



Analysis of Spatial Inequalities in Tehran Metropolis

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ARTICLE INFO	ABSTRACT
<p><i>Received: 05 March 2021</i></p> <p><i>Reviewed: 12 March 2021</i></p> <p><i>Revised: 20 April 2021</i></p> <p><i>Accept: 05 May 2021</i></p>	<p>Purpose: Nowadays, Spatial and social inequalities are universal and expanding phenomenon. Identification and spatial analysis of social, economic and ecological inequalities in metropolises is one of the essential and basic proceeding for planning and achieving urban sustainable development. Aims to reviews the quality of spatial differentiations between the 374 neighborhoods of Tehran metropolis.</p> <p>Methodology: The method of the research is descriptive-analytic. To identify regions' development levels in Tehran, 10 sub-criteria in the form of 3 main criteria were used. With Using of AHP method and EXPERT CHOISE software each criteria and sub-criteria mutually were compared relative to each other, evaluated and scored. Finally, by method of hierarchical clustering, Tehran metropolis neighborhoods in terms of ranking of development at five levels of developed, relatively developed, medium developed, less developed and underdeveloped regions, were clustered and in the Arc GIS settings were displayed as a map.</p> <p>Findings: The result of indicators review shows that Tehran metropolis lacks socio-physical unity and spatial differentiations between the north and south of it remain still as the main feature of spatial structure of Tehran metropolis.</p> <p>Originality/Value: The present study believes that continuance of the current procedure, not only in Tehran but also in national level is a main challenge over the way to achieve urban sustainable development and good city.</p>
<p>Keywords: <i>urban sustainable development, Analytic Hierarchy Process (AHP), Spatial Inequalities, Tehran Metropolis</i></p>	

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1. Introduction

The tendency to urbanity and increasing metropolises has become the dominant process in the world especially in developing countries. The speed and rate of urban growth and urbanity in developing countries had been more than other countries. Currently, 56/2 percent of the world's population live in urban areas [1]. It is predicted that, the world urban population will be amounting to 68 percent of the total world population on horizon of 2050. According to forecasts, the maximum increase of urban population is in developing countries and the countries' urban population will be more than doubled and become from 2.5 billion to 3.5 billion on 2050 [2]. The combination of tendency to inherent centralization of the capitalism system (external factors) and the pre-industrial infrastructural inability in these countries has led to capitalism's intense centralization and has created the exogenous urbanity [2]. Exogenous urbanity in Iran has created with taking into account the oil revenue in pre-industrial society that urbanity causes the rapid and inequalities urbanity [4, 5]. Tehran metropolis has developed very fast under the influence of new world order in recent century which this rapid growth has led to the important development and changes in the spatial formation.

The economic, political, cultural, military, administrative and services centralization in Tehran has provided a wide range of employment opportunities. Simultaneously, activities relative stagnation in other cities of the country and enjoying the better services has accelerated the development. So, the population of Tehran metropolis has increased from 155.000 people in 1907 to 8.679.936 people in 2016. Moreover, the urban area has increased from 24 square kilometers in 1921 to 180 square kilometers in 1966 and 630 square kilometers in 2019 [6, 7]. During this period of rapid urbanity growth surpassed on development (Quantity over quality); environmental problems, economic dualism and spatial heterogeneity have been intensified; so, the various problems resulting from the social and spatial fragmentation has threatened the urban sustainability. Therefore, future of this city which has national, regional and global importance is at risk [8, 1]. Identification and spatial analysis of social, economic and ecological inequalities in metropolises is one of the essential and basic actions for planning and achieving urban sustainable development. In this research, spatial inequalities and the level of development of 374 neighborhoods in Tehran metropolis have been analyzed using the various indicators of social, economic and environmental and Analytic Hierarchy Process model (AHP).

2. Literature Review

The concept of space and its related meanings have been used and discussed mainly from the second half of the 1960's at first among the geographers and some of the economists (related to the concept of the space) then among other scientific fields. The concept of space in geography has been utilized in two meaning; absolute Space and relative space. Absolute space has objective, specific and natural qualities but the relative space continuously changes at effect of the social and economic demands and technological conditions. Therefore, relative space is constrained by the time and location [9, 10]. Relative understanding of space in absolute space is just a relation between events and their characteristics. Therefore, it depends to time and process or something that an individual or community feels it. In this approach of the space, relative or created space is a conceptual space and community proceeds [11]. From David Harvey point of view, there are relative spaces according to human performances and social processes [9].

In urban management and rural areas' encyclopedia, space has been defined as objectivity of role taking and effectiveness of individuals and group of people in location. In other words, the outcome of the

interaction among the two socio-economic and natural-ecological forms the space. Then, space could be defined as a kind of social proceeds. As space is formed from related components, then could be accounted as a system [12].

From a systemic approach, city is a socio-physical complex system which is composed of multiple sub-systems. The efficiency and the dynamics of this complex system are dependent on the coordination and equivalence in the inner and outer systemic relationships. On one hand, Variety, multiplicity and diversity of the different elements and dimensions of the city and urban living, on the other hand, decision and policy making factors effective on making the city and directing its development leads a problem in the lack of coordination mechanisms between sectorial and institutional for achieving the unity and integrity Which refers to the scattering and inequality [13]. Reviewing the various texts about fragmentation reveals that there are two types of large scattering on urban issues [14, 15, 16, 10]:

- Fragmentation in various city aspects and urban living
- Fragmentation in planning and management system

In this research, the first type of fragmentation (spatial and social fragmentation) has been studied. Social fragmentation means existing plurality in social classes which is a historical and expanding issue in cities. The distinction between rich and poor sectors has been the historical reflects of industrial development and wealthy power for purchasing desirable areas with good perspective, better transport, schools and air quality in order to have better life [15]. The chasm process (gap) among the rich and poor in cities after the 1950's, Suburbia intensification and urban sprawl that is another type of spatial fragmentation is shown more in suburban rich areas and urban poor areas. (European Environment Agency, 2006. Ewing et al, 2002). [17, 18]. The newest kind of distribution and social differentiation could be seen in formation of wealthy gated communities, this time not only in terms of space but also in terms of physical fence has also been isolated from other urban parts [16]. Spatial inequality refers to conditions in which various spatial or geographic units on some variables have different levels [19]. Spatial heterogeneity reflected in shortage and poverty in lifestyle, health care, good schools, job opportunities, food, transportation, education, adequate housing, security, data and having indicators of piped water services, gas, electricity, etc [20].

Spatial inequalities intensified with increasing social inequalities in big cities and spatial inequality reinforces the social inequalities [21]. In this context, "Tounis mentions to the urban space as the class classifications extent and hostility, Contrasts between capital and labor, arithmetic and self-interest are its characteristics; like George Zimmel that knows the city as center of the social inequalities intensification and class classification". Also, detachable is due to socio-economic inequalities could be affected by government policies and governments could intensify the spatial segregation conditions [19]. David Harvey also emphasizes on interdependence among the social inequalities and spatial structures [9].

The concept of social justice from the late 1960's is used by geographers in urban studies in order to reduce severe inequities, poverty and Then, above all, the Radical and Liberal doctrine were affected [9]. Depending on social, geographical and historical conditions meaning of justice is different [22, 23]. In the other hand, Justice is bound to time, place and type of military relations and social structures [24]. It means that everybody achievement is equal to his/her merit or competency. Justice is a proper and equitable action or feature [25]. From Edward Suja point of view, justice has a geographical concept and equitable distribution of resources, services and access them is human basic rights [26]. The liberalism doctrine followers consider the social justice for more as means of protection the status quo,

moral virtue and humanity task. Thus, pay attention to the equitable distribution more than equitable production method is shown in their work limited. While, The radicalism doctrine followers Including Henry Laufer, Manuel Castells, David Harvey and Edward Soja also emphasize to the production and the goods consumption. According to David Harvey, social justice theory is based on interaction of the spatial and social realities. In other words, Socio-economic inequalities of community affect the spatial structure and any changes on it has a direct effect on socio-economic relations and the community income distribution. Therefore, as time and space are inseparable, social and spatial inequalities are interdependent. He believes the private sector logic is in order to maximize the profit and this is the same natural propensity to development of rich neighborhoods more than poor one which intensifies the inequalities of the income distribution [27]. Hence, the urban distinct forms due to social, economic and political various processes could be indicative of social justice scale in the city [23]. Spatial and social justice are from basic concepts of urban sustainable development. In other words, poverty and inequality reduction and relying on social justice and geographical equality are basic actions on urban sustainable development. The concept of sustainable development in the world literature for the first time in 1987 brought with publication of the Environment World Commission and United Nations Development called Our Common Future. It is a famous report in the name of Brandt Land has defined the sustainable development as follows: "Development which meets the present needs without reducing the ability of future generations to meet their needs" [28]. Sustainable development has multidimensional concept of economic, social and environmental [29]. Sustainable development Principles are as follows:

- Sustainable development objectives is multifaceted and ecological balance, social justice and economic survival are together and inseparable [30].
- In ecological aspect, while development is sustainable that natural resources usage be proportional to their reproduction rate and pollution and waste production be in their absorption capacity and refinement of the ecosystem.
- Also, in social and cultural aspects, development is sustainable that be included the intergenerational justice and basic needs' provision and the vitality culture be promoted with depositary and environment-friendly criteria.
- Sustainable social system must be achieved to the equal distribution of resources and facilities equality and social services including health, education, gender equality, political accountability and participation [31].

In economic aspects, the development is sustainable in which consumption, distribution and production pattern changed towards localization [30]. Economic system pays to the maintaining and expanding of the employment opportunities and sufficient income at local level and deal with globalization challenges and Prevents from forming imparity between the different economic sectors

3. Methodology and Research Indicators

The present study is a descriptive-analytical research. For recognizing spatial inequalities of Tehran metropolis, Analytical Hierarchy Process (AHP) and Delphi Process are utilized. AHP is one of the most prevalent multi-criteria decision-making methods [32]. In 1977, AHP was invented by Thomas L. Saaty. This method has had various applications in different branches of science [33]. The basis of this method is to devise binary comparisons and recognize the level of preference and priority of compared elements over each other and in relation with the predefined criterion. The method is used to solve

evaluative and multi-criteria problems, prioritize the contested options on the basis of the predefined criteria and sub-criteria [34]. Due to versatility of criteria and indexes in identification process of spatial inequalities, the present study believes that AHP is considered to be an ideal research methodology. The first step in AHP is to generate a hierarchical structure of the research problem. In this hierarchical structure, objectives, criteria, options and their interrelations are discerned. The next four steps in AHP are to calculate criteria and sub-criteria weights, calculate options weights, and calculate options scores and to analyze logical incompatibility of judgments [35. 36].

In order to identify development level of neighborhoods of Tehran metropolis through utilization of statistical data of 2016 census report, 10 indexes are categorized in three main criteria, which pertain to the city's Social (which includes indexes such as Population density, Household size, Literacy rate and Population with higher education) Economic (which includes Percentage of employed, experts, high ranking officials and managers, Percentage of employed, unskilled labors, Percentage of households owning a car and Percentage of households with 5 or more rooms) and Environmental aspects (which includes Air pollution and Noise pollution) After this categorization, all the aforementioned criteria are compared in pairs through utilization of Delphi Process, AHP and Expert Choice software platform. This comparison will indicate the weight and significance of each criterion in the development level of the city. In the next stage, sub-criteria of each main criterion are evaluated and scored in relation to each other. After calculating incompatibility coefficient, the final weight of each neighborhood is realized. Table (1) shows criteria, sub-criteria and their allocated weights. In the last stage, hierarchical clustering is utilized to cluster neighborhoods of Tehran metropolis on the basis of their development levels. The results of this clustering are represented and mapped in GIS interface.

Table 1. Weights of evaluation criteria and sub-criteria of development

Criteria	Sub-criteria	Weight	Incompatibility coefficient
Social	Population density	0.093	0.05
	Household size	0.063	
	Literacy rate	0.132	
	Population with higher education	0.186	
Economic	Percentage of employed, experts, high ranking officials and managers	0.163	0.01
	Percentage of employed, unskilled labours	0.133	
	Percentage of households owning a car	0.060	
	Percentage of households with 5 or more rooms	0.060	
Environmental	Air pollution	0.036	0
	Noise pollution	0.071	

Accordingly, the Tehran metropolis is divided in to 5 zones with different levels of development:

Level 1) developed

Level 2) relatively developed

Level 3) Medium developed

Level 4) less developed

Level 5) underdeveloped

The map below shows the extent of different zones in Tehran.

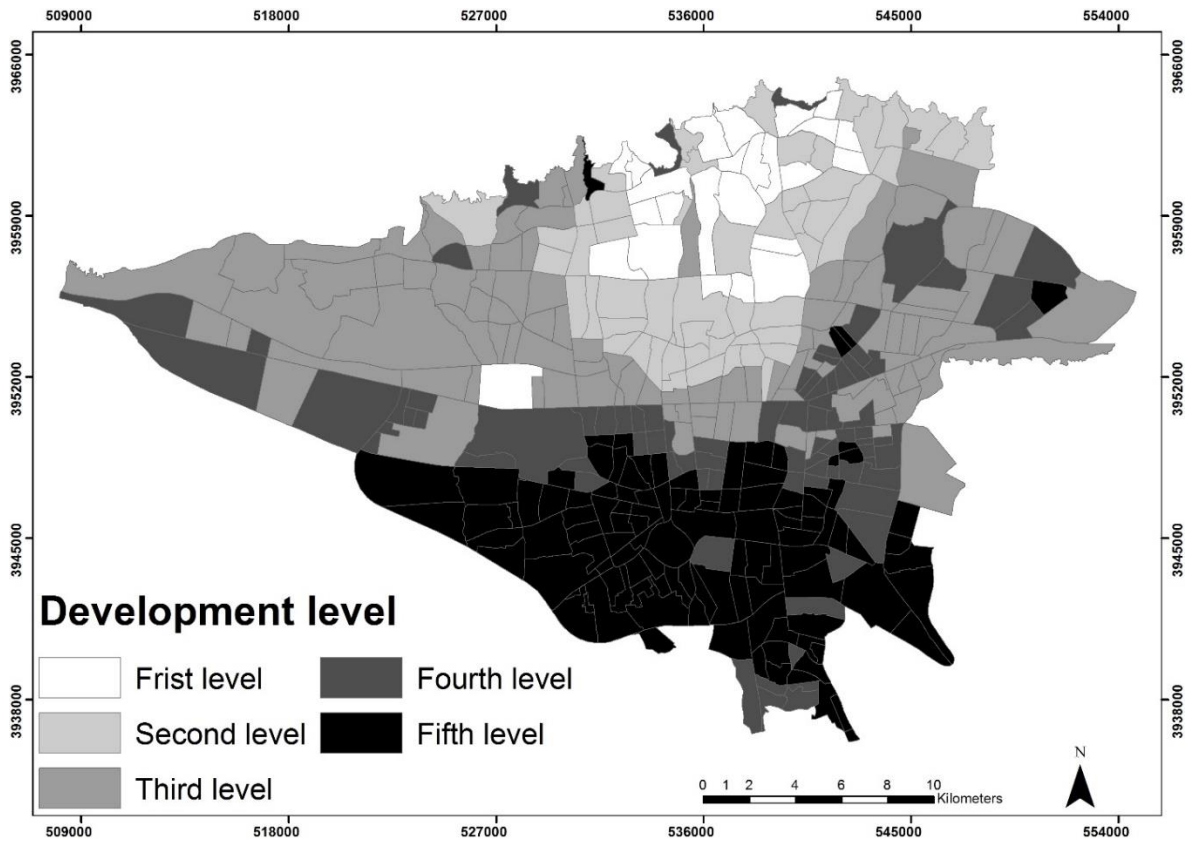


Fig. 1. The level of development in Tehran metropolis area

As it is shown in the Figure (1), the first level zone is mostly in north of Tehran and therefore this part is the developed area of the city. The south of Tehran in the fifth level zone of the city and that is why it is the underdeveloped area.

4. Discussions and Findings

In order to show spatial heterogeneity in Tehran metropolis area and inequality among extracted zones, the characteristics of research indicators have been analyzed in the form of the subjects under study.

According to the statistical blocks of Iran population and housing census in the year 2016, the population of Tehran metropolis was 8693706 which the proportion of this population in each zone is as follow:

- 549715 people (6.3%) in the first level zone
- 1107746 people (12.7%) in the second level zone
- 2384570 people (27.4%) in the third level zone
- 1934052 people (22.2%) in the fourth level zone
- 2717623 people (31.3%) in the fifth level zone

Table (2) shows the demographic characteristics of each zone in Tehran metropolis area in comparison with each other and the city of Tehran.

Population density in the underdeveloped zone of the city is very high and in more developed zones this figure declines (Table 2). High density is a source of many social and economic problems, indicating a kind of inefficiency in access to urban facilities by residents of the city.

Table 2. The demographic characteristics of Tehran metropolis based on zones

Zone	Proportion of population (%)	Household size
Level 1	6.32	2.96
Level 2	12.74	3.03
Level 3	27.43	3.13
Level 4	22.25	3.09
Level 5	31.26	3.27
Whole city	100.00	3.14

In general, the study of social and economic indicators based on the general census data of the population and housing shows an obvious gap between the underdeveloped and other zones of Tehran metropolis. The inhabitants of this zone are less educated than the rest of the city, and because of lack of sufficient skills, they achieve lower quality jobs as well as occupational status. The literacy rate in underdeveloped zone (88.12%) is lower than the average and three other areas. Therefore, the residents of this zone suffer from more illiteracy.

It is obvious that due to the less opportunities of education, the percentage of individuals who are highly educated is much lower in underdeveloped zone in comparison with the other zones and with the city. In fact, this figure declines constantly with the decrease in level of development. As it is shown in the table 3, the proportion of highly educated people in developed zone (level 1 with 40.31%) is approximately 5 times higher than the underdeveloped zone (level 5 with 8.69%).

Another indicator that has been considered in this section, is the percentage of households using the internet. As the other social indicators, this figure is also dependent on the level of development. Therefore, this percentage in the first level zone is almost 2 times more than fifth level zone.

Table 3. The social characteristics of Tehran metropolis based on zones

Zone	Literacy Rate	Female Literacy Rate	Percentage of Population with Higher Education	Percentage of Households Using Internet
Level 1	96.79	96.47	40.31	75.85
Level 2	95.87	95.17	33.88	72.36
Level 3	95.09	93.87	25.08	67.65
Level 4	91.97	90.26	16.04	52.49
Level 5	88.12	84.94	8.69	37.78
Whole city	92.48	90.75	20.55	56.44

The economic characteristics of different zone have been assessed by six diverse indicators. Owning a car and a house can be economic indicators. As it is shown in table 4, the percentage of households who own personal car has a direct relationship with the level of development. This trend is also true in percentage of landlord households. The percentage of house ownership amongst households in developed zone is 61.56% and it goes down to 48.94% in underdeveloped zone which is even lower than the whole city.

Percentage of employment, unemployment rate and the percentage of unskilled labors and experts of all employees are four economic indicators which are related to employment status. The unemployment rate in underdeveloped zone is lower than the developed zone and therefore the percentage of employment declines with the increase in level of development. This can be due to the fact that the individuals living in poorer areas have inclination to do even low level jobs. The percentage of experts and unskilled labors have total opposite trends. The percentage of unskilled workers in underdeveloped zone is higher than the other zones and the whole city. While on the contrary, the proportion of experts in developed area is have the same status and it is almost 6 times higher than the underdeveloped zone and approximately 2 times higher than the percentage in the entire city. This can be an implication of the difference in education opportunities in these zones.

Table 4. The economic characteristics of Tehran metropolis based on zones

Zone	Percentage of Household owning a car	Percentage of Employment	Unemployment Rate	Percentage of Unskilled Labours of all Employees	Percentage of Experts of all Employees	Percentage of landlord Households
Level 1	76.68	84.37	15.63	6.25	51.64	61.56
Level 2	71.35	85.59	14.41	4.88	42.73	57.96
Level 3	67.74	86.20	13.80	3.92	29.85	53.07
Level 4	50.60	87.05	12.95	6.74	17.92	51.50
Level 5	41.20	87.05	12.95	12.07	8.73	48.94
Whole city	56.99	86.46	13.54	7.34	23.57	52.71

Some of the characteristics of urban housing can be used as criteria in identifying poor settlements. The number of households and individuals in a residential unit rises with the reduction in level of development. The proportion of residential units which are durable is almost 95% in developed zone and it goes down to 72.48% in underdeveloped zone.

The size of residential units is another criterion in assessing physical features and the quality of life in human settlement. As it is shown in the table below, the percentage of residential units which are under 80 m^2 is much higher in level 5 zone. Also, the proportion of households living in residential units with 3 or more rooms rises with the growth in level of development. Generally, the quality of housing has a direct relationship with the level of development in Tehran metropolis.

Table 5. The physical characteristics of Tehran metropolis based on zones

Zone	Number of Households in a Residential Unit	Number of Individuals in a Residential Unit	Percentage of Durable Residential Units	Percentage of Residential Units Below 80 m^2	Percentage of Households with 3 or more rooms
Level 1	1.005	2.98	94.81	12.13	89.97
Level 2	1.006	3.04	91.39	17.93	88.09
Level 3	1.005	3.14	90.85	34.76	79.78
Level 4	1.007	3.11	82.25	63.01	58.56
Level 5	1.019	3.33	72.48	75.11	45.37
Whole city	1.010	3.17	83.78	49.39	66.53

5. Conclusion

Nowadays, spatial and social inequalities are universal and expanding phenomenon. Identification and spatial analysis of social, economic and ecological inequalities in metropolises is one of the essential and basic actions for planning and achieving urban sustainable development.

The metropolis area of Tehran has grown rapidly in the last century under the influence of the modern world order, and this rapid growth has brought about significant changes in its spatial form. Economic, political, cultural, military, administrative and service centralization in Tehran provided widespread employment opportunities, while the relative decline of activities in other parts of the country and the excessive enjoyment of better services in Tehran have accelerated this development. The growth of the city surpassed its development, in other words, the quantity has overcome the quality; environmental problems, economic dualism and spatial heterogeneity have been intensified; so the various problems resulting from the social and spatial fragmentation has threatened the urban sustainability. Therefore, the future of this city which has national, regional and global importance is at risk.

In this research, in order to determine the spatial and social fragmentation in Tehran metropolis area within urban sustainable development of 3 main criteria (social, economic and environmental) and 10 sub-criteria or indicator is considered. The geographic distribution of development indicators proves the existence of spatial and social heterogeneity between neighborhoods in Tehran. Socio-spatial heterogeneity in the city is obvious in terms of different indicators for housing, education, employment, demography and infrastructure. Most development indicators are concentrated in the north of Tehran; So that the developed and relatively developed zones including first and second level of development are located in north of the city, while the moderately developed, less developed and underdeveloped zones (third to fifth level of development) are in southern part. In other words, Tehran metropolis has no physical unity and the spatial heterogeneities between its north and south have become the main feature of the spatial structure of Tehran metropolis area. Continuing the current trend is a major challenge in achieving sustainable urban development not only for Tehran, but also for the country. Therefore, it is imperative that Tehran's urban management take new steps to better understand this phenomenon and to apply new and effective methods to reduce the effects and various aspects of inequality and spatial duality.

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