basis for the development of technological and entrepreneurial knowledge.  
2- Technological knowledge is present in implicit and explicit blueprints as inventions (or technical solutions) that either materializes in new products or is readily used in the production of goods and services.  
3- Entrepreneurial knowledge comprises business-relevant knowledge about products, business concepts, markets, customers, and so on “(Karlsson and Johansson, 2006, p 6)

After the definition of the word of knowledge the concept of knowledge worker appears. Knowledge workers shall be understood as the main bulk of every regional knowledge network. The economy of the new era needs highly skilled knowledge workers. Nowadays, the regional economic management assumes that there are two kinds of labor force, knowledge workers and goods producing workers. Knowledge workers produce knowledge initially while goods workers produce commodities. Recently, the scholars include the knowledge workers as a new independent variable to write an economic production function for example (Anderson et al, 1987) suggested as “The presence of the two different workers has caused two different production functions”. The first one was the traditional production function where production is related to capital and labour resources. As equation (1) below illustrates:

\[
Q = f(L, C) \tag{1}
\]

In (1) \(Q\) is the volume of production, \(L\) is the labor force input, and \(C\) is the amount of capital invested with the knowledge worker, the production function can be written as below:

\[
Q_1 = Q\{g(S_i, X_i), f(L_i, K_i)\} \tag{2}
\]
In equation (2), \( S_i \) is the number of knowledge workers, \( X_i \) is the amount of knowledge accessible or the knowledge capital stock, \( L_i \) the number of goods workers, and \( K_i \) is the volume of commodity capital (Anderson et al, 1989).

Who are the knowledge workers and what characteristics do they have? Samples of knowledge workers are managers, professors, researchers, engineers, financial analysts and systems analysts. The knowledge workers have the particular characteristics to develop and use knowledge. They are educated with a constructive ability. They have innovative ability and can solve problems. They also know how to generate systems analyses. The targets of the knowledge workers are to produce useful data such as critical analyses, evaluations, instructions, plans, maps, insurances, and, as well, increasing the existing knowledge. The knowledge workers create new knowledge and save present knowledge. A knowledge worker is self-managed at a high degree. The companies expect that the knowledge workers themselves recognize how to plan, organize, and manage their duties. Generally, the knowledge workers have the following duties:

- Responsibility for their job or what the flowcharts of the organization determined for them.
- Making and producing new knowledge or increasing the knowledge and saving existing knowledge.
- Managing the process of producing new knowledge

It is clear now that who are the knowledge workers and what they do within an organization. Let us now look at the various types of knowledge production below.

5.3.3 Knowledge production categories

AlHawamdeh (2003) defines the concept of knowledge production as "Knowledge producing is generating and discovering of new knowledge of any types". When producing value in a knowledge-based commodity it is necessary to control the competences of various industries or sectors of the economy. We shall also control the capability of every individual knowledge worker involved. We see, however, that knowledge creation and innovation processes have become increasingly complex during the recent years. There is a larger variety of knowledge sources and inputs to be used by organizations and firms. At the present, there is more collaboration and division of labor among institutions while producing knowledge compared to past times. As Nonak and Takeuchi argue: "In the contemporary global economy the competition is enormous and uncertainty is associated with everything so, you need knowledge" (Nonaka and Takeuchi, 1995). The importance of knowledge diffusion is an absolute
requirement in every region. In this situation, the importance of knowledge creation is a high priority for every sector of society. Government policies play an ever greater role in the integration among and within different sectors. This also holds for the urban planning and design sector.

We shall offer a categorization of knowledge goods. Therefore, we asked people what type of knowledge our regional knowledge network should produce. Knowledge may be classified into various categories depending on the purpose of its use. Knowledge may be capped as firm asset like patents, employed technologies and research and development capacity. Strategic policies based on attracting creative and skilled knowledge workers in the region will ensure the best development of the region.

Karlsson and Johansson (2006, p 4) commented on the impact of aggregated knowledge on the development of a region as “Localized knowledge will have a sustained influence on the future development. The pertinent firms stay in the region because of the region’s favorable accessibility and possibilities to knowledge resources”. Following the recent trend in recognizing knowledge as a reason of production, efforts have been made to agglomerate economics and to minimize the transaction costs. Because of the trend Michael Porter in his well-known study on the competitive advantage of nations, calls this minimization trend a diamond of advantage (Porter, 1990):

“This diamond consists of the following elements:

- **Factor conditions** – A region’s endowment of factors of production, including human, physical, knowledge, capital resources, and infrastructure, which make it conducive to success in a given industry.
- **Demand conditions** – The nature of home demand for a given product or service, which can pressure local firms to innovate faster.
- **Related and supporting industries** – Networks of buyers and suppliers transacting in close networks to foster active information exchange, collective learning, and supply chain innovation.
- **Firm strategy, structure, and rivalry** – A climate that combines both intense competitions among localized producers and bigger regional cooperative and collective companies” (Porter, 1990, p 314).

Let us now to state that the region shall provide the suitable infrastructure for creativity and knowledge production by attracting knowledge based institutions in the region. The knowledge network of the region shall produce both pure knowledge and applied marketable knowledge as well as knowledge with place-based traditional origin.
5.3.4 Impact of a regional knowledge network

Every network arises in response to a particular set of circumstances. Some conditions like the challenges that an organization faces can raise the demand for the network being at work. Sometimes people are interested in working together when the pre-required resources are available to support the work. All networks have different timelines, abilities, goals, and objectives. Consequently, networks tend to be evaluated relative to the circumstances surrounding their initiation, and in particular, to the funding that supported them.

The actors in the networks are organizations that are directly involved in knowledge production or some institutions that use the knowledge goods. Organizations that participate in cooperative research and development programs are also involved in the regional network.

To classify the involved organizations in the regional networks research and scientific institutes are at the core. On the industrial side we have different types of firms from small technology firms to large diversified companies with large centralized research and development facilities. Such industrial small and large firms demand and use applied research and the universities and research centers offer pure and applied knowledge goods. We must study the effects of the networks in a region from all points of views to assess the impact of the economic growth of the region and its development. Karlsson and Johansson (2006) suggested the types of the network impact in a region as "Knowledge affects the production function of a firm to improve the productivity of inputs. Knowledge affects the value of products produced by the firm". Karlsson and Johansson required adequate accessibility to urban infrastructure:

"To supply the needed resources is important for firms in a region. The regional economic institutions must have:

- Access to labor categories with different human capital profiles.
- Access to input suppliers including services and knowledge.
- Access to venture capital.
- Access to research and development resources in other companies.
- Access to research laboratories and universities.
- Access to capacity and quality of infrastructure, institutions and entrepreneurs" (Karlsson and Johansson, 2006, p 6)

Urban infrastructure and well planned and designed towns make the region attractive. The attractive regions are capable of attracting households who supply needed labour. Some scholars focused on the interactions between regional companies and knowledge centers for example Kobayashi (2008, p 128) argued, “To understand the regional division of production, knowledge, and capital, as well as their dynamic evolution with technical changes, it is necessary to move beyond the analysis of a single firm’s behavior. The regional
decision makers shall assign network dimensions to the analysis of interactions between many firms, individuals, and organizations”. Kobayashi described well the mobility of knowledge as well pointing out that it is transnational and mobile. In this respect no country or region has a natural advantage or disadvantage. It is only a question of action. It is also stated in the literature that developing regions should cooperate more actively with learning regions regarding their development and growth. On this subject, Florida wrote: “Learning regions function as collectors and repositories of knowledge and ideas, and provide the underlying environment or knowledge infrastructure, which eases the flow of knowledge, ideas and learning” (Florida 1995). In addition, in the knowledge economy knowledge and skill formation are important. Kermally in his book writes about the link between education and skilled workforce "In future we need skill, education and knowledge in any company to take the competitive e advantages” (Kermally 2004, p 3).

To summarize the discussion on the impact of the network we can say that a regional knowledge network affects all aspects of the social life of people as well as the physical features of the region. The regional knowledge network attracts more skilled and educated knowledge workers and their families in the region. Thus, the network will change the demographic aspects of the region. Then, urban infrastructure and new urban spaces will be built. The regional network will affect natural resources and natural environment, and increase the demand for the knowledge goods. It will increase the interaction between local folk and technology and the new technological devices. It also will enlarge cooperation between the region regions of Iran as well and in particular between a central place like Chabahar and other regions.

**5.3.5 Regional knowledge infrastructures**
Proper regional and urban infrastructure to attract the knowledge workers in the region is needed. Additionally, adequate urban possibilities, technical facilities and necessary services are needed to plan, design, and make a successful regional knowledge network. Smith (1997) has a definition for knowledge infrastructure, as “Knowledge infrastructure is a complex of public and private organizations and institutions whose role is the production, maintenance, distribution, and protection of knowledge”. Smith's definition is interesting because it describes key factors of regional knowledge infrastructure. It demonstrates that the role of knowledge infrastructure in the context of regional development can be extended to include the learning capacity of the region's institutions and workers. A region's knowledge infrastructure consists not only of the organizations but, also the linkages and connections. The knowledge infrastructure has network qualities as transportation and utility system (Smith, 1997).
According to Smith, thus, a regional knowledge infrastructure includes private sector organizations and institutions such as industry associations, training centers, trade publications, collectively established technical standards and research and development institutes. Public sector entities include research councils, patent offices, institutions for higher education, libraries, databases and the legal and administrative regulations to support the well-functioning of these entities. Goldstein in his article argues that the infrastructure shall be suitable to the characteristics of the region: "I also believe that development of the region is done while researchers introduce knowledge infrastructure according to their region" (Goldstein, 2005, p 202).

Some urban infrastructure is vital. The transportation and communication infrastructures are evident as compulsory infrastructures to develop a region. The advanced economies are well connected electronically both externally and internally. The knowledge governance system is also an infrastructure. Therefore, new knowledge, modern technologies, and information are agglomerated in the advanced regions. Therefore, scholars recommend giving best possible infrastructural conditions, see for example, Batten and Karlsson (1996).

One other important critical infrastructure factor is the nature of connections between various nodes of a knowledge network. The degree of autonomy or integration between the jointed organizations is determinant. The knowledge infrastructure could be critical for the process of transformation of knowledge among the member nodes. Technical solutions, especially those related to the security of sewerage networks, or protections against earthquakes, are helpful to guarantee the security of the urban governance system. Notably, the scholars believe that the regional knowledge networks shape their human, physical, and organizational infrastructure according to the strategic targets and particular conditions of the region. Their argument is that the critical infrastructures are in essence man-made.

5.3.6 Knowledge management

Management of a regional knowledge network is a complicated and significant task. It depends on the size, nature, and essence of the organizations including in the network. It is relevant to the kind and volume of knowledge goods which it will produce. There are helpful theories concerning the running of the regional knowledge networks and managing the knowledge industry. (Uriarte, 2008, p 13) commented on the subject of knowledge management as “Knowledge management is the conversion of tacit knowledge into explicit knowledge and sharing it within the organization. Putting it more technically and accurately, knowledge management is the process through which organizations generate value from their intellectual and knowledge based assets. Knowledge
management is concerned with the process of identifying, acquiring, distributing, and maintaining knowledge that is essential to the organization”. Pervaiz et al, in a book on learning through knowledge management, suggested that: it is a set of cross-disciplinary organizational processes for the continuous creation of new knowledge and the creative and innovative capacity in the labour force (Pervaiz et al, 2002, p 417).

Davenport and Prusak explain how leaders manage the provision of knowledge assets. The authors discuss knowledge creation and knowledge transfer. They introduce knowledge as a power that will increase by more use. They suggest that the power gives the benefits to the people who transfer it to others. They argue that knowledge transfer is one important tool in every organization (Davenport and Prusak, 1998).

According to Indergaard the experiences of organizations that have carried out fruitful knowledge management suggest five sets of methods and tools to manage a knowledge network successfully, creating communities of practice, knowledge repositories, expertise directories, peer assistance, and best practice replication (Indergaard, 1997).

We know the importance of collaboration between the knowledge institutions. Keeble and Lawson (1998) considered trust as a function for the collaboration: “A high level of interaction based on relationships of trust and reciprocity are needed”. Tiwana describes the role of professionals in the knowledge based economies: “Knowledge professionals play a critical role in the knowledge based economy. They can demand better working conditions, greater freedom, increased job satisfaction. This means that the knowledge will not be easily bound to one company and it will go where they can meet greater satisfaction”, (Tiwana 1999, p 34).

Creech and Willard in their book on strategic intentions, focused on the role of a regional knowledge network management and nonstop monitoring and auditing of the network activities. They argue that creating knowledge networks for sustainable development should focus on the everyday operations of the network (Creech and Willard 2001, p 80).

Summarizing the discussion concerning the management of the regional knowledge network shows that the management of a large-scale organization composed of knowledge-based companies is a complicated responsibility that requires creativity, talent, intelligence, and hardworking management. It also needs clear definitions of the nature and type of communicative interaction. The manager should formulate the strategic policies of the regional network on a teamwork way and not based on the hierarchical method.
5.3.7 Hypotheses and assumptions
Focusing on what the theoretical review suggests we will state the following hypotheses on knowledge urban development in the Chabahar region:

- While the population of the Chabahar region is increasing, the number of educated people also increased sharply compared to the previous decades. Some of these people can be counted as knowledge workers. Therefore, the urban planners should use their knowledge and skills in an organized way for the sake of the urban planning and design.
- Knowledge worker as a new variable in the new modern economy is included in the production function of also the Chabahar region. Therefore, the region shall attract them to come as many as possible.
- It has been presumed that active formal and informal knowledge networks affect positively sustainable urban planning and design, and social development of the region.
- Competence management is a key factor of the network success.
- The global experiences exhibit that a successful knowledge network requires supporting urban infrastructures.
- Both regulating and deregulating aspects of the regional network are necessary.

The validity and trustworthiness of the hypotheses will now be checked in the region with the help of a qualitative case study mainly based on interviews.

5.4 Regional knowledge networks in mirror of social realities

5.4.1 Market analysis
To plan and establish a suitable regional knowledge network in Chabahar you need a real understanding of the regionally relevant factors. Therefore, a case study has been designed to study all such factors in detail and to see the strength of the presumptions presented earlier. This chapter thus studies the region of Chabahar and explores the knowledge production activities across the area. We propose to identify all institutions and centers that supply knowledge goods and compare the situation of the region to the recommended academic standards. We also study the situation of knowledge workers in the region observing the qualitative and quantitative features of Chabahar's knowledge producers to find the degree of demand for planning and establishing of a regional knowledge network.

A study was made using field observations to find out whether the regional knowledge network satisfies the wishes of regional knowledge workers. The field observations will illustrate whether the knowledge goods will have the
desirable market discussing three basic questions, will there be users to buy the products of the network, how quickly and at what price will the knowledge goods be absorbed in the market, and how shall the regional knowledge network be modeled to make it more compatible in its national and international markets.

The market potential analysis examines total demand and supply data that helps the regional developers to understand the effective demand for the building of a regional knowledge network. The market analysis finds also demand and supply of various knowledge products. The demand analysis looks at the situation of knowledge producers such as size, and capacity of universities and Institutions. We study facts about number of knowledge workers, types of knowledge products and management qualities. We also need to get access to data on income, affordability and life expectations, and preferences of the regional knowledge workers. Migration and commuting patterns in the region is studied. This will help to design the regional knowledge network well to accommodate the types of knowledge productions necessary to develop the region. After the above analysis, it would be possible to model a regional knowledge network suitable to the particular conditions of Chabahar and to see its positive impact on the development.

5.4.2 Process of field studies

The understanding of opinions, expectations, priorities, and work/life expectations of different knowledge workers contributes to the results of having a scientific and professional regional knowledge network. Public participation also provides a better model designing of the aimed network and managing the knowledge industry. During the field studies we have fostered the public consultation and participation by use of structured interviews. During the interviews, the questions focused on the following five basic issues:

1. Knowledge workers and their distribution according to age, gender, and incomes. Additionally, we observed the types of institutions they work for.
2. Information about the volume of different knowledge production elements in the region
3. Knowledge market, interests and expectations of different users like companies, factories, public institutions, universities, and people at large.
4. The different facilities and infrastructures needed for building the regional knowledge network.
5. Respondents’ particular ideas and suggestions on the regional knowledge network.

During the phase of interviews we covered all gender, age, tribes, income, and ideas of knowledge workers to get as much of a complete coverage as possible.
5.4.3 Observations

Regarding age distribution, the regional knowledge workers have been categorized into four group ages as you see in the Table 5.1 below:

Table 5.1 Age distribution in the sample population

<table>
<thead>
<tr>
<th>Age group</th>
<th>Number</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-30 years old</td>
<td>16</td>
<td>16.6%</td>
</tr>
<tr>
<td>30-40 years old</td>
<td>64</td>
<td>66.6%</td>
</tr>
<tr>
<td>40-50 years old</td>
<td>14</td>
<td>15.5%</td>
</tr>
<tr>
<td>50-60 years old</td>
<td>2</td>
<td>2%</td>
</tr>
</tbody>
</table>

Reference for data: (Piri, 2010)

The results show that about 17% of the regional knowledge workers are 20-30 years old, about 67% between 30 and 40 years old, while 15.5% belong to the group of age 40-50 years old and 2% are more than 50 years old.

Looking more precisely at the results on the age distribution suggests that a majority of knowledge workers are young. Actually, two thirds belong to the group age 30-40 years. These facts suggest a significant recommendation to the regional planners to consider ideas and expectations of this age group.

About the educational level of the knowledge workers, we divided them into four educational levels bachelor, master, doctoral, and post doctorate. The answers show that most respondents have a master's degree, see Table 5.2.

Table 5.2 Education levels of knowledge workers

<table>
<thead>
<tr>
<th>Educational level</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Master</td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>Doctorate</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>Post doctor</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Reference for data: (Piri, 2010)

As the table suggests the most percentage of knowledge workers have a master's degree. This means that the regional knowledge network should provide some suitable infrastructure to encourage the workers to complementary education. We observed the types of workplaces that knowledge workers work there and assembled their monthly incomes. The observation is that 75% of knowledge workers work in state owned organizations while only 25% of them are found in private sector.

We also asked the knowledge workers about their incomes considering four groups of monthly incomes. The result of this inquiry is in Table 5.3 below.
Interpreting the table shows that most knowledge workers receive 1000-2000$ per month which means that they have a difficult economic situation. Monthly income categories show a considerable variability.

**Table 5.3 Monthly incomes of knowledge workers in the region**

<table>
<thead>
<tr>
<th>Monthly income</th>
<th>1000-2000$</th>
<th>2000-3000$</th>
<th>3000-4000$</th>
<th>&gt; 4000$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of workers</td>
<td>76</td>
<td>16</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Share of workers</td>
<td>80%</td>
<td>16%</td>
<td>0%</td>
<td>4%</td>
</tr>
</tbody>
</table>

Reference for data: (Piri, 2010)

Most knowledge workers thus belong to group one and receive 1000-2000$ per month. Only 4% of the workers receive a higher salary, more than 4000$.

We explored the factors related to the welfare and other life expectations among knowledge workers and asked them how much every reason is important. The survey results are extracted in Table 5.4. Numbers indicate the share of respondents giving a certain priority answer.

**Table 5.4 Stated priorities location factors (share giving a certain answer)**

<table>
<thead>
<tr>
<th>Welfare and life expectation factors</th>
<th>Very important</th>
<th>Important</th>
<th>Not important</th>
</tr>
</thead>
<tbody>
<tr>
<td>House close to work places</td>
<td>38</td>
<td>38</td>
<td>24</td>
</tr>
<tr>
<td>Flexible work time</td>
<td>35</td>
<td>40</td>
<td>25</td>
</tr>
<tr>
<td>Permanent job</td>
<td>69</td>
<td>27</td>
<td>4</td>
</tr>
<tr>
<td>Social security</td>
<td>62</td>
<td>23</td>
<td>15</td>
</tr>
<tr>
<td>Public transport</td>
<td>33</td>
<td>30</td>
<td>37</td>
</tr>
<tr>
<td>Modern and fair shops</td>
<td>47</td>
<td>33</td>
<td>20</td>
</tr>
<tr>
<td>Individual freedom</td>
<td>59</td>
<td>31</td>
<td>10</td>
</tr>
<tr>
<td>Higher salary</td>
<td>70</td>
<td>24</td>
<td>7</td>
</tr>
<tr>
<td>An interesting job</td>
<td>58</td>
<td>33</td>
<td>9</td>
</tr>
<tr>
<td>Possibilities to run the job</td>
<td>59</td>
<td>30</td>
<td>11</td>
</tr>
<tr>
<td>Private car</td>
<td>55</td>
<td>23</td>
<td>21</td>
</tr>
<tr>
<td>Attractive town</td>
<td>55</td>
<td>34</td>
<td>11</td>
</tr>
<tr>
<td>Good education for children</td>
<td>67</td>
<td>33</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: (Piri, 2010)

Let us see the ideas of the respondents about their priorities. First of all it should be noted that around one hundred persons have responded to the questions. The number of respondents differs somewhat between questions with 104 persons giving their opinion on the permanent job and social security questions and only 88 stating an opinion on town attractiveness. The table exhibits that most knowledge workers are concerned about permanent job.
Almost 70 percent out of the persons being interviewed voted for the permanent job. Then, the index of social security is given a higher priority than others. Higher salary is also a high priority. Only 30 out of 96 persons stated that the public transportation is a high priority. Why do they not recognize the importance of public transportation? We understood that they do not trust the reliability of public transportation. Attraction and beautification of towns, functional traffic network and other urban infrastructures are also important for the knowledge workers.

To find the types of knowledge production needed we observed the size of institutions/organizations where knowledge workers are employed. You see in table six that the major knowledge workers work in big companies with 100-1000 people. The number of responders who work in a small space is the least almost 17% of the sample community. Medium size organizations with 20-50 or 50-100 people are about 18% up to 23% of our statistical sample. You will see the results in Table 5.5 below.

Table 5.5 Knowledge workers in different size of work places

<table>
<thead>
<tr>
<th>Size of company</th>
<th>10-20 workers</th>
<th>20-50 workers</th>
<th>50-100 workers</th>
<th>100-1000 workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of workers</td>
<td>16</td>
<td>22</td>
<td>18</td>
<td>40</td>
</tr>
<tr>
<td>Share of workers</td>
<td>17%</td>
<td>23%</td>
<td>18%</td>
<td>42%</td>
</tr>
</tbody>
</table>

Reference for data: (Piri, 2010)

The table shows explicitly that the category of workplaces with 100-1000 workers have the major share in the region, i.e. more than 40%. This means that the big state owned institutions have a dominant role in the region for producing knowledge.

In fact, majority of knowledge workplaces in the region belong to the government. It means that the knowledge goods will be produced mainly by the state. The field observation shows that knowledge producing to a high level is commanded, controlled, and less freely chosen by the researchers. According to the gathered data 95% of the total institutions' members are male and only 5% of them are female. The fact says that during the establishing of the regional knowledge network female scientists shall be absorbed.

We asked the knowledge workers about the types of knowledge goods necessary to develop the region. The knowledge workers stated their ideas about the knowledge production patterns, see also Table 5.6 below:
Table 5.6 Types of necessary knowledge goods

<table>
<thead>
<tr>
<th>Type of knowledge goods</th>
<th>Number of votes</th>
<th>Percent of votes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market oriented knowledge goods</td>
<td>56</td>
<td>58%</td>
</tr>
<tr>
<td>Basic &amp; pure science</td>
<td>54</td>
<td>42%</td>
</tr>
</tbody>
</table>

Reference for data: (Piri, 2010)

Some 58% of the respondents believe that applied and market oriented knowledge goods must be produced while 42% of them said that basic and pure science is significant to develop the region. However, some of them are in favour of both applied and basic knowledge production. A surprisingly high percentage of knowledge workers think that the future knowledge network should produce basic knowledge goods. Usually privately owned institutions are keen on market-oriented research, which will lower their production prices, shortening the process of their production or lead their companies to more tangible results. Presumably, the existence of such high sympathizing for pure knowledge goods is because of the presence of state owned organizations in the Chabahar region.

5.4.4 Predicting the impact of regional knowledge networks in Chabahar

We asked the knowledge workers to state their opinion about the impact of the network on the development of the region. The hypotheses were obtained earlier via the literature review on the impact of a regional knowledge network and have been tested with the help of the instructed interviews. The relationships between four major independent variables and the development of Chabahar have been observed. The most common observed issues extracted from the four variables were; impact of the network on the welfare of local inhabitants, attracting the knowledge workers and scientists to the Chabahar’s region, the impact of the networks on the development of the region. The explorations are in Table 5.7 below:

Table 5.7 Impact of the knowledge network on Chabahar

<table>
<thead>
<tr>
<th>Variables affecting the regional development</th>
<th>Yes True</th>
<th>No Not true</th>
<th>No idea</th>
</tr>
</thead>
<tbody>
<tr>
<td>The network will improve the welfare of people</td>
<td>78</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>The network will attract scientists to the region</td>
<td>74</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>The network will increase the economic growth</td>
<td>76</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>The network will contribute to the development</td>
<td>80</td>
<td>4</td>
<td>12</td>
</tr>
</tbody>
</table>

Reference for data: (Piri, 2010)
As the table tells, a high number of the regional knowledge workers believe that the establishment of a regional knowledge network will affect positively the development of the region of Chabahar.

If you disregard the no answers, and the ones who did not comment, the opposing answers about the positive impact of the regional knowledge networks in the region is very low. A higher percent of the responders, more than 80%, are strongly in favor of the establishment of a regional knowledge network in Chabahar.

To see more precisely the ideas of the interviewed people we considered different grades for various ideas and classified the ideas into three groups; establishment of a regional knowledge network is wrong, I have doubts to building the network, and finally the network making is a right action, see Table 5.8.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Right action</th>
<th>I have doubts</th>
<th>Wrong action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grading</td>
<td>0-7</td>
<td>7-14</td>
<td>14-20</td>
</tr>
<tr>
<td>Average</td>
<td>3,5</td>
<td>10,5</td>
<td>17,0</td>
</tr>
<tr>
<td>Respondents</td>
<td>3</td>
<td>9</td>
<td>84</td>
</tr>
</tbody>
</table>

Source: (Piri, 2010)

Thus, people give a score of around 16 from total 20 to the project of planning and building a regional knowledge network in Chabahar. Despite the fact that some people are not informed enough about the advantages of a regional network the grade 16 is a score to encourage the regional decision makers to establish a suitable regional knowledge network.

5.4.5 The necessary infrastructure for the knowledge network
We observed different urban infrastructures in the region of Chabahar, and in particular we observed the infrastructure required to design and build a regional knowledge network. When we asked the knowledge workers whether there is the necessary urban infrastructure in the region a high percentage replied no, some 90% of responders said that the adequate urban infrastructure does not exist. Only 10% said yes there is enough urban infrastructures. A pertinent observation then suggests that there is not adequate urban infrastructure in terms of public transport, communicating trains, subway, houses, electronic communication, etc. The shortages are enormous as we see when exploring the ideas of the sample community about the direct required infrastructure to
establish a regional knowledge network, see the questions and the ideas of the respondents in Table 5.9.

As you see from the table almost 95% of the respondents stated that infrastructure components such as enough funding, technical devices, access to high-speed internet, adequate suitable workplaces, and communication with other regional network is very important. They are key ingredients for planning and making a regional network in Chabahar.

Table 5.9 Different ideas about urban infrastructure

<table>
<thead>
<tr>
<th>Infrastructure component</th>
<th>Very important</th>
<th>Not important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial support</td>
<td>96</td>
<td>0</td>
</tr>
<tr>
<td>Technical possibilities</td>
<td>91</td>
<td>5</td>
</tr>
<tr>
<td>High speed internet</td>
<td>90</td>
<td>6</td>
</tr>
<tr>
<td>Access to inter-and intranets</td>
<td>88</td>
<td>8</td>
</tr>
<tr>
<td>Communications with other regional networks</td>
<td>85</td>
<td>11</td>
</tr>
<tr>
<td>Adequate comfortable workplaces</td>
<td>89</td>
<td>7</td>
</tr>
</tbody>
</table>

Source: (Piri, 2010).

Only approximately 5% of the responders are not aware how significant it is to supply the required infrastructure. We should say here that the observation proved that the infrastructure should be supplied before planning and building of a regional knowledge network in the region.

5.4.6 Ideas about the management of the regional knowledge industry

Exactly similar to the scholarly suggestions, the respondents believe that to produce knowledge goods requires skilled and talented managers to lead the regional network. They want the management to outline and formulate pertinent strategic policies for the industry. We asked the knowledge workers who should decide the types of knowledge to be produced. They answered about the needed types of knowledge goods in the Chabahar region. Some 52% believe that market oriented knowledge goods are more needed while 48% said that pure knowledge is necessary. However, a large percentage of the respondents believe that both applied and basic knowledge production will be required to develop the region.

According to the results of our quantitative collected data, some 73% of respondents insist that the process of knowledge production should be freely innovative and not controlled. However, 27% of the responders like a controlled and predetermined process for producing knowledge. One other important feature of managerial responsibility is the regulating and deregulating of
principles and the enforcing of laws. Some 50% of responders have particularly focused on the international copyright law. They want to respect the international regulation and at the same time they see a connection between respecting the international regulation and rewarding bonuses and other encouragements for innovative scientists. During the interviews many of the regional workers asked for more regional, national and international collaboration. Table 5.10 below lists the important managerial factors and the ideas of the regional knowledge workers about them.

Table 5.10 Regional ideas about management issues

<table>
<thead>
<tr>
<th>Managerial factors</th>
<th>Important</th>
<th>Not important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educated and skilled managers</td>
<td>95%</td>
<td>5%</td>
</tr>
<tr>
<td>Pertinent strategic policies</td>
<td>92%</td>
<td>8%</td>
</tr>
<tr>
<td>International copyright regulations</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Bonus and rewards to new ideas</td>
<td>67%</td>
<td>33%</td>
</tr>
<tr>
<td>Regional, national and international collaboration</td>
<td>84%</td>
<td>26%</td>
</tr>
</tbody>
</table>

Reference for data: (Piri, 2010)

According to the table above a high percentage of the respondents believe that skilled managers are important and suitable optimal strategic policies are important as well. What is unexpected is the high percentage of not important answers to the copyright law. However, the significance of forgiving bonus to new ideas goes up to 67%. It means that the respondents recognize the relationship between the new ideas and respect to the copyright.

5.4.7 The Chabahar Model of a Regional Knowledge Network, CMRKN

Now, after observing the key variables about the regional knowledge network in the Chabahar region, the time is ripe to model a regional knowledge network.

Here we introduce a systematic step by step procedure to plan a suitable network based on the specific conditions of the Chabahar region. After the empirical investigation above you will agree that the increasing number of knowledge workers should be in favor of the urban planning and design. The respondents stated that the various urban infrastructures are prerequisites for a knowledge network. Therefore the first step is to suggest a model for the regional and urban infrastructures. You have also read that the majority of the respondents believed that competent management is significant. Therefore the model shall establish a modern management system. The next step as the knowledge workers and the theories suggested is the determination of the organizational structure of the network and the types of relationships with the outer world. The theoretical studies and the empirical investigation suggested
that the knowledge network should have a capable and equipped center as the hub of the network. So, the next step to establish a regional network is the provision of the hub. Then, the management system will decide the process of the production and the types of knowledge goods. Finally, according to the investigation the network should include a systematic auditing and assessing machine to check its results.

We think the following flowchart will exhibit the process of planning and establishment of a knowledge network in Chabahar and similar regions as a step by step process. The Chabahar Model of a Regional Knowledge Network, CMRKN, is summarized in Figure 5.2.

![Flowchart of the regional knowledge network building model in Chabahar](image)

**Figure 5.2 Flowchart of the regional knowledge network building model in Chabahar**

### 5.5 Conclusions

The chapter presumed that a regional knowledge network will give rise to a better urban planning and design. We studied the latest ideas among international scholars about the usefulness of such networks. The Asian Development Bank in a report recommended the counties to implement such knowledge networks. We studied the ideas of the knowledge workers in the region and the majority of them are in favor of a regional knowledge network (see Table 5.8). The field observation also proved that the market to buy and sell knowledge goods does work quite well in the region. This is why a higher percent of the regional knowledge workers, more than 80%, are strongly in favour of the establishment of a regional knowledge network in Chabahar.
Therefore, the presumption's validity concerning the demand for the introduction of a regional knowledge network in Chabahar has been proved.

This chapter discussed on the phenomenon of knowledge workers. You have read that they have emerged in the Iranian regions as well. The points of the scholars related to the characteristics of the knowledge economy have been studied; see Karlsson and Johansson (2006). Earlier the Swedish scientist Åke E. Andersson suggested progressing of the traditional production function by adding a new variable, namely the knowledge worker. So, the urban planners shall include the knowledge of the scientists and skilled practitioners in the process of urban planning and design. Many believe that knowledge workers contribute to the development of the region when a suitable milieu and necessary facilities exist.

There was another hypothesis under scrutiny in the chapter. If there are adequate urban infrastructures the planners can overcome the obstacles and get better outcomes by working with the knowledge workers. According to the ideas presented by the respondents before any decision about the planning of a regional knowledge network, necessary urban infrastructure shall be provided so that Chabahar will be able to attract knowledge workers. (Smith, 1997) and (Goldstein, 2005) believed that infrastructure is a foundation for regional knowledge networks. The ideas of the region about the types of urban infrastructures prove the need. We studied the needed urban infrastructure in the region (see Table 5.9). We learned from advanced regions, particularly in Sweden, to suggest the regional knowledge network here as well. The regional knowledge network shall have a central administration with peripheral institutes and peripheral devices. The hub of the network shall be built with clear defined connections between all involved nodes of the system.

An important socioeconomic aspect of a regional knowledge infrastructure network is its organizational structure. You have read in this chapter that Uriarte and other scholars discussed on the subjects of the organization and management of such networks. We understood that the degree and the form of collaboration between the different organizations depend on the different external situations. To make collaboration between different kinds and sizes of institutions, universities and organizations in the region could vary from unifying somewhat of closer communications up to total merger. You have read that Pervaiz stated that knowledge management consists of a set of cross-disciplinary organizational processes that seek the ongoing and continuous creation of new knowledge. Similar to Pervaiz, the majority of the respondents consider particular abilities, talent and skills for the managers. The respondents promote an intelligent, skilled, and scientific management team. The managers shall pursue a mutual communicative mode of interaction with the staff and try to involve them in the process of work. The field studies show that a high
percentage of knowledge workers are young (see Table 5.1). The management of the network shall consider the expectations of this young age group while creating the regional knowledge network. Their special hope is the possibilities for complementary education. This means that the regional knowledge network shall provide some suitable educational programs to encourage the workers to take up complementary education and good education for their children (see Table 5.4). You recognized that the presence of women in the knowledge industry is very low indeed (only 5%). Therefore, the regional knowledge network should make a special effort to attract female researchers to make a logical gender allocation in the workplaces.

The chapter studied the theories about knowledge production and types of knowledge goods. (AlHawamdeh, 2003) defined the concept of knowledge production and elaborated well on the different pure knowledge and applied knowledge. You have read in this chapter that Nonaka and Takeuchi (1995), discussed on the importance of the production of knowledge. We studied the ideas of the regional knowledge workers about different types of knowledge. Some 56% of the respondents believe that market oriented knowledge goods are needed. Simultaneously, 54% believe that basic and pure knowledge is important to develop the region as well (see Table 5.6).

The final hypothesis of this chapter was on the copyright. Knowledge production rights like copyrights shall be rigid to encourage the knowledge workers to more innovative creations. The majority of the respondents will welcome and follow likely regulation in this field. We suggest the findings of this chapter as a model to plan and build a regional knowledge network in the region of Chabahar and similar regions of Iran and elsewhere.
Imagine you live in a developing region where the population is growing rapidly and there is a demand for more urban neighborhoods. Therefore, you must build new homes and towns for emergency situations without the necessary urban and regional traffic networks. You always see congested avenues and passages and the traffic flow is jammed. At the same time, the new towns are neither satisfactory for residents nor gorgeous objects for investors and tourists. You believe that your city needs modern urban and regional transportation networks to breathe do you not? Author’s sense

6.1 Urban development needs transportation infrastructure
This chapter discusses the link between urban planning and suitable transportation networks. Iran approved national plans to build new towns. The urban planners targeted to settle increasing numbers of people in the new towns. However, many new towns failed to be attractive enough to accommodate the planned number of people. Lacking of well-designed and functional urban infrastructure, particularly traffic networks are one of the leading factors causing the stoppage. So, the lack of traffic and transportation networks in the new towns caused problems for their inhabitants and declined the people's willingness to live in the new towns. At the same time, the new towns lack regional corridors to connect them to neighboring cities and communities. My hypothesis is that new towns without including urban traffic infrastructures and regional transportation networks will not enable us to settle the people successfully. Since the problem of non-existence of necessary urban and regional transportation networks in the region is multi-disciplinary, the methodological approaches for its solving should discuss different dimensions of the problem. In this chapter we will see the problem both in theory and practice.

6.2 Background of the problem
The role of transportation infrastructure is a known historical fact. The world history on urbanization shows people planned and built the cities near possible water channels and overland roads to make contacts with other communities. Jiangping states three targets for the transportation: “There were three targets facing the transportation in different countries; increasing responsiveness to customer needs, adjusting to global trade patterns and coping with rapid automating” (Jiangping, 2012, p 156). Despite the historical advice the relationship between transportation infrastructure and the development of new towns has become complex in Iran recently. A major reason causing the
complexity is the simultaneous increase of population and urbanization. When the demand for communication and the transportation infrastructure is a basic human need for the growing regional population, the traffic network infrastructure should provide the means for communications and transitions of ideas, wealth, and services among the urban inhabitants. Surprisingly many new towns in Iran stay without transportation infrastructure. Because of urban crisis and social pressures, the urban and regional planners do not include planning of traffic and transportation infrastructure in the process of new town planning and design. Elshimy witnesses that "The traffic and transportation networks mitigate the current none sustainability and unattractiveness of new towns at a large-scale" (Elshimy, 2011).

So, the current thesis recommends a suitable urban and regional transportation infrastructure network to overcome the problems of non-sustainability and non-attractiveness of the new towns.

6.3 Urban and regional transportation in the mirror of theories

6.3.1 Transportation networks and sustainable development

Generally, sustainable development refers to a city’s ability to meet its needs. Michael Kinsley understood the importance of the sustainability as: “A sustainable development means stewardship, careful, economical and long-term management of land, society and resources” (Kinsley, 1997, p 7). At the same time, many scholars believe that a sustainable development links strongly to suitable urban and regional transportation networks. Sometimes, despite good intentions to plan transportation networks, those good intentions are far from the real practice and many new built towns in Iran do not have proper access to traffic and transportation infrastructure networks. Visiting the newly built towns reveals that the towns are hermit dormitories, while one strategy of every new town is the difficulty for the various planning activities to create new jobs for its residents. Rosales incorporates urban sustainability indicators into the transportation planning process and discusses the significance of transportation planning (Rosales, 2011). When the transportation planning is so important to what does the transportation planning paradigm amount? Muchukuri and Grenier define the term of transport planning as: “Transport planning is a field involved with the evaluation, assessment, and design and placing of transportation facilities” (Muchukuri and Grenier, 2009, p 3). Transport planning includes natural resources used in transportation, transportation knowledge, transportation technologies, transportation vehicles, transportation networks, and transportation management. Because of natural and environmental problems in Iran, the transportation network should cope with the regional conditions. Sumant et al suggests a new city model to reduce demand for transportation and so to conserve natural resources (Sumant et al, 2011).
However, Sumant's suggestion is not helpful in the case of Ramshar where the issue is to build new towns when many people demand to live there. Nevertheless, we have learned from the scholars that a significant view of the transportation model shall be the promotion of the sustainability as the Transport Planning Society suggested: “The role of transport planners is shifting from technical analysis to promoting sustainability through integrated transport policies” (Transport, 2006). The society argued about the role of the transport planners by issuing a plan for sustainable urban development. The following key roles must be performed by transport planners:

- Take account of the social, economic, and environmental context of their work.
- Understand the legal, regulatory policy and framework within which they work.
- Understand and create transport policies, strategies, and plans that give room to meet socioeconomic and environmental needs.
- Design the necessary transport systems and services.
- Understand the commercial aspects of operating transport systems and services.
- Know and apply the relevant tools and techniques.
- Must be competent in aspects of management, in particular communications, personal skills and project management (Transport, 2006).

After reviewing the meaning of transport planning, the role of the transport network with the sustainable urban development and the role of the planners, we will study different technical properties of a typical urban transport network.

### 6.3.2 Components of a generic transportation network

When scholars discuss on traffic and transportation infrastructure networks they name two views of infrastructures; hardware and software. Several parts of a traffic network are included in hardware infrastructure and others are in software. However, in this discussion as Fulmer (2009) suggested we propose three significant parts of a generic network.

- Infrastructures are basic necessary installations to movements. They would be streets, roads, freeways, railroads, airlines, water lines, canals, pipelines, terminals, airports, train stations, bus stations, cargo storage, truck terminals, fuel stations, and harbors.
- Transport instruments are machines, automobiles, cars, trucks, airplane, helicopters, trains, ships, bicycles, humans and other tools which travel on the infrastructures.
Operations refer to the actions that cause functioning of machines and services. It refers to methods which offer precise and continuous functions of infrastructures and machines similar to financing, regulations and policing.

To plan and build both urban and regional transportation networks in the region this chapter needs to supply the three parts that Fulmer suggested.

6.3.3 Technical view of a traffic infrastructure network

We said earlier in this thesis that the regions suffer from absence of knowledge, technology, experts and technological tools and devices. Obviously, knowledge and technology require investment in transport and traffic systems. Yuji et al state about the importance of knowledge, technology, and funding in transportation infrastructure suggested a rational model: "Most regional transportation planners today use what is called the rational model of planning. The model views transportation planning as a logical and technical process. The model uses the analysis of quantitative data to decide how to best invest resources in new and existing transportation infrastructure" (Yuji, I., et al., 2011, p 7). The Yuji model helps overcrowded populated regions with rapid increase in the number of automobiles on the roads to plan logically. A significant part of the course of planning and design of a traffic network model is the prediction of future needs and demands. By the help of futures studies, this chapter will clarify where to improve the technical aspects of the traffic infrastructure network. Flyvbjerg et al noticed the importance of the futures studies to plan the technical features of a transportation network: "A large part of planning for transportation involves the technical process that is designed to predict where future investments need to be made" (Flyvbjerg et al, 2005). To use a suitable traffic and transportation model and improve the knowledge and technical views of the transportation networks Johnston suggested a four-step transportation modeling, trip generation, trip distribution and mode choice, and, trip/route assignment (Johnston, 2004).

The model of a transportation network and the process of its planning and design include both ex-ante and ex-post analysis phases. While ex-ante studies contribute to the planning of the transportation networks ex-post analysis involves monitoring of the results. About the importance of the latter step Johnston argued, "For evaluation to be meaningful it should be as comprehensive as possible. For example, not only looking at decreases in congestion the model should consider economic, equity and environmental issues related to our selected transportation model" (Johnston, 2004). Thus, the technical features of the traffic model should analyze and consider both the technical state of the present and understanding the future needs as well.
6.3.4 Laminar flow of urban traffic

One basic urban problem which creates many urban traffic problems such as pollution, and traffic jam is the narrow and short space passages in the regional cities. Fluent traffic requires scientific, modern, and sustainable infrastructure networks. Such networks involve the design of roomy streets and squares, design of traffic control installations including traffic signals, signs, and pavement markings. Traffic flow management is one part of laminar traffic flow in new towns. Increasingly, planning of fluent traffic needs intelligent transportation systems with engineering disciplines. To make a fluent flow of traffic in every new town needs to decide the measures pertaining to the boulevards, streets and other passages. Since the transport model developed in this thesis includes a regional freeway, we will also discuss fluent flow of traffic on freeways. The model is aimed to cut the frequency and severity of accidents. Traffic collisions are at an alarming frequency now in the region.

Cornell Local Roads Program published in 2009 suggests a program to guarantee the safety of traffic on roads. The program includes the steps in a typical traffic safety process, i.e. to identify and rank locations to be investigated, gather and analyze data, identify possible countermeasures to reduce the severity or frequency of crashes, implement improvements, and evaluate results (Cornell, 2009). The above-suggested program is useful to prevent the current mortal traffic accidents.

The thesis tools should be used to plan an environmental friendly transportation network. About the climatic and environmental design of corridors Shahraki suggested “Designing of freeways environmentally and climatically needs more considerations. Some of the considerations are improvement of the natural environment, plantation of suitable trees and battle with sand storms and heat” (Shahraki, 2008). Environmental urban traffic networks need spatiwise avenues, streets and boulevards with tall trees along their two sides to beautify the new town and combat the hard climate. Additionally, the even topography, environmental reasons and expensive fuels suggest that there should be an agenda to use bicycles in the towns. Pucher suggested that an important step to increase cycling is having special lanes for cyclists using arguments as: “In both Europe and North America, the main approach to increasing cycling and making it safer has been the provision of more and better bike paths and lanes” (Pucher, 2011, p 451). What Pucher said for cycling in a new town is necessary in this region to design a proper bicycle traffic system. Wooded paths, necessary street furniture and suitable trees can encourage cycling. The urban cycling paths network should connect residential areas, workplaces, and shopping centers.
6.3.5 Rationality and functionality of transportation networks

Generally, a rational model has logical and technical views and uses the analysis of quantitative data to decide the best characteristics in the new transportation infrastructure network. The area of rational modelling is wide although it is both feasible and suitable to the new towns as Shahraki suggested "Our rational model of transportation network shall be defined based on the regional conditions and traffic data. Particularly, it shall discuss today's major logical demand security which becomes less accessible" (Shahraki, 2005). To plan a functional model of transportation network many scholars recommend the pentagon model. For example Nijkamp suggested: "Many transport systems in Europe face major difficulties, although a number of systems are performing better than others. A pentagon model that encompasses the following five most important key factors for a successful design and management of transport may be interesting: They are hardware, software, organization ware, financial ware, and ecological ware" (Nijkamp et al, 1994). The pentagon transportation system assumes that a high quality functional fluent traffic encompasses of five above named wares. I define the five wares briefly. Hardware refers to buildings, stations, and mechanical instruments with qualitative and quantitative effective technological standards while software involves digital information programs and databases, registration of statistical facts and digital operating systems. Organization ware means the existence of a managerial organization that runs the flow of traffic based on the predicted demands. Financial ware specifies the necessary financial methods, the degree of interfacing of private, state, and cooperative sectors in the investments while ecological ware promotes the public transport systems and saves the environmental components.

6.4 Urban and regional transportation in practice

6.4.1 Place of Ramshar in Iran

Ramshar is situated 40 kilometers south of Zabol city, along the Zabol-Zahedan road. Sistan is regarded as the continuation of the Helmand region most of which is in Afghanistan. Ramshar is close to the Afghanistan border, see Figure 6.1 below:
Ranshar is situated on an even plain although to the east direction at about 25 kilometer away there are some small hills. The new town is limited to the Lootak plain and has the cities of Mohammadabad and Zabol respectively in the north direction. From the south direction, the new town is open until the bifurcation of Zabol-Zahedan. From the western side the domain of Ramshar continues until the mountains of Nehbandan. From the east direction, the new town is close to the sand dunes frontier of Pakistan and Afghanistan. Ramshar needs particular attention in the urban traffic planning aiming to connect it to the peripheral cities and the main regional road network.

6.4.2 Ramshar needs urban and regional transportation networks

Ramshar is on the main relational road of Afghanistan-Nimrouz-Zabol-Zahedan-Chabahar. This main relational road connects the major populated centers while it lacks the necessary technical, security and comfort standards. Access to Ramshar requires improvement of the existing narrow small road. The idea is to plan and build a freeway from the junction of Zahedan-Nehbandan to Zabol and to Nimrouz city in Afghanistan aiming to accommodate the present and future transport demands of the region. There are many serious traffic accidents along the regional road network that make driving very hazardous. The Iranian traffic
commission reports that every year 25000 people are being killed and 600000 injured in traffic collisions when 150000 of them remain crippled. The commission suggests that one major reason to such figures is the non-standard roads and streets (Traffic, 2008). Field observations for the thesis project recognized that there is a strong opinion to build a corridor connecting Ramshar to the city of Nehbandan, via the western plains. Obviously, the link will give a faster connection between Ramshar and Nehbandan.

Additionally, Ramshar needs access to small border towns and villages such as Zahak, and Miankangi via a new frontier line. Since the regional strategic plan considers the Sistan plain as a free economic zone the freeway of Nimrouz-Zabol- Zahedan-Chabahar would give a secure and fast access from Afghanistan to the Oman Sea; see a graph of the proposed corridor in Figure 6.2.

![Graph of the suggested regional transportation network](image)

Figure 6.2 A graph of the suggested regional transportation network
Source: Shahraki (2006)

6.4.3 Transport model of Trans Sistan Network, TSN
We consider the northern part of the above graph as a regional transportation network model. Since this traffic and transportation planning study is the first one in this region we have named it the Trans Sistan Network, TSN, see also Batten et al (1995). As Batten defined I will describe and analyze a system here. Mathematically, a very convenient way to represent this kind of system is as a graph. An abstract graph is simply a set of nodes together with a set of edges connecting various pairs of elements in a system. Figure 6.2 exhibits a
graph of the TSN model consisting of nodes and edges. Vickerman analyzed
the impact of the Trans–European Network and concluded that the corridor
affected the economy and security of the region positively, particularly in the
eastern European countries; see (Vickerman, 1995). In line with Vickerman it
seems likely that the TSN will impact southeastern Iran positively as well. One
perspective of the TSN is the analysis which proves its contribution to the
security and sustainability of the region. A significant characteristic of the region
was the lack of sustainability and security. For the current application we
gathered data that exhibited the necessity of the TSN.

6.4.4 Two parts of the Trans Sistan Network, TSN

The TSN model is developed for the urban traffic infrastructure in the new town
of Ramshar and a regional transportation corridor. Generally, the theme of
fluent traffic in any new town should analyze the following two pivotal problems,
the urban one and the regional one. The first problem is to forecast the traffic of
automobiles, problems of flow in the streets and squares, problem of parking,
subjects on railroads and train stations, problems of bus and taxi stations and
cyclists. The second one is to solve the problems related to sidewalks,
pedestrian bridges, safety, and health of pedestrians.

The regional transportation network is to increase connections and movements
among regional villages, towns, and cities also connecting the region to the
main national traffic systems and neighbouring countries. The regional corridor
will break the isolation of the new town of Ramshar. However, planning and
building of the regional corridor must follow the advanced technical and
environmental standards and codes of freeways. As said earlier, since the
region suffers from sand dune typhoons we will need to protect the freeway with
the help of tree plantations. The freeway should also include buffer lines for
cyclists for the villagers to use to travel by bicycle and motorcycle between
nearby towns and neighbourhoods. Figure 6.3 depicts a sectional perspective of
the particular characteristics of the proposed regional corridor.
6.5 Technical characteristics of the TSN

We calculate the traffic capacity for the corridor that is particularly significant to decide its technical characteristics and its measurements. Figure 6.4 shows a graphic representation of the Trans Sistan Network with capacities on links.

Suppose that there is a flow of goods traffic from one station to the other one for example from southern Khorasan to Afghanistan. The capacity limits the flow on every edge in the graph. As you see on the graph each edge of the network has a denoted number based on the experimental statistical data which we provided. For example, see the path of Nehbanadn–Zabol with a transported kg/hour goods traffic capacity. We propose to find the largest weight of goods
that can be transported between nodes. We need to have equations stating that
the flow on any edge does not exceed the capacity for the edge, and equations
showing the sums flowing into and out of the nodes. The TSN system provides
an automated model to perform these calculations.

The capacity for passenger traffic in every part of the corridor could be
calculated similarly. The method will contribute to deciding the technical
characteristics of the corridor. The calculations suggest that the
corridor/freeway on its major part has the two crossing bands on every
direction. Additionally, on each side a three metric wide space is needed to
design a sidewalk and a cycling line. The freeway would have tall trees to
prevent winds, sand storms, and noise pollution. On both two sides of the
freeway necessary facilities such as gas stations and resting buildings will be
built which by increase or decrease speed ramps and different level
intersections are affordable. The duty of the freeway is to connect the major
centers of the Sistan plain. When freeway passes more regional towns and
villages, it acts as a regional corridor.

6.6 Impact of the TSN in the region
The clearest consequences of the proposed corridor are a change in the
lifestyle, declining of animal use for cargo transport and use of new vehicles and
transport facilities. The corridor will presumably reduce the number of Sistan
traditional horses. The corridor encourages the regional traders to use legal
freeways instead of natural dangerous paths. The expectation is that current
irregular travels will be regulated. The corridor shortens travel distances and
travel times. Finally, the corridor increases the number of movements and
transports in the region.

The corridor increases private trips and people will spend more money for their
visits in other cities. Right now, many people travel to Zabol and Miankangi from
other provinces to shop and use the advantages of the free economic zone. The
proposed corridor will ease the travels and the trade. When there are valuable,
historical buildings and ancient cultural works in Sistan the corridor will increase
the number of tourists and the number of job opportunities. The corridor will
increase the price of land and property in the region. The collaboration among
the neighbouring countries is likely to grow and it will boost the regional
economy.

Since the ecologic system of the region is totally related to the Hirmand River
and its branches and to Hamoon Lake, the planners shall take care when
placing the bed of the corridor. Everywhere the corridor crosses the watersheds
and water resources they will have to consider particular civil engineering
remedies to cut the detrimental effects. The corridor remains a wide harmful
impact on the lands. The bed of the corridor occupies approximately 2400 hectares. Since the region is a cultivated area, the drawing of the project line and the localization of the stations and other required facilities should be done in ways to harm agricultural farms as little as possible. The corridor will generate air pollution and noise when the regional traffic number increases.

The corridor is useful for the sustainable development of the Sistan part in Afghanistan as well. The corridor will have positive effects in provinces such as Nimruz, Helmand, and Zabol in Afghanistan. The corridor eases commercial and cultural mutual relations with Pakistan and Bangladesh as well.

The corridor causes growth of legal travel and transport of approved goods in the free economic zone of Sistan. The corridor contributes to the enforcement of laws in the free economic zone. Thereupon the conditions will become better for domestic and foreign investments. Additionally, passengers and business people from adjacent countries can get access to the free sea via Chabahar harbour and other provinces of Iran are using this corridor. The corridor will change the cultural and economic life of the local people. So, the security of the region and the chances for a sustainable development will improve.

6.7 The Trans Sistan Network makes the region sustainable

6.7.1 Field studies
To investigate the hypothesis of how much the traffic network contributes to sustainable development of the region we argue the profitability in terms of security and sustainability.

We gathered the data on the regional traffic in Table 6.1. The table shows the estimated numbers of buses, minibuses, private cars and trucks. The numbers are provided by typical direct sample observation on Zahedan-Zabol road, near the new town of Ramshar, round the clock at various times for a time period.

<table>
<thead>
<tr>
<th>Type of vehicle</th>
<th>Average number per hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus</td>
<td>1</td>
</tr>
<tr>
<td>Minibus</td>
<td>0.25</td>
</tr>
<tr>
<td>Private car</td>
<td>30</td>
</tr>
<tr>
<td>Truck</td>
<td>1</td>
</tr>
</tbody>
</table>

Reference for data: Shahraki (2006)

Table 6.1 shows that regional people travel by private cars instead of public transportation. Based on the observation we consider 30 passengers per one bus hourly, ten passengers per one minibus per hour, three persons per one private car per hour and 15 tonnes of cargo per one truck per hour. Because of
the increasing demands of public and private economic sectors to reach the Oman Sea and the increase of the regional population we predicted a ten percent passenger increase and 18 percent freight transport raise in case of corridor building. We suppose that the corridor will increase the tourists by 20 percent. Other positive effects will remain as Table 6.2 reports.

Table 6.2 Impact with and without corridor calculated for one year

<table>
<thead>
<tr>
<th>Type of impact</th>
<th>Without the corridor</th>
<th>With the corridor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger traffic/number/year</td>
<td>376680 Passengers</td>
<td>414348 Passengers</td>
</tr>
<tr>
<td>Cargo transport/kilogram/year</td>
<td>129600000 Kg</td>
<td>152928000 Kg</td>
</tr>
<tr>
<td>Declining of travel time/minutes</td>
<td>210 Minutes</td>
<td>120 Minutes</td>
</tr>
<tr>
<td>Attracting tourists/person/year</td>
<td>0</td>
<td>120 Tourists</td>
</tr>
<tr>
<td>Increasing of the regional productions/kilogram/year</td>
<td>0</td>
<td>300000 Kg</td>
</tr>
<tr>
<td>Increasing of jobs/number/year</td>
<td>0</td>
<td>100 Jobs</td>
</tr>
<tr>
<td>Growth of international collaboration/percent t/year</td>
<td>0</td>
<td>4%</td>
</tr>
<tr>
<td>Population growth in Ramshar yearly</td>
<td>0</td>
<td>300 People</td>
</tr>
<tr>
<td>Improving of the quality of lands/m²</td>
<td>0</td>
<td>20000000 m²</td>
</tr>
</tbody>
</table>

Source: Shahraki (2006)

Table 6.2 shows the improvement of every impact if the TSN will be built. Now it is possible to discuss the costs of the corridor. The main source in our arguments is an earlier published book in Persian, Strategies to develop Ramshar, containing an econometric analysis of the new town (Shahraki, 2006).

6.7.2 Costs
Costs to buy land for the bed of the corridor
The bed of 200 km long and 60 meter bred of our corridor covers 1200 hectares land. The price of the land shall be paid.
Costs to build the corridor
The prices to build the freeway which we need according to the current regional fees should be financed.
Costs for the maintenance
This item depends on the future urban management and conditions. However, we must calculate this item as well.

6.7.3 Benefits of the TSN corridor
Table 6.3 reports the types of benefits which the construction of the TSN will provide.
Table 6.3 Benefits of the corridor

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Type of benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Increase of passenger traffic</td>
</tr>
<tr>
<td>2</td>
<td>Increase of cargo transition</td>
</tr>
<tr>
<td>3</td>
<td>Decline of travel time</td>
</tr>
<tr>
<td>4</td>
<td>Growing number of inhabitants in Ramshar</td>
</tr>
<tr>
<td>5</td>
<td>Tourist attraction impact</td>
</tr>
<tr>
<td>6</td>
<td>Growth of regional production</td>
</tr>
<tr>
<td>7</td>
<td>Creating job opportunities</td>
</tr>
<tr>
<td>8</td>
<td>Increasing international cooperation</td>
</tr>
<tr>
<td>9</td>
<td>Improving attraction of region by the corridor</td>
</tr>
</tbody>
</table>

Reference of data: Shahraki (2006)

Cost benefit balance of the corridor
Well, there are the necessary facts to claim that the construction of the TSN is helpful indeed to make the region sustainable and secure. We made a monetary calculation earlier and subtracted the total cost from the total benefits of the TSN. We experienced a ten profit ratio initially, a very high profit indeed (Shahraki. 2006). We recognized that the alternative of building corridor is helpful both economically and socially.

The hypothesis of this thesis claimed that the building of the TSN would contribute to traffic safety, economic growth, and sustainability of the region. As you have seen the analysis verified the hypothesis about the benefits of the TSN.

6.8 Conclusions
The thesis states that the regional transportation corridors and urban traffic infrastructure networks make new towns sustainable and functional in Iran and similar regions in the world. The chapter studied general theories on linkage between sustainable urban planning and design and transportation infrastructure. Both the theoretical studies and the case studies demonstrated that the planners should not plan and build a sustainable and attractive new town without adequate urban traffic infrastructure and an adjoining regional transportation network.

Academic theoretical methodologies such as transport modelling, regional impact assessment, and regional economics helped us study the effects of a transport corridor. We gathered the necessary data by a statistical sampling method and by direct gauging of traffic capacity. Then, we analyzed the data and applied it to the planning of the TSN in the region. Theoretically and
Empirically, this chapter found that planning and design of a successful and sustainable new town requires not only housing and town building projects, but it needs to include urban and regional transportation networks in the process of planning as well.

The planners, civil engineers, and decision makers in the region have not considered the effects of adequate suitable traffic infrastructures for sustainable development of the new towns. There is a lack of feasibility studies, socioeconomic research and nobody has been predicting future needs. In this perspective, the chapter suggested the model of the Trans Sistan Network, TSN, for the area of the Ramshat’s new town. The model proposed is preliminary and can be seen as an indication of a direction of research-based practice needed in new town development in Iran.

This chapter comes to recognize that planning of an ideal traffic and transportation infrastructure network requires taking notice of specific local characteristics. The TSN has shown to merge the traffic infrastructure issues into new town analysis early in the planning process of building a new town. The TSN will amend the urban planning for the new towns. Thus, TSN will act as a logical and rational procedure for strategic urban planning in the region. TSN will contribute to a better accommodation of the increasing surplus metropolitan population in the new towns. TSN’s urban planning procedure will also help the planners and developers in Iran and similar regions to reduce the housing problems in crowded metropolitan areas. The TSN is a model for the key required urban infrastructure to make sure the sustainability of the regions when traffic safety and development.
Imagine you live in an arid region where the growing population is demanding more homes and urban spaces. Therefore, you must build new homes and towns for emergencies without the necessary water. You always see treeless streets, empty water pipes, and a queue of people to get allocated water. At the same time, the new built towns are neither satisfactory for residents nor nice-looking for investors and tourists. You would believe that you need water to build new sustainable towns and to take away ever-increasing anxiety on water, do you not? Author’s reflections

7.1 Introduction

This chapter is to discuss a dilemma in the region. From one side a growing need for new towns exists in Iran and on the other side the water scarcity is being a key reason hindering the new town building. The recent history of new town making in Iran passes a way that is very dissimilar to the way which it should go. Nowadays in the dry and semi-arid climates, people need water for drinking, industrial needs, and agricultural uses to supply food, provide hygiene, and living requisites at an acceptable standard. We understand that new towns are necessary for Iran, but there is not enough water to build new towns.

This chapter is to plan water supply and distribution before the process of planning and design of new towns. The present planning style does not include enough pre-studies to find out suitable sites with necessary natural resources and water assets for a new town. The urban planners in the region should listen to Klinken et al who argued: "For the rapidly expanding and unplanned settlements and towns, water service provision presents a different challenge" (Klinken et al., 2012). At the present, the developers in Iran build new towns without properly ensuring of the necessary water resources and with no contingency planning of essential water supply and distribution infrastructure networks. Therefore, people are sometimes not willing to live in the new towns. As this thesis analyzed in the previous chapters the new towns are vulnerable, draw on non-renewable resources, and are simply not sustainable.

The thesis focuses on the need for provision of water resources before the process of planning and design of a new town actually starts. After discussing issues relating to supplying the water, the thesis highlights the need for management of the collected water. Morris suggested to plan and to manage with respect to the local particularities: "The issues that should be examined in a water resource management plan necessarily vary with the nature of the area and its water management problems" (Morris et al., 2007, p 4). Thus, we aim to
suggest a practical method for new town planning and design which includes the provision of needed water. We acknowledge, as Kasperson wrote, the global environmental changes that reduce the water resources: “Global environmental change and sustainability science increasingly recognize the need to discuss the consequences of changes” (Kasperson, 2003, p 159). We will examine possible theoretical and technical methods to overcome the existing crises of urban developments in this regard. And we will encourage the urban developers to revise their current work methods by introducing a systematic procedure for analyzing the provision of water resources before planning and design of any new town.

The hypothesis is that new towns without providing of needed water will disable us to settle the people successfully. We presume that in practice a successful systematic urban planning and design requires simultaneous attempts to give attention to the water resources focusing on the provision of the needed water resources, water supply infrastructures, water distribution networks, and urban water management programs.

7.2 The paradoxical problem
Housing and new town building projects in central and southern parts of Iran are faced with the non-existence of water resources. Conceptual, theoretical, organizational, practical, socioeconomic, environmental, and natural factors have caused the problem. How shall the developers plan and design a new town to meet the needs of its inhabitants and sustainable result?

Although the water problem exists in Iran, water is a global problem from the new town of Al Sadat in Egypt to the new towns of Pakistan and India, from new towns in the Australian deserts to the deserts of Nevada in the USA, from Shihezwe in China to Aktau in Kazakhstan. After six decades of new town buildings, the question still exists. Now, the majority of the involved actors recognize that they should make progress from the traditional planning, design and building styles. The new towns of Iran in the southeast part of the country have more or less the condition that Tomasella illustrated for the Amazon area: “Drought, fire and their interactions play an important role in the carbon dynamics, vegetation–atmosphere interactions, hydrology, and health of Amazon ecosystems, and in the livelihoods of Amazon residents” (Tomasella, 2008, p 1773). Inhabitants are damaging the built environments and the developers reply with ignoring the feasibility studies, natural resource analysis, not understanding of the endowments of the sites of the new towns. Worse, the municipal organizations and management bodies are unable to provide the necessary technical knowledge and skills. The recommendation of Seto and Christensen is helpful for the planners and developers in Iran when they argue that: “Satellite remote sensing is not only useful for consistent aggregation
across scales; it lends itself to the development of consistent datasets that can be examined as a large statistical sample of urban areas" (Seto and Christensen, 2013, p 2).

At present, Iran must plan, design, and build new towns and supply water resources for urban consumption simultaneously. In fact, there is no room at all to reduce the importance of planning water infrastructure. Town planning should include water supply, water distribution, and building of water reservoirs in the first step of the process. The problem has a natural dimension when the region experiences drought and less precipitation so that the available water volume is scarce indeed. In fact, the technical problem is to control seasonal floods, to collect and gather the obtained water from catchments and use them during the drought periods in the new towns. Regional new towns should also save and protect other natural resources like soil against winds and erosion and land surfaces against the disappearing of vegetation. This will also improve the natural water resources in the long run. In addition, the problem has another technological dimension as well. The region lacks modern technologies, instruments, and academic knowledge to improve the natural resources especially the water resources.

Other significant urban problems such as unplanned and unauthorized developments, need of modern urban traffic infrastructure, pressures of socioeconomic unrest and environmental pollution further worsen the planning situation concerning water resources.

7.3 Unsustainable urban water developments in theory

7.3.1 The concept of sustainable urban development
Population growth parallel to degradation of natural resources forced today’s urban planners to focus on sustainable development, particularly in developing countries. Wheeler defines sustainable urban development as: "Sustainable urban development improves the long-term social and ecological health of cities and towns" (Wheeler, 1998). Scholars and experts argue that modern lifestyles at a distance from the natural life use up our non-renewable natural resources. They argue that the current lifestyles cause polluting and destroy the ecosystems. A continuation of the present trend will cause climate change. The scholars in the fields of urban planning and natural science suggest changing the current trend. For example, Wheeler, 1998) wrote on the perspectives of a sustainable city as follows: “Compact and efficient land use, less automobile use and yet better access, efficient use, less pollution and waste, restore natural systems, better housing and living environments, a healthy social ecology, a rational economy, public participation and involvement and preservation of local culture and wisdom".
As we look at sustainable development of the water resources point of view the list of Wheeler is important for any region and for southeastern Iran in particular. To meet the perspectives the planners will have to use a proactive strategic program. The first step is supplying the water needed for urban consumption. Later, the planning and building of a new sustainable town can proceed. Without such strategy, it will be hard to meet the desired results. Progress will simply dry out.

7.3.2 Background of the non-sustainable new towns

While the new town building requires adequate water resources, the world at large has concerns with water resources as Merret (2002) wrote “In addition to the increase in the world’s population in the early years of the new millennium there is a second source of anxiety about the future availability of global water resources for people” (Merret, 2002, p. 1). Shahraki (2011) describes that during the recent six decades people migrated from villages and rural areas into towns and urban areas. In essence, the demands on new towns were the result of the growth of the urban areas and metropolises. A historical review of new town building in Iran suggests that the phenomenon goes back six decades. At that time, the rapid growth of population emerged as a problem. The growing population changed the shape of communities economically, culturally, physically and environmentally at a high speed. In Iran, new town projects were usually associated with the idea of solving of immediate urban problems like the demand for homes, the need for other urban spaces, congested traffic regimes, and pollution. Therefore, the planning process for new towns was not integrated with the ideas of sustainability. Hardman (2013) expresses concerns on integrating of rural areas and agricultural areas with urban areas and suggests that: “The rural urban fringe has now been the dominant space globally, requiring explicit policy interventions that manage the RUF as a place in its own right”. As Hardman is concerned the pressure of the increasing population and accelerated urbanization has been hard. For example, see the growth of population and urbanization in Iran and the province of Sistan and Baluchistan in Table 7.1.

Table 7.1 Percent population in rural and urban areas

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban areas of Iran</td>
<td>47</td>
<td>55</td>
<td>61</td>
<td>71</td>
</tr>
<tr>
<td>Rural areas of Iran</td>
<td>53</td>
<td>45</td>
<td>39</td>
<td>29</td>
</tr>
<tr>
<td>Urban areas of Sistan and Baluchistan</td>
<td>25</td>
<td>41</td>
<td>46</td>
<td>50</td>
</tr>
<tr>
<td>Rural areas of Sistan and Baluchistan</td>
<td>76</td>
<td>59</td>
<td>54</td>
<td>51</td>
</tr>
</tbody>
</table>

Reference for data: Iran’s central office of statistics
The table shows the raising of urbanization during a time of 1977 until 2007 when the urbanization in Iran went up from 47% of the population to 71% it jumped from 25% up to 50% of the total population in the province of Sistan and Baluchistan.

After the enlargement of metropolises, the new towns purposed to prevent anarchic urban expansions, to stop unplanned enlargement and to distribute the growing population. However, experiences prove that they did not meet the targets. Housing and town building projects are still going in wrong directions. Karimy believes that the urban growth in Iran can be analyzed in reference to the theory of the economic growth (traditional society, transition period, and surge up, maturing and consumer society. (Karimy, 2011) Karimy’s review on the history of the new town buildings in Iran suggests three separated periods of new towns’ building as follows:

The late 1960s were the time of the rapid growth of population in metropolitan regions. The growth forced the responsible authorities to recognize the demand for new towns, but the conceptual framework and the required details were not elaborated. From beginning of the 1970s many new town projects were started. Gradually, many new towns emerged and everyone who did not afford to live in big cities attempted to get accommodation in the new towns. This period lasted until the end of the 1990s, when finding a home in a new town became harder. At the same time, environmental problems, degradation of natural resources, and sprawling of residential areas raised the fear of non-sustainability. From the beginning of the new millennium the awareness on the environmental catastrophes and the disappearing of water resources, started to increase and sustainable development was debated. In the current decade, the lack of natural resources, particularly the absence of water, hinders the building of new homes and towns see (Karimy, 2011).

7.3.3 The impact of natural hazards on the sustainability of new towns
The degradation of natural resources and disappearing of water resources in Iran is an important obstacle to build new towns. To cut the impact of the climate change and the natural conditions Flodberg suggested less energy use: “An important measure for climate change mitigation is to reduce the energy use in buildings worldwide” (Flodberg, 2003). The recommendation of Flodberg is understandable particularly when drought is the biggest problem. In sustainable building of the new towns we should agree with Flodberg and use less water as well. Goodman et al argued for recognizing the central role of water: “The choice of a hydro physical assessment shaped how the water solutions were framed in the ensuring policy formulation. Focusing exclusively on the materiality of water had several implications” (Goodman et al, 2008). Goodman’s points are pertinent when the region is in a drought state. The
phenomenon of drought degrades natural resources like water resources and soil.

The Keetch Byran Drought Index (KBDI, 2002) defines the difficulties of drought as “A drought is an extended period of months or years when a region notes a deficiency in its water supply, whether surface or underground water. Generally, this occurs when a region receives consistently below average precipitation. It has a significant impact on the ecosystem and agriculture of the affected region”. Drought may persist for several years. But even a short intense drought can cause significant damages and harm the local people and their livelihoods. Drought will degrade the quality of existing water resources. It depletes the water resources in the drought regions and causes a dangerous water crisis in existing towns. It effectively stops new town building; The US Energy Department (2006) discussed on the common impact of drought on the communities and introduced the impact as: “Drought can reduce water quality because lower water flows reduce dilution of pollutants and increase contamination of remaining water sources. Common consequences of drought include: diminished crop growth, dust storms, habitat damage, dehydration, mass migration, social unrests and war over natural resources”.

Understanding the reasons of drought is especially important under conditions of rapid growth of population. The growth undoubtedly has direct consequences for the environment. Poverty is a significant impact of the drought. Poverty means the loss of able-bodied and trained staff to combat the drought. Conflict is another significant impact of the drought. To analyze the reasons of the drought in the Sistan plain we will first analyze the need for Helmand River water in the two neighboring countries of Afghanistan and Iran. The rush of farm workers to big cities, establishment of military and paramilitary jobs and bankruptcy of farms contribute to the scarcity of water. There is evidence to suggest that drought in the region is continuing to accelerate. A number of scholars use the term catastrophe as Mojtahedzadeh wrote: “The Lake Hamoon catastrophe is the most similar to Oral lake catastrophe. Generally, the drought damages natural resources. Natural resource degradation is the most dangerous enemy of the access to water for the population in these regions” (Mojtahedzadeh, 2001).

7.3.4 The regional hydro drought
Large wide areas in Iran like the Loot desert, large parts of the Indian peninsula and the Egyptian desert there the population growth is high with no adequate water resources will have major development difficulties. There are two major forms of land degradation resulting in soil erosion in the regions, deforestation and rangeland degradation. The two forms of degradation are tenacious and have far-reaching implications not only for soil quality, but also for water
resources. Therefore, the regions are threatened sharply by the degradation of water resources as is the subject of discussions among many scholars. It is also the field of activities of some organizations both at the international level, like UNDP, and at the regional level, like governmental authorities. Pavanello portrays the water resources during the drought time: “During the period, in several places the level of underground water went down remarkably. Rivers and springs looked to disappear” (Pavanello, S., 2009, p 34)

Desertification is both parallel to drought, and it is a result of the drought. Sara describes the phenomenon of desertification as: “Desertification is a process of acidification resulting from a long-lasting dry period. During the process, regional wind erodes the soil and transfers it to sand dune. The erosion rate of soil and the disappearing rate of existing water resources go up. Therefore, wind erosion and acidification are active. Thus water erosion, water shortages, and last elimination of the water resources are the explicit result of desertification” (Pavanello, S., 2009) Arid and semi-arid environments have special characteristics which the urban planners must address before any new town building can commence. Since regional people do not have access to the technologies and infrastructure to save the precipitation and use it timely intense rainfalls are difficult in themselves. The task of planning and design of new towns in the regions first requires methods to hinder the ongoing degradations of water resources and to supply new water.

7.4 Water for new towns in practice

7.4.1 Case study
This part of the chapter studies the hydrological features of the region aiming to suggest a method for abstracting water from destructive floods. As you read in the earlier chapters the new town of Ramshar has been planned two decades ago. It is one of the most obvious cases of the lack of sustainability considerations. Apart from managerial reasons the failure is due to fundamental planning deficiencies This observation introduces the problem of water depletion as a main hindrance to develop the new town of Ramshar. Since Ramshar is close to border of three countries Iran, Afghanistan, and Pakistan, it has an international position. Ramshar is 40 kilometers south of Zabol city, along the Zabol-Zahedan road in the Sistan plain. Sistan houses the continuation of the Helmand River basin mainly in Afghanistan; see the place of the region in Figure 5.1 in the previous chapter. Some 1000 hectares land on the Sistan plain has been set aside to make the new town of Ramshar, 40 kilometers away from Zabol city. The new town currently occupies 1000 hectares of land and will increase its area up to 2000 hectares. The target was to settle 70000 people in Ramshar, but it has not been met. Ramshar is definitively an arid region has not much precipitation, on average 127 mm per
year (Ministry of housing and town building, 2000). From a climatic perspective, Ramshar is thus clearly in a desert and arid region. Figure 7.1 shows the average yearly temperature in Ramshar.

Figure 7.1 Temperature data in Ramshar. Source: Sistan and Baluchistan State Office of Meteorology

Figure 7.1 suggests that the urban planners have a desert climate with a hot and dry weather and no place for rains. Therefore, they cannot count on regional precipitation. However, they may work with rarely occurring and strongly pulsed and unpredictable rains. Ramshar should supply required technologies and infrastructure to save the precipitation and use it timely. The Ministry of housing and town building has calculated the necessary water volume for a supposed number of 70000 inhabitants to be 150-200 liters per day with a distribution of 35-55 percent going to household use.

Since Ramshar’s climate is arid, every person on average needs 200 liters of water per day. Thus, Ramshar needs 200 \times 70000 = 14000000 liters water per day. To develop the new town of Ramshar hydraulic supply system, knowledge of the area is necessary at two stages. The first stage is planning when the general plan of Ramshar is being decided. Estimations of the discharge hydro graphs along the natural watercourses and computation of possible water resources should be done during this phase. The second stage is selection of details such as design of storm water channels and pipes to carry the water to consumers.
7.4.2 Hydraulic data of Ramshar
The Sistan region has a gigantic, sensitive and complicated hydraulic system that includes five parts. The Helmand River is a water importing river to the plain. The name of the Helmand River in Iran is Hirmand. It originates from the western edge of the Hindukoosh mountains that range 40 kilometers west of Kabul. The Helmand River takes the course of southwest direction and gathers several tributaries. It ends at the border of Iran and spills into Lake Hamoon. According to Najafi and Vatanfada (2011) the total length of the river is 1050 kilometers and the catchment area is 370000 square kilometers. The Helmand river system feeds mainly from snow and rain falling on the mountain of the upper reaches. Table 7.2 below exhibits the characteristics of the river.

Table 7.2 the characteristics of the Helmand River

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>River width</td>
<td>400 m – 1500 m</td>
</tr>
<tr>
<td>River slope in the region</td>
<td>Upper 1/2500 lower 1/4000</td>
</tr>
<tr>
<td>Riverbed elevation at Sistan</td>
<td>475-520 m</td>
</tr>
<tr>
<td>Total length of the river</td>
<td>70 km</td>
</tr>
<tr>
<td>Monthly average river discharge upstream</td>
<td>80 $m^3$/Sec</td>
</tr>
<tr>
<td>Minimum discharge</td>
<td>2.6 $m^3$/Sec</td>
</tr>
<tr>
<td>Annual average runoff</td>
<td>3340 million $m^3$</td>
</tr>
<tr>
<td>Annual minimum runoff</td>
<td>980 million $m^3$</td>
</tr>
<tr>
<td>Annual maximum runoff</td>
<td>8280 million $m^3$</td>
</tr>
</tbody>
</table>

Source: (Whitney, 2006)

Further, rivers that originate within Iranian territory are Bandan River, RudShur River and Chahak River also spilling into Lake Hamoon.

Recorded observations suggest that once every 20 years the floodwater creates an overflow from the Hirmand River and spills into a normally dry river known as the Shile Rud in the Gode Zereh sandy desert. A flood in 1885 damaged major parts of rural and urban areas in the region. God Zereh was full of flood water during three years (Whitney, 2006). Lake Hamoon with its sweet and qualified water is the most important lake in the region. The lake occupies an area of 520000 hectares during the high water periods. During the dry periods, its size declines considerably to 120000 hectares. During the dry times Lake Hamoon is separated into three parts; Poozak Hamoon, Saberwe Hamoon and Hirmand Hamoon. Usually the level of Hamoon water begins to rise from February and reaches its peak level in the June. The changes are directly connected to the volume water imports from the Hirmand River basin, see (Fakhereh et al, 2012).
In high water times, floods and overflowing water come to Lake Hamoon and then to the Shile Rud. Shile Rud is located south of Lake Hamoon and acts as a spillway and a main drainage. This river is 100 kilometers long and ends in Afghan territory. The water that passes from Shile Rud during a flood is significant for water storage and water infrastructure networks in Ramshar. The overflowing water volume is from two billion to 15 billion cubic meters (Ministry of Housing and Town Building, 2000).

According to the results of geological investigations, the water table in the plain is generally within a range of one to three meters beneath the ground surface. The fluctuation of the water table in each well or pit shows a correlation with the levels of running water nearby. The information from 500 meters deep boring in Zabol city shows that most likely the region should not hope for underground water resources.

7.5 Flood routing and the hydro-social change balance program, SNFHP

We found out that the major water resource in the region is the Hirmand River that originates in Afghanistan. Since regional disputes on the water exist, the regional planners will have to supply water in the surroundings. Ramshar's water supply cannot be dependent on the disputes. A major technique to supply the needed water in an arid region is to forecast the irregular sharp floods. A common problem in practice is the estimation of the rise of a river at any given point in the stream during the course of a flood event. We may solve the problem with the help of the technique of flood routing using a flood hydro graph from an upstream point to a downstream point. Table 7.3 reports the volume of water at 11 stations for upstream and downstream positions around Ramshar.

<table>
<thead>
<tr>
<th>Station</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upstream volume/Mega Liter</td>
<td>10000</td>
<td>2000000</td>
<td>50000000</td>
<td>500000000</td>
<td>1500000000</td>
<td>5000000000</td>
<td>10000000000</td>
<td>12000000000</td>
<td>6000000000</td>
<td>1000000000</td>
<td>0</td>
</tr>
<tr>
<td>Downstream volume/Mega Liter</td>
<td>10000</td>
<td>2000000000</td>
<td>3000000000</td>
<td>4000000000</td>
<td>2000000000</td>
<td>10000000000</td>
<td>80000000000</td>
<td>12000000000</td>
<td>2000000000</td>
<td>300000000</td>
<td>0</td>
</tr>
</tbody>
</table>

Reference for data: (Ministry of housing and town building, 2000)
Figure 7.2 sketched a flood hydro graph for Sheile rud as the flood water flows downstream into the desert area southeast of Ramshar. The hydro graph used the data in Table 7.3.

In the hydro graph, the time of the peak rate of flow occurs upstream at point A known as the translation. Second, the size of the peak rate of flow at the downstream point goes down at point B southeast of near Ramshar known as the attenuation point. There the shape of hydro graph flattens out. Using the continuity equation we obtain that the inflow to the river at every input point is equal to the outflow of the river at the output point plus the change of storage:

The derivation of the flow balance is important to predict floods in the lower parts of the basin at Ramshar. The result helps us understand the hydro graph and to decide the reservoir capacity. As you saw in the hydro graph when the flood event occurred, an increasing amount of water will flow down the Sheile rud River.

By using the continuity equation for water flow we may calculate the volume of the water entered and the volume of existed at any time and point. Figure 7.3 shows the principle of the calculation.
The urban planners should also apply the hydro social change balance for Ramshar to manage the supplied water using the flood routing technique. Here we present an example of using the system for a five-year period. Table 7.4 in its generic form has both supply and demand categories. The table reports data from the time interval 2010-2015.

<table>
<thead>
<tr>
<th>Categories of supply</th>
<th>Mega liter per year</th>
<th>Categories of use</th>
<th>Mega liter per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rain water collection</td>
<td>$1.27 \times 10^4$</td>
<td>Households</td>
<td>510</td>
</tr>
<tr>
<td>Groundwater extraction</td>
<td>$9.45 \times 10^{-3}$</td>
<td>Agriculture</td>
<td>$4.5 \times 10^6$</td>
</tr>
<tr>
<td>Surface water extraction</td>
<td>$5 \times 10^9$</td>
<td>Commerce</td>
<td>100</td>
</tr>
<tr>
<td>Water from other regions</td>
<td>$3.34 \times 10^4$</td>
<td>Manufacturing</td>
<td></td>
</tr>
<tr>
<td>Less leakage and evaporation</td>
<td>$9.2 \times 10^4$</td>
<td>Public services</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other uses</td>
<td>100</td>
</tr>
<tr>
<td>Total net supply</td>
<td>$5.003 \times 10^9$</td>
<td>Total use</td>
<td>$4.500 \times 10^9$</td>
</tr>
</tbody>
</table>

Reference for data: (Shahraki, 2006)

The total volume of rainwater to be collected can be calculated by multiplying the area of Ramshar with average yearly rains. Other categories of supply have been computed by the data of the case studies. We call the technique the hydro social change balance program. It helps to decide the quantitative and qualitative features of the hydraulic reservoirs that Ramshar needs. By this method, Ramshar can collect floodwater for use in its water management program. The method suggests supplying water resource before planning, design, and building of new towns in the region. The flowchart in Figure 7.4
shows the process of the building of a Sustainable New town with help of the Flood routing technique and Hydro-social change balance Program, SNFHP, step by step.

<table>
<thead>
<tr>
<th>Analyzing possible regional water resources</th>
<th>Pre-studies, feasibility studies and spatial plans of new towns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning of water supply and water distribution</td>
<td>Skeletal shaping and physical design of new towns</td>
</tr>
<tr>
<td>Water management by regional hydro-social change balances</td>
<td>Performance of urban functions and services</td>
</tr>
</tbody>
</table>

Figure 7.4 Flowchart of the SNFHP

The method suggests that any planning, design and building of a new town in the region must save the existing water resources and supplying extra water volumes. The SNFHP method is a helpful tool to plan, design, and build a new sustainable town.

7.6 Conclusions

The chapter discussed the paradoxical problem that while population is growing continuously in number the wasting of natural resources prevents the building of new towns. The chapter argued that the dilemma originated from natural hazards, environmental catastrophes, social conflicts, and implementation failures of new town strategic programs. We suggested that poor management of drought is a significant reason for the unsustainable urban development. Thus, the depletion of water resources is the main problem for urban development in the Iranian southeast.

We observed the new town of Ramshar in an arid and semiarid climate and saw that the volume of rainfall and available water is less than the new town needed. The planners need innovative programs to overcome the problems of water in the regions. Our field observations suggest that every new town builder must think of the irregularities in regional rains. The rare precipitation in the region is sharp when it arrives, of short standing and hazardous. In the region flood control and rainwater storage are essential activities. The thesis suggested a
new possibility to supply the needed water by using flood waters. The flood routing technique is a procedure to control the seasonal floods and to store large volumes of water. Then, a hydro social balance program will manage the gathered water use. Strategic program components such as control of population growth and family planning, increase of environmental awareness, regulation of natural resource use and international collaboration on water management practices are helpful to plan and design durably.

This chapter presented a method of sustainable new town building, the flood routing technique and the hydro-social change balance program, SNFHP. The method sets the water supply in the earliest step of a new town building process. The SNFHP depends very much on the nature of the local problem, the data available, local site characteristics, and general necessities of the planning agency.
8 Plan and design new towns with ancient architecture and modern technology

8.1 Introduction
This chapter concerns the energy supply for the new towns. It describes the current problems of architecture and building which caused expensive and unsustainable energy use. Since the ancient heritages prove that the architects used natural energy well in that era, this chapter aims to encourage the new town planners to use a new school of architecture based on applying ideas from ancient architecture, but with the help of new technologies this time. The chapter studies particularly the ancient architecture in the region. It will use the experiences of ancient architecture with new knowledge to address the current new towns’ problems in terms of energy use. It will design a modernized version of the ancient homes to encourage the architects of the new towns to pursue its idea.

8.2 Architecture needs returning to nature

8.2.1 World history of architecture at a glance
The history of architecture is an exciting and multifaceted story that reports socioeconomic conditions, lifestyles and building methods in various eras. Related to their geographic places, local climates and socioeconomic ordering people have built homes and other structures. We understand many issues such as forms and plans of homes and building materials from history. The history of architecture and building also reports that we have come a long way since people first used natural energy sources for their homes and biomass fuels for their fires. Taylor writes on the subject as follows: “The ancient Chinese used concentrated solar power for heat energy and fire, Native Americans used hot springs as renewable geothermal sources for cooking and healing, and some speculate the Egyptians used wind power to help build their pyramids. From Greece and Rome to Persia and North America, people benefited of geothermal, water, wind and solar power in the ancient world” (Taylor, 2010)

Even today, remaining ancient heritages prove what Taylor wrote. We see still the ancient Persian wind towers that use wind to cool and heat homes. We also see ancient Roman gravity aqueducts for creating water power, ancient Jerusalem gray-water plumbing to reuse water, ancient Roman thermal baths that could withdraw geothermal heat energy and ancient Greek cities that used passive solar systems for heating. We see the Native American cliff dwellings that used passive solar shade for cooling as well. In all examples of the ancient
buildings, people had focused on the connection between architecture and nature. During history, people have experienced many types of relations with nature.

The technological outcomes of the industrial revolution altered the human need for natural resources. Now this thesis argues that the architecture and building might learn from returning to nature. Roaf and Hancock analyzed the need for a relationship between architecture and nature to design energy efficient buildings (Roaf and Hancock, 1992). We refer to the method of Zargar, who divided the history of the relationship into several known eras, see (Zargar, 2011). To analyze the correlation between architecture and nature we divided the history of architecture into ten different historical known periods, see Table 8.1. In the left column of the table, you see the names of the known periods of architecture. In the middle column, we have evaluated the level of dependency of architecture on nature and natural resources with the help of qualitative concepts. The right side column shows the numerical evaluations.

The numerical evaluations are the interpretations of the qualitative evaluations in the middle column. We reviewed the ideas of the scholars about the building styles and technologies, and energy efficiency of the constructions (Zargar, 2011) to determine the degree of the architecture dependency on nature. For examples we read the ideas of Yisheng and Hagan. See (Yisheng, et al, 2002) and (Hagan, 2001). Yisheng discussed the energy provision in the China’s rural areas during the times. Hagan looks for a new contract between architecture and nature while reviewing the past relationships.

Those ideas plus debates with colleagues assisted to find the dependency degree of architecture to nature in the form of an representative set of numbers. So, we found the numbers of evaluations after enough arguments in the architecture and building style of every era and put them in the right side column of the table. The numbers in the right column are based on subjective assessments. We have constructed an interval of lowest value zero up to one hundred.

In the table, the qualitative evaluations and the numerical evaluations are aimed to assess the degree of architecture's solidarity and cohesion with the natural resources and nature.
Table 8.1 Degree of dependency of architecture on nature in different eras

<table>
<thead>
<tr>
<th>Era of architecture</th>
<th>Qualitative evaluation</th>
<th>Numerical evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cave architecture</td>
<td>Linked to natural resources totally</td>
<td>100</td>
</tr>
<tr>
<td>Prehistoric architecture</td>
<td>Linked to natural resources totally</td>
<td>100</td>
</tr>
<tr>
<td>Ancient architecture, Greece, Rome, Egypt, China, Persian Etc.</td>
<td>Linked to natural resources totally, however slightly less</td>
<td>85</td>
</tr>
<tr>
<td>Architecture of early basement life of Christianity</td>
<td>Linked to natural resources, less than before</td>
<td>70</td>
</tr>
<tr>
<td>Architecture before the Renaissance, Gothic, Romans and Byzantine</td>
<td>Linked to natural resources, used more natural light in buildings</td>
<td>65</td>
</tr>
<tr>
<td>Architecture after the Renaissance, Baroque architecture</td>
<td>Linked to natural resources, less because of changes in building methods</td>
<td>60</td>
</tr>
<tr>
<td>Architecture since the industrial revolution until recent revolutionary technical changes</td>
<td>Detached to natural resources and based on technical facilities than nature</td>
<td>35</td>
</tr>
<tr>
<td>Architecture since the informational time</td>
<td>More distancing from natural resources and continuation of earlier nature fighting</td>
<td>25</td>
</tr>
<tr>
<td>Present architecture in developing countries</td>
<td>Detached from natural resources and critical and hostile behavior to nature</td>
<td>15</td>
</tr>
<tr>
<td>Future architecture</td>
<td>Need for returning to nature</td>
<td>75</td>
</tr>
</tbody>
</table>

Source: (Shahraki, 2009)

8.2.2 The urban design problem

This thesis argues that there are rational socioeconomic and environmental reasons to return to the ancient natural friendly architecture school, but this time with new knowledge and technology. Blaugm noticed that the formation of the society has changed gradually and communities left the earlier socioeconomic regimes: "More likely the major general feature of the present socioeconomic life is the widest changes in concepts of social and economic formations. Amongst the changes the emergence of knowledge-based and advanced communities is a pleasing event" (Romášek, Š., 2012, p 11) Simultaneously one result of the new knowledge economy has been a sharp reduction of the rate of mortality, particularly in the developing countries, and the increased population growth. The current trend damages the natural resources and the environmental components increasingly. Thiberg agrees to this target and in his
article “Homeless, and the responsibility of the architect”, suggests: “The modern architect's profession is a product of the needs and expectations of industrialized societies. The plan necessary to solve the problem of homelessness shall stand on nature and its infinite resources again” (Thiberg, 1997, p 5). We recognize that as Thiberg said that the best way in planning and design is to build new towns is in strong connection with nature and applying renewable natural resources.

8.3 Background of Iran's architecture and building

Architecture is an important element of the Iranian culture. It not only has displayed a great variety both structural and aesthetic, but also as Upham Pope writes it has included a wide range of applications: "Persian buildings vary from peasant huts to tea houses and from garden to majestic structures” (Upham Pope, 1971, p 1). The energy efficiency in Iranian traditional houses had been a functional feature of the architecture. Jamshidi et al comment on the feature as follows: "The Iranian architects build a suitable space with an appropriate comfort level based on the environmental conditions and climate. They found several solutions for energy production in traditional houses” (Jamshidi et al, 2011). Architecture in Iran and especially in the south of Iran has had a sad history. Although the Sistan region has invaluable climatic ancient heritages, it has drowned in chaos and imitation. After the end of the two world wars, urbanization increased in Iran. Failure of the land reforms, the decline of the agricultural sector and integration of the peripheral villages to the cities relied lifestyles on fighting nature. Table 8.2 reports the yearly average numbers of immigrant families into the major cities. According to the table, the migration to the cities started in 1940, seven decades ago. The table shows well how the rush to big cities has increased by the time passing.

Table 8.2 Number of migrants to big cities of Iran

<table>
<thead>
<tr>
<th>Time</th>
<th>Share of households</th>
<th>Yearly change</th>
<th>Yearly percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>After 1940</td>
<td>32</td>
<td></td>
<td>6.1</td>
</tr>
<tr>
<td>1940-1950</td>
<td>36</td>
<td></td>
<td>0.2</td>
</tr>
<tr>
<td>1951-1955</td>
<td>31</td>
<td></td>
<td>8.1</td>
</tr>
<tr>
<td>1956-1960</td>
<td>53</td>
<td></td>
<td>1.2</td>
</tr>
<tr>
<td>1961-1965</td>
<td>52</td>
<td></td>
<td>8.2</td>
</tr>
<tr>
<td>1966-1970</td>
<td>61</td>
<td></td>
<td>29.5</td>
</tr>
</tbody>
</table>

Reference for data: (Tehran University, 1971)

Increasing of urbanization in the recent decades left millions of poor people without water and shelter. Ghobadian describes the problem below: "Continuous increase of the population caused depletion of the water resources
so that we are disabling to settle our people" (Ghobadian, 1990, p 27). Particularly, the discovery of oil resources in Iran separated Iranians from nature with a higher speed compared to neighboring countries. Tofigh (1990) writes about the speed as "Urbanization in Iran accelerated by the discovery of the oil resource and its extraction in the previous century. The new revenues caused basis for collapse of traditional society and the economy. People left the nature and immigrated to Tehran and other big cities". When people left the traditional lifestyle they built their homes expensively and without sustainability considerations. Most of them did not have any relationship with nature since they were supplied with fresh air, light and energy with the help of new mechanical and electrical devices. Sistani comments on the event as follows: "In recent decades people used fossil fuels in buildings to make cool and heat and on this way they kept aloof from nature and natural resources" (Sistani, 1990, p 118)

Recently, the socioeconomic perspectives of the community have changed. Social conflicts in neighboring countries, energy crises and the need for mass construction for coming generations are examples of the changes. Shahraki highlights the changes in south of Iran as follows: "The rapid current globalization caused socioeconomic and lifestyle changes in southeastern part of Iran. During the recent decades state planned macroeconomic programs have effected on the regional traditional economy, lifestyle, and culture" (Shahraki, 2012). Therefore, the regional inhabitants live in a transitional era and every aspect of new towns’ projects will need to be revised. We believe strongly that architecture and building will play a substantial role to stop the current fight against nature.

8.4 The present planning and architecture problems

"The new towns have been planned and built without attention to traditional lifestyle, identity, people’s culture, and habits. Consequently the cultural requirements of Iranian cities are not responding" (Asadi, 2012, p 9). Asadi argues convincingly, but the new architecture is faced with more problems than culture and traditional lifestyle contrasts. Small neighborhoods have become cities and cities are inside the protected walls. New rings of walls have been added constricting the horizontal views of blue skies. Natural rivers have become sewers filled of pollution. Difficulties of new towns in Iran particularly in its arid and semiarid regions are still more complicated. In the regions, the new town projects faced climatic hardness, depletion of natural resources and degradation of environmental components. Consequently, the regional cities put stress on eroded soils and show a thirsty earth with no plants. Shahraki comments on the problems: "New towns’ developments in the regions were not successful. Failures such as expansion of unplanned and unauthorized urban
districts, need for urban infrastructure, lack of public urban spaces, vulnerable and unresisting buildings against earthquakes and natural hazards, lack of knowledge and technology and weak management are visual perspectives of the present urban development here" (Shahraki, 2012)

Amongst the urban problems, climatic conditions are the biggest. Climatic and social conflicts damaged the natural resources as Shahraki writes: "The current problem is a two-faced one. From one side the increasing population in the poor region demands new urban neighborhoods and from the other side the growing inhabitants damage the water resources. This two facial problem has been deepened by the time passing and has reached at a critical level now. At the present we have to plan, design and build new homes and to supply water resources for consumption simultaneously" (Shahraki, 2013). Therefore, it is important to build homes and urban districts in an ecologically and environmentally friendly way. Orrskog follows natural rules to overcome the depletion of natural resources and writes: "The city, understood here as a built environment in the landscape, should obey the following necessary rules: save ground, protect the ecosystem as gene banks and build with a regard for the carrying capacity to the city" (Orrskog, 1993).

In addition to the issue of natural resources another major problem is the provision of urban services. The new towns do not have urban infrastructures proportional to the rate of demand. Further, the regional architecture and building ignore the aesthetic perspectives. Grütter writes that Plato believed two sorts of beauty as: "From one side beauty of nature and creatures and from the other side geometrical beauty" (Grütter, 1987). Today, the new towns have lost the beauties that Grütter cites from Plato. In the previous chapters we have discussed the major problems to build new towns in Iran at length. Below, you see a list of the problems as Madanipour suggested:

- Lack of academic knowledge
- Non-existence of new technologies and advanced building machines
- Non-existence of scientific regional and spatial planning policies
- Depletion of natural resources
- Climatic hardness
- Degradation of environmental components
- Need for transportation network and urban infrastructure
- Regional social conflicts
- Non-attractive/beautiful homes and towns
- Unsuitable and weak management. (Madanipour, 2006)

The above list introduces major obstacles to plan and design new towns in the regions. In the next part of this chapter we are going to focus on the ancient
architecture as a way of a natural architecture and to leap the new towns’ obstacles.

8.5 How shall urban planning and architecture return to nature?
Future architecture and building should be based on sustainable development principles. Sustainable home and town building protects the natural resources and uses them rationally and wisely. Manenti comments on the concept of sustainability as follows: "The idea of sustainability is based on the need to keep the natural resources which already exist, so the earth could offer them for the future generations" (Manenti, 2011). Today's homes are not sustainable and look more and more similar in the regions regardless of culture and local natural resources.

At the same time, the loss of regional difference undermines the uniqueness of the buildings. We urge the urban planners, architects, engineers, entrepreneurs, and decision makers in the regions to design and build like ancient buildings, but with new building materials and new technologies this time. Ghobadian recommends:

"If today's architects apply ancient structural systems with a scientific understanding of the new building materials and technologies and with an understanding of the regional climate they will build functionally. If today's builders use traditional building styles and knowledge while they influence the progress of lifestyle, they will produce purposeful homes actually. Simultaneously, despite the shape and form of the buildings will seem traditional, but they have a modern expression indeed" (Ghobadian, 1990, p 3).

What Ghobadian suggests will put nature at the core of revision in the architecture and building style. The ancient architecture school used a range of technological rules to give a more comfortable life in the home and to keep the building against natural disasters and time related exhaustion. Gravette, Oktay, Moradgholi and Turner described and analyzed the techniques of ancient architecture to apply natural resources, see (Gravette, 2000), (Oktay, 2002), (Moradgholi, 2012) and (Turner, 2003). Here we will discuss only some of the ancient techniques which are still observable as follows:

- Building of windmills
- Building of windbreaks
- Building of wind rooms
- Using vegetation and water
- Design inner, outer and middle spaces
- Protecting the building by the help of the earth
• Creating solar walls and windows
• Making a thermal shell around the building
• Creating shadows against sun heat
• Building of natural ventilators
• Shaping the structure by the help of plan and placing
• Isolating the buildings by natural materials.

The ideas of scholars like Manenti, Ghobadian and several others together with the observation suggest that natural town building may be functional, rational and economic. Particularly when limited economies, inadequate fossil fuels and costly energy will be inaccessible a remaining alternative is to return to nature in a wise way. In the next part of this chapter will see how the ancient architects used the above listed techniques.

8.6 Introducing ancient architecture in Sistan plain

8.6.1 Introduction
One of the earliest documented climatic architectural designs of ancient time belongs to the Greek philosopher Vitruvius who believed that: "We must at the start take note of the climate in which we build" (Oktay, 2002, p 1003). In the Middle East old civilization architects used local building materials such as clay, sands, stones, plaster of lime and ashes and various woods to build their homes and towns. Maad was the earliest centralized government in Iran. Maad's architects built surprisingly solid houses, bridges and castles. They built for normal people as well and used mainly simple native building materials. Zarei writes about the Maad architecture style: "Maad architecture was not royal. On the contrary they built for people and promoted public spaces. Since they used dried mud, clay blocks, and wood their wonderful buildings have been demolished by passing times" (Zarei, 1998, p 49). The picture below shows the building material used by Maad architecture in the Sistan plain.
In the Sistan plain in the southeast of Iran we still see Maad building heritages. Moradgholi describes the importance of heritages: "Sistan is a rich collection of historic buildings and archeological sites in the desert. Through this civilization the missing link between the civilizations of East and West was found" (Moradgholi, 2012). Architecture in Sistan used wide tall walls with light colors in response to the hot weather. They designed their homes with cupola roofs and small openings. Their building materials included sun-dried brick and cooked bricks. They tried to absorb temperature fluctuations. One function of the small window is to combat dust and sand dune storms in the arid regions. The ancient architects arranged windows to direct the airflow into rooms and to ventilate the air constantly. Turner writes: "The ventilators keep air moving through the environment and therefore keeps the inhabitant cooler" (Turner, 2003). Other common techniques in the region to combat the heat were courtyards, patios, and verandas. Oktay names more techniques: "With high walls and outer spaces they provided shade and a relaxing environment for their inhabitants and for social gatherings, evening entertainment, food preparation, and domestic work such as laundry" (Oktay, 2002, p 1014).

A significant characteristic of the ancient building method was its functionality. The people built their homes to satisfy their active life necessities and their culture and traditions. Zargar describes the necessary rooms in an ancient home: "Homes were affected by producing, distributing, and consuming activities. Every home was an independent unit. They needed special rooms for food storage, fodder, guests, carpet kneading, and tools" (Zargar, 2011, p 83)
In the next section we will introduce some practical features of Sisan architecture.

**8.6.2 General functions of Sistan architecture**

As an example, we will introduce the ancient Sistan architecture style in some detail here. My purpose is to see how it worked with the climatic hardness. Sistan is a wide plain in southeast of Iran close to Afghanistan with Zabol city as its capital. Sistan is the heritage of the intelligent and creative Maad architecture. It is a unique instance of knowledge, industry, and culture in ancient combination. The following photograph exhibits general features of a traditional settlement district in the Sistan plain.

![Traditional settlement district in Zabol. Source: (Shahraki, 2007)](image)

When you see the neighborhood in the above photo you recognize a number of techniques used in the old architecture. We observe the high compactness of homes and the suitable localization of buildings as a part of functional plans. Natural ventilators are used along with applying suitable building materials. The architects were using buffer and middle spaces and designed suitable size and place for every opening of a house including so-called wind rooms and natural light intakes. A signature was the use of plants and vegetation together with natural moisture isolation elements.
8.6.3 **High compactness of homes**

Usually the ancient architects built homes close together. One reason was security. Mass homes could be defended against enemy threats and eventual wild animal attacks. However, the most significant reason was to protect the buildings against hot, winds and hard sand dune storms. Figure 8.3 pictures the high density of the homes in an aggregation of buildings.

![Figure 8.3](image)

In the picture, it is visible that the ancient architects protected the homes from continuous regional dry windstorms by heaping up of buildings.

8.6.4 **Suitable localization of buildings**

Site planning and placing of the building in Sistan traditionally depended on factors of hard winds and sunshine. Kasmaei analyzed the impact of local winds on the buildings. The arrows in the figure below illustrate the behaviors of local hazardous winds around and through a building.
To combat the winds and climatic hardness ancient architects in Sistan were building the homes at the northern edge of the site with a suitable declination with the north south axis. The following sketch shows the arrangement, Figure 8.5:

With the help of the technique sketched architects prevent hazardous hot sand dune storms in the summers and cold weather in the winters.

### 8.6.5 Functional plans

Traditional architecture as the legacy of the ancient building style applied functional plans based on the livelihood of local people and the natural environment necessities. The structural plans and the details arranged the indoor spaces so that they needed less energy. They placed living rooms and workplaces that required more warm energy in the south side of the buildings, while they set the food store on the north side of the building to be colder. Figure 8.6 shows a typical plan of an ancient home in the region.
The architects recognized that the shape and form of buildings are important determinants to consume less energy. They also understood that the plan must be suitable to the lifestyle of the regional people and their economic activities.

8.6.6 Natural moisture isolation

Clive et al suggested that ancient architecture had knowledge of niche construction and techniques to protect the structures by available natural materials "Organisms that directly or indirectly modulate the availability of resources to other species, by causing physical state changes in biotic materials. In so they modified, maintained, and created habitats" (Clive, 1994, p 373). More than biological techniques the ancient constructors used natural materials such as natural cement to isolate the building against water and moisture. They also used buffer spaces to prevent noise pollution and to create silent rooms where necessary. They used natural vegetarian poisons against ants and insects in the wooden elements of the building as well.

8.6.7 Natural ventilators

Another ancient effective technique in Sistan ancient buildings was ventilators. Ventilation shifts were made in different sizes, shapes, and forms. Fortunately recently many researches, such as Lashkaran, Saidian and Nordquist have been doing research related to various uses of wind power in ancient Sistan (Saidian, A., 2012. Example of sustainable architecture in forgotten Iranian architecture). People generally used one side ventilation shift on the roof of every room, see the following photo.
The figure shows that old Sistan buildings used the cupola roofs with a small window (Kolak) on the center of the cupola as a ventilator. Architects in the desert area of Yazd used a four-sided ventilator in bigger buildings. This kind of natural ventilators is shown in the following picture.
Four-sided ventilators suck the air into the building from four sides. Then, the sucked airflow is brought down into the rooms on the bottom of the house; see the technique in the above photo.

8.6.8 Suitable size and place for roof openers
Sistan old houses used small and simple windows at the height of the walls to transfer outer clean air into the building without heat and dust. The openers on the tops of walls improve the distribution of the natural light and cut the direct heat and light, see an illustration of the technique in Figure 8.9.

Figure 8.9. Technique of small windows on the top of outer walls Source: Iran office of ancient monument preservation

The placing of windows, walls, and circulations of various indoor spaces with outdoors are significant to reduce energy consumption. Bullen and Love described the importance: “To reduce operating energy use we need high-efficiency windows and insulation in walls, ceilings, and floors. Another strategy, passive solar building design, is often carried out in low-energy homes. Designers orient windows and walls and place trees to shade windows and roofs during the summers while maximizing solar gain in the winter” (Bullen, P., & Love, P., 2011, p 32). The Sistan ancient architects already a long time ago developed the suggestions of Greg and Alevantis.

8.6.9 Using wind rooms
Another ancient architectural technique in the Sistan plain was the wind room. A wind room is an interesting technique that you still see it in other Middle East regions. Sistan people applied it to make their buildings cool by the help of natural resources. The wind room was at the bottom of the building and directly under the ventilator. The flow of water and wind went into the wind room and
produced a natural desirable clean cool air. Living rooms and workplaces were around the wind room and the cool air flowed into them. In fact, the flows of water and wind passed down into the room, the warm air went up and the pressure made desirable fresh air with less moisture in the lower surfaces.

8.6.10 Using middle spaces
Traditional homes usually were built in two stories. The ground floor was for domestic animals like cows, sheep and horses. The upper floor was for the members of the family. Kave argues that between the yard and the building they had a middle space called veranda which means "iwan" in regional language. The middle space or the balcony used to be in the front of the building and was called Dakoncha. The wall around the Dakoncha was about one half meter and a stairway led you to it. The picture below shows a typical Dakoncha.

![Figure 8.10 the technique of Dakoncha. Source: (Shahraki, 2007)](image)

8.6.11 Using natural light
Ancient architects in Sistan, with the help of all techniques described earlier, strived to save energy and use natural light. We demonstrated that they placed the Kolak and windows in suitable places and directions to use natural resources effectively. The Kolak and windows that we described earlier had a major role to use the natural light. The technique of the classic Kolak lighted the Sistan homes by daily sunshine and the nightly moonlight well.
8.6.12 Applying suitable building materials

"Clay is an available building material in Iran that dictated major forms in traditional Iranian architecture. Heavy clays have encouraged the development of the most primitive of all building techniques. Bricklayers compressed solidly molded mud and allowed it to dry. Tenacious lime mortar also eased the development and use of brick" (Pirnia, 2005). Pirnia described that the ancient architects supplied the native building materials and colors in the region. The materials were harmonized with the climate and the built environment. Givoni writes about the building materials as follows: "In many arid and desert regions buildings are designed with small openings and heavyweight materials. These materials include dried mud. They use white or light colors" (Givoni, 1969). The ancient builders blended straw, clay mud, and water carefully. Sometimes it took about one month to give an acceptable mortar by vibrating the materials every day. The following photo shows the operation.

![Combination of straw and mud](Shahraki, 2007)

Then, they blocked the mortar with a cast in different sizes. The result of the operation is illustrated in the following picture.
Until now, the chapter introduced some features of the ancient building technology in Sistan. My purpose is to encourage the urban planners and architects to focus on the ancient techniques combined with the new knowledge to change the current problematic development trend in the regions. We suggest a new school that stands on lessons from ancient techniques combined with new knowledge, technology, and modern building materials. We hope the new idea will be attractive in addressing the real needs of people.

8.7 Use modernized advanced ancient architecture

We used the ancient building technologies such as natural ventilators, climatic site placing of building; thermal functioning arrangement of indoor places, shaping suitable building forms, fitting openers, roofs, and wind rooms to design an advanced version of the Sistan ancient building. My purpose is to use natural energy and less mechanical and electrical energy with help of new knowledge, technologies, and building materials. We hope that this pilot model seen as a green building reduces environmental impact of the new town projects, uses natural light and benefits natural and renewable energy. Although my idea is new here, green building has been promoted earlier in advanced regions. As an example the American environmental protection agency formulates the aims of green buildings as follows:

- “Although new technologies are constantly being developed to help the current practices in creating greener structures, the common goal is that green buildings are designed to reduce the overall impact of the built environment on human health and the natural environment by:
- Efficiently using energy, water, and other resources
- Protecting occupant health and improving employee productivity
As the US environmental protection agency stated the natural light is important both economically and technically. To use natural light we first studied the flow of light and wind in the place in detail. Only after the site observation, we could find a proper place for the building and its openers and could find the measures of the windows. Figure 8.13 shows the place of the home on the site.

Figure 8.13 Analysis site for our new version of the ancient building method. Source: Author

After the site analysis we made a decision on the form and the shape of the building. You will see the ground floor plan below in Figure 8.14.
Figures 8.14 and 8.15 illustrate that we tried to form the structure in harmony with daily light aiming to reduce the energy use. The two-story modern house model has buffer spaces, room for work and production, a cooking place and food and feed stores in its ground floor.

Figure 8.15 applying the ancient techniques of ventilator and wind room in a modern building. Source: Author
The members of one family will live in the first floor. There, they have a computer and digital workroom, rooms for private life, room for guests, washing and cleaning room and other needs. We applied the ventilator and wind room techniques in the building too. Figure 8.16 is a picture that shows a linear section of the model. You see a pool in the center of the wind room and windows around it. When the air flows down on the water makes cold air and the rooms around will enjoy it.

The green climatic pilot building inspired by the Sistan ancient architecture is a functional home based on the economy and traditional customs of the region. Below you see this modern version of an ancient home that supplies living and working possibilities for members of a family. The model pays special attention to building materials to be climatic and environmental friendly, see Figure 8.16.

The picture shows how we applied the ancient techniques in the pilot building. For example, we reduced the outer surfaces to suitable sizes to allow the structure protection against winds and their negative consequences.

8.8 Conclusions

This chapter followed the research model of the past → now → future logic. We described the advantages of the ancient architecture and particularly the ancient Sistan building method. Then, we pictured the present situation of the new towns and the urban neighborhoods in the developing countries and we argued that multidimensional critical problems of new towns related to costly energy consumption and less relationship with nature. We illustrated critically
the present new town planning and design in terms of association with nature. We argued that the recent socioeconomic changes need sharp revision in the present architecture and building style while the regional population is increasing and the natural resources are disappearing. In such a situation, the planners of the new towns should build green and climate-adjusted to overcome the present problems.

To contribute to the idea presented by this chapter more practically we observed directly the case of Sistan ancient architecture. The case is pertinent to the aim of this thesis since Sistan has a famous ancient architecture heritage. After the analyzing of the ancient climatic building technology in Sistan, we presented a pilot model for future homes set in the Sistan plain. The pilot model provides a vision of the ancient building techniques while using new knowledge, technologies and building materials. We think that the model will be applicable in the similar regions worldwide.

Since the socioeconomic situation has changed globally, Iran needs to plan and design the new towns based on new realities. We hope the model presented will convince scientists, planners, architects, engineers, entrepreneurs and decision makers in the region that the time is ripe to change the current problematic trend of new town building. A useful idea would be to start to use the ancient architectural experiences with the help of advanced knowledge and technologies.
9 Urban planning and design in unauthorized neighborhoods

Imagine you were born in a developing city in 1940. At that time, your city had sixty thousand inhabitants. The regional resident number grew and people began to move into your city. When you were a teenager, the failure of national socioeconomic plans caused still more immigration. Later, when you were around thirty years old regional conflicts increased the rush of people to your city additionally. They built their homes without plans and necessary permissions. After a time the urban manager recognized the shelters as parts of the city, but without urban services for those people. At the present, people demand more settlements and more urban spaces. People build without minimum requirement standards and without the necessary infrastructure. The dilapidated buildings damage the attractiveness of your city. Today you are an older person and believe that your city should be revitalized physically and socially for all people, do you not? Author’s experience

9.1 Introduction

The current chapter addresses the unauthorized neighborhoods which caused critical multifaceted difficulties in Iran and many other countries. Informal urban districts are a huge challenge against planned and managed urban developments. A major part of the problem is the unsuitable spatial placing of the illegal neighborhoods. Since the districts are being built unplanned and plot by plot, they emerge as derelict holes in the perspectives of the cities. However, the challenge is more than an architectural and visual one. It involves many other problems too, as a reflection of physical and social difficulties.

The aim of this part of the thesis is to explore the reasons of the emergence of unauthorized neighborhood in Iran in general and in Chabahar in particular. We will describe the socioeconomic, legal, spatial, skeletal, and functional effects of the informal districts by help of academic theoretical methods and by field observation of strategic regional/urban revitalization procedures. We will suggest a redevelopment program to renew/rebuild present informal and eroded areas of Chabahar.

The program will suggest possible procedures to stop the expansion of the unauthorized neighborhoods, to renew the unplanned earlier built homes and to recover the socioeconomic and skeletal troubles of Chabahar city.
9.2 Introducing the problem of unauthorized settlements

9.2.1 Background of the unauthorized residential areas in Iran

The unplanned and informal urban districts are a global problem. However, we limit here the discussions to the history of unauthorized neighborhoods in Iran and in Chabahar in particular. About the background of unauthorized neighborhoods in Iran, Hadizadeh (2003) states as “Outskirt-sitting and informal housing is rooted in structural social changes, the emergence of economic crises and accelerated migration of villagers to the cities. The problem is not only a local physical and skeletal subject, but rather it derives from regional and national plans” (Hadizadeh, 2003, p 3). The population increase is much more than the official planned urban spaces can accommodate. A sharp increase in demand has augmented the informal districts in numbers out of control. The history of outskirt siting in Iran goes back almost eight decades. For example Dehghani (2001) argued that “The population of Iran has increased 6.3 times during the recent five decades. The rate of urbanization in Iran is 70% now”. The accelerated growth of urbanization causes more informal and critical skeletal expansions. It has created crowded unauthorized areas at the margins of the cities. Further, the failure of the land reforms, the declining of the agricultural livelihoods, integration of the peripheral villages to the cities and changing the farmland to buildings caused serious urban problems during later times.

Table 9.1 reports the average number of families which have come to the major cities of Iran. The table reports the immigrant households only from 1986. Ten years later, the migration streams increased by 39%. In 2006, the rural-urban migration numbers peaked at 50%. The table shows well how the rush of migrants into the big cities has increased during the past decades.

<table>
<thead>
<tr>
<th>Year</th>
<th>Households (million)</th>
<th>Increase of migrants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>3.6</td>
<td>39</td>
</tr>
<tr>
<td>2006</td>
<td>9.3</td>
<td>50</td>
</tr>
</tbody>
</table>

Reference for data: (Iran’s statistical center, 2006)

Annabestani (2011) discussed the reasons of the immigrations as you see in Table 9.2 below. The table shows the average percent distribution among reasons that caused the immigration to the city of Sabzavar.
Table 9.2 Reasons that caused in migration to Sabzavar

<table>
<thead>
<tr>
<th>Cause</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unemployment and poverty</td>
<td>39</td>
</tr>
<tr>
<td>Drought and declining of agricultural production</td>
<td>19</td>
</tr>
<tr>
<td>Urban attractions</td>
<td>4</td>
</tr>
<tr>
<td>Cheapness of homes in informal urban districts</td>
<td>16</td>
</tr>
<tr>
<td>Other reasons</td>
<td>12</td>
</tr>
</tbody>
</table>

References for data: (Annabestani and Anabestani, 2011)

As the table suggests during the time studied 19% of the in-migrants moved to the big cities because of the natural hazard of drought and decline in farming livelihood. Unemployment and poverty caused 39% of internal migrations as a major cause. Other national observations indicate that the number of migrants and the unauthorized neighborhoods are increasing in size permanently.

9.2.2 Background of the unauthorized residential areas in Chabahar

The phenomenon of unauthorized urban neighborhoods harms the cities in the developing countries. Several scholars, for example Davis, believe that the event is an increasing reality (Davis, 1995). Informal districts are features of poverty that show the fiasco of urban and regional planning policies. To see the magnitude of the problem in Chabahar we shall introduce Chabahar itself first. Chabahar is a significant harbour from economic, strategic and geopolitical points of view. Chabahar city is at the southeastern point of the Sistan and Baluchistan provinces on the coast of the Oman Sea see Figures 4.1 and 5.1. In the map Zahedan is to the north of Chabahar. From west direction, Chabahar is neighbor to the Kerman and Hormozgan provinces. From east side Chabahar is close to Pakistan. From south direction, Chabahar has a three hundred kilometers long border coast.

The background of unauthorized neighborhoods in Chabahar goes back to the 1970s when the second Pahlavi started many big development projects like the Chabahar-Zahedan corridor, the Pishin dam, and the Konarak military airbase, and some massive housing projects,. Many people moved to Chabahar. Table 9.3 shows the Chabahar population development from 1960 until 1995.

The first core of Chabahar was the quarter of Masghatia. The unauthorized districts in Chabahar have emerged almost in the form of slum dwellers made of palm straw materials. People from different ethnic groups in Baluchistan came to use the hunting potentials and commercial services. They settled in the
Shirha and Korsar districts along the eastern direction of the coastline. Masghatia at the beach of the Chabahar Gulf was the place to present the fishing production and commercial services. It was the place for trade of commodities, which were imported from Dubai and other Gulf Emirates.

Table 9.3 Increasing population in Chabahar

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of people</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>1800</td>
</tr>
<tr>
<td>1965</td>
<td>2828</td>
</tr>
<tr>
<td>1970</td>
<td>5922</td>
</tr>
<tr>
<td>1975</td>
<td>20544</td>
</tr>
<tr>
<td>1980</td>
<td>34619</td>
</tr>
<tr>
<td>1985</td>
<td>48858</td>
</tr>
<tr>
<td>1990</td>
<td>111306</td>
</tr>
<tr>
<td>1995</td>
<td>324200</td>
</tr>
</tbody>
</table>

Reference for data: (Ebrahimzadeh, 1999)

In the 1990s, the establishment of a free trade zone in Chabahar had been announced. The announcement encouraged many people to move to Chabahar at an accelerated speed many times faster than in the Pahlavi era. Figure 9.1 illustrates the speed of population increase.

Figure 9.1 the curve shows the increase of Chabahar population during the time period.
However, since the failure of the strategic plans of the free trade zone many of the migrants settled in the unauthorized districts around the city. The two following maps show the expansion of Chabahar’s unauthorized districts during the recent decades, see Chabahar’s general plan. You see in Figure 9.2 that the original core of Chabahar expands towards the directions shown by the arrows.

Figure 9.2 Chabahar's initial harbor, Masghatiha. Source: Chabahar’s general plan

After the Islamic revolution, more people moved to Chabahar. The arriving people ignored the municipality standards and established the first unauthorized edge district. By that time, many people from other regions migrated to Chabahar and started to build new informal settlements rapidly. Figure 9.3 exhibits the unauthorized informal land uses by a dark red color.
Figure 9.3 Urban lands occupied by unauthorized areas. 
Source: Chabahar’s general plan.

As you see from the map the unauthorized zone occupies a huge area bigger than the legal urban districts in Chabahar. The phenomenon clearly threatens the sustainability of the city.

9.3 Impact of unauthorized neighborhoods on Chabahar

9.3.1 Terminology
The Chabahar inhabitants designate the unauthorized districts by words like outskirt-settings, huts, and self-growing settlements. An English dictionary defines the term of outskirt setting as "The outer parts of a town or city". Dehghani (2007) defines huts as "Those are areas with particular socioeconomic, cultural, skeletal features. Those differ apparently from the planned urban areas". Sheikhi (2002) states that a "Self growing settlement is a crowded and accelerated growing edge district which has two characteristics. It has shaped on the shoulders of self-motivated people and it has formed in the absence of the controlling and management of the official institutes rapidly".

The unauthorized area does not have the necessary infrastructure. About the particularities of the outskirt-settings Shahraki (2008) suggested: "There are
three key signs which distinguish between an authorized urban area and a legal neighborhood while visiting a city at a glance, the physical and skeletal views of the area, the functional and economic features of the area, and the legal and social characteristics of the area.”

Next, we discuss on the effects of the informal homes for the city and different theories to mitigate them.

9.3.2 Introducing the impact of informal districts on Chabahar
We focus mainly on the negative impact while the target is to renew the city of Chabahar. The result of the theoretical exploration and field observation suggest that problems caused by the unauthorized homes can be categorized into six groups as follows:

Group1 Ignorance of macro/micro urban land use policies
You have seen earlier that the first core of Chabahar expanded over the time until the desperate and poor people rushed around the core and set up unauthorized neighborhoods peripherally. The result of ignorance of urban land use programs was the emergence of the unauthorized urban districts such as Shiriha, Islamabad, Seidabad, Atashabad and Ramin.

Group 2 Shocking impressions on architectural and visual views of the city
Poor people are not able to pay attention on the architectural and aesthetic aspects of their homes. They try to build those by primary building materials. We observed that the unauthorized districts are composed of poorly designed lodges and huts. The following picture visualizes a view of an informal district in Chabahar.
Figure 9.4 a block of unauthorized settlements with poor visual views in Chabahar

Group 3 Hazardous impact on physical shape and urban infrastructure
As said earlier the informal urban districts suffer the skeletal problems. Since the plazas, streets, and passages have not been planned with the help of architectural design, the geometrical shapes of urban places are problematic. The areas lack the needed urban infrastructure and services. People carry water from a long distance to their homes. They do not have access to the urban water provision infrastructure. The situation of solid waste collection is critical as well. The electrical power network infrastructure is unacceptable.

Group 4 Expansion of old urban textures
Buildings in the areas are old and out of standards. Architectural standards, structural requirements, and infrastructure necessities do not exist. Building materials do not fulfill the necessary technical standards and the materials are unacceptable and out of minimum tolerance. Thus, they must be replaced by new regulated safe homes and spaces.

The result of the observations done block per block and home per home revealed that most of the homes should be demolished or renewed and some parts should change their use. In the Table 9.4 below, you see the result of the observation in every unauthorized district. The table reports the percentage of homes that should be demolished, change their applications, or be renewed.
Table 9.4 Percent of the homes with various qualities in informal districts

<table>
<thead>
<tr>
<th>Unauthorized urban districts</th>
<th>Percent of houses to be demolished</th>
<th>Percent of renewable houses</th>
<th>Percent of houses to change function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atashabad</td>
<td>55.2%</td>
<td>9.8%</td>
<td>35%</td>
</tr>
<tr>
<td>Islamabad</td>
<td>50.8%</td>
<td>7%</td>
<td>42.2%</td>
</tr>
<tr>
<td>Jadgalabad</td>
<td>54.9%</td>
<td>5.4%</td>
<td>39.7%</td>
</tr>
<tr>
<td>Sorkhrig</td>
<td>91.1%</td>
<td>0%</td>
<td>9.9%</td>
</tr>
<tr>
<td>Seidabad</td>
<td>61.5%</td>
<td>10%</td>
<td>29.5%</td>
</tr>
<tr>
<td>Shirija</td>
<td>71.7%</td>
<td>14.3%</td>
<td>14%</td>
</tr>
<tr>
<td>Osmanabad</td>
<td>69.5%</td>
<td>13.4%</td>
<td>19.1%</td>
</tr>
<tr>
<td>Korsar</td>
<td>50.4%</td>
<td>12.8%</td>
<td>36.8%</td>
</tr>
<tr>
<td>Moradabad</td>
<td>90.9%</td>
<td>2.1%</td>
<td>7%</td>
</tr>
</tbody>
</table>

Reference for data: (Shahraki, 2008)

Group 5 Undesirable socioeconomic bearings
Unauthorized settlements are the result of unfavourable socioeconomic situations. From the other side the informal and outskirt districts produce various privatization arrangements. The picture below shows the result of long time privatization at the Ramin outskirt settlement in Chabahar.

Figure 9.5 Long time informal settlements in Chabahar suburbs

Figure 9.6 below shows how the unemployment or low paid temporary seasonal jobs prevent people from saving. While the community does not have any savings they do not invest in home creation projects and the efficient outcome is
low indeed. Therefore, the circle will continue forever if the external actors do not intervene.

Figure 9.6 Loop of poverty. Source: (Dehghani.2007)

Group 6 Unauthorized areas prevent sustainable urban development
Undoubtedly, the outskirt urban regions are not sustainable. According to theories and experiences the areas not only are unsustainable, but also threaten the functional, socioeconomic, skeletal, architectural and perspectives of Chabahar itself. They simply threaten the future of the city.

9.4 Theories for mitigating the impact
My literature exploration suggests that there are a number of classical relevant theoretical approaches to solve the problems of unauthorized and unplanned urban settlements. The various ideological ways could be classified into six groups as follows:

9.4.1 Question-oriented ideas
This school understands the phenomenon as a normal and natural part of urban life. In other words, its proponents are not keen on recognizing the roots of the problem as Sheikhi (2002) argued, "This idea tries only to decrease the social turbulence, crimes and socioeconomic hazards caused by the informal urban
districts”. In fact, the school does not consider the origins of the problem. It seems that this idea cannot solve our current multifaceted problems.

9.4.2 Fundamentalist views

This school differs sharply from the question-oriented idea. Fundamentalists focus on the origins that cause the unauthorized areas. Healey found this idea helpful in urban planning and argues that the school explores the links between the political and socioeconomic regimes of the city and the informal homes (Healey, 1992, p 143). It searches for the connection between the capitalist and unplanned urban homes. So, the fundamentalist method analyzes the housing and town building facilities that the communities provide for people (Fainstein, 2000, pp 451-478). Recognizably the fundamentalist school has influenced a number of renewing programs.

9.4.3 Ecological ideas

The scholars of this school integrate the flow of energy, movement of materials, and movement of communities and humans together. In such an integrated system, humans in the ecosystem face two significant threats namely, rapid population increase, and, quick development of technology. Sympathizers of this idea mainly look at the physical aspects of the problems caused by unauthorized areas Zahedani (1977). The ecological idea helps any planning tool to save the environment and to prevent depletion of natural resources. For example Momtaz (2000) argued: “The ecological school applies the land policy to solve the problems caused by the phenomenon of unauthorized neighborhoods. The land policy would manage the populations under the umbrella of the regional plans”. Shahraki (2008) promoted the school and argued that “Ecological urban development requires inclusion of renewal projects in strategic policies on protection of natural resources”. The ecological school considers the basic human needs. Human is a biological element in the natural and built environment. It demands both material flows and urban places.

9.4.4 Regional systems thinking

From a regional point of views, there are actions and reactions. The interactions happen according to certain regularities among internal and external stakeholders of an urban system. If you consider a city as a regional system then every part plays in the game of the urban development. As Rabbani discussed “A city is a mixture of spaces and systemic relationships which supply productions, attractions, tools, and services” (Rabbani, 2002, p 18). In other words this idea considers the city as a big organism that spends inputs in
the form of financial investments, supplies urban infrastructure, uses energy, affects environmental components and natural resources, and produces outcomes such as urban services, health, and attractiveness.

9.4.5 Liberal school
The liberal school pays attention to socioeconomic and skeletal aspects of urban districts. The school studies the degree of accessibility to the urban services and incomes. It seems that the liberal ideas on the informal neighborhoods are affected by the ideas of Malthus. Saei (1999) interprets the idea of Malthus as follows: “The poverty is a feature of god’s determination and it is a part of life’s nature so the governments should not support the poor people. The school assumes that the mass populations in unauthorized areas caused the deep poverty. The school argues the causes well; but, it fails to see more deep roots of the problem.” Generally, the liberal school investigates the qualities and conditions of urban life, but does not focus on the distribution of livelihood resources.

9.4.6 Strategic planning school
This school promotes possible solutions. From one side it is nearer to the problem-oriented school and from the other side it differs when it aims to change the urban critical situations. Shahraki (2008) described the school as follows: “Strategic planning school is keen on social homing projects, strategic land policies, provision of infrastructure and renewing programs. It translates every program code to a clear possible practice”. In Chabahar, we prefer application of the latter school but the ecological school promises to be very helpful as well.

9.5 Policies to renew unauthorized urban districts
A renewal program is a useful way to mitigate the problem of the unauthorized urban districts. On this subject Wates (1964) suggested that: “Urban renewal has many positive effects. Replenished homing stock might be an improvement in quality; it may increase density and reduce sprawl; it might have economic benefits and improve the global economic competitiveness of a city. It may, in some instances, improve cultural and social amenity, and it may improve opportunities for safety and surveillance”. The municipality of Chabahar has a renewing/rebuilding team in the city government. Scientific members of the International University of Chabahar have collaborated with the program. The group would prefer to work with the problem-oriented method. They have scanned all informal and unplanned urban spaces in detail. For the first time the
municipality provided a plan of the unauthorized neighborhoods at block level in Chabahar, see also Figure 9.3 and Table 9.4 in this chapter. Since the group was scanning the unauthorized neighborhoods, outskirt areas, lodges, tinplate villages and old urban areas, the situations of the informal neighborhoods within the general plan of Chabahar have been determined. Synchronously we argued that the general plan of the city should be revised. To provide a new general plan for Chabahar we agreed to change the urban land ordering based on socioeconomic strategies, statistical facts, and natural environmental realities.

Amongst different urban skeletal design procedures, we selected the street-axial model (the model has been introduced earlier in this thesis). The model first considers land for freeways, streets, avenues and other secondary urban passages. Then, the model allocates land for other needed urban spaces. The street-axial model is pertinent to the unauthorized crowded urban neighborhoods in view of their critical urban problems and lack of suitable traffic spaces. To create the model we drew a basic traffic map with names of streets and urban passages. On the map, we determined all edges of traffic networks like roads, streets, railroads, and water supply lines. We exhibited the nodes of the traffic network like bus stations, terminals, and airport of Chabahar in the map as well. The following map shows the land allocations for necessary urban spaces according to the street-axial model.

Figure 9.7 Urban land allocation policy Source: General plan of Chabahar
You see on the map how the method of urban skeletal design allocated land for other urban spaces like residential, educational, and public and green purposes. The following table reports the plots considered for every urban spatial purpose.

Table 9.5 Allocation of urban lands for various urban spaces

<table>
<thead>
<tr>
<th>Types of application</th>
<th>Area (square meters)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>3203775</td>
<td>13.90</td>
</tr>
<tr>
<td>Commercial</td>
<td>197656</td>
<td>0.86</td>
</tr>
<tr>
<td>Educational</td>
<td>151641</td>
<td>0.66</td>
</tr>
<tr>
<td>Higher &amp; professional education</td>
<td>393393</td>
<td>1.70</td>
</tr>
<tr>
<td>Cultural</td>
<td>13453</td>
<td>0.06</td>
</tr>
<tr>
<td>Religious</td>
<td>102523</td>
<td>0.45</td>
</tr>
<tr>
<td>Tourism</td>
<td>88340</td>
<td>0.38</td>
</tr>
<tr>
<td>Medical</td>
<td>159714</td>
<td>0.69</td>
</tr>
<tr>
<td>Hygienic</td>
<td>1355</td>
<td>0.01</td>
</tr>
<tr>
<td>Sport</td>
<td>106258</td>
<td>0.46</td>
</tr>
<tr>
<td>Official</td>
<td>287363</td>
<td>1.25</td>
</tr>
<tr>
<td>Green spaces</td>
<td>217290</td>
<td>0.94</td>
</tr>
<tr>
<td>Military areas</td>
<td>139873</td>
<td>0.61</td>
</tr>
<tr>
<td>Industrial</td>
<td>209864</td>
<td>0.91</td>
</tr>
<tr>
<td>Urban installations</td>
<td>148375</td>
<td>0.64</td>
</tr>
<tr>
<td>Transport and storage</td>
<td>290423</td>
<td>1.30</td>
</tr>
<tr>
<td>Water passages</td>
<td>3407231</td>
<td>14.80</td>
</tr>
<tr>
<td>Unused</td>
<td>11322577</td>
<td>49.20</td>
</tr>
<tr>
<td>Gardening</td>
<td>39268</td>
<td>0.17</td>
</tr>
<tr>
<td>Fisheries services</td>
<td>2528021</td>
<td>11.00</td>
</tr>
<tr>
<td>Total used urban lands</td>
<td>23008393</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Reference for data: Chabahar's general plan

Table 9.5 suggests that the total used urban land area is equal to 2300 hectares. Residences use more land compared to other urban spaces. As you see in the table fishing services occupy more than 10 percent of the urban area. It is logical since fishing is the main livelihood here. Higher education spaces are 2% of the total urban lands which is much for Chabahar.

As adequate unused urban lands, the group could plan and design the urban spaces according to our socioeconomic and feasibility studies. The situation was enjoyable for the urban developers so that we could have developments that are newer. We could also gather more urban lands and use them for new public spaces. We benefited from the opportunity to plan new residential and
cultural spaces for Chabahar. To save nature we would make the homes and the urban places climatically adjusted. Respecting the climate and nature of Chabahar we planned new urban districts separately, but connected them together with boulevards and wide streets. The majority of people are poor indeed and need official support to improve their built environment. The city needs to renew the unauthorized neighborhoods by social homing policies, by legal land granting to the people, and by monitoring and auditing mechanisms to build homes and other buildings. Developers of Chabahar must use systematic thinking as well. They must consider the different parts of Chabahar as interacting members. The developers will use the problem-oriented school to understand where Chabahar should go in the future. The applied theoretical approaches will decide the skeleton and architectural features of the future built environment.

Further, the municipality of Chabahar should stop the current informal developments and guarantee planned, desired, and targeted developments. The developers must respect the frontage limitations of rivers, water canals and the coasts. The municipality must predict future demands for various urban spaces by help of academic forecasting methodologies. Regulation and deregulation works are very vital for Chabahar. The municipality surely needs public participation in the revitalization programs.

9.6 The Chabahar renewing program

9.6.1 Components of the program

Renewing means a program of land to be reused, new development projects, redevelopment projects, and regulating activities in the areas of Chabahar. Urban regions in developing countries have experienced both successful and failed renewal programs. The renewal programs have had a major impact on the socioeconomic and physical features of the cities. Renewing of informal districts in Chabahar has both theoretical and practical perspectives as Shahraki (2008) suggested, “Renewing of informal settlements always has two wings. The first wing is the theoretical framework and the second one is potential projects to interpret the theories into possible building projects”. The renewal program should be seen as an economic engine to push towards economic growth. Several scholars are in agreement with this idea. For example Anglin listed some sides of renewal programs as “Urban renewal may involve replacement of businesses, the demolition of buildings, the relocation of people, and the uses of eminent domain as a legal instrument to possible the development projects”( Anglin, M. K., 2002, p 562).

The general purpose of the renewal program in Chabahar first is to house people suitably and then to control the future development projects under the
umbrella of the general plan of the city. To meet the targets of the renewal program it included the following mother projects:

- Public participation
- Increasing of urban managerial capacity
- Land assembly programs
- Improving of aesthetic perspectives
- Climatic, bionic and green town building projects
- Plantation projects
- Solving the problem of unusable homes
- Projects to build climatic buildings.

Note that every mother project includes many sub-projects. In this chapter we report only the mother projects briefly. Further documentation of the subprojects is available from the current author in the Persian language.

9.6.2 Public participation

The group produced films to enhance the public awareness and public participation. The publication encouraged public contribution to improve the quality of their homes and the built environment. We recommended establishing a new technical office in Chabahar City Hall to ease communicating with people. Citizens are referred there and supplied with information about the new acts, standards, codes, funding facilities and bank loans to improve their homes. Some of the people must sell their lands to the municipality and then they receive new lands in specially planned zones according to the general plan of Chabahar. People learn about new building materials. Such planned help and guidance substantially increased the public participation.

9.6.3 Increasing of urban management and organizational capacity

Enabling knowledge and managerial capacity of official bodies is significant to overcome the urban problems. The International University of Chabahar collaborated with the official housing and town building agencies to complete the first general plan draft for Chabahar. On this way, Chabahar’s mayor had been convinced to revise the general plan and rework a new general plan for Chabahar based on academic methodologies and new professional studies on the past, present and future of the city.

The municipality of Chabahar agreed to control the physical expansion of the city and work with the land use policies of the general plan. The technical office controls the technical qualities of future private and official developments. The technical office will control new/renewed/strengthened neighborhoods according
to their sizes that you see in the following Table 9.6. The Iranian home bank funded the renewing program in Chabahar. The home bank agreed to pay the costs of the renewal projects in the form of long-term loans. The bank would lend the fund with a four-percentage mortgage to every home. The size of every home should be determined during a meeting between one representative of the bank, one engineer from the housing and town building office and the owner of the unauthorized home based on the size of the family.

Table 9.6 Sizes and funding amount of the approved homes

<table>
<thead>
<tr>
<th>Funding in US$</th>
<th>Percent of total removal area</th>
<th>Sizes of homes per square meter</th>
</tr>
</thead>
<tbody>
<tr>
<td>6000</td>
<td>2.9</td>
<td>Less than 100</td>
</tr>
<tr>
<td>10000</td>
<td>14.1</td>
<td>100-200</td>
</tr>
<tr>
<td>15000</td>
<td>39.6</td>
<td>200-300</td>
</tr>
<tr>
<td>20000</td>
<td>21.4</td>
<td>300-400</td>
</tr>
<tr>
<td>25000</td>
<td>6.4</td>
<td>400-500</td>
</tr>
<tr>
<td>34000</td>
<td>6.6</td>
<td>500-700</td>
</tr>
<tr>
<td>42000</td>
<td>4.4</td>
<td>700-1000</td>
</tr>
<tr>
<td>47000</td>
<td>5.5</td>
<td>More than 1000</td>
</tr>
</tbody>
</table>

Reference for data: Chabahar’s general plan

In the table, the left column reports the sizes of the approved homes to receive land and funding. The column in the middle states the percent of each type of unauthorized home. The right side column of the table is to show the amount of the funding by the bank.

9.6.4 Improving of the aesthetic perspectives

The group planned and implemented projects to protect the historical heritages like the Portuguese castle and the English post office building and to improve the regional attractiveness. The renewal program included new attractive public spaces to attract tourists. It used water, light, and colors for the various attractions.

9.6.5 Climatic and green town building projects

Since the environmental components have been damaged in the unauthorized areas and people are poor there, the climate and green urban planning and
design should contribute to sustainable development. The renewal program has projects in the district and the town dimensions to solve the earlier described critical urban problems in the unauthorized areas. The group divided the new built neighborhoods into blocks and sub-districts. The group worked with the three scales method which has been described in the previous chapters of this thesis. We organized workshops and projects according to the divisions. In every division, the group planned infrastructure projects for the urban fluent traffic and transportation, urban sewage, urban water networks and power distribution systems. The projects will protect the environmental components and will save regional natural resources as well. The main idea in every project is the ecologic town building school. The idea would give less energy consumption, less development costs and integrating the buildings into local nature, see chapter eight of this thesis. We are interested in the works of architects who insist to plan ecologically. We planned and designed buildings for the program by the bionic architectural design ideas. We tried to express the layouts and lines of the structures by borrowing the forms and shapes from local traditions. Instead of the classical drawings, we based the new urban district's design on the local natural requirements. The idea was to strike a balance between structural technologies, aesthetic perspectives of the neighborhoods and nature. The following three-dimensional plan which we worked out for the program shows the result of the method composed of climatic harmony, ecological ideas, bionic design school, and postmodern architectural styles.

Figure 9.8 Three-dimensional plan of a new urban neighborhood in Chabahar. Source: A. Shahraki
As you can see from the plan, the neighborhood includes blocks of apartments, villas, a cultural and religious center in the core of the district and other accompanying buildings. We made decisions about the functional aspects.

The necessary spaces for various needs have been determined according to their sizes and technological measures. The structure of the building should tolerate all likely tensions caused by floods, winds, and earthquakes. We selected suitable building materials to fulfill the earlier mentioned purposes. The new neighborhood project has green and climatic buildings, see also the US environmental protection agency (2009). The agency defines the green buildings as follows:

- “Although new technologies are constantly being developed to aid current practices in creating greener structures, the common aim is that green buildings are designed to cut the overall impact of the built environment on human health and the natural environment
- Using energy, water and other resources wisely
- Protecting occupant health and improving employee productivity
- Reducing waste, pollution, and environment damages”

Since the suggested buildings in Chabahar are targeted to carry out the three above responsibilities, the buildings are likely to be green and climatic. The following three-dimensional plan, see Figure 9.9, shows one type of home which we recommended in the renewed urban district.

Figure 9.9 a three dimensional plan of a green home. Source: A. Shahraki.
The home in the plan has less energy consumption and uses renewable natural resources. We wish that the new neighborhood would modernize the old and unauthorized areas with this type of buildings. The question arose what purposes other architects who are keen on climatic and bionic design have in their work. To find the answer we explored some works of green architects. For example, Borovoye (2008) planned an ecologist and bionic city in Kazakhstan and described the aims of the city as “Town uses the solar energy and wind energy to produce electricity … traffic is planned to zero dioxide emission, buildings will be future structures according to bionic standardize learning from animals to consume natural light and energy”. (Borovoye Biocity, 2008, p 9)

The renewing program would save the natural resources by design a new green neighborhood in Chabahar. One goal of the renewing program in Chabahar is to attract tourists into the region. Therefore, some projects are to supply more tourist facilities and services. As an example, the group designed some coastal bowers along the coast of the site; see the following picture that exhibits the recent built bowers with the help of the organization of the Chabahar’s economic zone.

Figure 9.10 a picture of the built bowers by the organization of the free economic zone to attract tourists.
We assume that such developments will contribute to fulfilling the targets of the renewing program in Chabahar.

9.6.6 Assembling of urban land
The rebuilding group assembled urban lands that people used outside of the general plan’s purposes. It found homes that should be removed. The group changed the assembled lands to public urban spaces. Then, the group used the collected lands to plan new projects aiming to protect the natural environmental components in the unauthorized neighborhoods. Projects would increase green spaces like parks and protected areas or save attractive volcanic sites, (called Gelafshan in the region). The volcano is boiling continuously and throws up the doughy clay up to twenty meters height. The action of throwing up the liquid clay together with the characteristics of natural environment produce exciting views and people enjoy watching it. It is interesting for scientists and researchers as well.

9.6.7 Plantation projects
The group set up green spaces along two sides of the streets and avenues. People should plant trees in front of their homes as well. The program designed a recreational area in every neighborhood so that everybody could reach a local park after maximum four hundred meters walking.

9.6.8 Solving the problem of unprofitable homes
How should the program tackle the unprofitable buildings? The group made decisions about various kinds of homes in the unauthorized areas. The group saw three groups of informal buildings in the areas. Those were; homes which should be renewed, homes which must be empowered, and homes which should be destroyed. Then, it planned and performed many projects pertaining to each class. After demolishing some of the unauthorized homes, the program could supply much space of urban land in the informal areas. In the regions with a high density of population and lack of adequate spaces for a fluent traffic a renewal program should result in freeways and suitably attractive streets. By the help of the street-axial model, first of all the group planned a boulevard as a main street with its exits in the form of secondary traffic passages along two sides of the boulevard. In the middle of the boulevard, an urban square has been planned with the help of statistical data and expected urban support functions around it. Only then, new homes and other necessary urban spaces should be designed around the boulevard.
9.6.9 Projects to build climatic buildings

The exploration suggested that the climatic urban planning and design is both economically and environmentally feasible (Langdon, 2007). Climatic planning and design will revitalize the critical unauthorized neighborhoods. So, in this part of the chapter we report on a green building pattern which we worked out and recommended for the renewing program. Climatic urban planning and design in Chabahar requires considerations completely different to, for example Zahedan city at the north of Sistan and the Baluchistan province or to Tabriz in the province of western Azerbaijan in Iran. It means that those considerations that make the buildings climatic in Zahedan or in Tabriz do not make Chabahar’s buildings climatic.

Since Chabahar has a humid warm climate, we covered the space between the entrance room and the building inside to make shadow and stop the direct sun exposure. The marginal roofs on the building stop the direct heating of the peripheral walls and make it cooler inside the building. The following plan shows the suggested home, see Figure 9.11.

![Three-dimensional plan of a climatic home in Chabahar. Source: A. Shahraki.](image)

In the picture, you will apparently see the special middle space and the extra roof. The structural plan of the home will allow the flow of air within the living
rooms, sleeping rooms, kitchens, and workplaces. As Chabahar is wet and warm, the stoppage of air makes troubles. Therefore, the named spaces should have windows on the opposite walls to let the movement of fresh air through the home. Please see the two-dimensional plan of a designed home with openers suitable to the climate.

![Figure 9.12 Plan of the home's ground floor. Source: A. Shahraki.](image)

The plan displays how we have located narrow windows on the two opposite walls symmetrically. By this method, the air will flow through the building.

The use of ventilation shafts is a climatic traditional method to cool the buildings without costly mechanical and electrical equipment. However, in Chabahar the ventilation shafts should be designed differently to those in warm arid Middle East cities. We suggested the ventilation shaft suitable to Chabahar by placing wide windows with little height at the highest part of the building right under the roofs. This design will mitigate the hot sunshine, see Figure 9.11. Experiences suggest that a higher height provides more air in homes. Since the local natural warm air moves up a cooler temperature stands on the grounds of the rooms. Thus, it is necessary to use higher heights compared to homes in moderate regions. Chabahar requires its own scales due to heights, openers and the position of the openers. Using suitable building materials is significant to produce climatic homes. The best pertinent building technology for Chabahar’s climate is the armed concrete system. However, the armed concrete system is
very sensitive and you must fulfill all building standards. You should make efficient use all standards about granulated sizes of the concrete, quality of water, type of Portland cement, type of steels and other involved materials. My observation suggests that the regional building materials lack required standard qualifications. Worse, the work styles are unacceptable. We would recommend armed concrete frame system building very conservatively for Chabahar. The green and climatic buildings are economical and many studies verify the benefits of green building. Langdon (2007) argued as “Studies have shown over a twenty-year life period, green buildings have yielded $53 to $71 per square foot back on investment. Confirming the beneficially of green building investments. Further studies of the commercial real estate market have found that energy star certified buildings do higher rents, sale prices and occupancy rates as well as lower capitalization rates potentially reflecting lower investment risk”. In other words, the cost of green buildings returns benefits to the users during the life cycle of the buildings. So, to build green in Chabahar is environmentally and climatically interesting, and economic.

9.7 Conclusions
This chapter discussed the unauthorized urban settlement for the first time in the region of Chabahar and introduced scientific analysis of the phenomenon. The renewing group of Chabahar municipality scanned informal and old homes, blocks and districts according to their names, maps, and necessary data attributed. The thesis explored the causes of the emergence of the areas and found socioeconomic problems and poverty as major reasons.

The chapter has classified the effects of the informal homes in Chabahar. We studied ideas and theoretical hypotheses that scholars around the world suggest to program the renewing developments. The chapter highlighted the importance of natural resources, saving the environmental components, and increasing of the functionality of the city during the renewing efforts. It was suggested that the climatic schools and strategic determined planning ideas would be particularly useful since the unauthorized neighborhoods need both natural environmental and socioeconomic aids.

Based on the strategic regional and urban goals and considering the general plan of Chabahar, the municipality of Chabahar should plan the renewal program. The climatic and ecological renewal program for the unauthorized areas of Chabahar included eight groups of mother projects. The package included projects for public awareness and participation to improve the inhabitants’ own town and homes. It included projects to increase the knowledge and management capacity of official bodies in Chabahar. One key
part of the package is the regulation and deregulation negotiations to bring in force building acts, codes and standards in the region.

The program has renewal beautification projects to save the historical places. The renewal program increases the attraction of Chabahar so that the city will invite tourists and investors. The program has removal projects to assemble land areas aiming to use them later for urban infrastructure and public and green spaces. The package program to renew the unauthorized neighborhoods in Chabahar will solve the lack of urban infrastructure and urban services.

To judge the results of the renewing program until now, we shall state that the renewal projects have had both successes and failures. The failures are dependent on management, financial and knowledge shortages. Sometimes social conflicts prevent the success of the renewing programs. We hope that the ideas and experiences suggested by this chapter will renew the unauthorized neighborhoods in the continuation successfully. The renewing program as a pilot project will be applicable in similar regions in the world because of suitable pragmatic theories and practices the validity of which has been tested in the laboratory of Chabahar.
10 To plan, design and build new towns based on culture, livelihood and needs of people

10.1 Introduction

This chapter aims to examine the role that the planning and design of a new town can play in the process of providing housing and urban spaces in Iran and similar developing countries. You read earlier that the new towns should make room for the growing number of inhabitants, but when the houses have not been built based on the real needs of the regional people the new towns cannot absorb the newcomers. The new town of Ramshar has the same problem to overcome this obstacle for attracting residents.

By local decision-makers we were asked to review the causes of the failure and to offer appropriate strategies for success. We studied the theoretical foundation of the new town planning and design historically to understand the working of the new towns. Through case studies we would uncover the major difficulties on the way of a sustainable urban planning and design in real life. We used a market analysis to predict the types and characteristics of the needed urban spaces in the new town and to reprogram and redesign the new town based on the real needs and attractions of the inhabitants.

The aim of this chapter is to discuss the weaknesses of the current new town planning and design in Iran and to suggest an optimal planning and design model aimed for decision support. The model is going to be based on particular features of the region and classical market analysis with the help of mathematical linear programming and other academic methods.

The method to meet the aims involves both theory and practice. By the help of field observations we wish to explore demographic, socioeconomic, natural environment and building perspectives of the region to clarify the real needs of the people. The method helps to understand the failure of the urban development programs and to forecast the necessary urban spaces and infrastructures in the region. We applied the strategy of the case study to see the validity of our hypothesis and presumptions. We use the findings of the case study and the results of a market analysis in the region to suggest a suitable model for the planning and building of a new town in Ramshar. In fact, the market analysis procedure will help to understand the future needs. The research method of this chapter focuses on the importance of natural resources and the urban infrastructure particularly transportation networks. As Åke Andersson, a famous scholar in the subject, recommends: "Post-industrial
countries are characterized by increased mobility. In the countries changes happened due to the urban developments. These structural changes have led to an increased competition between cities and regions" (Andersson, Å., et al, 2000, p 5). Another method of this chapter is the methodology of benchmarking, BM. We compare outcomes of the current urban development projects in Iran to other possible patterns namely the European standard codes.

The major hypothetical theory is that the present built environment has not fulfilled the preferences of the regional people. We think that every house and every new town should be built according to the local situation, regional market demands, regional culture and local economic conditions. We believe that the current method of the urban development should be revised based on the modern academic theories, experiences of pragmatic engineers and international collaboration to overcome the fiasco. Our mission is to create learning at the regional level using the processes and tools of the knowledge economy.

### 10.2 What is the problem in planning and building of new towns in Iran?

The urban developments in Iran are not successful and its new town planning has been failed in design, architecture, sociology and the involvement of the influential actors and factors in the process of planning, (Zamani and Arefi, 2013).

Failures such as expansion of unplanned and unauthorized urban districts, need for urban infrastructure, lack of public urban spaces, vulnerable and unsafe buildings against earthquakes and natural hazards, lack of knowledge and technology and weak management are obvious perspectives of the present urban developments in Iran and similar regions.

Despite several new town projects in Iran during the recent decades many people stay in urgent need for homes, urban public spaces and urban infrastructure. Mohammadi explored the problems of urban planning in Iran and among other factors mentioned in the following: "Homes for poor inhabitants with insecure employment lack services which are prone to social problems. As shown by international experience and urban studies, this is not a transient phenomenon in developing countries, but on the contrary in its continuously expanding" (Mohammadi, H., 2010, p 68).

As Mohammadi and other scholars declare at the same time, the new towns do not fulfill the vital necessities for living and they do not offer required urban services. The situation worries many people who do not have access to good
homes and infrastructures. So, the need for a new planning and building practice and professionality exists in Iran.

One policy to tackle the anxieties is to house people in the new towns. During the recent decades Iran and other developing countries planned, designed and built new towns. Ziari and Gharakhilou believed that the policy was to home the ever-increasing people in the new towns and to distribute the metropolitan crowded population there. “The major objectives of the new towns after the revolution and as one of the strategies of urban development were to absorb the overflow population of large cities, to offer housing to low income groups, to prevent population growth and anatomic enlargement of the cities, to decentralize population and industries, and to accommodate workers of the industry sector near the industrial poles” (Ziari and Gharakhilou, 2009, p 146).

In such a situation the target should be to change the present unsuccessful urban development method and aim to produce attractive and high-standard cities. This is why the debate on the result of the policy and the situation of the new towns is still continuing. The question is how do the new towns look like in terms of meeting their planning targets and in lodging the people? To find the answers we shall understand the preferences and ideas of the regional people about the problem to build according to their wishes. Thus, in this chapter we will discuss the following subjects:

- How shall the developers supply residential spaces, public urban places and necessary urban infrastructure for the growing number of people in the regions?
- If the planners aim to place the people in the new towns how shall the developers design and build the new towns?
- Which design characteristics should the new towns have?

The problem is still wider when you discuss the details. One feature of the problem to build new towns is lack of knowledge, new technology and professional skill. Another side of the problem is the absence of ex ante and ex post analysis, location studies, urban economic studies, land policies and urban spatial programs. One serious aspect of the problem is the fact that the urban development has not happened under the guidance of regional programs and scenarios. In fact, the current urban expansion has roots in emergency needs and pressures of non-expert social groups. According to the experiences the following urgent policies shall be discussed:

- To stop the irregular development and to prevent widening of mother cities, see for example the explanation of the problem in (Zahedani, 1977).
To move workplaces and other productive units from residential areas of the metropolitan into new industrial towns, see for example (Ziari, 2006, pp 412-422), who examined the planning and functioning of the new towns constructed in Iran.

To free the areas from smokestack factories in the mother city for the sake of green, educational and public needs, see for example (Hatami et al, 2013) who examined the criteria applicable in the optimal location of the different urban spaces in the new cities.

To build high-standard new towns proportional to the real needs of the regions. (Shahraki, 2006) analyzed the issue of real needs of the regional people and to build for people.

To ease the traffic burden within the mother city, e.g. reduction of travel times and time wasted in congestion as developed in the Traffic report (2008).

To make the towns functional by creation of job opportunities and preventing new towns to become dormitories. Tavassoli (1988) addresses the design of urban spaces from this perspective.

To absorb people’s small capital from brokerage activities into investment in housing, productive industries and manufactures. Afrakhteh studied the most important factors contributing to the underdevelopment of Zahedan city including the separation of population centers from their social and economic hinterlands (Afrakhteh, 2006, pp 423-432).

To highlight the importance of infrastructure and urban public facilities, see for example Metzger and Olsson, 2013, pp 102-128).

To build aesthetic, attractive and comfortable homes and towns, see for instance the textbook written by Grütter (1987).

To keep the natural resources and save the environmental components, see for example the discussions presented with (Eco-towns, 2008).

The above listed problems and academic attempts to address them suggest that the Iranian urban development trend is in an incorrect direction. This blind and detrimental trend should be shifted to new knowledge-based planning and design methods.
10.3 New towns in the mirror of global history

10.3.1 Background of new towns in theory
In all ages from the ancient era, new towns have been constructed with the help of new ideas for different functions. Charlie Gates introduces the ancient cities perspective as follows: "The early dynastic period which succeeds the first era in Mesopotamia? However, the written evidence about the history of the early dynastic city-states is fragmentary until 2500-2400 before Christ" (Gates, 2011, p 31).

Gates discussed the urbanization in Egypt and other old societies. Ancient civilizations in the Middle East, Egypt, China, India and America had wonderful cities for example the city of Naples which was called Neapolis in Greek. Neapolis was a town in the Roman civilization era for which some of its monuments still exist (Wethered, 1937). About the earlier efforts of building homes and towns with standards and plans Gelernter writes: "Olden Middle Eastern cities and Egyptian architecture left the irregular earlier styles and started to plan and build their homes and towns on geometric rules and principles", (Gelernter, 2001, p 3).

During the Middle Ages usually the role of planner, designer and builder of a house was in the hands of one expert person. Zargar wrote about the types of the middle age buildings: "The skeletons and bodies of the structures usually followed the climate situation. They used native and available building material like timbers", (Zargar, 1992, p 75).

The United Kingdom was a pioneer in founding urban planning and design as an autonomous science (Foth, 2009). In 1909, William Hesketh established an independent urban design institution. At the same time, the University of Liverpool established a fresh publication named Town planning review. The Town planning review made a firm connection between suitable theory and practice. It still exists. The United States moved slower on this way. Harvard started a design course in 1909. In the 1930s, US was home of Cornell, Columbia and Illinois architecture and planning schools. Already in 1917, the American City Planning Institution was working. For the first time, urban designers used quantitative data and they were able to prepare macro/micro plans based on population numbers. Kovacic et al suggested the need for a multidisciplinary planning method as follows: "Beyond the classical planning goals, design processes for sustainable buildings feature a high number of integrated planning objectives that link economical, ecological and socio-cultural aspects", (Kovacic et al, 2011).
The need for the multidisciplinary planning encouraged the use of statistics in the urban planning processes. After the Second World War, the urban design had been defined as a skeletal design and the developers had been affected by the results of the wars (Penrose, 2012). In the 1950s the growth of the population caused immediate requests for homes adjusted to the needs of children. Demand for schools and playgrounds were voiced as well. In all industrial countries, almost synchronously, economic growth caused new pressures for fresh investments in manufacturing areas and office spaces.

The economic improvement encouraged consumption particularly of durable commodities. Among the most significant goods were houses. Consequently, the speed of urban development changed the old planning and design methods so that an intellectual revolution happened in the regional and urban studies that nourished the urban planners and designers. Several geographers and industrial economists presented new applied theories. Böventer wrote about the general theory of localization offered by August Lösch as follows: "August Lösch from Germany wrote the general theory of localization. The theory is a basis to decide the sites on building projects in a region by the help of mathematical modeling" (Böventer, 1987).

During the 1960s, systems analysts presented a complete perspective for what urban design should be. They stated that urban design ought to be a science and not only a professional business. They purposed exactly what Stephen Marshall suggested on the issue of supporting fundamental science and pure knowledge instead of commercially based theories. "Urban design seems to settle for: (i) reliance on classic treatises as a source of wisdom rather than more recent scientific findings; (ii) treating hypothetical suggestions and assertions as if facts; (iii) selectively reporting and combining originally scientific knowledge in an unscientific way; and (iv) criticizing urban design theories mainly for their normative stance rather than their scientific validity", (Marshall, 2012, p 257).

Systems' theoreticians believed that sketches should be in the form of mathematical models instead of independent architectural drawings. Then questions arose like: Designing for what type town and for whom? On the way of finding the answer they took distance from merely technical and quantitative analyses.

In the 1970s, human geography theoreticians provided a very cohesive set of theories based on social classes. For example, Thrift reviewed the determination of social action in space and time during the urban planning process (Thrift, 1983, pp 23-57). This type of theory about the city dominated all speeches and discussions during the decade. Conversely, almost in all countries the developers looked out to define the real needs of the societies.
Susan Fainstein defined the theory as follows: “In its reliance on the good will, communicative planning theory typically passes over structural conflicts of interest and shrinks from analyzing the social context that blocks consensus building. Socialist theory and practice do concern themselves with the question of equity. In its Marxist form socialist theory called for public ownership of the means of production. As socialism operated in the Soviet Union and Eastern Europe, it involved state ownership of economic enterprises; for the social democratic parties of Western Europe the collective ideal was pursued by redistributing privately generated revenues through the state sector” (Fainstein, S., 2013, p 2).

Since 1990s the professional institutions united to define standard codes and to impose the laws during the building process, see for instance Brand (1995). Finally, since the rapid speed of demands for new towns in developing countries during the last recent decades the discussions on new theories are continuing. Now it is understandable that new academic theories based on mutual correlation of theory and practice shall come in power to help the urban developers. Peter Moser describes the need for new theories as follows: “The use of knowledge, or more specifically urban knowledge, has become increasingly common in urban development policies in European democracies in recent years. In terms of urban policies and practice there are many ways to make use of knowledge, whether it is scientific knowledge, evidence based learning or the more tacit and intangible forms of knowledge” (Moser, P., 2013, p 4).

10.3.2 Background of new towns in practice

The ancient Roman architect Vitruvius was the earliest builder who linked functionality and architectural beauty of a building. Summerson wrote on the relation: “Vitruvius requires solidity, usefulness and elegance for the aesthetic of a building”, (Summerson, 1963). Functional building needs laws and standards. Jones et al noticed the importance of the standards as follows: “Architectural graphic standards have long been revered as an indispensable resource in architectural offices, presenting design and technical information on the building subject matter. It is also a historic record of the materials, construction practices, and techniques commonly in use”, (Jones, C., and Livne-Tarandach, R., 2008, p 1075).

The background of standard structures with the use of prefabricated pieces goes back to the eleventh century when the Japanese architects used standards. In Japan the basic unit was Tatami. Tatami is a Japanese mat. Grütter writes: “The size of Tatami was a standard module. The module contributed to functionality, beauty and mass production of prefabricated pieces
of buildings”, (Grütter, 1987, p 302). In the seventeenth century purchase of prefabricated houses was possible in Moscow. Grütter reports: “In the suburb of Moscow was a market for prefabricated houses and people could visit the homes and buy. After shopping they set it in its new place”, (Grütter, 1987, p 496).

After the industrial revolution new technologies, new building materials and the growth of the population made possible the mass production of new buildings. Linda Clarke describes the historical change and the labour process in the production of the built environment. She outlines the cities in feudalism time, the industrial era, and the emergence of mass production (Clarke, 2013). The movement of automation and mass production initiated policies for the building of new towns in many countries. The towns were often built by governmental initiatives and Acts (e.g. Britain, France, and former Soviet Union) and sometimes by regional and local authorities (e.g. Sweden and Netherlands) or even by private contractors (e.g. United States). To see the working of the new towns, we may classify them as follows:

New towns as new capitals: There are many examples of this function; Versailles in France, Washington D.C. in America, Canberra in Australia, New Delhi in Hindustan, Brasilia in Brazil, Islamabad in Pakistan and Abuja in Nigeria. Dawson and Lord explored the state controlled urban development programs and wrote as follows: “The federal program of urban development action grants was introduced in 1977. It was a mechanism for encouraging investment through the pump-priming grants and loans”, (Dawson and Lord, 2012, p 9).

New towns as industrial hubs: The famous early examples are new towns in the former Soviet Union that had been built in the less developed regions around industrial complexes like iron, petrochemical and wood industries. The policy of the former Soviet Union transferred to the former socialist countries, especially Poland and Hungary. There are also new industrial towns which were built by private companies for instance the Canadian joint new towns for mineral exploration. At the same time, many new towns have been built when their earlier activity was related to the tourism industry. The famous new example is Singapore as Cho-yam Lau reported: “Singapore has redeveloped its central area into business districts. It relocated the affected population to new towns”, (Lau, 2011, p 230).

New towns to home surplus population: They have been built to accept extra population and decline accumulation of super large cities. Examples are provided by the new town of Hashtgerd near Tehran in Iran. Bhattacharya and Sanyal wrote on new towns in India: “India’s “bypass” approach to urbanization seeks to decongest its post-colonial metropolises by building new towns for a
new economy of knowledge-based activities and businesses driven by global capital on their fringes” (Bhattacharya and Sanyal, 2011, p 41). The British new town movement was also supposed to develop at a distance from their mother cities and becoming independent.

*New towns as new urban districts:* This group acts as new quarters and has been built according to modern town building principles, equipped and completely separated; see for example the new Chinese cities (Logan, 2011). However, they are most often seen as new suburban districts of mother cities, e.g. Swedish quarters around Stockholm.

After these global observations we can conclude that the new towns may be seen to work multi-dimensionally; supplying of homes, providing infrastructure, generating workplaces, and forming outlets of urban services.

### 10.4 Case studies

#### 10.4.1 Introduction

We studied the new town of Ramshar to analyze and compare its planning outcomes to well-planned, functional and successful new towns in advanced countries such as Sweden. The new town of Ramshar had been planned about three decades ago. Ramshar is one of the most obvious unsuccessful cases of new towns in Iran. The failure has its roots in natural, knowledge, skill, and technology management and corruption factors. However, one major clear mistake is the fact that the buildings had not been in line with the lifestyle and traditions of the inhabitants. Therefore, as a part of the case study we will carry out a market analysis to understand the real needs, priorities and demands of people. We will study the qualitative and quantitative features of Sistan’s socioeconomic situation to assess the structure of demand for Ramshar’s existing and future buildings. We begin the market analysis by posing three basic questions, will there be users to rent or buy the buildings, how quickly and at what rent or price will the buildings be absorbed in the market, and, finally, how might the new town be planned or marketed to make it most compatible in its regional market?

#### 10.4.2 An attempt at a market analysis

This market potential analysis examines aggregate demand and supply data which will assist the planners to understand the effective demand for different urban spaces by user groups. This demand analysis considers the following data:
- Demographic characteristics of Ramshar’s region and its periphery.
- Income, affordability and purchasing power of the local people.
- The rate of unemployment and employment.
- Migration and commuting patterns in the region. This will help design the traffic system of the region that is a basic problem.
- Studying of the target groups, the number of likely consumers and their priorities.

After completing of the above listed analyses, it would be possible to illustrate the following issues in Ramshar. We will establish an inventory of existing houses, flats, offices, spaces and other facilities including vacancy rates and characteristics of the vacant stock. We will attempt to assess the recent absorption of built houses and spaces including types of tenants or buyers. Market rents or sale prices and how they differ across the site and in quality of product will be obtained together with sales, rents and improvements.

10.4.3 Process of the field studies
To foster the public consultation and participation we used writing polls and questionnaires. The questions focused on the population and its distribution, age and gender, the job market and the rate of unemployment. Further we looked at the real estate market, and the preferences, interests and expectations of people. During the phase of questionnaire distribution we tried to cover all groups of people in the community, as much as possible, to get representative results. Five hundred questionnaires were distributed and two hundred and eighty equal to 56% were returned. Their data content was collected, grouped and analyzed. Then, we could interpret the results and indicate some qualitative conceptual suggestions trying to predict more likely future trends of the needs, expectations and priorities.

10.4.4 Observations and data sources
Characteristics of the sample population
Some 57% of the respondents are from Zahedan and 43% from Zabol, 86% male and 14% female. The major shares of the respondents are local people so that the birthplace of 82% has been the cities of Zahedan and Zabol or some small towns and villages in the region. The birthplace of the remaining 18% is in other provinces. In all it can be stated that almost all respondents are the regional inhabitants. The age distribution is such that 11% of them are younger than 30 years, 75% between 30 and 50 and 14% is more than 50 years old. The main fact is that 75% of the respondents are between 30 and 50 years old. The fact that respondents are people, who are more involved in the economic activities, ensures the validity of the answers.
Member numbers of families
The result suggests that every family has four members average. Some 57% of the total family members are male and 42% of them are female. The sample population states that 68% of family members are within the labour force and 32% of family members are less than 18 years old. We could say that during the first phase of the Ramshar development, building of educational, hygienic, sport and other urban spaces for the group of 7-18 years old are very much needed. The target of Ramshar is to lodge 5000 people during its first development plan. It means that Ramshar has to give facilities for 1135 persons equal to 24% of the Ramshar population during the phase.

Employment
The obtained data show that 20% of the responders are unemployed. Approximately 80% of the employed people work at governmental organizations and only 20% of them work in private sectors. We recognized that people in the state sectors do not receive more wages compared to private sector employees, but they have special powers and advantages which will have caused a widespread inborn corruption. The dishonesty tends to prevent the growth of private sectors. Table 10.1 reports results for various kinds of economic sectors.

Table 10.1 Number and share of jobs in different economic sectors

<table>
<thead>
<tr>
<th>Type of job</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unemployed</td>
<td>56</td>
<td>20</td>
</tr>
<tr>
<td>Other jobs</td>
<td>30</td>
<td>11</td>
</tr>
<tr>
<td>IT and computer</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Military</td>
<td>120</td>
<td>43</td>
</tr>
<tr>
<td>Education</td>
<td>30</td>
<td>11</td>
</tr>
<tr>
<td>Care and hygiene</td>
<td>20</td>
<td>7</td>
</tr>
<tr>
<td>Private sectors</td>
<td>20</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>280</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: (Shahraki, 2006)

Income of the regional inhabitants
According to the obtained data regional people have varying levels of income. Almost 50% of respondents were paid less than 3000 Rials monthly, approximately equal to 100$ per month. Only 14% of them receive 5000-8000 kRials per month, see Table 10.2.
Table 10.2 shows the fact that the majority of the people are poor indeed apart from some particular individuals. Therefore the incomes are not at all in proportion with the high prices of the buildings.

<table>
<thead>
<tr>
<th>Income/month</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;8000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5000-8000</td>
<td>40</td>
<td>14</td>
</tr>
<tr>
<td>3000-50000</td>
<td>100</td>
<td>36</td>
</tr>
<tr>
<td>1500-3000</td>
<td>110</td>
<td>39</td>
</tr>
<tr>
<td>&lt;1500</td>
<td>30</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>280</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Source: (Shahraki, 2006)

10.4.5 Impact of Ramshar’s project on the socioeconomic development

We checked whether the building of Ramshar will improve the quality and quantity of people’s life. The analysis is used as an example to see if the project will increase investments in the region or not. We collected the various ideas of regional people on the question and categorized them in Figure 10.1 below.

Figure 10.1 Ideas on positive impact of Ramshar in the region
Source: (Shahraki, 2006)

10% of the regional population believes that the Ramshar project will not improve the regional development while a higher percent of people expects
positive regional impact for Ramshar. 31% have their doubts. It seems that most regional people have a positive expectation for the future of Ramshar.

10.4.6 Ideas about different regional impacts of Ramshar

We asked the sample of persons about their views on the impact for the regional development of Ramshar new town. The opinions of respondents about the various impacts are summarized in Figure 10.2:

![Regional ideas about different impact of Ramshar](image)

Figure 10.2 Ideas about different types of regional impacts of Ramshar.
Source: (Shahraki, 2006)

As you see in Figure 10.2 the share of respondents who do not believe the positive impact of Ramshar, particularly in terms of improvement of life is 21%. On the other hand, some 16% of respondents believe that the project will cause advantages for the region. Some 14% does not expect that the project will increase cooperation in the region. Approximately 49% of respondents believe that building Ramshar will create a positive development result.

We also explored the regional opinions if the building of Ramshar is a correct decision. Table 10.3 shows the average grade which people gave for the idea of building Ramshar. The lowest grade is 0 and the maximum grade is 20, thus an interval between 0 and 20, as it is usual in Iranian schools.

<table>
<thead>
<tr>
<th>Description</th>
<th>Grade range</th>
<th>Average</th>
<th>Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growing cooperation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creating advantages</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Growing Investment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Growing life quality</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
To build Ramshar is a right action
From 14 to 20  17  99
I have my doubts on the project
From 7 to 13  10.5  40
To build Ramshar is totally wrong
From 0 to 6  3.5  141

Source: (Shahraki, 2006)

Thus, people gave the grade 9.3 from total of 20 to the decision of building the new town of Ramshar. In fact, some people have many doubts about the future of Ramshar and they are not optimists. This grade proves that people fear failures in terms of planning, design, constructing, using building materials, required infrastructure, management and distinct laws. It indicates that the types of houses characteristic of Ramshar may not be suitable to the lifestyle of the regional people.

10.4.7 Impact of Ramshar on the labour market

Let see if Ramshar will influence on the labor market positively. Let also understand if the answer is yes how and in which extend? We selected six significant indicators related to impact of Ramshar on the labor market. Please see the result in the following table:

<table>
<thead>
<tr>
<th>Type of impact</th>
<th>Not true</th>
<th>Having doubt</th>
<th>True</th>
<th>No idea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth of job opportunities during the next 10 years</td>
<td>28</td>
<td>42</td>
<td>26</td>
<td>4</td>
</tr>
<tr>
<td>Shortage of work force will appear</td>
<td>46</td>
<td>15</td>
<td>30</td>
<td>9</td>
</tr>
<tr>
<td>The demand for educated personnel will increase</td>
<td>72</td>
<td>17</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>The demand for unskilled and uneducated personnel will decline</td>
<td>36</td>
<td>32</td>
<td>25</td>
<td>7</td>
</tr>
<tr>
<td>Illegal economic activities and smuggling still will increase</td>
<td>14</td>
<td>35</td>
<td>44</td>
<td>7</td>
</tr>
<tr>
<td>Ramshar will be more attractive as a workplace</td>
<td>78</td>
<td>14</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Source: (Shahraki, 2006)

The empirical data state that a majority of respondents do not believe that Ramshar will affect the labour market positively. You see in the table that 92% of respondents believe that Ramshar will not supply job opportunities. If you
look at other indicators in the table you do not generally see a positive judgment about the impact of Ramshar on the regional labor market. On the other hand, since Ramshar is a border town the problem of smuggling can have an impact on the responses. Almost 48%, think that the building of Ramshar without modern traffic infrastructure and digital instruments will boost the illegal economy and smuggling.

10.4.8 The housing market in Ramshar

The regional planners need to understand why Ramshar does not attract people and whether the failure depends on the types of building production. We asked people in the region about the types of buildings, the kind of applied building materials, the architectural views of houses and the amount of money they want to invest in them. Table 10.5 tells the result of the empirical observations.

Table 10.5 Percentage of interest in various architectural types of buildings

<table>
<thead>
<tr>
<th>Architectural characteristics</th>
<th>Respondents</th>
<th>Interest/percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm and modern architectural structures, anti-earthquake</td>
<td>156</td>
<td>56</td>
</tr>
<tr>
<td>Firm and traditional structures, anti-earthquake</td>
<td>124</td>
<td>44</td>
</tr>
</tbody>
</table>

Source: (Shahraki, 2006)

You see in Table 10.5 that 56% of people prefer modern architectural styles. A large percent of people would like traditional architectural types as well. However, both groups insist on firmness and resistance of the buildings against earthquakes and natural hazards (Shahraki, 2006). Another significant factor is the economy. Therefore, Ramshar needs new technology and knowledge to decline the costs of productions. We also asked people if they want flats or villas. Table 10.6 tells what the respondents prefer relating to their lifestyle.

Table 10.6 Measuring demand for various houses

<table>
<thead>
<tr>
<th>Types of houses</th>
<th>Respondents</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Villa of more than 500 square metres land</td>
<td>26</td>
<td>9</td>
</tr>
<tr>
<td>Villa of 200-500 square metres land</td>
<td>100</td>
<td>36</td>
</tr>
<tr>
<td>Villa of 200 square metres land</td>
<td>120</td>
<td>43</td>
</tr>
<tr>
<td>A 2-4 room flat</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>A 2 room flat</td>
<td>31</td>
<td>11</td>
</tr>
</tbody>
</table>

Source: (Shahraki, 2006)
The data in Table 10.6 generally states that people prefer villas to live in. This is understandable since people produce livestock and agricultural commodities and they could not live in flats. Some 88% of the respondents prefer villas sitting on 200 $m^2$ land compared to flat alternatives preferred by only 12%.

The observation proves that the flat building in Ramshar is a basic error. The field observation further contributed to the understanding of the regional market demands for the building production and urban services to be offered. People would simply like to see detached houses in Ramshar rather than apartments.

10.5 The findings of the case studies

10.5.1 Need for new urban planning methods
The purpose of the case study in this chapter was to contribute to the understanding of the reason of the urban planning, design and building failures in the region. The goal was to predict the needs for different types of buildings as well. We understood that the development of Ramshar requires a new systematic method. The methods should be composed of well-planned housing and town building plans under umbrella of regional strategies.

10.5.2 Stopping the current problematic direction
The site of Ramshar has been selected on insufficient grounds. According to place requirements and site planning techniques, described in this thesis, the place is not appropriate. The place has not good soil in terms of resistance to various climatic tensions, vegetation is lacking, and there is low tolerance towards storms. The place of Ramshar does not have natural water resources necessary for urban water either.

Within the new town project of Ramshar developers have constructed hundreds of flats which are empty now. The buildings seem to have been built without respect to the lifestyles of local people. Ramshar does not have adequate transportation facilities and people cannot move in and out of Ramshar, see also chapter 8 in this thesis. We think Ramshar does not have bright possibilities to be expanded. The general plan of Ramshar should be revised. The development of Ramshar along the current trajectory runs the risk of being extremely limited in the future because of the hindrances mentioned above.

10.5.3 Increasing the capacity of organization and management
Ramshar suffers from lack of professional knowledge and competent management, absence of public participation, lack of distinct laws and suffers
greatly from the ongoing deep-rooted corruption. Therefore, before every urban
development in the future the structure of the administrative organization and its
ability should be renewed. An auditing, assessment and controlling mechanism
will have to be established to judge the results of state funding investments,
periodically, see also chapter 6 of this thesis.

10.5.4 Using the regional and urban economic laws
The origin of the decision to build Ramshar has not been built on an acceptable
planning process. The town building standards and codes, feasibility studies,
looking for the best optimal place, existing of the natural resources particularly
water resources and urban economic principles were not included in the
decision making method. Therefore, the new town of Ramshar has to base its
planning on the classic laws, codes and disciplines of urban design and
building. It also must stand on the particular climatic and socioeconomic
local/regional conditions. The new town of Ramshar is a state project and
particular official agencies use the money and natural resources without enough
public control and monitoring. Ramshar should report its financial activities
periodically and clearly according to modern economic accounting principles.

10.5.5 Increasing of the planning and design ability
We understood that the apartments and houses which have been built are not
suitable to the climate, and to the socioeconomic necessities and lifestyles of
the regional people. So people are not willing to work or live in Ramshar. New
building plans should be provided by spreading information in the society widely
to benefit the best possible engineering, architectural and economic ideas. The
innovative structural plans should be adapted to the hard climate by their
physical design and environmental considerations. Engineers should aim to
supply high-standard and functional built environments by drawing up new
building plans, providing new street maps, and plans for public structures and
public spaces.

10.5.6 Use of regional water management techniques
The most significant obstacle to develop Ramshar is the lack of water
resources. Ramshar depends on the Hirmand River which originally comes from
Afghanistan, see chapter 6 in this thesis. However, other components of natural
resources are damaged because of rapid degradation of the environment.
Particularly soil and vegetation have been damaged badly. The degradations
interrupt the natural circulation of water. Ramshar is not able to exist without
hard attempts to adjust to the climate and to stop the depletion of the natural
resources in the region. Therefore, Ramshar parallel to its urban buildings should work with necessary projects about the effective use of regional natural resources.

10.6 Conclusions

The theoretical part of this chapter had two sides. One was a historical studying the face of the new towns. The other was about the working views of the new towns. The case study observed the new town of Ramshar to understand how the failure of the new town planning, design, and building method had emerged. The main purpose of the chapter was to discuss how to plan, design, and build sustainable new towns in Iran attractively. While the population growth in metropolitan cities causes many critical urban difficulties the planners and developers need to build the new towns in a way which is acceptable to the people who are to have their homes there.

Therefore, we believe that the decision to build new towns and to distribute the population in them was a logical and rational target. Nevertheless, the policy has not been in favor of a sustainable development because the new towns have been built without feasibility studies and well planned programs. The new towns had not the chance to use the public wise men and to use the public participation so that they did not meet desirable outcomes. You read in earlier parts of this chapter about ideas of the respondents on the building of Ramshar new town. There people gave the score of 9.3 from total 20 which it means a notable failure. The important new element of this investigation is that the inhabitants themselves have been given a voice along with the government experts.

This chapter argued that the place of Ramshar is not a suitable site while finding a suitable place to build a new town is a basic step within the process of every new town planning. The fact that the new towns are constructed under the pressure of anxieties without enough pre-studies and forecasting causes bad architectural and physical results. Most new towns did not follow the acts, the standard codes and academic and professional processes to become beautiful and attractive. We observed an imbalance between the public urban spaces and residential spaces in the new towns so that the new towns became only dormitories. The new towns need new urban infrastructure.

This thesis argued that the texture of the population in the new towns should not be monotonous. Every city should give a chance to all groups and classes of people to live in a dynamic working place. This social variety is possible via provision of homes for different social groups. Generally, a standard and well-planned city has its own strategic program about the number of households,
homes, services, and jobs, where it can involve the inhabitants, while the observed new towns do not have such programs.

Another big challenge to build a new town is the management system. The new towns need modern, responsible, creative, and expert managerial teams. The modernizations should influence all perspectives of the new towns. New towns should be modernized from planning, physical design and infrastructure views. They need modern building materials, new technologies and advanced maintenance schemes. We observed the need for clear regulations to hand over the flats, villas, land, and other production of the new towns to needy people and to combat the deep corruption.
11 Collective results of the thesis

11.1 Main goals of this thesis
This thesis research is the result of my several years of teaching and practice in urban planning and design. I was recognizing the need for improved urban planning methods in workshops and learning environments. This research started from the problems that the new towns face and which will squander every work task and resource consumed.

During the academic research work and workshops, we recognized a major difference between the advanced developed regions and the developing populated problematic regions in urban planning and design projects. In the advanced regions the urban planning and design have strong intellectual, artistic and spiritual aspects, while in the developing regions it has extreme views of the needs, problems and social crises. Therefore this research is a problem-oriented study. The research has begun with the introducing of 12 groups of problems. The 12 groups included the discussed planning problems in the literature and those experienced in the new towns.

Thereafter the aim was to contribute to increasing the knowledge body about the urban planning and design. This thesis also intended to collect the practical experiences for planners and developers working at the regional level. The case studies of this research became the avenue to pursue the aim. The thesis opened the discussion on sustainable urban planning and design to increase the awareness of the critical urban planning which millions of people meet in the regions. The research recommended changes and improvements in the current non-sustainable urban planning and design tradition.

11.2 Uncertainties, problems and failures in Iran's new towns planning and design strategy
Traditionally during the recent five decades the department of housing and urban development has the task of guiding and regulating of the housing and new town building. After the Islamic revolution according to the thirty first principle of Iran's constitution the Islamic state should provide housing for all Iranians: “Housing is the right of every Iranian individual and family. The state is bound to provide the implementation of this article” (Constitution of the Islamic Republic of Iran). During the recent thirty five years the government proceedings have seen ups and downs. In the eighties, influenced by the ideas of the revolutionaries, the government confiscated lands and homes. The state and the charity organizations gave lands and mortgages to the poor people.
The Jihad organization was also much involved in the development work, but almost all of these policies were cancelled later. In the 1990s the result of the eight year war with Iraq and due to internal conflicts the provision of a home became more difficult and costly. Today the department of housing and urban development is a weakened and corrupted office. The Housing foundation is another revolutionary institution working on housing issues primarily in suburban cities and villages. During the last decade the state issued a new housing program called for the Mehr (affection) project. Tens of thousands of apartments were built, but the projects were unfortunately full of those 12 problem groups discussed in this thesis. Recently the new transport and town building minister announced the Mehr project to be failed and cancelled. (Isna, Iran’s student news agency, 2013-11-10)

Land, houses and other real estate in today's Iran have a strong business feature. People invest their capital in the real estate to avoid the banks and to keep the value of the money against higher inflation, which is currently booming at 36% (Central bank of Iran). They expect to sell their real estate after a time with a large profit. With this situation, the vast majority of people such as youth and women remain homeless. Since housing and urban development managers are non-elected, corrupted and incompetence the urban crises have increased. The twelve problem groups are greatly exacerbated. Urban planning and design is confused and no specific strategy is in sight. Thus, the regions of Iran, and their cities and towns, need new methods in sustainable urban planning and design.

11.3 The theoretical implications of the thesis research
This dissertation presumed that the 12 groups of obstacles would be resolved to meet the sustainable urban planning and design, see Table 2.1. Then, it studied the concept of sustainability (following Kinsley, 1997) to understand what perspectives a sustainable built environment should have, see also (Orrskog, 1993). In this field, the thesis suggested that a sustainable new town planning and design system requires knowledge and new technologies ((Seto and Christensen, 2013). Theories on natural and water resources anxiety have been explored ((Merret, 2002). The thesis suggested that the theoretical framework of an urban planning and design shall include the planning and management of urban water in the earliest step of the process. Then the thesis studied the aspects of the environmental sustainability (Vadiati and Kashkooli, 2011) to suggest the theoretical ways for the institution of the sustainable environment. It has been studied that the urban planning process in Iran does not include a suitable relation among the authorities, the knowledge bodies, and the people (Ziari, 2009). So, the ideas on planning and public participation have been explored to improve the planning perspective in the regions (Sager, 2011).
This thesis argued that ideologies are the basis of urban planning and design. Ideologies, cultures, and lifestyles create social regimes and urban decision systems (Wallerstein, Brenner et al, 2011 and Asplund, 1993). The relevant theories on the skeleton and physical perspective of the new towns have been studied to provide theories on the issue (Rolleston and Awatere, 2009). Natural disasters and earthquakes are major sources that threaten the new towns, see Table 2.2 (Tasnimi, 2001).

The thesis studied the theories in this field to aid the theoretical framework of the urban planning and design. The thesis presumed that lack of urban infrastructure made the new towns unstable. Therefore it studied the theories on the matter to add to the knowledge on the relevance between urban infrastructure and sustainable urban development, starting from what contemporary scholars stated (Snickars et al, 2013, Sheffrin, S., 2003).

Theories to plan and design when working with new towns have been studied when the cities are usually dormitories in Iran and they are not planned for permanent urban functions (Shahraki et al, 2010). Functionality in theory will affect positively the theoretical framework of urban planning and design. This thesis explored the theories on the architecture and beauty of the new towns (see Güter, J., 1987), cultural (see Carset al, 2005) and traditional discussions and social conflicts to recommend better ideas and concepts in the areas, see (Christopher, A., 2001), (Tofigh, 1990) and (Research group, 2010). One significant theoretical contribution of this thesis is the fact that the 12 problems in urban planning and design affect each other as an interwoven web interactive web.

The theoretical explorations of this thesis demonstrated a general agreement of the classical scholars and recent modern specialists with the hypotheses of this dissertation. The idea of the thesis to base the urban planning and design system on a problem-oriented method proved to be useful for the regional planners and developers. The thesis contributed to the theoretical foundation for a better applied urban planning and design system in the region and suggested appropriate linkages to theories to develop sustainable new towns.

11.4 The experimental results of this research
By the help of the theories provided, the empirical chapters of the thesis have started with a more practical view of research on the various obstacles on the way towards sustainable urban development. It has presented feasible and systematic work process of urban planning and design to overcome the problems in the regions.
The two case studies in the fourth chapter of this thesis have been done with the help of the problem-oriented and benchmarking method in the micro, meso and macro perspectives. The case studies challenged the validity of the theories and ideas on the subjects concerning sustainable urban planning and design. Chapter five of the thesis suggested that the lack of the knowledge in the urban development projects caused many crises. The chapter suggests to make a pertinent regional knowledge network in collaboration with the global knowledge bodies.

The sixth chapter recognized the absence of urban infrastructure as a meaningful problem to build urban areas sustainably. The thesis presented the model of the Trans Sistan Network to build both urban traffic infrastructure and regional transportation networks with a corridor approach suitable for the region. The seventh chapter understood the water shortages in the region as a main hindrance for urban development projects. Therefore it presented a comprehensive model to extract water from the rarely occurring but sudden and sharp floods. The model instructs how to obtain water, to store it in hydraulic storages and how to manage the urban waters with the help of a so-called hydro social change balance.

Chapter eight of this thesis contributed to the discussion of issues relating to the provision of energy. It identified the advantages of the ancient architecture when they used natural energy and encouraged the designers to get inspiration from the ancient architecture with the help of the new technologies to use natural and renewable energy.

Chapter nine was intended to help the urban planners to rebuild the informal urban districts. The problem of unauthorized neighborhoods is wide and difficult indeed. The thesis explored the reasons for the informal expansions and presented a renewing program. The renewal program used the concept of mother projects for rebuilding or new building of the city in three different dimensions.

Chapter ten of this thesis presented a practical model for predicting the necessary urban spaces and building based on a market analysis. This model will make the new towns attractive when the developers will understand the consumers’ ideas about their productions. The chapter represents a breakthrough in finding out consumer preferences and attitudes for urban development programming. Through the results we witness how a sample of regional inhabitants conceives different urban development alternatives and how their own future plans match these processes.
11.5 Collective results of this thesis for solving the new town problems

This thesis understood that sustainable urban planning and design needs theoretical and ideological frameworks to lead the urban planners towards strategic desirable determined goals and to avoid planning fiascos.

The findings of this thesis show that the twelve groups of problems require working with the following strategies in the regions to meet sustainable urban planning and design:

- Generating awareness in public opinion and particularly in the professional community about the vital need for better urban planning and design.

- Formulating of strategic plans for revitalization and rehabilitation of the natural resources and environmental components are necessary prerequisites; otherwise the regions are in really risky positions.

- Provision of plans for building urban infrastructures in both hardware and software facilities is of fundamental importance but also fundamentally difficult.

- Working locally with a global outlook is necessary. The planners and designers in the regions should benefit from the global funding possibilities, knowledge stocks and technological progress.

This thesis argued strongly that the nature of urban planning and design in different regions is different in some fundamental degrees. While urban planning and design in Iran should continue to tackle the critical problems and the huge demand pressure in the advanced and postmodern countries, the conceptual and artistic perspectives of the urban planning and design is more recognizable. We hope the discussions, analyses and models presented in this thesis will be useful for the people who are active in the provision of a better built environment and consequences for a better life for people. Our fundamental claim is that the new town planning should be based on new knowledge placing the future inhabitants in the centre. Their quality of life is a strongly determinant factor for the future economic and social viability, and vitality, of Iranian new towns.
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Sustainable new towns in Iran

Re/flections on problems and practices of urban planning and design using case studies

ABDOL AZIZ SHAHRAKI

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