Application of DPSIR Conceptual Framework in Analyzing the Impact of the Type and Level of Physical – qualitative Changes on Urban Construction

Sina Ataee[1], Ali Soltani[2], Kalil Hajipoor[3]

1. M.A in Urban Planning, Faculty of Art and Architecture, Shiraz University, Maallabad, Goldasht, Shiraz, Iran
2. Professor of Urban Planning, Faculty of Art and Architecture, Shiraz University, Maallabad, Goldasht2, Shiraz, Iran
3. Assistant Professor of Urban Planning, Faculty of Art and Architecture, Shiraz University, Maallabad, Goldasht 2, Shiraz, Iran

Abstract

Diversity and complexity of the process of physical changes in urban environments have led to consider the conceptual framework as a tool for simplifying the perception of changes in identifying the indicators and variables affecting changes and changes types resulting from classifying variables and indices. The conceptual framework can be used to identify the levels of study and kinds of variables as well as to analyze, and illustrate their impact on the environmental change. The present study has adopted structure of DPSIR conceptual framework with the aim of introducing a functional tool capable of describing and classifying variables affecting such physical changes in urban areas, regarding kind and level of effectiveness. This conceptual framework is considered one of the most common analytical tools in environmental studies. DPSIR is the acronym which stands for Drivers, Pressures, States, Impacts, and Responses. In this study, the causes of physical changes occurred in the study area (Region 11 of Tehran Municipality) and their implications have been identified through the study of content analysis of the urban plans and methods of field data collection (such as questionnaires and interviews) on the basis of DPSIR conceptual framework with respect to the level and type of impact each variable exert on the descriptive analysis method. The results of the analytical-descriptive diagnosis show that four variables of intention to reside, immigration, ethnic orientation and expanding markets for goods and services in the study area are the key drivers of change in the status of the physical and social structure of the area.

Keyword: DPSIR, Land Use Change, Environmental Impacts, Spatial Quality Change, Region 11of Tehran Municipality

1.Introduction

Diversity and complexity of the process of physical changes in urban environments have led to consider the conceptual framework as a tool for simplifying the perception of changes in identifying the indicators and variables affecting changes and changes types resulting from classifying variables and indices. The conceptual framework can be used to identify the levels of study and kinds of variables as well as to analyze, and illustrate their impact on environmental change. Therefore, the structure of conceptual framework is highly effective on the conceptual frameworks of the problem, so that the frequent wrong classification and absence of recognition of variables make the problem solving complicated and vague or even infeasible. This issue is more complicated when research problem such as issues of land use entails great perceptual- content complexity. Therefore, the use of an appropriate conceptual framework and mastery of its functions can be studied as a research problem. In this study, the problem has been stated in the DPSIR conceptual framework in association with physical changes derivers in urban areas. Since changes in land use are affected by physical variables impacts on changes in social and economic structures of cities on one hand, their implications have an impact on all subsystems of urban organization on the other hand. Thus, perception of change factors using former urban plans content analysis in previous decades and their classification on the basis of their type and kind of impact in the form of a conceptual framework would be a useful tool in the decision making process to adopt effective strategies.

The purpose of this study is to identify and analyze the role of factors affecting physical changes through the study area based on the DPSIR conceptual framework.

2. Literature Review
2.1. Background Studies

DPSIR framework has been widely used in environment planning. It been used as a tool in planning-related research on land cover and land use. So far, examples of such research are given in the table below (Table1.)

3. Materials and Methods

In order to collect the required Information Process Data, library documents and field methods have been

----
*Corresponding author.
Sina.ataee.shahrsazi@*gmail*.com

applied. Content analysis of urban plans and related documents as well as field study perceptions are used to discover the affecting factors on land use changes and their type and level of impact and decision-makers' responses to changes' results have been classified in terms of DPSIR conceptual framework and analyzed. The following figure shows the research process: (figure 1.)

3.1. Case Study Area

District 11 in Tehran Municipality with an area of about 1200 hectares and a population of about 240 thousand people is one of the important central areas in Tehran metropolis. Most projects regarding the upper part of downtown introduce this area as a core part in the city. The special characteristics of this region are the diversity of activities and applications. Important political government centers, regional markets with trans-regional function, major industrial units, specific uses, specialized medical centers with trans-regional function, and major regional art and music centers in a wide variety of physical fabrics adjacent to residential areas have been established in the district. Weight and authority of the above-mentioned is to the extent that any of the activities mentioned above cannot be one-dimensional dominant role in the region 11. This is the very feature of urban centers [6]. Establishment of trans-regional applications such as Hor Garrison and Beit-E-Rahbari and also a group of cultural and artistic leaders of the City Theater at Tehran University derived from government policy (national and local) caused changes in the nature of the residential function and physical structure of the region, So that by deploying military use, residential construction in the surrounding regions has increased despite the fact that the requirements of regional and political use, and dedicated special zones lead to rupture in residential physical fabric. Applications such as City Theater provide space for social interaction and recreational activities in the region. In addition to Trans-regional function, such applications show point and zone impacts on the internal structure of the area. In other words, the establishment of such a cultural complex on the northern edge of the region not only increases the spatial quality of the region, but extensively influences on Valiasr street and Enghelab street by formation of the composition cultural institutes, art schools, and etc. On the other hand, investors have been investing in industrial – workshops fields in southern area with the expansion of goods markets and services in northern area, especially in the edges of Jomhori, Kargar-e-Joonobi, Valiasr and Enghelab streets resulting in mixed work shop centers with residential structure, weakened residential function and thereby reduction in the residential appeal of the region. Labor immigration and the formation of social contexts with low economic potential are among other impacts of these investments in the southern part of the region. Following such changes in the residential

application, developers intended to change the application of natural and social structure of the region to commercial one. The general tendency of the original inhabitants of the northern metropolis has been reduced leading to immigration to other areas in the Northern metropolis. General trends of residents are to migrate to other parts and investors tend to invest more on business applications and services. Also, ethnic segregation caused by mixed immigrants from different parts of the country led to the weakening of social cohesion. In the analytical part of the study, changes are classified and recognized based on the DPSIR conceptual framework [7].

3.2. Concepts, Perspectives and Theoretical Foundations

3.2.1. DPSIR Conceptual Framework Introduction

There are many conceptual frameworks to study the environmental indicators. Among them DPSIR framework is widely used because of its capability for reflecting the exist and future needs. This framework has initially been used as PSR including Pressures, States and Responses by Organization of Economic Corporation and Development (OECD) in 1994. But many commentators felt that this framework is limited in showing the factors that instantaneously effect on environmental change and social, economic and institutional(organizational) aspects that create such pressures are not included. Such critiques led to the introduction of the concept of derivers. Similarly, others felt that this framework may not solve the problems stirring up the community, so the Impact concept was added to the context [8]. Titled DPSIR, this framework was first proposed by European Environmental Agency (EEA) to deliver environmental reports. It offers a formula for the relationship between different areas of human activity and the environment in the form of causal relations to explain environmental issues [9]. According to the framework, the process of environmental management as a recursive cycle includes the following five steps:

1) Derives

Driving forces are originated from needs; it means that the need for something is felt in the communities, and accordingly, the necessary forces are created or dominated to meet the needs. So the driving forces change in relation to needs. This feature causes a contradiction between the driving forces of different stakeholders as their needs are different. For example, in land economy sector, private developers and investors determine the driving forces originated from the needs of being profitable and reducing construction costs; while in terms of national policy driving forces are originated from the need for reducing unemployment,

increasing employment and providing house for all people from different social classes [10].

2) Pressures

Human activities exert pressures on the environment; the results of the process of production and consumption are such examples. These pressures can be classified into three main categories:
-Extensive use of natural resources
-land use change
-Emissions of greenhouse gases, chemicals, swages, noise and radiation into atmosphere, water and soil.
Therefore, land use changes as one of three main human behaviors stimulates the environmental processes in natural, economic and social structures. For example, construction licensing, as the permission for land use change in the urban area is the kind of pressure that causes changes in the physical structure and consequently affect the social and economic structures [11].

3) States

Environmental state is affected as a result of such pressures, and as an implication the quality of various environmental factors changes in relation to performance. For example, immigration to cities as a result of pressure causes structural changes in the physical and social conditions. The arrival of new immigrants to a metropolitan area causes changes in behavior and social patterns governing the area and the physical context changes proportional to their income level [12].

4) Impacts

Changes in physical, chemical and biological aspects of the environment determine the ecosystem's quality and human's welfare. In other words, changes in states may have economical or environmental impacts on ecosystem's functions, the bio-acceptance ability, and finally community's economic and social performance. For example, irregular increase in construction of tall buildings in an urban area decreases the quality of the residential environment in the region. Conversely, increase in providing green spaces and leisure space improves the spatial quality. These impacts are known as direct impacts. Sometimes the causes leading to changes in the physical structure of the cities can't be seen clearly. These changes are indirect impacts of pressures which can be identified in long term [13].

5) Responses

The responses given by society or policymakers are the result of unsuitable impacts. These responses can be made to each of the raised portions of drives to impacts. One of the examples of responses that are related to the driving forces is a policy change in transportation from private to public. And one of the examples of responses that are related to pressure is increasing levels of industrial-service jobs in urban areas, which can be considered as an environmental pollutant [14]. The following Figure shows the schematic DPSIR's conceptual framework (Figure 2). This framework is very useful to describe the relationship between the roots (causes) and the results of the environmental problems. But in order to understand their dynamics nature, concentration on the relationships among the elements is necessary and useful. For example, the relationship between the drivers and pressures caused by economic activities is an economical productivity and technological performance related to the system which is used. If economical productivity increases, the pressure caused by drivers will decrease subsequently. Similarly, the relationship between the impacts on human, ecosystem or states depends upon the threshold and state of systems. Moreover, the community's responses to the impacts are dependent on the method of understanding and evaluation of the impacts, and the responses which are resulted from driver's behavior depend on the effectiveness of the responses [15].

3.2.2. DPSIR framework and decision – making

In this framework, the duty of the decision-makers is to analyze system and evaluate the driver's roles, their pressures, their effects on variables of state and finally the impacts such as their external consequences. These groups determine the appropriate responses to direct resulted impacts toward desirable way through impact assessment. Therefor drivers, pressures and states are the possible involvement levels. Decision maker chooses one of the levels or combinations of them in order to apply a response within the scope of its authority, responsibility, and ability. In reality, the local managers are not actually able to intervene in social and economic drivers, but their authority is effectively linked with environmental states and sometimes with pressures. Conversely, policy makers in higher levels who have influence on the pressures and drivers, have less chance of direct intervention to the environmental states [16].

3.2.3. Strength and Weaknesses of the DPSIR framework

The strength of this framework is the point that it comes up with a simple way for planners to communicate with the environmental state (in various physical, social and economic aspects). This framework forms the association between various rules and principles by making relationships between different sectors of the society and the form of the city, also it is helpful to understand the relationship between researchers, policymakers and stakeholders. One of the problems with this conceptual framework is that the environmental problems cannot be easily converted into other indicators or make relationship between the indicators. However, while this method is highlighted as a useful tool in analysis, this framework is confusing for

many unprofessional users to be used and to come up with clear indicators. The reason is that this framework is used as the mere tool for summarizing trends in various problems rather than providing a causal relationship between the various elements [17]. Hence, the DPSIR framework is still far from an effective practical methodology for the decision making process which basically lacks executive output. Adjusting this framework for DSS requires the development of an innovative theory and methodologies which presents a descriptive report in terms of a framework for integrated assessment modeling (IAM) and evaluation of procedures. However, in the studies of land use, regarding its complex relations with other studies of the impacts on environmental changes, this framework can be used to identify the key drivers of changes and their impact and responses which can be given to each of the changing levels.

4. Analysis, Results and Discussion
4.1. Recognition of Physical – Quality Changes
Given the results of urban layouts content analysis, the existing land use situation assessment, and the conclusions resulted from the interview with the regional municipal authorities, changes in the region can be explained in four categories as the following:

4.1.1. Management paradigm shift (from traditional to modern) and immigration
During the first Pahlavi era (1920-1940), we witnessed the destruction of old or historical context to make way for the new in cities, especially in the capital, among the most important of them, the creation of commercial-official land uses outside of Tehran Bazar and in the peripheral areas of main streets as a consequence of the domination of Modernism approach in the administrative structure of the country's macro-management. Occurrence of North-south phenomena in Tehran metropolis in the Second Pahlavi era and as an implication of the formation of new urban residential-commercial cores caused the social polarization in city. Since the native and residents of district 11 in Tehran had been counted as bourgeois at that time, they moved to new residential areas and were replaced by newly arrived immigrants who had low or medium economic status. Therefore, immigration of the low income to the area increased. Hence, there is no accurate statistics regarding the amount of immigrants (from) and (to) region; in order to estimate the amount of this variable, the natural increase in level of variation in population (the difference between fertility and mortality) is deducted from the general increase in level variation population. These amounts are presented in the following table (Table 2). Thus, government-management paradigms' shift in the Second Pahlavi era led to the immigration of native inhabitants and they were replaced by newly arrived immigrants. This driver caused changes in the social structure and functional

relationships in the region, so that according to existing documents (such as Farman Farmaian's plan for Tehran or comprehensive plan for Tehran), placement of the immigrants who were considered as the lower class and the poor led to an increase in the population density in region (due to the immigrant's nuclear families or the coexistence of several families together in one unit that were previously used by one family due to the inability to afford an independent unit) and caused functional decline in social and physical structure of the region (Table3).

4.1.2. Transition from residential to commercial
Since the Islamic Revolution we have been witnessing that the commercial functions have been penetrating into residential context of the region. For instance, the penetration of warehouses of trades like bookstores into the second and third layers of peripheral context of Kargar Street. It can be mentioned that those goods and services markets are developed as a consequence of private investment and tendency of people for purchasing from specialized centers and caused changes in the absolute level of housing in the region. This factor has an influence on tendencies of the residents in the region and formation of a denser residential context. The following diagrams show the ratio of absolute level of commercial to residential areas between the years 1975-2010(Diagram.1). As it can be seen in the diagram, the ratio of the pure areas of commercial to residential had been increasing toward 0.5. According to the official documents, from the middle of the second Pahlavi era (1950 onwards) the horizontal growth in the region 11 had been impossible, these changes in commercial land use occurred in terms of transition from residential land use to commercial or residential-commercial and changes in the density of renovated buildings. Hence, there is an inverse relationship between expansion of goods & service markets and pure level of residential area. The construction licensing variation diagrams and average store construction demonstrates that on one hand change in the number of construction licensing have not had linear trend of increase or decrease and have passed severe fluctuations. On the other hand, the average store construction has constantly increased through an increase trend. It can be concluded that the changes and construction developments in the region has not followed a specific paradigm of planning and particular goals and has been determined by supply and demand and the general condition of the construction market. The massive increase in the number of licenses in recent years has been due to the implementation of an old context renovation policy in Tehran. According to the regional municipal statistics, almost 85 percent of the licenses in the last 5 years have been issued for demolition and renovation. Continuation of this procedure and its physical realization can be considered the impacts of master plan of Tehran (2005); it can demonstrate the role of decision-making planners in

changing the urban context in this region for the first time (Diagram.2 and 3). Therefore, the expansion of goods and services markets, construction licensing, permission for the number of stores and commercial area changes are considered the pressures on residential context that its direct impact is changes in area and quality of residential housing. These pressures are created due to developers' investments, existing needs and general tendencies towards the construction based on municipality principles implementation (Table 4).

4.1.3. Physical implementations by public & governmental organizations and institutions

The placement of various specific land uses such as Hor military garrison, Imam Ali Military University and Beit-E-Rahbari has caused physical segregation in residential context in the region. Also, the presence of educational-cultural land uses such as City Theater hall in district 11 and Tehran University on the northern edge has resulted in the creation of cultural-educational activities, such as educational institutions, bookstores, publishing and outdoor spaces for social interaction, such as Daneshjoo park and cultural indoor spaces such as book cafes and etc. specially in Enghelab, Valiasr and Karegar streets. These kinds of activities have had an influence on the social structure of residents and users. Thus, municipality and military organizations are of the most influential institutions in the physical changes in north and central part of district 11. These changes have had an impact on nature and extension of residential areas. The impacts of these institutions are listed in the following table (Table5).

4.1.4. Changes in Spatial Quality

In this research, given the lack of processed information to evaluate spatial quality indicators in district 11, the survey method and questionnaire are used in order to understand the change in the quality and to obtain required quantitative information. Thus, some indicators categorized in two groups of enhancing and reducing spatial quality have been chosen for district 11, then native or senior residents (predominantly) have been questioned about the quality of space and their changes over the past 30years. In order to complete a questionnaire, classified cluster sampling method was used and the districts of the region are selected as sample categories; then cluster sampling is carried out in each district based on neighborhood boundaries. The Cochran formula is used to determine the sample size. According to this formula, based on maximum population of 300,000, with tolerance of d=0.05, sample size is estimated 384 people. Since most assessments are focused on the areas enclosed to Hafez to Jomhori Streets, Qazvin Square to Enghelab Street and Jomhori and Navab Freeway due to easier access to information, most of the questionnaires were distributed in these areas. The following tables show the values of the variables mentioned in the questionnaire in two

categories of enhancing and reducing quality indices, afterward they have been aggregated and the significance ratio has been implemented (Table 6). The numbers of mentioned valuable have been standardized in order to assess the enhancing and reducing quality indices, average of aggregation of indices in each decade was calculated and is shown in the following diagrams (Diagram.4 and 5). According to the above diagrams, reducing quality indices have linear trend of increase in average, meaning that there is an increase in their influence on reduction of residential housing quality in District 11. The slope of the graph is almost 0.05, while the diagram of average changes of enhancing spatial quality indices shows a goal seeking procedure with the variation slope of 0.03. Hence it can be concluded that considering the sever changes in the reducing indices and goal seeking procedure of enhancing indices, and generally reducing indices are dominating and overcoming the residential quality. So it can be concluded that reducing spatial quality indices exert some pressures on the quality of residence in the region. The indices and driving forces are summarized in the following table (Table 8).

4.1.5. Determination of the variables type and level of impact based on DPSIR conceptual framework

Based on the findings of the previous section, it can be concluded that changes in three social, physical and spatial quality levels are mostly due to the increase in propensity to invest and the immigration of work force to the region and their implications. Therefor in general, variables which have influence on changes can be summarized as following (Table 9). Among the pressures' variables, tendency to inhabit the region are under dominance of other variables. Occurrence of north-south phenomenon, ethnic orientation and mixture of ethnic groups with different cultures as well as the growing penetration of goods and services markets, entirely has affected on reduction of native inhabitants' tendency to dwell on the region and have caused immigration of natives from the region to newly developed regions. Based on mentioned under pressure states, tendency to inhabit and immigration (occurrence north-south phenomenon) directly affect the social structure and has changed social combination of the region. It has resulted in departure of native residents from the region and immigration of workers to the region looking for job. This change in the combination and social stratification has been followed by changes in physical structure as a consequence. Thus, newly arrived immigrants to the region (according to what was mentioned in the abovementioned studies) are mostly from the lower strata of society with weak economic statues resulted in the formation of dense residential context in the region. Moreover, these social changes have reduced the quality of region indices' performance from the original inhabitant's perspective, which is the main reason for their immigration from the region. Thus,

ethnic orientation and combination of different cultures and ethnics which is the consequence of immigration variable directly affect the social structure of the region. Expansion of goods and services markets is directly influential in changes in the physical structure and quality of the residential environment. This variable causes the attendance of non-resident population into the region during work hours and thus changes the regional combination and social behavior of the region. Direct and indirect impact levels of each of these variables are presented in the following table (Table 10). Meanwhile, urban planners have attempted to change socio-economic and cultural structure and physical context of the region by preparing urban development plans with various titles such as FarmanFarmaian' plan, master plan of Tehran in 1991, Atac plan and Tehran Comprehensive plan over the last 40 years. As the most important determiners of urban development process, these plans have yield responses to the changes or the

impacts resulted from pressures on the region including the functional division into three parts: governmental, residential and commercial; provision of a plan for reviewing hierarchical structure of street network especially in the southern area; enhancing the accessibility to public services; elimination of environmental contaminating activities' inconsistencies by excluding them, upgrading, modernization and reformation of residential construction principles and so on. All aforementioned responses are to states or impacts changes and none of the planners' responses has intervened in the derivers' authority or nature and kind of pressures. This means that in their encounter with implications and effects of changes, planners have been seeking for temporary solutions and have not provided fundamental solutions for changing the needs as a result of changing behaviors of derivers and their pressures on the functional structure of the region (Table 11).

Table1: Sample studies conducted using DPSIR

| Title	Researchers, year	Findings
Application of the DPSIR model to analyze ecosystem service drivers	Hou et al. (2006).	Urbanization, industrialization and economic development are the most positive drivers of supply and welfare services for rural residents. The development of agricultural land and increased agricultural economy are two important negative drivers of ecosystem capacity and living standards of local and rural residents [1].
The application of the DPSIR framework to environmental degradation assessment in Northern Ghana	Agyemang et al,.(2007).	The main drivers of environmental degradation include transportation, economics politics, population growth, immigration, and poverty. The DPSIR framework for environmental evaluation is an efficient tool for organizing complex environmental information to facilitate decision making [2].
Ex-ante impact assessment of policies affecting land use, Part A:Analytical Framework	Helming et al. (2012).	In this paper, an analytic framework for assessing the economic, social and environmental effects of land use change is proposed where effective indicators being classified based on the DPSIR conceptual framework [3].
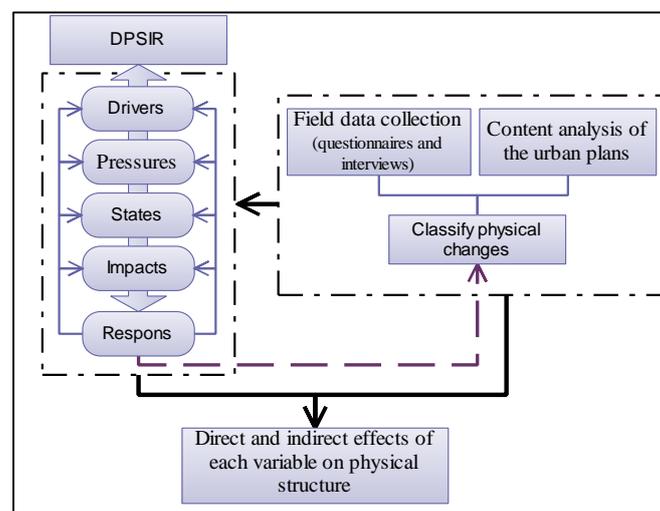
Figure 1: Process of research
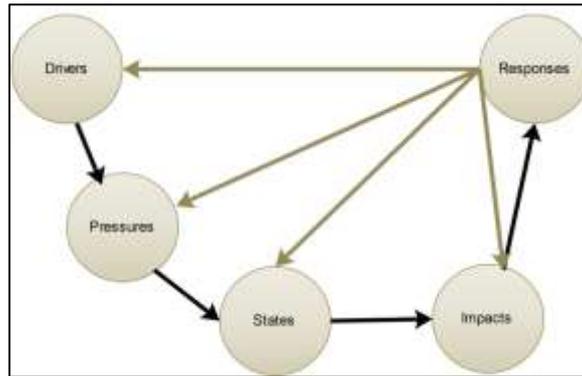
Figure 2: DPSIR conceptual framework [14]

Table 2: Number of immigrants (from) and (to) region [18]

Year	Immigrants to region(person)	Immigrants from region(person)
1976-1986	-	15252
1986-1996	-	1671
1996-2006	20114	-
2006-2011	7985	-

Table3: Driver of government-management paradigm shift in DPSIR

Driver	Pressure	State	Impacts
Creation of new urban cores due to paradigm shift in governance - Management (from the traditional approach to modern management)	Occurrence of North – south phenomena. (Widely after late 1970th)	Physical structure. Population and social structure.	Reduction of the residential attraction in the region and domestic immigration to other region. Placement of medium economic migrants. Increase in population density. Decline in physical context.

Diagram.1: the ratio of absolute level of commercial to residential areas between the years 1975-2010[19]
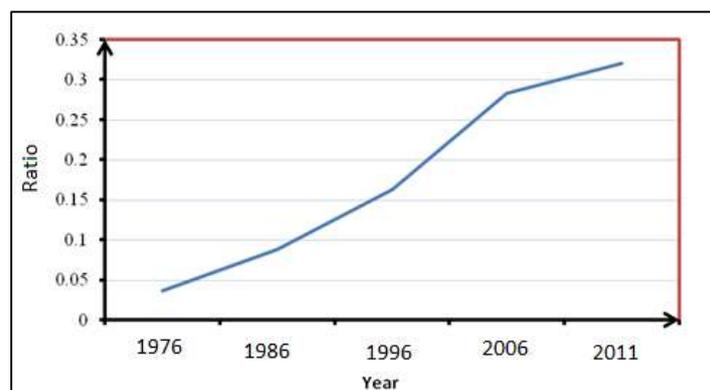
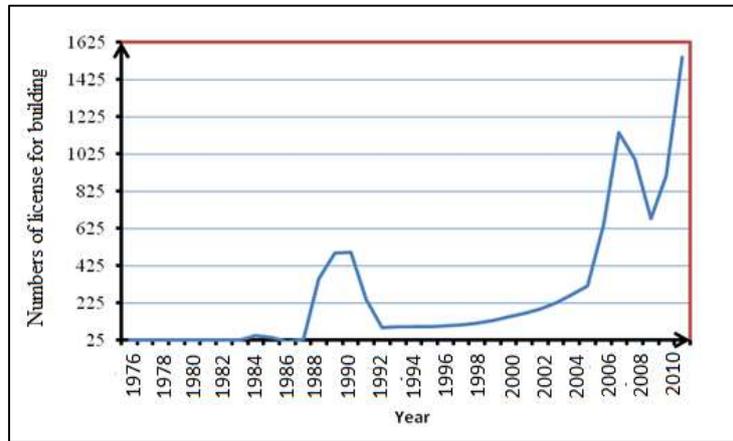Diagram.2: The construction licensing variation diagram [20]

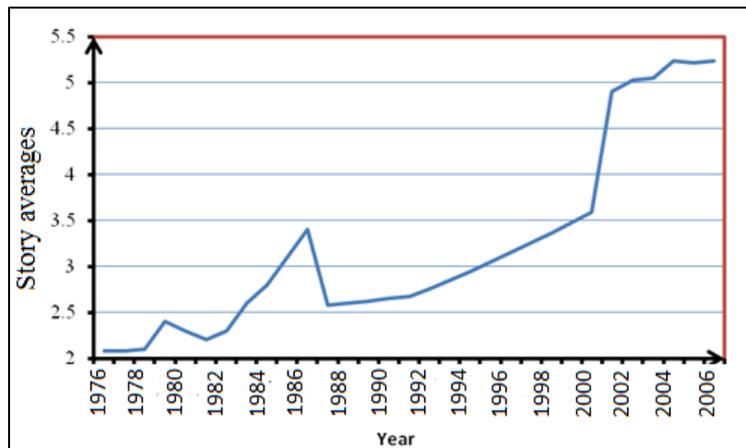Diagram.3: average of building stores diagram [21]

Table 4: variables in the conceptual framework

Driver	Pressure	State	Impacts
Developers' Investments. General tendency of society. Local principles.	Construction licensing. Permitted Number of stores. Commercial construction. Expansion of goods and services markets.	The nature of the residential function. Residential zone area.	Changes in area of residential and commercial. -transition from residential to commercial and weakening of residential function. -Mixing work shop centers with residential context. -Reduction in residential attraction in the region. - Domestic immigration to other regions.

Table5: Variables in the conceptual framework

Drivers	Pressures	State	Impact
Municipal and government	Creation of new land uses and specific functions: military - governmental, university, Art complex such as City Theatre hall. Growth and urban development: construction of Navab highway, sales of building density, horizontal expansion of the city.	The nature of the residential function. Area of residential zone. Physical structure of the city.	- Penetration of residential land uses into adjacent part of military land uses and highway. - Physical segregation resulted from the placement of certain land uses. -sever population movement due to demolition and renovation projects (Navab highway and Razi Park). -transition from the residential nature to work and business. - Formation of dense context resulting from irregular density sale. - Creation of spaces for social interaction (city theater hall) -Development of cultural- educational spaces affected by the Tehran University

Table 6: Reducing spatial quality indices

Reducing spatial quality indices	Importance ratio				Studied decade		
	4	3	2	1	1981-1991	1991-2001	2001-2011
The number of residential complexes	high	Relatively high	medium	low	0.87	1.3	2.92
Reduction of residential houses areas	high	Relatively high	medium	low	0.9	1.24	2.34
The number of noisy and disturbing land uses	high	Relatively high	medium	low	1.28	0.68	0.59
Strangers immigration to the region	high	Relatively high	medium	low	1.48	2.37	3.04
Various ethnical tendencies	high	Relatively high	medium	low	1.48	2.28	2.31
the immigration of natives to other regions	high	Relatively high	medium	low	0.88	1.52	2.22
The number of houses changed into warehouses	high	Relatively high	medium	low	1.66	2.28	3.12

Table 7: Enhancing spatial quality indices [1]

Enhancing spatial quality indices	Importance factor				Studied decade		
	4	3	2	1	1981-1991	1991-2001	2001-2011
Access to retail	high	Relatively high	Medium	low	0.82	1.38	1.98
Access to public services	high	Relatively high	Medium	low	1.56	1.62	2.37
Access to a variety of commercial land uses	high	Relatively high	Medium	low	1.56	2.25	2.34
The Number of cultural and recreational complexes	high	Relatively high	Medium	low	0.91	1.32	1.36
implementation of municipal principles	high	Relatively high	Medium	low	0.83	1.58	2.16
Variety of leisure and recreational spaces	high	Relatively high	Medium	low	0.89	0.86	0.86

1. The numbers of mentioned valuable have been standardized according to: $z = \frac{x - \bar{x}}{\delta}$.

Diagram.4: The average changes of reducing spatial quality indices diagram.
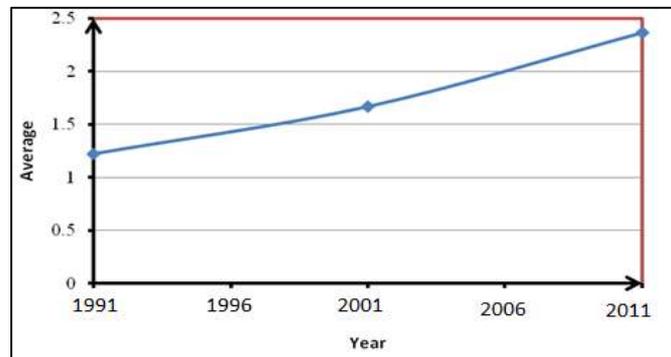

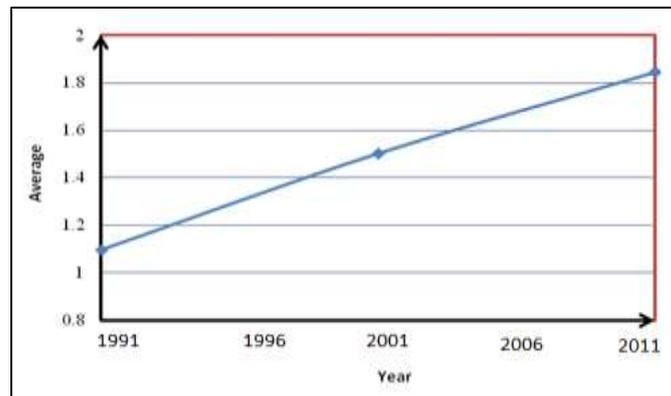Diagram. 5: The average changes of enhancing spatial quality indices diagram

Table 8: Qualitative indicators status in the conceptual framework

Driver	Pressure	State	Impacts
Society tendencies. Private Investment. Municipal principles.	Migration (from) and (to) the region. Expansion of services land uses. The average number of stores. The ratio of activity and use.	Social structure. Physical structure. land uses combination	Reduction in the quality of space. Increase in the quality of space

Table 9: The main influential variables in DPSIR framework

Pressure	State	Impacts
Tendency to inhabit. Migration (occurrence of north-south phenomenon) Ethnic orientation. Expansion of goods and services markets.	Social structure Changes. Physical structure Changes. Spatial quality Changes.	Migration of low-income to the region. High population density. Penetration of service land uses in residential context. Dense residential context.

Table 10: Direct and indirect effects of variables

Variable	Direct impact on state	indirect impact on state	Direct impact	indirect impact
Tendency to reside (occurrence of north-south phenomenon)	Social structure.	Physical structure. Spatial quality.	Immigration of low incomes into the region.	High population density Dense Residential context.
Ethnic orientation.	Social structure.	Physical structure. Spatial quality.	social segregation in Neighborhood	Physical separation in region from Cognitive Perspective (segregation between objective and subjective perception of mental-social)
Expansion goods and services markets	Physical structure.	Social structure. Spatial quality.	Dominance of commercial land uses over residential land uses.	Formation of trans-regional behavior and relationships. Decline in housing quality.

Table 11: The type and scope of planner's response on qualitative and physical changes in the area

	State	Impact
Planners' Response	- Functional division into three parts: governmental, residential and commercial. - provision of a plan for reviewing hierarchical structure of street network - enhancing the accessibility to the public services	elimination of environmental contaminating activities' inconsistencies by excluding them - regeneration and renovation of brownfields - upgrading, modernization and reformation of residential construction principles and complete control and supervision over quality of construction and building density

5. Conclusion

According to this research's findings, the paradigm's shift from traditional to modern management approaches and the policies arising from it has had a deep influence over the physical and qualitative changes in district 11 of Tehran Municipality which is considered a central region as a primary driver of the changes in Tehran during Pahlavi era. and is followed by other drivers such as tendency for private investment, changes in the public interests and urban processed principles. Domination of modern principles in management structure that has caused historical discontinuity, expansion of industrial workplaces in the central Tehran and new urban development in northern regions of Tehran also has caused great changes in the physical and social-economic structure of the central core of the city (which also includes the target region) and has resulted into innovative changes in Tehran's urban spatial organization. As noted earlier, these changes can be categorized into four groups of pressures influencing the quality and physical states of the region: tendency to reside, emergence of north – south phenomena, ethnic combination and expansion of goods and services markets. These pressures have had both direct and indirect impacts on social and physical context of the region. Meanwhile, the planners have tried to restructure the social-economic structure and

physical context of the region over the last 40 years by providing various urban development plans such as FarmanFarmaian Master Plan, Tehran master Plan (1991), Tehran Comprehensive Plan (2005) and Neighborhoods Strategic Plan (2005). As the most important determiners of urban development, these plans have yield responses which are to impacts changes and none of the planners' responses has intervened in the derivers' authority or nature and kind of pressures. The reasons could be rudimentary understanding of the key drivers which change environment and also event-oriented approach toward urban issues. This means that the planners just look in the impact level to identify causes, whereas the causes of effects in complicated systems like cities may be identified in deeper levels such as pressures or derivers. The results of this study indicate that if planners are looking to solve physical and social problems in District 11 of Tehran Municipality, they should concentrate on derivers including people, investors and urban principles tendencies and considering designated visions for the region, then incorporate the change process of these drivers' impact or substitute them with other drivers in their decision making process.

References

Hou, Y., Kandziora, M., & Burkhard, B. "Application of the DPSIR model to analyze ecosystem service drivers. Nanjing, China." Nanjing Agricultural University, 2006.

Agyemang, I., McDonald, A., and Carver, S. "Application of the DPSIR framework to environmental degradation assessment in northern Ghana." Natural Resources Forum , 212–225,2007.

Helming, K., Diehl, K., Bach, H., Dilly, O., König, B., Kuhlman, T., et al."Ex-ante impact assessment of policies affecting land use, Part A:Analytical Framework. Resilience Alliance." J. Ecology and Society., 16 (1). 2012

Lalande, N., Cernesson, F., and Tournoud, M.-G. "Perceptual Modelling Of Environmental Indicators To Assess Land Uses Impacts On Water Quality." International Congress on Environmental Modelling and Software. Germany: International Environmental Modelling and Software Society (iEMSs). 2012

Carr, E. R., Wingard, P. M., Yorty, S. C., Thompson, M. C., Jensen, N. K., and Roberson, J. "Applying DPSIR to sustainable." International Journal of Sustainable Development and World Ecology ., 543–555. 2007

Boomsazegan Consulting Engineers. "Strategic-structural plan of Tehran."Municipal of Tehran, Tehran. 2006 (persian).

Atak Consulting Engineers. "Master plan of Tehran". Municipal of Tehran, Tehran. 1992 (persian).

Turner, R. K., Hadley, D., Luisetti, T., Lam, V. W. Y., and Cheung, W. W. L. "An introduction to socio-economic assessment within a marine strategy framework." Department for environment, food and rural affairs., 10-11. 2010

EEA. "Reporting on environmental measures:Are we being effective?" European Environment Agency, Reporting on environmental measures. 2001.

Gardin, N., Wojda, P., and Brouyere, S. "Stress factors and associated physically based criteria and conclusions on the directions to be followed for developing a physically based vulnerability assessment method" University of Liège, Hydrogeology and Environmental Geology and Aquapôle., 7-8. 2006

Potschin, M." Land use and the state of the natural environment." J. Land Use Policy. 2009

Koornneef, J. M. "Shifting streams: on the health, safety and environmental impacts of carbon dioxide capture, transport and storage." Proefschriftmaken.nl. 2010

Niemeijer,D.,de Groot,R. Framing environmental indicators :moving from causal chains to causal net works." Environ.Dev.Sustain9, doi:10.1007/s10668-006-9040-9. 2007

Bidone, E. D., Lacerda, L. D." The use of DPSIR framework to evaluate sustainability in coastal areas. Case study: Guanabara Bay basin, Rio de Janeiro, Brazil."J. Regional environment change .,(4), 5-16. 2004

Kristensen, P. "The DPSIR Framework." workshop on a comprehensive / detailed assessment of the vulnerability of water resources to environmental change in Africa using river basin approach. Nairobi. Kenya. 2004

Giupponi, C. "From the DPSIR reporting framework to a system for a dynamic and integrated decision making process". MULINO Conference on European policy and tools for sustainable water management., Venice. Italy. 2002.

Furman, E., Peltola, T., and Varjopuro, R. (2009). "Interdisciplinary research framework for identifying research needs" Finnish Environment Institute., (17).

Farmanfarmaian Consulting Engineers. "Master plan of Tehran." Municipal of Tehran, Tehran. 1969 (persian).

Tehran urban planning and research center. "Tehran Neighbourhood Development Plan(Region 11 of Tehran Municipality)." Region 11 of Tehran Municipality, Tehran. 2009 (Persian).