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Studying The Spatial Structure of Comprehensive Urban Development Plan Based on City's characteristics

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ABSTRACT

Being informed of each city's spatial structure can increase its planners' success and significantly help in modifying urban environments. Urban development plans, especially comprehensive ones, are among the most influential factors in the spatial structures of cities. Because the outcome of the spatial structure of a city is almost determined in these plans. Therefore the spatial structure of comprehensive urban development plans based on the City's characteristics has been analyzed in this research. Studied components were analyzed in three main areas, including "spatial features," "functional features," and "physical features" in three comprehensive plans of Tehran (approved in 1968, 1992 and 2007). The research methodology is "applied" in terms of purpose, "descriptive-analytical" in terms of research method, and "evaluation" in terms of content. Library and survey methods are used for Information gathering. The results showed that from the first to third comprehensive plans have proposed different spatial structures for Tehran, which are respectively: linear structure, radial structure and network structure. Tehran had scattered and irregular growth in the 60s and 70s of the solar calendar because of not realizing the proposed structure and strategies of the first and second comprehensive plans. In general, it can be said that the comprehensive plans of Tehran intended to create a city with a polycentric structure.

Keywords: *Spatial Structure, Urban Development Plan, Comprehensive Plan, Tehran*

INTRODUCTION

The function and spatial structure of cities and their impacts on social well-being, economic growth and sustainable development have increasingly attracted the attention of geographers, urban planners, economists and other social scientists in past two decades and have resulted in an interesting discussion among urban planners and policy makers for a long time. (Burger et. al, 2011: 161; Houthum &: 747). The experts consider the structure of a city as physical design and the framework of a city as well as the land-use plan and believe that in the study of city structure, urban growth and development policies, intra urban transportation, housing and urban morphology pattern are assessed. Also, various urban functions are considered in the study of city structure including residential, administrative, commercial, educational, religious, transportation, etc. (Bazrgar, 2003: 26). Today, the dynamism and sprightful of each City have a straight relationship with the method which structured its spatial elements (Cheng et.al, 2006: 604).

Tehran, as the biggest metropolis in Iran, has an unbalanced spatial structure with characteristics such as ungovernable development, differences in the densities of population and building between different regions, pendulum daily trip pattern, polycentric construction and

differences in land-use plans among different regions (Bertaud, 2003; Hosseini, 2014; Pejohan, 2014). Comprehensive plans of Tehran are documents that target the sustainable development of this City. Over time, these plans have normally evolved following the existing conditions and intellectual paradigms which govern each period, and its policy has changed so much. In fact, urban development documents are the result of their own time thinking. Despite this obvious principle that urban development plans and especially comprehensive plans have an effective role in the spatial structure of cities, however, there are few types of research about Tehran which pay attention to all three comprehensive plans simultaneously and design a comparative study about the content and role of each of these plans to form an urban spatial structure according to the approaches governing the environmental policymaking.

Understanding and analyzing the characteristics of Tehran's urban structure is important because of its size; planners and designers are not able to provide a plan for the whole City, and if they pay attention to the most important components and elements construct this City, and the relationship between them, the effect of urban planning actions will increase. The problems of Tehran that are related to the urban structure include traffic, air pollution, lack and shortage of leisure spaces, an increase in land price differences in different parts of the City, and social and spatial inequality in different neighborhoods of the City, which can be overcome by researching in the spatial structure of the City and its transformation over time.

Each of Tehran's comprehensive plans has drawn a particular spatial structure about Tehran in their content and approach (which can be followed in the final plan document), which of course, was adjusted to the discourse governing the planning environment of that time and the policy environment of that comprehensive plan. The basic question of this research is, what was the spatial structure imagined in each of Tehran's comprehensive plans?

Urban Spatial Plan

Arranging and organizing the phenomenon on the land surface, which is derived from physical working or human processes, is called spatial structure (Seifaddini, 2006: 119). Some experts consider urban spatial structure as a set of connections resulting from the urban form and people gathering, transportation, commodity flow and information (Rodrigue et al., 2009: 38). The spatial organization of each City is the emergence of complex relationships between different systems, including power system, land-use system, population settlement system, identity symbols and concepts (both artificial and natural), and communication system among the framework of the socio-economic systems of an era and the past heritages of the systems of that City. The evolution of cities' spatial organization shows the increasing importance of human factors compared to natural factors. Just as nature has affected the face of a city by its various aspects such as suitable climate, access to water, natural defensive features, access to construction materials..." the evolution processes of human societies over history, especially the discovery of the concept of production surplus by complicating social and economic relations has affected on the expansion of urban residence and specific spatial organizations derived from these relationships" (Morris, 1374: 14).

Many studies have been accomplished separately about the spatial structure of cities and urban development plans. Despite this, few researchers have studied the relationship between these two factors. In fact, most of the reviewed studies, especially Iranian studies, have paid attention to the evaluation of the realizability of comprehensive plan recommendations, and the role of

these plans in shaping the spatial structure and its changes in different time periods has been neglected. As a summary of reviewed research, the table below shows the most important variables of each research in the field of spatial structure with their approach to the problem.

Table 1. a summary of accomplished research in the field of spatial structure and urban development plans

Author	Research Approach	The most important variables or emphasized components
Fu and Zhang (2017)	Environmental	Components of the quality of life, environmental indicators, governing polluting industries, reducing industrial production, absorbing overspills, housing components
Wang and Chen (2017)	Political, economics	distribution and compression, discourses governing the master plan, local governance
Wang et al. (2017)	Economics	Zoning, distribution, the amount of population settled in the urban context, land market control, stock exchange and land hoarding, attachment of land to the limited city areas
Long et al. (2012)	Political, economics	Controlling urban development, geographic variables of urban growth, the scale of urban growth
Joseph and Wang (2010)	Physical, political	Population density patterns, zoning patterns, land-use laws and regulations, centrality (mono-centric or polycentric)
Hualachin and Leslie (2006)	Economics	Centrality (mono-centric or polycentric), access network capability, side effects caused by commercial and industrial activities, zoning and land use regulations

Bertaud (2001,2002,2004)	Physical, economics	Population density, travel patterns, centrality (mononuclear or multinuclear), land use per capita
Baniamerian et al. (2016)	Physical, political	compression and distribution, population density, inefficiency in providing urban services, number of cases referred to the Article 5 Commission, attaching of land to the city limits, amount of land use changes
Jalili and Kazemian (2016)	political	Qualitative variables related to the way comprehensive plans are politicized
Hajizade (2016)	physical	Land development policies, compaction and dispersion, the efficiency of public services, access within the City, the costs of creating urban infrastructure, and continuity or discontinuity of the spatial structure.
Hosseini (2015)	Physical, political	Urban centers, daily travel pattern, the population density pattern
Ghadami et al. (2013)	physical	The orientation of urban development, building density, population density, centrality, compression and dispersion
Khormali (2012)	physical	Land size, urban development orientation, building density, number of floors, functional areas
Saeidnia (2012)	physical	Land-use components, main elements of spatial structure, planning strategies and policies

Sadeghi et al. (2012)	physical	Streets, context features (microlithic parts, building age, facade materials)
Rezaei Rad (2011)	physical	Building density, number of floors, link of physical elements, confinement, the granularity of parts
Zangane Shahrki (2011)	Environmental, social	Policies and the way of using urban land, population density, number of floors, geographic variables (slope, location, distance to heights, presence of water)

Cities are made of different structures, including social, economic, physical structures and etc. However, while mentioning "city construction" in professional texts of urban planning, it means the physical construction of a city, and the elements and components and their functions with each other are considered (Bazrgar, 2003: 57). The physical structure of a city has four important components as shown in the following feature:

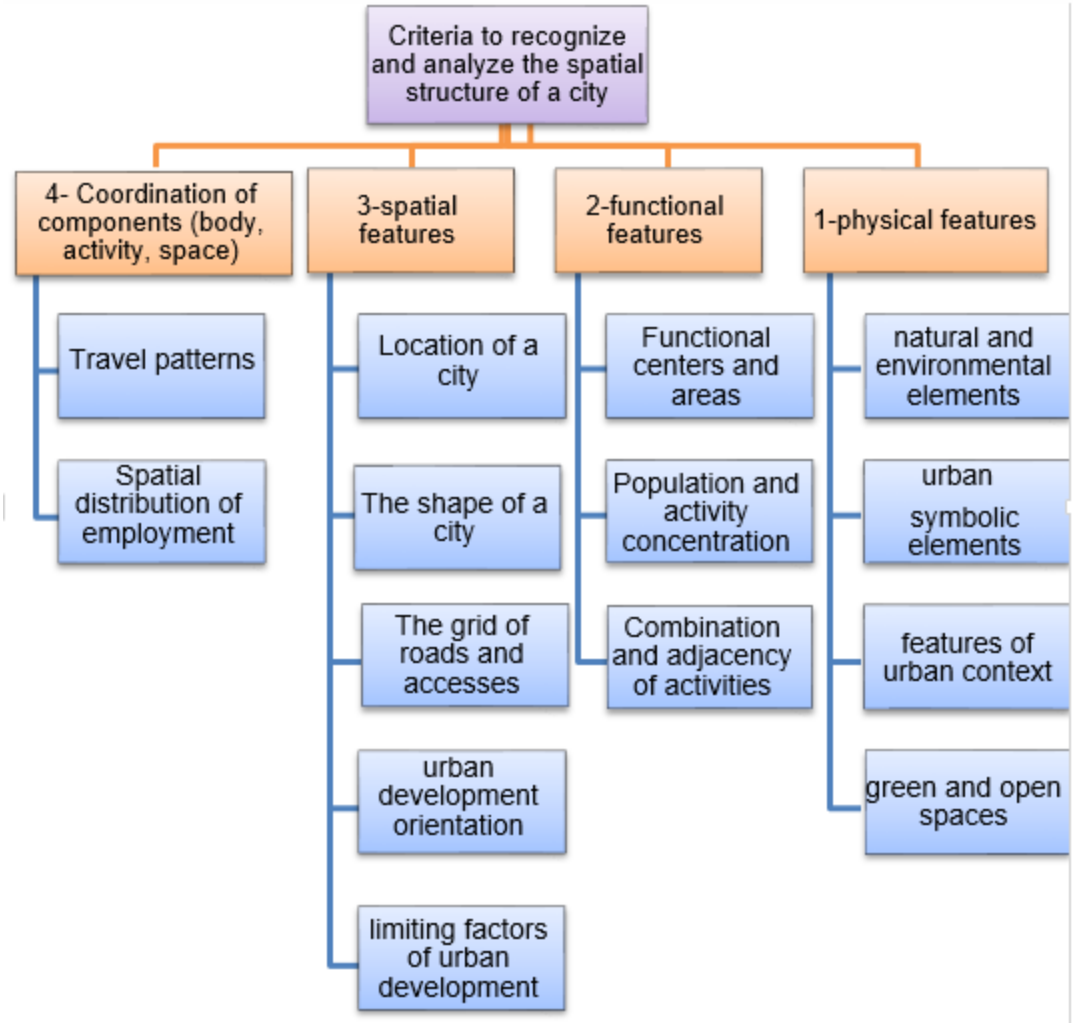


Figure1.criteria to recognize and analyze the spatial structure of a city.

• **Physical features of a city**: it includes natural and environmental elements, symbolic elements and urban signs, features of the urban fabric, and open and green urban spaces.

• **Functional features of a city**: it includes functional centers and areas, patterns of population density and concentration, and adjacency of activities and utilities.

• **Spatial features of a city**: includes the location of a city, development orientation, limiting factors of development, the shape of a city (such as sectorial, network, etc.) and the network of roads and accesses.

• **Coordination between body, space and activity:** including travel patterns and spatial distribution of urban employment.

The researcher has considered the first three components of spatial structure in this research. The fourth dimension is not included in this research due to the lack of information about daily travels and the weakness of statistics and information related to employment, the wideness of the subject area and also requirements for advanced models of traffic analysis and econometrics. Three studied dimensions have 11 key components, which will be evaluated by 15 variables in the content of the comprehensive plans of Tehran. In other words, the content of the

comprehensive plans of Tehran is studied in terms of each variable. The dimensions and components of this research are shown in the following table according to the main parameters.

Table 2: studying dimensions, components and parameters of research

Main components of analyzing the spatial structure	Studying dimensions in this research	parameters
Intervention in the spatial form of a city	orientation of suggested development plan	Development in eight geographical directions, paying attention to the physical obstacles to development
	The suggested pattern of urban growth	Suggested model of urban construction (network, sectorial, linear, etc.)
	Suggested framework in plan	Area of the suggested road network (square meters) The geometric pattern of the suggested road network (radial, network, etc.) Suggested accesses (local roads, main and secondary arterial roads, freeways, highways) How to connect the road network to functional centers The way of connecting the road network to functional centers
	Tendency degree in spatial development in horizon scheme	The amount of land attached to a city (hectares)
Intervention in the functional features of a city	Suggested land capita	The amount of land suggested for each person in each utilization (square meters)
	The way organizing and establishing functional areas of a city: areas of residence, work and activity, leisure, protected and valuable areas, merged areas	The area of suggested lands of a city The spatial location of suggested areas Suggested population density, population prediction

	The measure of using environmental sustainability	non-aggression to agricultural lands, gardens and green areas
Intervention in the physical features of a city	The approach to plans for high-rise building	Number of suggested floors
	The degree of attention paid to urban decays in a city	Area of urban decays suggested for future development
	Granularity and massing of the urban context	suggested building density

Recognition of Studying Scope of Research

Tehran, with an area of approximate 733 square kilometers, is located in the area between mountains and desert on the southern slopes of central Alborz mountain and at 51°4' to 51°33' east longitude and 35°35' to 35°50' in northern latitude (Ahmadi, 2014: 68).

Figure 2.The geographical location of Tehran

Because of the difference in the altitude of Tehran in its different areas, the altitude in the south of Tehran is about 1100 meters from sea level, it is about 1210 meters from the sea level in central areas, and it is about 1800 meters from the sea level in northern areas. The width of the Tehran metropolitan is an area between mountains and a desert on the southern slopes of Alborz Mountain. The basin of Tehran is located in an area of 206,484 hectares and an average altitude of 1403 meters above sea level. This basin is limited to the Jajrud River and Karaj basin in the north, the Jajrud basin in the east, and the Karaj basin in the south and west (Ahmadi, 2014: 70). Also, Tehran's water network is supplied by dams and underground sources including (subterranean canal and wells). Today, there are about five hundred subterranean canals in

Tehran and its suburbs (Ahmadi, 2014: 70). The population of Tehran was about 7705036 million in 2006, which was 8154051 million in 2011 (Statistical Center of Iran, 2016).

Three comprehensive plans have been provided for Tehran. The first plan, which was approved in 1969, is, known as the Farmanfarmaeian comprehensive plan. The second plan (known as the organizing plan) was provided by consulting engineers of Atak after about two decades in 1992. Also, a third comprehensive plan was approved by The Supreme Council For Urbanism And Architecture as a "strategic and structural plan of Tehran urban development" in 2007. Meanwhile, there were also other plans such as the urban setting plan of Tehran in 2002, a detailed plan of 22 regions as a development pattern of Tehran and 3 main detailed plans.

Tehran has 3 detailed plans now. The first plan was provided in the pre-revolutionary, the second plan was in the 1990s, and the third one was composed in the 2000s. The composition of a detailed plan of Tehran is undertaken by Municipality despite other cities of Iran in which housing and urban development organization of the province are responsible. However, in the 1990s, due to Tehran Municipality's disagreement with the new comprehensive plan and the lack of on-time review and approval of the detailed plan, the review and approval of changes in the detailed plan of Tehran were gradually accomplished by The Committee Of Bill No .five. Therefore, in the spatial development of Tehran in the 1990s, the role of this committee has been beyond its real essence, which is monitoring and making decisions about changes in the detailed plan. The third detailed plan is currently (2017) being prepared and approved.

Methodology

The research methodology is "applied" in terms of purpose, "descriptive-analytical" in terms of research method, and "evaluation" in terms of content. Library and survey methods are used for Information gathering. The study population includes three comprehensive plans which were approved by The Supreme Council For Urbanism And Architecture in 1969, 1992 and 2007, respectively, and their final reports are available now. Because the analysis of the content of these plans has been considered in this research, hence we have no sampling, and all three plans have been studied completely. The basis of review and analysis was the main approved document of each plan.

The time limit of this research, in terms of gathering data and information, includes the fifty-year period from 1966 to 2016. It begins from September 2016 to the end of August 2017(12 months). In terms of the research process, the location limit of this research is Tehran, which is divided into 22 districts.

Findings

The spatial structure of Tehran's comprehensive plans has been analyzed in three periods of 1696, 1992 and 2007 in this research. According to the conceptual model of this research, the effects of comprehensive urban plans on the spatial structure of Tehran have been studied on three main bases, which are derived from the theoretical foundations of spatial structure. These three bases are:

Spatial features: It contains variables and indicators which explain the way intervention in the shape, form and plan of the spatial construction of Tehran.

Functional features: It includes variables and indicators which explain the way of intervention in the land-use and zoning system in Tehran.

Physical features: It contains variables and indicators which are related to the analysis of the way of intervention in of Tehran urban context.

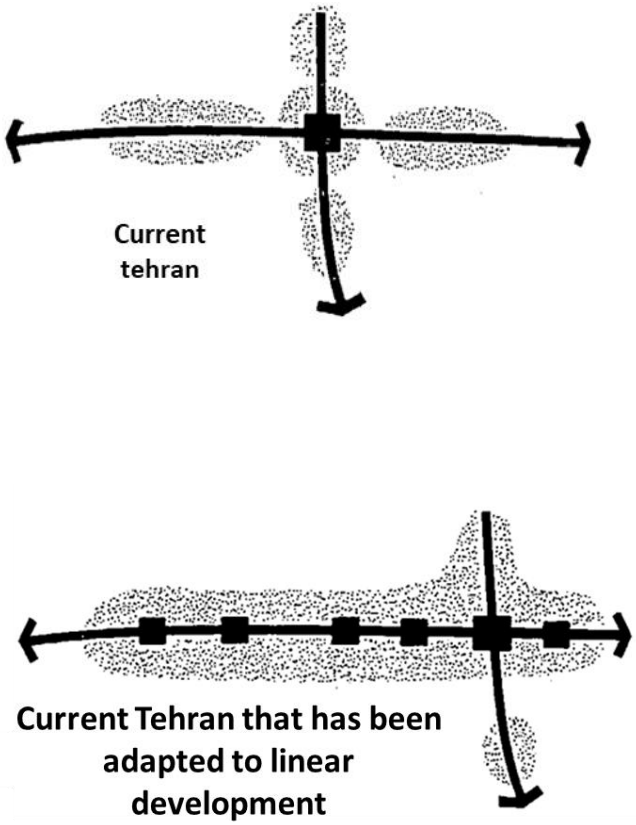
In the following, all three plans are evaluated separately based on the above components for each variable.

Way of Intervention in Spatial Features, Form and Shape of City

1-1- Spatial Plan and Suggested Orientation for The Future Growth of City

First Comprehensive Plan

It has been emphasized in the first comprehensive plan of Tehran that the source of many of Tehran's current problems, including traffic and crowded streets, is because of the development plan, which has taken place radial. Therefore, it has shown the current and desirable situation of Tehran in terms of urban construction plan as follows:



Tehran adjusted to linear development

Figure 3: Explanation of the development plan of Tehran in the first comprehensive plan

In fact, the primary idea of constructing urban space is formed based on a linear model. A first comprehensive plan has suggested the most extension of the City to the west in line with the roads of Tehran to Karaj as a linear development which has been shown in the following figure:

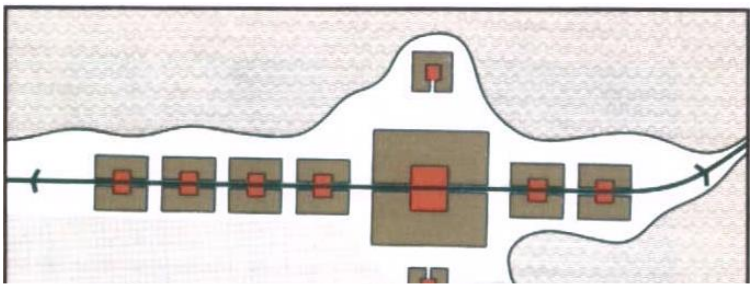


Figure 4-The idea of Tehran's linear development in the first comprehensive plan

Organizing Plan

It is a revision of the first comprehensive plan and organizing the problems and challenges of Tehran, as its name indicates. In fact, it has been tried to accredit the existing developments of Tehran in this plan, which are the result of unplanned constructions after the revolutionary of Iran. Therefore, while severely criticizing the idea of linear development, it was considered inefficient for Tehran and suggested a radial model that was more adjusted to the development of Tehran in the 1990s, which can be observed in the following figure:

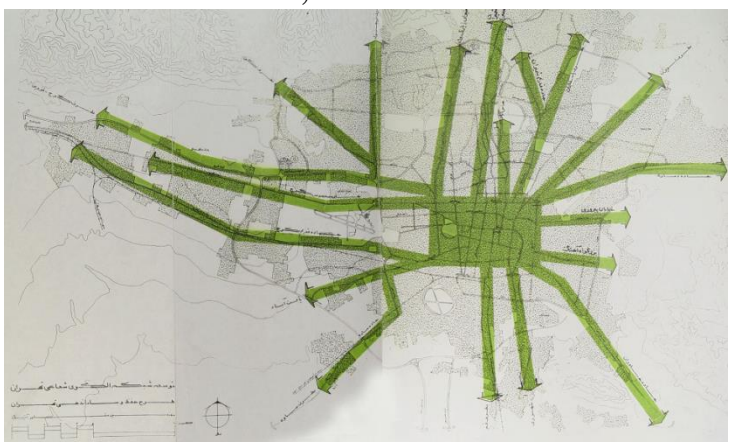


Figure 5. the idea of radial development of Tehran in organizing plan

Of course, as shown in the above figure, the orientation of the development arrows is from the center to the outside. In fact, the decentralization of the historical center of Tehran (traditional market(bazar) area) can also be seen in this plan.

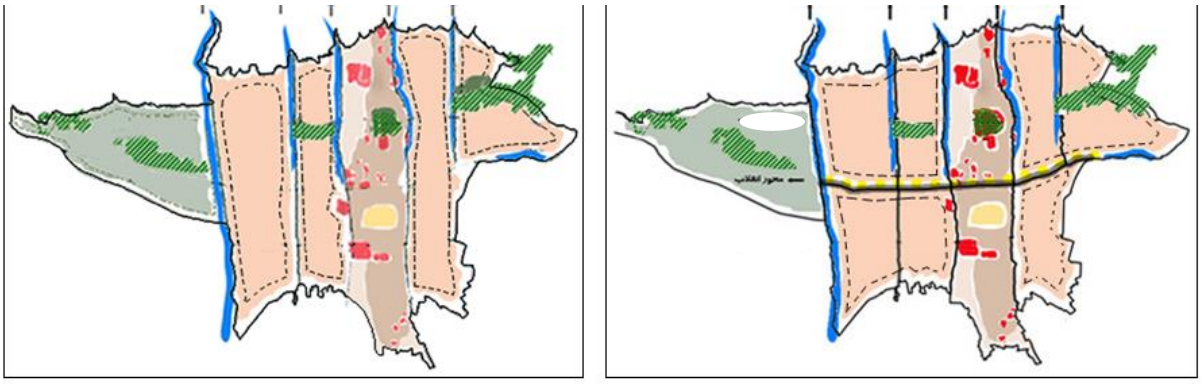


Figure 6. the idea of Tehran's network development in a strategic structural plan

Forming the idea of the development structure and spatial organization of Tehran is derived from the process of recognizing the structural elements and analyzing the transformation and

evolution of these spatial elements and processes. According to the results of the strategic structural plan, the process of recognizing and analyzing the development plan of Tehran has led to the recognition of two main types of spatial organization in the past and present, and the future urban spatial organization has also been suggested based on this process. According to it, the idea of Tehran's spatial organization is not the discovery and determination of urban spatial organization but also the result of analyzing structural elements and predicting future developments in a coherent, development-oriented and desirable framework.

The strategic structural plan has identified the spatial organization of the historical background of Tehran as a centralized, monogamous and coral type. The structural elements of this organization include three cores of Tehran, Rey and Shemiran (with the increasing predominance of historical Tehran), which have gradually become a single organ by merging with each other, which concentrates and directs all social, economic, political and spatial powers to its direction. This integrated and centralized organ has been very powerful and affected the spatial organization of this City.

The suggested orientation of development in this plan, as shown below map, although the idea of Tehran's development in this plan is as north-south linear (the central axis of Shemiran-Rey), however, the orientation of the emphasized is as radial axes to organize this City that is branched from this main axis. Therefore, it can be noted that the strategic structural plan has suggested the orientation of development from the center to the periphery, which is completely similar to the organizing plan.

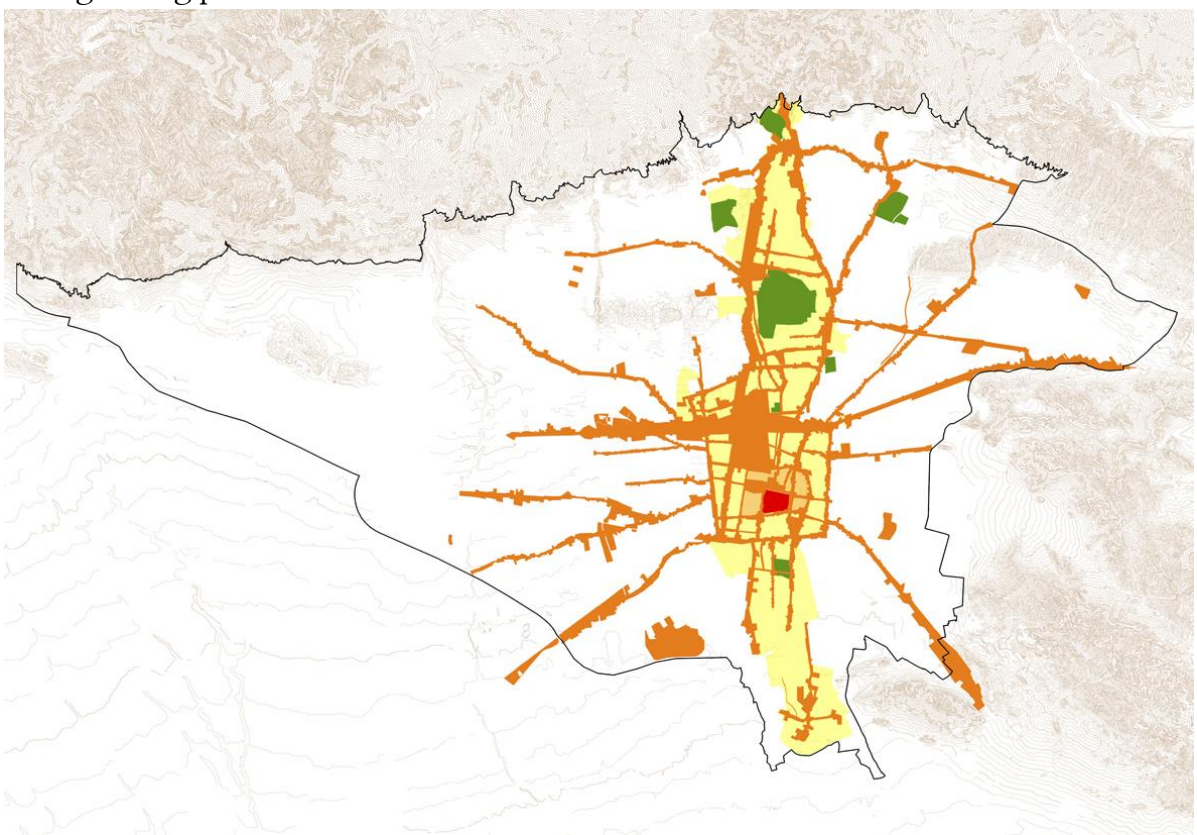


figure7. The orientations of Tehran's suggested development in the strategic structural plan

2-1-Suggested Framework for City

-First Comprehensive Plan

The suggested framework in the first comprehensive plan is based on the network of east-west accesses following the orientation of linear development. That is the network of east-west paths which form the main accesses and are intersected by north-south streets.

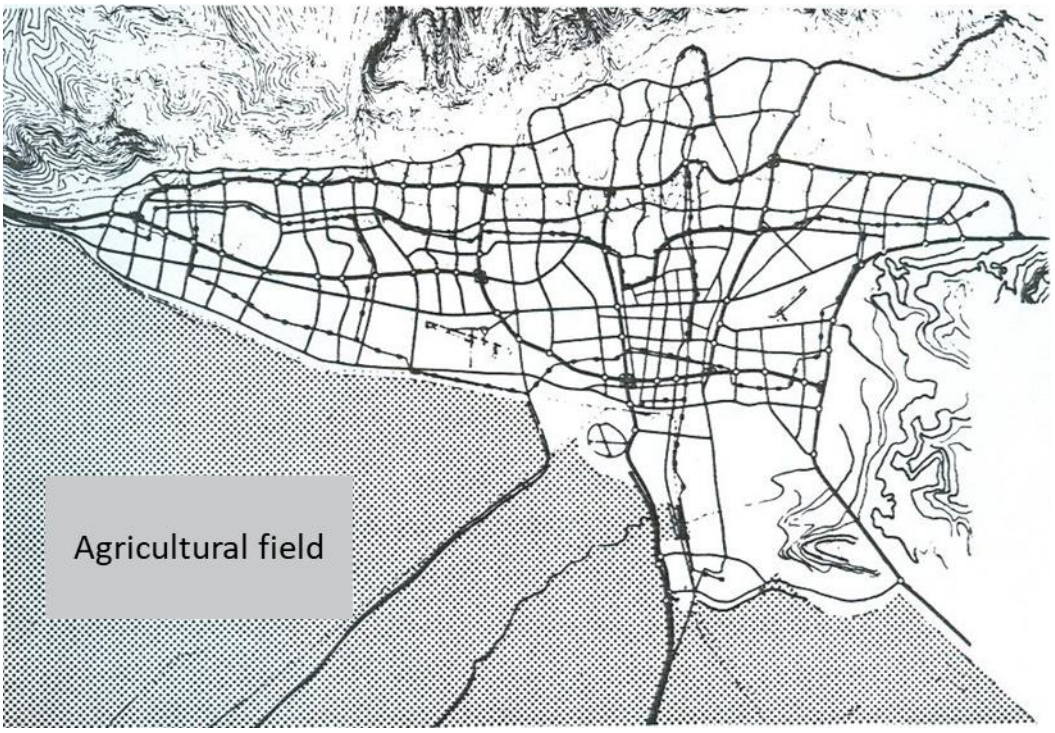


Figure8.lattice work of paths and accesses in the first comprehensive plan of Tehran

The below map shows the suggested framework for Tehran in the first comprehensive plan. It can be observed that 10 functional centers are suggested in a linear form on the east-west axis. Therefore, urban development in this plan is imagined from east to west. So that in the north, only one functional center (located in Shemiran) and one in the south (located in Rey) have been considered, and these two centers already existed and are the result of the historical development of Tehran. Therefore, by maintaining existing centers, 7 more centers are suggested in a linear form along the main roads.

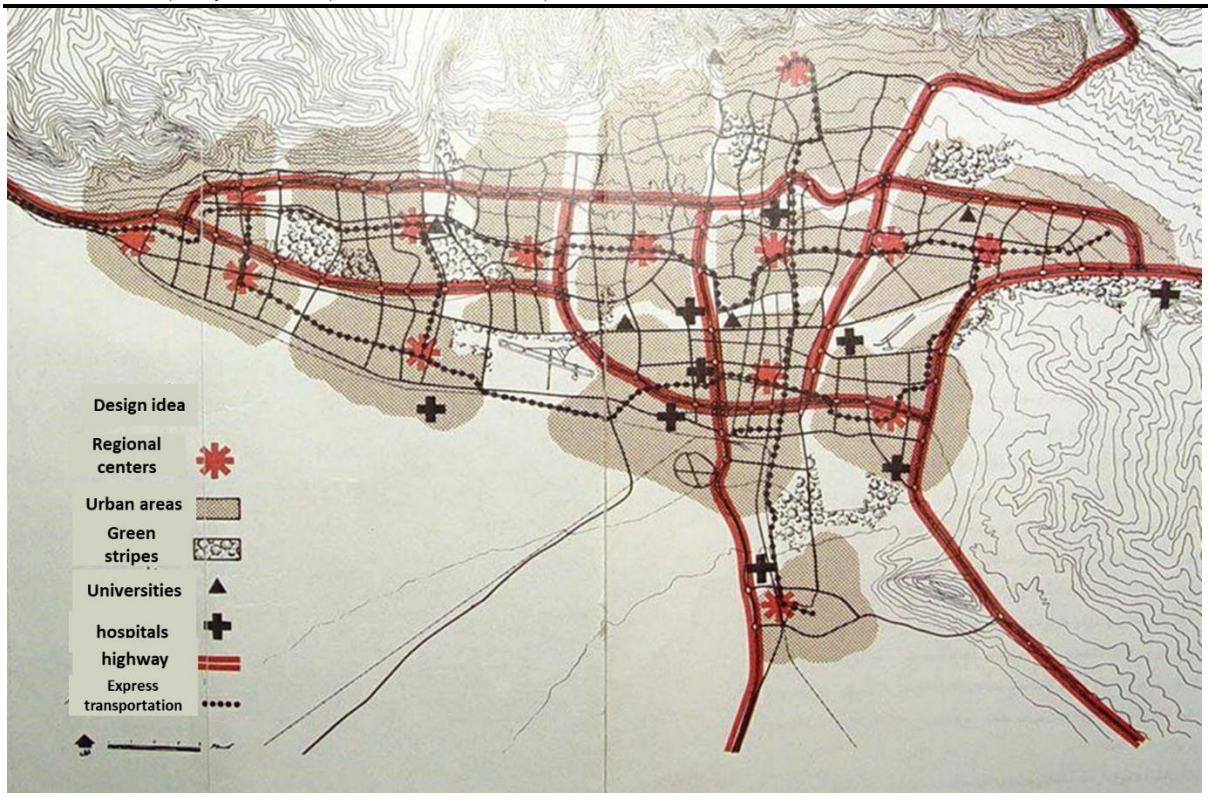
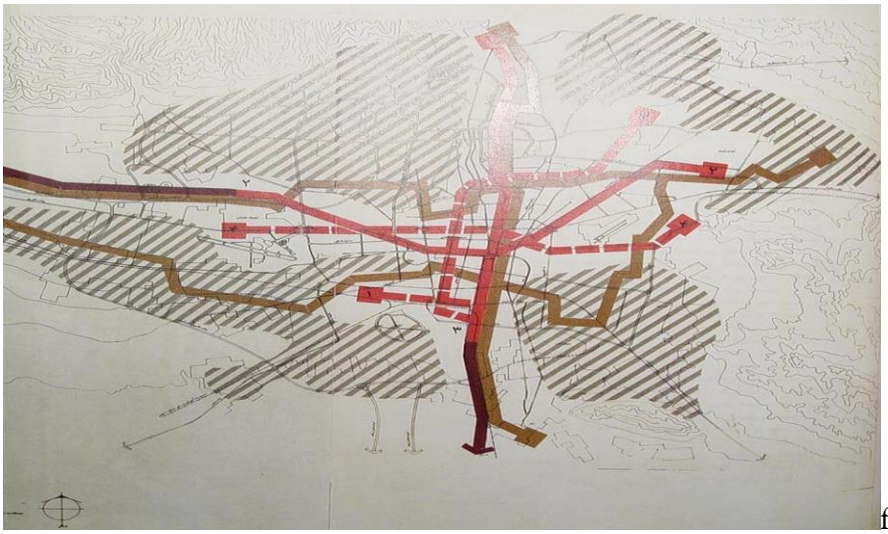


Figure 9. suggested framework in the first comprehensive plan of Tehran

Organizing Plan

The framework of the organizing plan is based on the high-speed transportation network, which got this idea from the first comprehensive plan of Tehran. As shown in the map below, the network of north-south accesses and radial paths are suggested on the linear paths of the first comprehensive plan. These suggestions were a part of the first comprehensive plan of Tehran, which was suggested by Sufreto's consulting engineers. In this project, a composite system of highway-metro was proposed to provide services to the central areas and to link the surrounding areas of Tehran. The construction of highways in Tehran, including Hemmat, Resalat, Yadegar, Imam Ali, Shahid Bagheri, Navvab, Azadegan, Niayesh and Sadr-Babaei, was suggested in the Sufreo plan for the first time, which was also proposed in the organizing plan and the suggested framework of plan based on it.

 figure 10. The framework of Tehran in organizing a plan

Strategic Structural Plan

A kind of network structure is suggested for Tehran in this plan, which is in accordance with the natural and historical structures and movement, performance and activity systems and includes five north-south axes and three east-west ones, which as well as facilitates the possibility of better movement and traveling in City and reduces travel demand, also provides organizing large-scale elements with urban and suburban functions of Tehran. The suggested framework of the strategic structural plan is based on linking the functional centers of north and south of Tehran with a straight north-south line that includes three major centers: Tajrish, Bazar, and Rey.

Figure 11.the structure of the network path of Tehran in the strategic structural plan

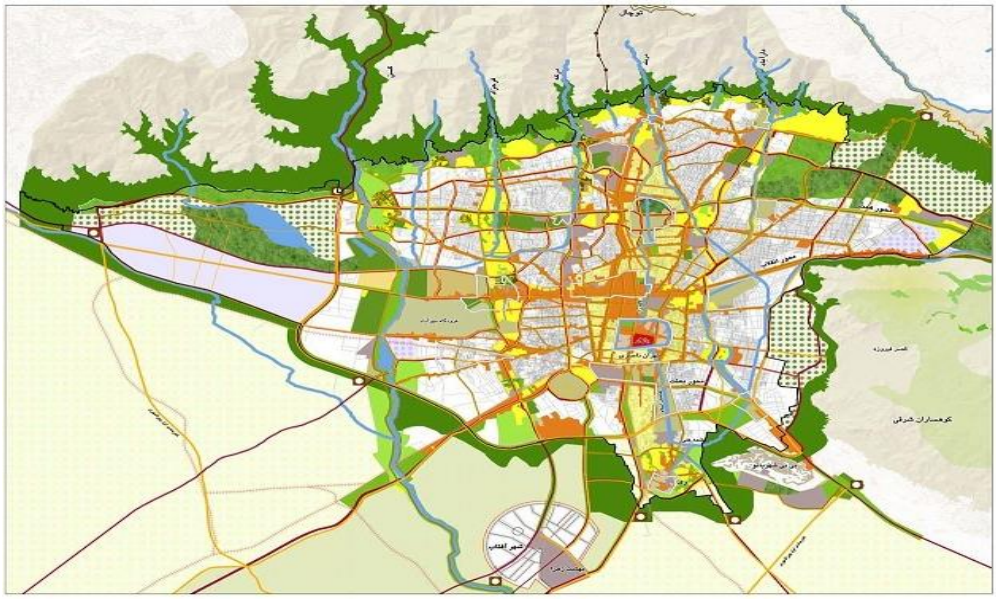


Figure 12. The main framework suggested in the strategic structural plan for Tehran

Tendency Degree in Spatial Develop in Horizon Scheme

First Comprehensive Plan

By studying the text of the first comprehensive plan, it was found that the main concern of its compositors was to prevent the expansion of Tehran. Therefore, extreme actions have been suggested to achieve this goal. However, it has attached a large area of surrounding lands to city boundaries, which is opposed to the above idea. This plan proposed two ranges of 5 and 25 years schemes for the expansion of Tehran in the future. The 5-year one was equal to 330 square kilometers, and the 25-year, which was the area under the protection, was 567 square kilometers. In this plan, two cycles of growth and expansion are predicted for Tehran. In general, the surface area of the City will be from 180 square kilometers in 1966 to 600 kilometers in 1992. That is more than triplicate. It was also predicted that urban lands would occupy 283 square kilometers in 1972, and this measure will be equal to 520 kilometers in 1986.

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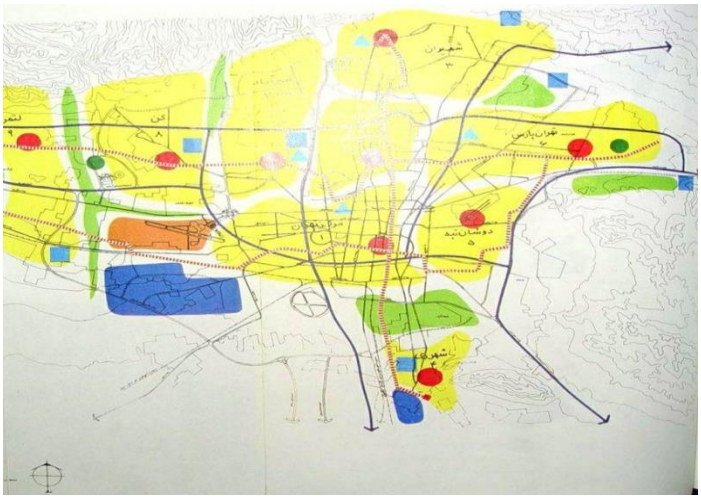

Figure 13. The way the development of suggested societies in Tehran's first comprehensive plan

Organizing Plan

Therefore, the comprehensive plan has retained the same scope as the first comprehensive plan because it was a revision of the comprehensive plan. Only lands in the southern parts of the City have been considered for future development. But the orientation of Tehran's border in this plan is towards the south of the City. In fact, the largest area assigned to the border in this plan has been the south side of the City, which is completely in accordance with the thought of encouraging the growth of southern parts, which can be seen in other suggestions of the plan.

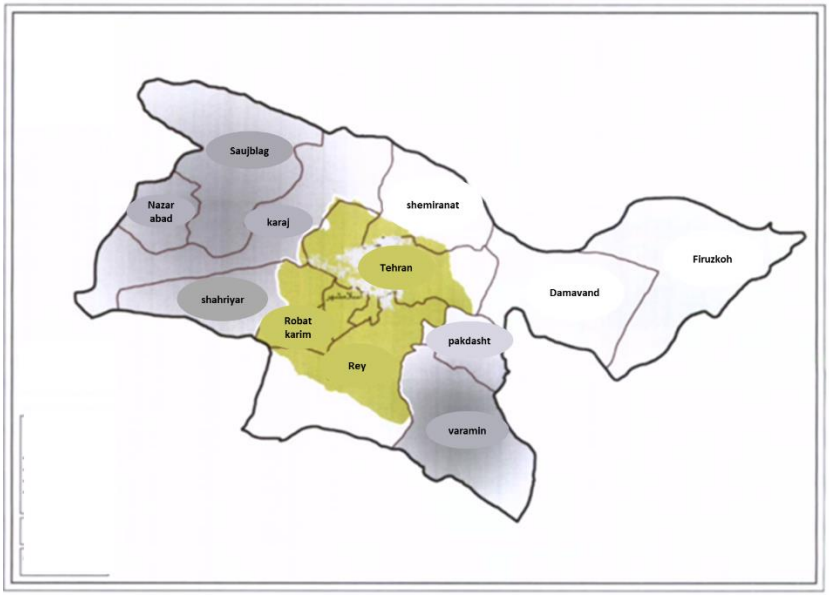

Figure14. city border in the organizing plan of Tehran

Strategic Structural Plan

In the strategic structural plan, the area of Tehran according to the 25-year area of Tehran in the first comprehensive plan (1970), the area of it and especially the levels defined for it in the north part, the area of the second comprehensive plan (1992) and the approvals of committee bill No five of Tehran is determined to be equal to 616 square kilometers.

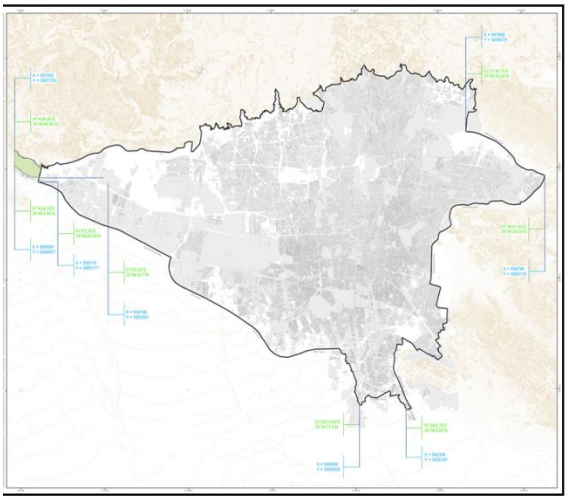

Figure 15. suggested area of the strategic structural plan

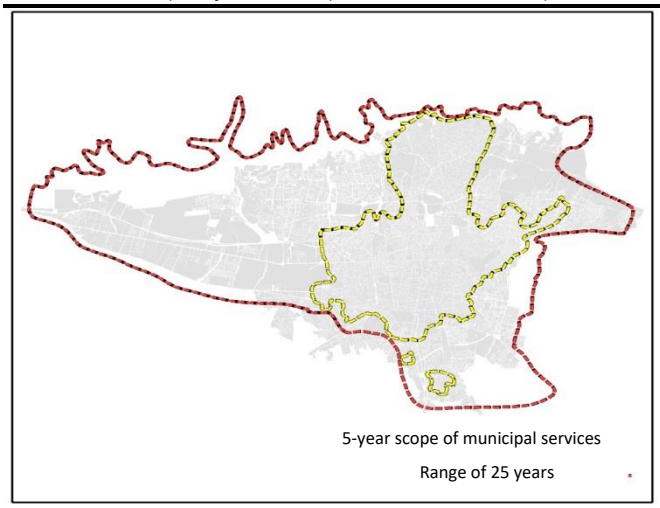

Figure 16. the area of 5 and 25 years strategic structural plan

In the strategic structural plan, the urban border of Tehran has finally been determined according to the fourth option from the above map, whose limits and boundaries can be seen below the map. This border is an area with an approximate surface area of 5918 square kilometers, including the current towns of Tehran, Rey, Shemiranat, Eslamshahr and Robat Karim, and Ghods and central Shahriar, excluding Joughin village.

Figure 17. the urban border of Tehran in strategic structural plan

Way of Intervening in Functional and Physical features of Tehran

Way of Organizing and Establishing Functional regions of City

First Comprehensive Plan

According to Farmanfarmeian's comprehensive plan, Tehran's urban divisions are such that it is divided into 9 large societies, which are completely distinct from each other, and each one is gathered around a central and independent urban core along high-speed transportation lines (such as metro and etc.). Different societies are separated from each other by a green strip. Based

on these divisions, in the center of each big society are some medium societies, and there are some small societies inside them. The plan definition of these societies is as follows:

Small society: an area where the number of children is equal to the capacity of an elementary school

Medium society: It consists of several small societies whose number of students is equal to the capacity of a high school.

Large society: It consists of several medium-sized societies whose population is appropriate for the various services and proportional to a major urban core.

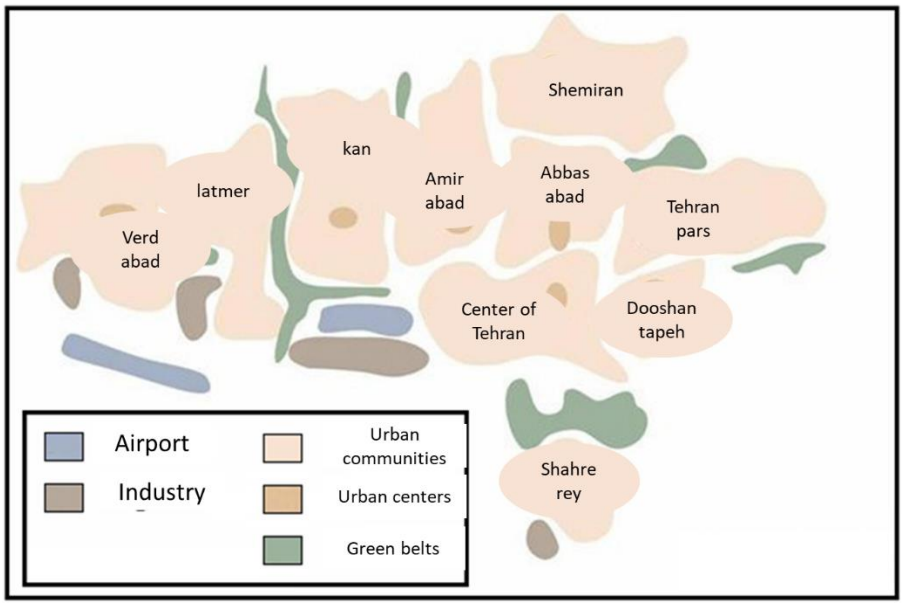

Figure 18. functional centers of the major urban of Tehran in the first comprehensive plan

Also, establishing a new neighborhood for administrative, political and international affairs was predicted in the first comprehensive plan. This project is called Shahestan Pahlavi. In order to do it, the Abbasabad region was considered suitable for establishing innovative urban spaces and establishing the modern center of Tehran due to its unique location in the center of the developed City of Tehran and also the privileged shape of its land.

Organizing Plan

In the comprehensive organizing plan of Tehran, the physical divisions of Tehran municipality in the hierarchy of the City are City, region, district and neighborhood, which; therefore, each of these physical divisions should have an administrative organization to provide urban services in its area.

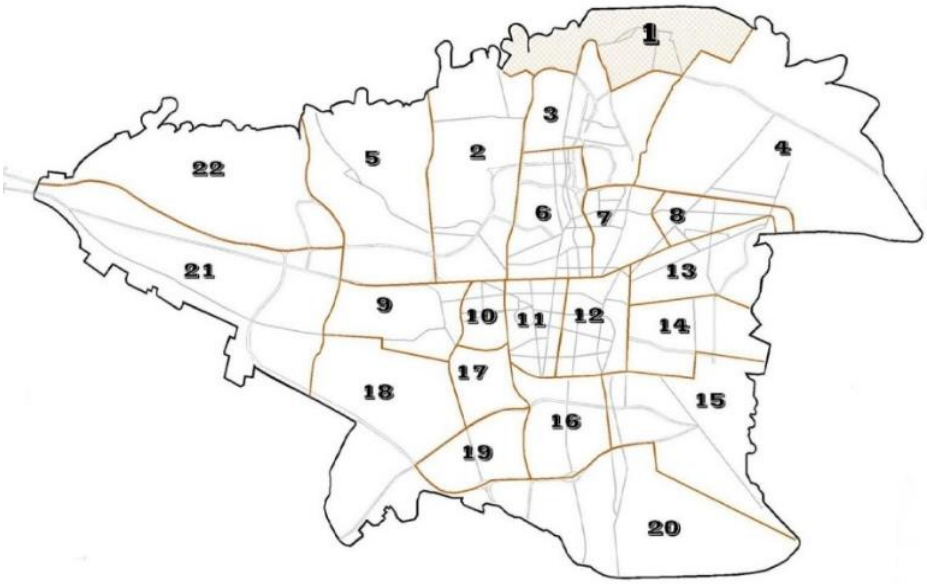

Figure 19. spatial units suggested in the organizing plan for Tehran

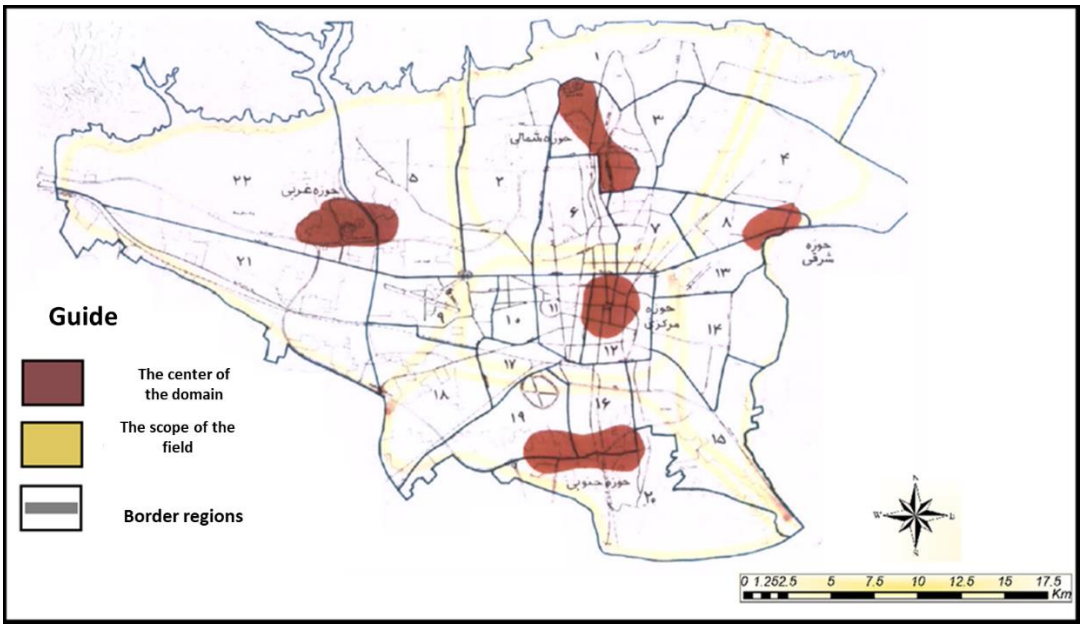

Figure 20. areas and main centers suggested in organizing plan

Strategic Structural Plan

Different strategies have been provided in the strategic structural plan of Tehran in the case of functional centers. There are strategies among them related to zoning, which include:

Reducing the number of municipal districts to 20 districts

Separating the lands of Abbasabad and Qal'eh Morghi for special management

Demarcating borders of areas with natural elements and highway network

Stabilizing city limits with clear and obvious lines

Separating larger areas, merging smaller areas and homogenizing the performance of regions

Help to identify the main center of Tehran more

Help to form a polycentric and multi-center system in Tehran

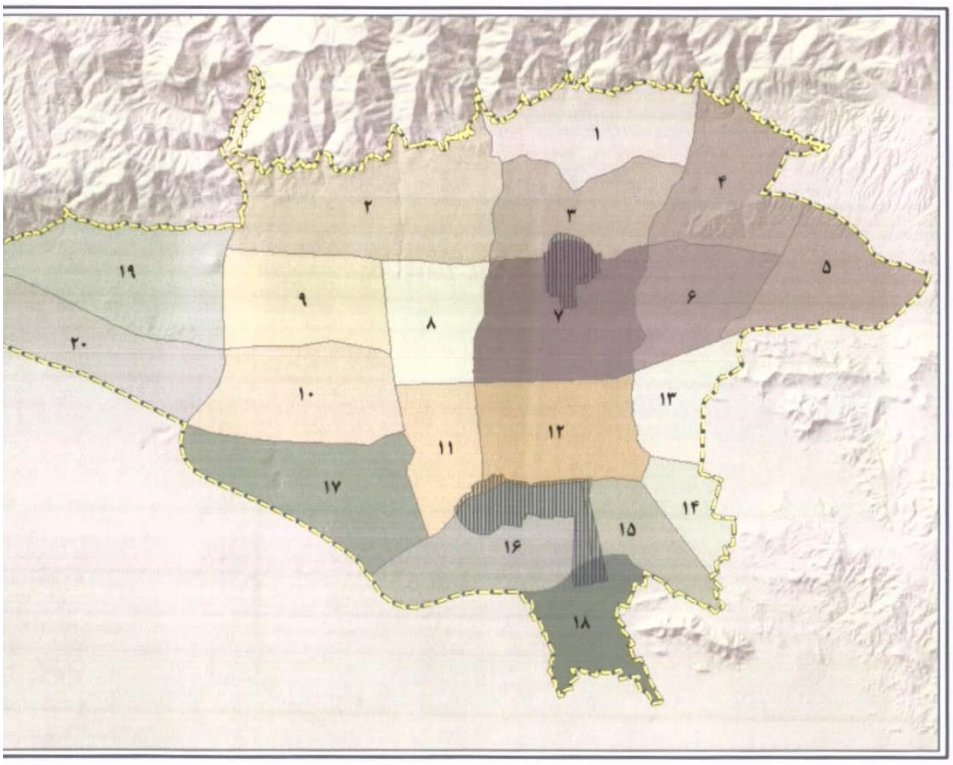

Figure 21. suggested demarcating regions of Tehran's strategic structural plan

A network of centers at different levels and scales has been organized in this plan in order to decentralize the city center and adjust its radial system by filtering its main center and significantly increase the share of a network system in this city structure by distributing centrality and establishing a desirable hierarchical system.

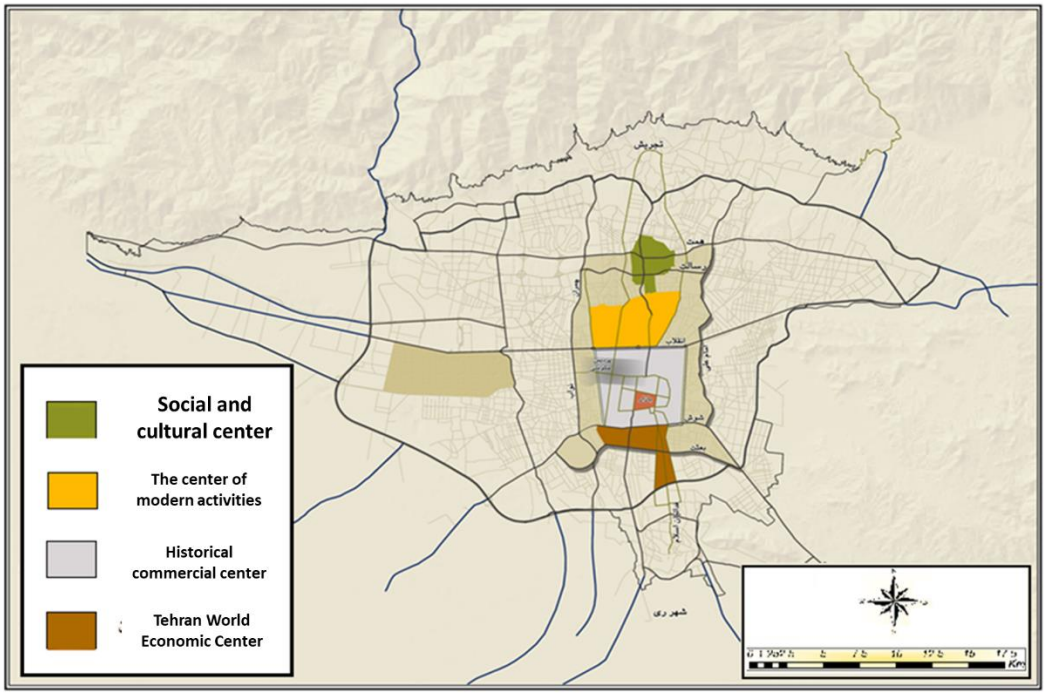

Figure 22. Suggested centers for the main activities of Tehran

The land-use characteristics of three comprehensive plans can be seen in the following table:

Table 3: Comparison of important suggested uses in three comprehensive plans of Tehran

Type of functional use	Previous plans				Existing situation(2002)		New suggested comprehensive plan of Tehran (2021 perspective)			
	First comprehensive plan (1992 perspective)		Second comprehensive plan (1996 perspective)				The first option (8/670)		The second option (9/100)	
	Surface area	Per capita	Surface area	Per capita	Surface area	Per capita	Surface area	Per capita	Surface area	Per capita
Higher educational	35.75	6.5	22.00	2/88	10.53	1.42	26.10	3.0	26.10	2.9
Health care	7.70	1.4	11.60	1.52	4.18	0.56	12.15	1.4	12.15	1.3
Cultural	6.60	1.2	4.00	0.53	2.92	0.39	13.00	1.5	13.00	1.4
Religious	1.65	0.3	2.70	0.35	2.25	0.30	8.70	1.0	8.70	1.0

Sports	2.75	0.5	12.40	1.62	9.68	1.31	17.35	2.0	17.35	1.9
Tourism (amusement and accommodation)	1.10	0.2	1.53	0.20	5.98	0.81	13.00	1.5	13.00	1.4
Urban facilities and equipment	1.65	0.3	4.00	2.43	14.46	1.95	21.70	2.5	21.70	2.4
Sum of services	57.20	10.40	58/23	9.53	50.00	6.75	112.00	12.92	112.00	12.31

Degree in Utilizing Environmental Sustainability in Urban Spatial Structure

First Comprehensive Plan

Environmental sustainability has been considered mainly in the first comprehensive plan by constructing greenbelts around suggested areas. The limited area of green belts in this plan had 215 square kilometers of surface area. This surface area increased to 230 square kilometers in 1976.

Organizing Plan

According to the studies carried out in the comprehensive plan, the per capita of green space in Tehran was about 0.5 square meters in 1966. Due to it, large areas were considered for green spaces in this plan. Green spaces were divided into three general categories. One group was regional open spaces, another group was green spaces between urban areas, and the third group was parked inside neighborhoods and regional centers. The green membrane plan between the areas was located as a boundary wall in comprehensive plan programs, based on which suggested comprehensive plan areas were separated from each other by a green strip (Atak Consulting Engineers, 2003: 65).

Strategic Structural Plan

The results of analyzing the content of the strategic structural plan indicate that this plan has paid attention to environmental sustainability in different parts and has tried to increase environmental sustainability indicators by providing strategies.

The most important strategies are:

Guarantee the sustainability of protected areas and the biodiversity of ecosystems, protecting gardens and agricultural lands and developing green spaces in boundaries, limited areas and urban complexes of Tehran.

Filtering activities and moving polluting centers and cargo terminals outside the city boundaries Preventing or reducing air and noise pollution by providing possible solutions, such as determining personal transportation and changing the features of heavy vehicles in terms of generating noise, developing public transportation, especially developing subway network, and improving the technology of producing and consuming suitable fuel with minimal pollution.

Optimizing waste management, especially dangerous waste, hospital waste and construction waste, and applying appropriate and new methods to dispose of waste with the least damage to the environment.

Protecting and organizing the mountain and mountainsides around the City by establishing a green belt, equipping the river valleys, and guiding and intervening in using mountain lands within the boundaries and limited areas of the City.

Protecting and organizing natural water flows (rivers, seasonal rivers and important waterways) in a limited urban area and establishing attractive and refreshing recreation spaces on the edge of surface water flows.

Protecting, developing and organizing gardens, protected areas, forest and urban parks (including Lavizan, Ghazal, Sorkhe-Hesar, Abbas-Abad, Pardisan and Chitgar) and natural-historical areas of Bibi Shahrbanoo and Cheshme Ali. in the limited areas of the City

Organizing urban spaces in terms of environmental qualities and visual discipline, identifying and responding to the psychological and emotional needs of citizens.

Improving the quality of the urban environment by developing public areas, creating vitality in the urban environment, strengthening the identity signs of the City and organizing urban furniture and equipment.

Developing green spaces in urban, regional, and local functional scales to provide at least 10 square meters of green space per capita in Tehran with a balanced distribution throughout the City.

Protecting, organizing and using the capabilities of forest parks, according to the Law on Forest Conservation and Logging, by improving performance to create suitable spaces for recreation, leisure, games and sports, accommodation and tourism, and crisis management.

Organizing rivers and watercourses, especially Kan River, as a green north-south urban and tourism axis with a coordinated and integrated intervention.

Establishing necessary facilities to improve the level of services needed in the tourism industry and locating suitable urban spaces for establishing accommodation and reception centers with global standards.

Allocating special areas of the City for recreation and tourism, especially in the suburbs of Tehran, including northeastern, eastern, southern (Bibi Shahrbanoo) and northwestern (region 22) limited areas.

Therefore, it can be concluded that more attention has been paid to environmental sustainability in the strategic structural plan than in the previous two plans.

Degree of Attention Paid to Urban Decays

First Comprehensive Plan

This plan has destroyed and renovated about 2000 hectares of Tehran, which is completely influenced by the discourse of renovation in modernity. According to it, urban decays are mainly located in the central and the southern part of Tehran. In this plan, overall, 6 modes are considered for renovation. But this plan does not specify how and when these areas should be reformed and renovated. Therefore, it has no enforceability.

Organizing Plan

In the organizing plan, the central areas of the City have been identified as urban decays. The criteria to identify urban decays in this plan are the same as the initial map of Farmanfarmaeian's comprehensive plan.

Strategic Structural Plan

In strategic structural plan, it has been tried to identify urban decays by using a scientific method. The range of urban decays in this plan has been identified based on three major indicators of "instability," "impermeability," and " microlithic parts ":

Instability: lack of proper structural system and non-resistant buildings

Impenetrability: lack of proper access and lack of paths with enough width for riding

microlithic parts: compression of contexts and the abundance of small plaques (pieces) with a small surface area

Table 4: urban decays of Tehran based on the indices of instability, impermeability and microlithic parts

Determining indicators of urban decays	Surface areas (hectares)	blocks	Residential units	Population (person)
instability	14792	13911	634179	2873811
Instability and microlithic parts	8669	10752	529744	2430.126
Instability and impermeability	3620	5294	275192	1200.005
instability, impermeability and microlithic parts (limited area of urban decays)	3268	4990	261786	1152.173
Sum	62100	30217	1483919	6742.165
The ratio of urban decays limited areas to limited urban areas	5.3%	16.5%	17.6%	17.1%

Microlithic parts and impermeability are not indicated urban decays by themselves.

Table 5: Summarizing and comparing the features of Tehran's comprehensive plans

	First comprehensive plan	Organizing plan	Strategic structural plans
The limited area of the City at the time	180 square kilometers	650 square kilometers	

of preparing the plan			
The scope of the suggested plan	650 square kilometers	707 square kilometers	621 square kilometers
The perspective of the plan	1991	1996	2026
The population of the City at the time of preparing the plan	2.7 million persons	6042584 persons	7711230 persons
predicted population in the planning perspective	5.5 million persons	7.65 million persons	8.7 million persons (10.5 million persons with a 20 % surplus)
The existing population density at the time of preparing the plan	150 persons per hectare		
Suggested population density	90 persons per hectare		
Per capita services per person	55 square meters	32 square meters	
Suggested number of functional centers	10 regions	5 areas and 22 regions	20 regions
Suggested development model (city construction)	linear	Irregular radial	Regular network
Suggested development direction	East to west	North to south	North-South, East-West

Conclusions

The purpose of this research is to study the spatial structure of urban development comprehensive plans based on urban features. The studies showed that the comprehensive plans of Tehran city have always sought to create a polycentric spatial structure for this City. The features of this type of spatial structure include the existence of a center that usually acts as the CBD (central business department) and organizes all the economic activities of the City. Establishing functional diversity by dividing and transferring part of the duties of the center to subcategories and reducing the pressure on the center in this way, gathering patterns of population traveling and employment as a radial or linear form among the centers and forming social nature and cultural identity for each center beside their economic activities.

By analyzing the content of comprehensive urban plans as the primary idea of development, spatial, functional and physical features, it was determined that such a purpose was mentioned

in all three plans. Nevertheless, the idea of polycentric Tehran in every three comprehensive plans has been suggested as different spatial forms.

This idea has been considered in the first comprehensive plan in a linear form by creating 10 urban centers as societies that are separated from each other by a green belt. Every society has a central core; each center plays a specific role in the spatial structure of the City, while land-use planning has been done for all urban cores in the same way. Latmer area is considered a recreational center for Tehran, Tajrish and Shemiran are retail and residential centers for high social classes, and the new center of Shahestan Pahlavi in Abbasabad is suggested as the political-administrative center of the capital. Other centers have also played a similar role.

In the organizing plan, the idea of polycentric Tehran has been developed as a suggestion for a radial form of development. This form was designed as opposed to the idea of linear development and was more consistent with the existing developments of that time in terms of development orientation. Because Tehran is a city that has expanded in all directions since the 1960s, in this plan, development to the south and southwest of Tehran has been encouraged by constructing numerous north-south highways. Therefore, one of the purposes of this plan was to realize Tehran's polycentric structure. The centers of these areas are located in Tajrish, Bazar, Rey, Tehranpars and Region 22, respectively. It should be noted the other ideas of this plan of polycentric Tehran, such as the construction of five satellite towns, consider Tehran and Karaj as two metropolises (twins) in the medium-term development model of the urban area of Tehran.

In the last comprehensive plan, a network (grid) form is provided for the spatial structure of Tehran and 20 regions are considered for Tehran; each region has a specific center. This plan, while knowing the idea of the two previous plans regarding the establishment of a polycentric Tehran, has tried to strengthen the link between the three Tajrish, Rey and Bazar. Therefore, despite two previous plans which emphasized that Rey has not a significant role in the structure of Tehran and remains a small town, this plan emphasizes the development of Rey as much as possible and developing its ling with Tehran. The most important difference between this plan and the previous two plans is the suggestion of functional areas instead of a land-use plan. Furthermore, it can be said that this plan is completely based on the structuralism point of view, and the impacts of constructionism can be traced in it more than in the other two plans. That is, it seeks to design the main structure and framework of the City based on historical and natural elements in order to achieve organizing urban development. In general, it can be said that the comprehensive plans of Tehran sought to create a city with a polycentric structure.

Suggestions

One of the requirements to realize the suggestions of comprehensive plans is the existence of interdepartmental cooperation between urban organizations. According to the fact that such an issue has not yet been achieved at the level of urban organizations, it is suggested that the preparations and initial steps of this affair be accomplished by the Ministry of Roads and Urban Development and Municipality by conducting relevant studies, forming working groups to attract interdepartmental cooperation and increasing the interaction of urban organizations and setting up systems and mutual portals between urban organizations to inform and update statistics and information about comprehensive and detailed plan changes.

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