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SPATIAL DISTRIBUTION OF URBAN SERVICES FROM THE SPATIAL JUSTICE PERSPECTIVE: CASE STUDY OF TEHRAN[1]

Abstract. The realisation of spatial justice, guaranteeing the quality of life for all citizens and the prohibition of citizens' exclusion are the fundamental principles of optimal urban management. Social seclusion is associated with social policies such as education, health, housing, employment, crime, welfare, poverty alleviation, etc. The spatial problems in Tehran are due to the political organising and political management of space in Iran on a micro and macro scale during the last hundred years. Tehran as the major metropolis of Iran has a special significance in the Iranian urban system; but in terms of spatial justice, the distribution of urban services across its districts is considered heterogeneous. The purpose of this paper is to evaluate the status of "Spatial Justice of Tehran" in terms of urban services and examine the level of difference between districts. Mixed method is used in this research. The results show that the distribution of urban services is not just in 22 districts of Tehran. According to the findings, district 1 has the highest level of services and districts 17 and 9 have the lowest levels of services.

Keywords: urban services, Tehran, spatial justice, level of utilisation, seclusion

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ИССЛЕДОВАТЕЛЬСКАЯ СТАТЬЯ

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Пространственное распределение городских служб с точки зрения пространственной справедливости (на примере Тегерана)

Аннотация. Реализация принципов пространственной справедливости, гарантии качества жизни населения, а также запрет на изоляцию граждан лежат в основе оптимальной модели городского управления. Социальная изоляция связана с такими аспектами социальной политики, как образование, здравоохранение, жилье, занятость, преступность, социальное обеспечение, борьба с бедностью и т. д. Пространственные проблемы, возникшие в Тегеране — столице Ирана, тесно связаны с политической организацией пространства в стране на микро- и макроуровне, наблюдаемой в течение последнего столетия. Исходя из постулатов теории пространственной справедливости, распределение городских служб по районам Тегерана отличается неоднородностью. Цель этой статьи — оценить пространственную справдливость Тегерана с точки зрения расположения городских служб и изучить различия между районами. В работе использован комбинированный подход. Результаты исследования подтвердили неравномерное распределение городских служб по 22 районам Тегерана: согласно полученным данным, наиболее высокие показатели наблюдаются в районе 1, в то время как для районов 17 и 9 характерны наиболее низкие значения.

Ключевые слова: городские службы, Тегеран, пространственная справедливость, уровень использования, изоляция

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1. Introduction

Space is not a container of human activity, but an active force that shapes human life. According to Soja, man produces space. Spatial justice includes fair and equitable distribution of valuable social resources and opportunities to use them (Soja, 2009)

Such a conceptualisation of spatial justice in the city requires the identification of power actors in various social, political and analytical fields, and evaluation of power relations, structures and processes of urban space production. In the world literature, the issue of the realisation of spatial justice has been considered in the distribution of public urban amenities (Tsou, Hung, Chang, 2005) . When there is no match between population and urban public services or when the level of income is low (Chang, Liao, 2011), the importance of the issue of spatial justice becomes more prominent.

Equitable distribution of facilities in the city will increase the quality of life in the city in the short term and will lead to sustainable development in the long run. One of the most important signs of spatial justice in cities is the balanced distribution of urban services (Hosseinzadeh Dalir, 2001). Unfair distribution of urban services results in population imbalances in the city and shapes the city's space unfairly (socially and economically) (Gray, 2002).

The purpose of spatial justice is the equitable distribution of facilities, utilities and services among the neighborhoods and areas of the city according to the basic needs, so that no neighborhoods or areas are superior to other areas or neighborhoods and the principle of equal access is respected (Varesi, Zangabadl, Yaghfourl, 2008). In fact, the distribution of services and facilities and their quality are linked to social well-being. They cannot be separated from marginal issues such as inequality of citizens and personal freedoms. It should be noted that even the most beautiful and best places, if faced with the lack or weakness of access to resources and facilities, cannot be enjoyable for the residents (Harvey, 1996).

One of the obvious shortcomings in urban planning in Iran is the lack of effective models for reducing existing urban inequalities and promoting spatial justice. Explaining the concept of spatial justice in the city and applying it can be a great help to urban planning in cities (Afsharnia, Zebardast, Talachian, 2022).

Since Tehran as the capital of Iran plays a major role at the national, regional and even international levels, it faces many problems in terms of sustainability indicators. Therefore, the analysis of spatial distribution and inequality of services in Tehran is of national importance and its results can be effective in increasing the efficiency of urban management. Therefore, the spatial distribution of urban services and disparities in urban areas should be evaluated and analysed. Balanced distribution of community assets at micro and macro levels stimulates the organisation of urban space. Spatial injustice in the city of Tehran imposes short-, medium- and long-term costs for the city's management system and the political system.

Based on statistics, Tehran is one of the world's most populous cities; in terms of density, more than 16 percent of the country's population is in this city, and more than 11,650 people live per square kilometre, while the 5,000 hectares is the urban decade. In addition to natural hazards that are somewhat involuntary, Tehran suffers from numerous other factors such as the lack of integrated management, unhealthy environment, costly traffic and transportation, increasing suburban residence and the problems that arise from it like the occurrence of crime, unauthorised and non-standard construction, etc. Although the above problems are visible and intercepted in the vast majority of Third World cities, not following justice-based strategies in the distribution of municipal services facilitates the above-mentioned factors more than ever. Overlap and coordination of the above issues have somehow affected the Tehran metropolis that the city suffered from structural differentiation and spatial disconnection. The gap between wealthy and non-wealthy areas in Tehran causes the forced seclusiveness of residents in non-wealthy areas, providing grounds for abnormal behaviours in the city.

From the viewpoint of the research novelty, insufficient attention is given to measured urban services distribution from the viewpoint of spatial justice in Tehran; most previous studies focused on separate regions. Therefore, the quality of urban services distribution among 22 regions of Tehran has been assessed in the current research for the first time. The next advantage is that a clear illustration of spatial justice-based urban services in Tehran will be made available. The current paper not only clarifies inequalities but also takes into consideration its possible consequences, especially its role in isolating citizens as the main cause of threatening constant urban development.

The aim of this paper is to assess the status of "Tehran Spatial Justice" in terms of urban services distribution. The significance of the problem arises from the fact that Tehran faces numerous challenges, including increasing population, abnormal physical development, increase of marginalisation, increase of urban poverty and isolation of citizens.

Therefore, studying the spatial distribution of urban services in 22 districts of Tehran can help policymakers and planners to realisation of spatial justice. Therefore, the main questions of the paper can be summarised as follows:

— Does facilities and services distribution in 22 districts of Tehran is consistent with the spatial justice standards?

— What is the ranking of urban districts in terms of population access to urban facilities and services?

In order to answer the above questions, this article first explains the concept of spatial justice in the city. Then, by measuring the "spatial distribution of urban facilities and services", the differences between urban districts are examined. Ultimately, urban districts are evaluated and ranked in terms of access to urban facilities and services.

2. Literature Review

— In the investigation "Visualizing fairness: Equity maps for planners" Talen (1998) has studied the quality of such services distribution as neighbourhood parks and playgrounds in American cities. The foregoing research is being done based on a demand-oriented approach to achieve spatial justice, hence the accessibility indicator has been used to analyse distribution of urban services. The findings suggest that services and facilities are needed to be distributed and located based on socio-economical characteristics in order to ensure spatial fairness.

— In the 2016 research "Investigating the Role of Spatial Justice in Urban Management (Study Area: District 6 of Tehran)", Tabe'ie and colleagues studied the conditions of service distribution in a neighbourhood area of district 6. The results of the Vikor model show that the distribution of services is not fair in the area of district 6.

— Mohamadi et al. (2014) presented a study "Analysis of the Services Spatial Distribution in the Urban Areas (Piranshahr City as a Case Study)", which revealed that a large part of the urban services is located in the central and northeast area and some of them are located in the west and southwest area of Piranshahr city.

3. Study Objectives

Generally, geographical studies and in particular political geography are done on different scales to enhance the life situation for citizens. Due to the destructive consequences of the unjust distribution of municipal services and facilities in the long term, this study seeks to explain the allocation of the services in Tehran from the perspective of spatial justice.

The most important objectives of the study are as follows:

— To evaluate the distribution of facilities and services on 22 districts of Tehran;

— To rank study areas in terms of the extent to which the resident population has access to facilities and services;

— To increase the awareness of urban managers in pursuit of a balanced distribution of municipal services and facilities in order to enhance the citizens' quality of life and sustainability of the environment.

4. Materials and Methods

The governing approach in this paper is descriptive and analytic and the mainstay of the discussion is the library resources, official statistics and field observations of researchers. The total legal area of Tehran (22 districts) is considered in this research and various data obtained from the official sources of the country (Statistical Centre of Iran and the municipality of Tehran in 1395). Excel software and TOPSIS model were used to compute data and rank the districts. In order to express the relative importance of the criteria and their relative weight, expert's model, Shannon entropy and experts are used in this research. Arc GIS is also used to draw maps. The present research has been conducted with the purpose of weighing the quality of urban services distribution in Tehran from the viewpoint of spatial justice; required indicators have been selected to give accessibility and predictably. The questionnaire method has been used to determine the importance and weight of given factors and variables. Hence, 100 lecturers and experts in geography, economy as well as urban and regional planning have been interviewed.

4.1. Research limitations

Participation of different people, limitations of statistical methods as well as preparing accurate statistics are among the most well-known drawbacks of the current research. On one hand, scarcity or failure in research services within Tehran's municipality, and on the other hand, wrong cul-

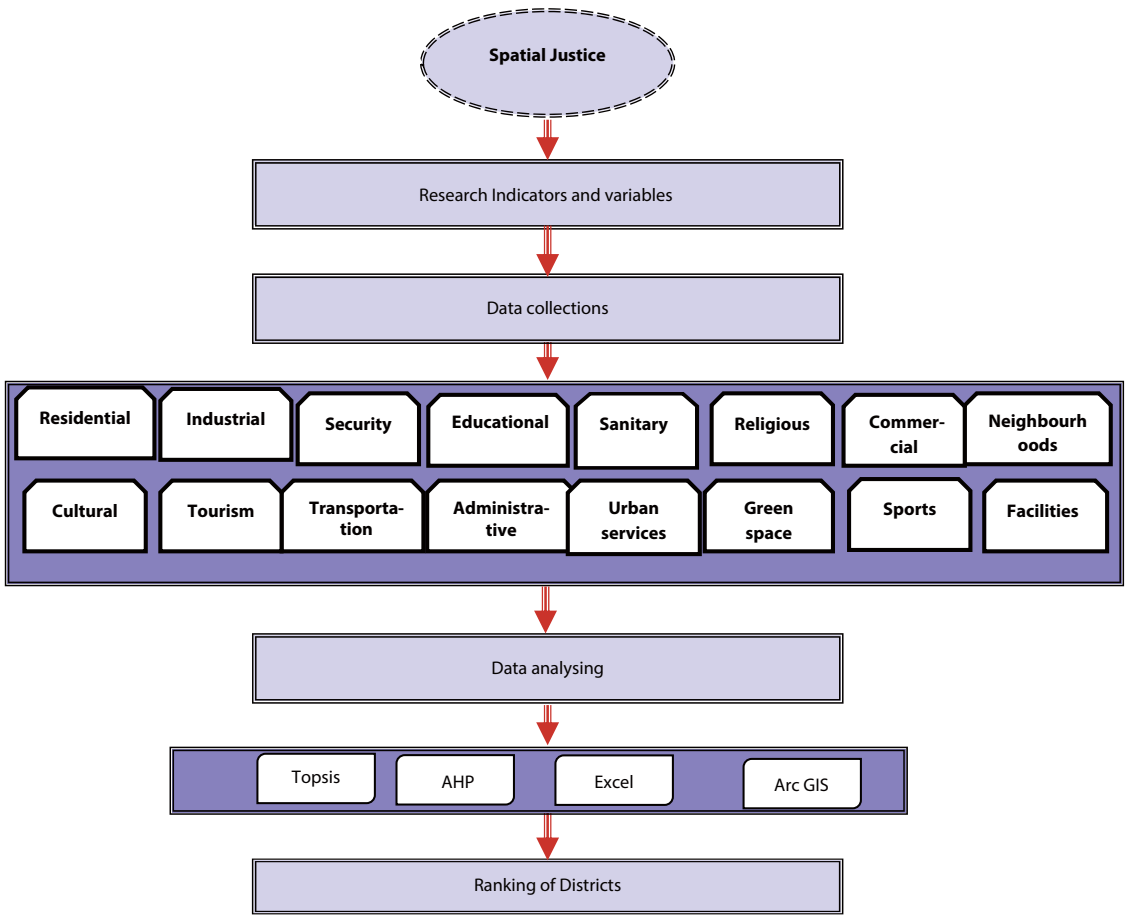

Fig. 1. *Research Method*

ture, have posed some difficulties for the researcher because required research data has been thought of as private.

5. Theoretical Principals

5.1. Spatial / Geographic Justice

The term "spatial justice" has not been used much until the last few decades and even today, geographers and planners are trying to prevent the use of the spatial attribute to seek justice and democracy in contemporary societies. Fundamentally, the spatial justice is either ignored or engulfed in other relevant concepts such as territorial justice, environmental justice and urban inequality (Soja, 2009).

Spatial justice links together social justice and space, most notably in the works of geographers David Harvey and Edward W. Soja. The field analyses the impact of regional planning and urban planning decisions. It is promoted by the scholarly tradition of critical geography, which arose in the 1970s (Brawley, 2009). The meaning of space and its relationship with society has been debated for a long time. Social researchers noticed the spatial dimension of social processes, but often consider them as separate dimensions, sometimes even dichotomising society and space, social justice and spatial justice. However, there is no common agreement on whether spatial justice is a meaningful or well-defined term (Weck, Madanipour, Schmitt, 2022).

The category of space and spatial justice has been discussed in two periods, scientific and political, as stated by (Jones, Goodwin-Hawkins, Woods, 2020). The first period, which began in the late 1960s, involved the introduction of concepts of spatial justice by individuals such as Davies (1968) who sought to understand how local services were distributed according to the needs of designated service areas. Lefebvre (1970) conceptualised the necessary fundamental socio-political changes. Harvey (1973) considered the city as the bedrock of spatial inequality associated with urban capitalism. Harvey believes that capitalism has destroyed space to ensure that space will be reproduced. Fainstein (2010) presents a philosophical approach to the issue of justice in a chapter of the book Justice City. He is for a justice-oriented city Democracy, Diversity and Equality (Silva, 2012).

In fact, spatial justice emphasises the role of good laws and processes in advancing justice along with managing social resources and allocating them among different users. Consequentialism claims equality in the results of laws and processes. In these approaches, the application framework includes a set of indicators related to the three dimensions of spatial justice (laws, processes and outcomes) and its three forms (procedure, detection and redistribution) (Uwayezu, de Vries, 2019).

5.2. Spatial / geographical injustice

Spatial injustice is both a result and a process, and while the consequences of spatial injustice are easy to discern, understanding the underlying processes that create spatial injustice is complex.

The specific term "spatial justice" has not been commonly used until very recently, and even today there are tendencies among geographers and planners to avoid the explicit use of the adjective "spatial" in describing the search for justice and democracy in contemporary societies. Either the spatiality of justice is ignored or it is absorbed (and often drained of its specificity) into such related concepts as territorial justice, environmental justice, the urbanisation of injustice, the reduction of regional inequalities, or even more broadly in the generic search for a just city and a just society (Soja, 2009).

Therefore, spatial injustice as the output of the decision-making system in places where there are more differences and complexities should be considered a productive matter. Spatial (in)justice is situated and contextualised in three overlapping and interactive levels of geographical resolution. The first results from the external creation of unjust geographies through boundary making and the political organisation of space. Examples range from South African apartheid and other forms of colonial control to more subtle efforts at spatial manipulation such as electoral district gerrymandering and the privileging of private property rights under the law (Hajat, Hafeznia, 2020). At a more local scale, unjust geographies arise endogenously or internally from the distributional inequalities created through discriminatory decision making by individuals, firms, and institutions. In the cases of exclusionary zoning, the siting of toxic facilities, and restrictive forms of racial segregation, discriminatory geographies have been challenged in the courts, becoming the focus for a rich literature on law and space.

How race, space, and the law interact is discussed, along with a brief look at the environmental justice movement. The third scale of geographical resolution is more regional, or mesogeographical, since it is rooted in the injustices associated with geographically uneven development and the so-called globalisation of injustice. Particular attention is paid to geographically uneven development as a general process underlying the forma-

tion of spatial injustice at the meso, or "middle," scale, between the urban and the global. Seeking spatial justice is expanded here to include regional coalition building, the search for regional democracy, and the development of new action strategies such as community-based regionalism (Soja, 2010).

Injustice is a multi-dimensional and complex concept, but it has two main axes: quality of life (from social and physical dimensions) and distributions of opportunities (access to social and physical infrastructure) (Martínez, 2009). Spatial injustice establishes unequal distribution of opportunities, wealth, advantages and political and administrative power in a geographical space (Hajat, Hafeznia, 2020).

5.3. Urban Spatial Justice

The concept of justice can be considered from different perspectives and concepts such as social justice, spatial justice, geographical justice, and environmental justice are also affected by the multi-dimensionality of this concept, but the important thing is that any change in the spatial organisation has a direct impact on society. Certainly, the use of various mechanisms and planning can have contradictory effects on the realisation or non-realisation of justice (Marsoosi, 2004, p. 91).

Spatial justice can be defined as the distribution of resources and services equally (Talen, 2002, p. 168). Spatial justice means that people "should be treated equally with residents wherever they live" (Tsou, Hung, Chung, 2005, p. 424).

Empirical research has focused on the issue of "what is justice" and "causal factors" in the distribution of services. For some, spatial justice is just equal access to basic public facilities (Talen, Anselin,1998, p. 596). On the other hand, there are little scientific studies about spatial justice and urban public facilities. In fact, studies dramatically focused only on facilities (Tsou, Hung, Chung, 2005, p. 424).

From this perspective, spatial justice in the city can be achieved with a critical approach. Therefore, one of the ways of achieving balanced urban development is the fair distribution of services and the realisation of social and spatial justice in different urban areas. Inequality in the distribution of services has a major impact on the spatial organisation and urban costs. Therefore, in order to achieve optimal urban management, fair distribution of facilities and services is essential.

Spatial justice and injustice emphasise the geographic or spatial aspects of justice and include fair and equal distribution of resources and opportunities in the social environment (Soja, 2009, p. 2). Social justice should include distributive justice and allocative justice simultaneously, because it is impossible to consider the public interest, needs and desires of citizens without distributive and allocative criteria. Therefore, any urban planning based on social justice should able to be effective both in distribution of needs, interests and desirability and in their allocation (Varesi, Zangabadl, Yaghfourl, 2008).

In the discussions of spatial justice, two views have always been taken into consideration. First view focused on redistributing of resources and second one focused on decision-making processes (Hewko, 2003). Hence, the two main axes in spatial justice are quality of life and the distribution of opportunities (Martinez, 2009).

Facilities and services are organised as separate units, but users are spatially continuous. As a result, there is a gap in access. In other words, regardless of the location of the facilities, there are always some people who are closer to the facilities than others. Therefore, planners should seek to combat inequality and deprivation in the distribution of services and facilities (Hewko, 2003).

Lucy (1981) and Krapton and Wick (1988) identified four major approaches to justice in relation to resource allocation that each of them can be operated in one or more ways: 1) Equality 2) Compensation or Need 3) Demand (Tastes and Priorities) 4) Market System (Payment Power) (Nicholls, 2001, p. 202).

5.4. Seclusion

The concept of social seclusion is an interdisciplinary concept linked to a variety of domains such as psychology and sociology. Naturally, various academic disciplines and scholars have given their definitions in this regard. Social seclusion refers to lack of communication or stable interactions with individuals and institutions that represent the mainstream of society (Wilson, 1991). Social seclusion means the lack of quantitative and qualitative social contacts (Delisle, 1988). Loneliness, low level of social contacts, low social support, feeling of separation from others, feeling of being foreign, isolating and suffering from loneliness are the main features of social seclusion. Social seclusion is defined by a combination of low social interactions and a sense of loneliness (Samuel et al., 2018). Seclusion has two distinct features: (1) lack of social communication and low level of participation in social activities; 2) loneliness and lack of social support (Pedersen, Andersen, Curtis, 2012, p. 2). Seclusion can be defined as separating from the mainstream of society and the sense of loneliness that arise from such separation. The seclu-

sion can be seen well in marginal areas and poor urban neighbourhoods.

5.5. Spatial Injustice and the Restless City

According to some researchers, "the term "urban conflict" can be taken to include all those forms social antagonism takes, when the resulting struggles happen in an urban spatial context. Is the city however simply a container of these struggles or does urban spatiality actually mold social conflicts, giving them form, affecting their meaning and their relations with specific urban rights and demands?" (Stavrides, 2010, p. 4).

The production and reproduction of spatial injustice (product from unequal power relations) in urban space is a matter of political geography. These processes shaping the forms of urban justice/injustice due to the presence of hidden and revealing elements of politics and power are among the issues of political geography. Unbalanced distribution of valuable space elements leads to unequal distribution of urban amenities and services. This is one of the drivers of unequal citizen access to the city space and provides a framework for urban isolation. Hence, the spatial injustice in the city has a tremendous impact on the balanced and unbalanced distribution of urban services, as shown in Figure 2 below.

Spatial injustice refers to unequal situations among citizens, which can have political, economic, and cultural backgrounds. The most important foundation of spatial injustice is the inequality of participation in power, which leads to inequality in access to opportunities. Inequality in power emerges when a limited number of citizens has social control . This provides the basis for the formation of dual social structures and the pattern of relations in society is formed in two forms of winners and losers. Ultimately, this polarisation will cause seclusion. The socio-spatial gap is the consequence of the lack of adequate attention to the real capabilities of individuals and geographic spaces. And when ordinary efforts do not make the necessary changes to improve conditions, community losers can organise in the form of protest movements, causing the tension in geographic space, as shown in Figure 3 below.

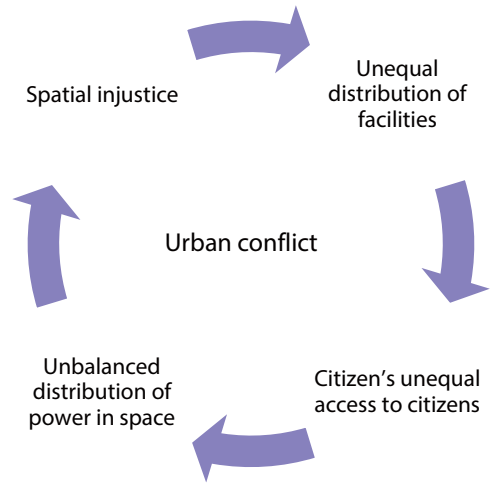

Fig. 2. *Reproduction of spatial injustice affected by unequal power relations*

6. Results and Discussion

6.1. TOPSIS Construction and its Implementation Steps

The Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) is a multi-criteria decision analysis method, which was originally developed by Hwang and Yoon (1981) with further developments by Yoon (1987) and Hwang, Lai, Liu (1993). TOPSIS is based on the concept that the chosen alternative should have the shortest geometric distance from the positive ideal solution (PIS) (Assari, Mahesh, Assari, 2012) and the longest geometric distance from the negative ideal solution (NIS). TOPSIS, as a multi-criteria decision-making method, is a simple but effective way to prioritise various indicators. This method evaluates the N option according to the M criteria. The TOPSIS method was introduced by (Krohling, Campanharo, 2011). The history of the use of the TOPSIS model in Iran has begun with limited use in the field of feasibility, prioritisation and performance evaluation since the beginning of the 1990's. The TOPSIS algorithm is a very powerful compensatory multi-criteria technique to prioritise options by simulating the ideal answer (Roghanian, Rahimi, Ansari, 2010).

Formation of data matrix based on M option and N criteria:

$$A_{ij} = \begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \cdots & \vdots \\ a_{m1} & \cdots & a_{mn} \end{bmatrix}. \quad (1)$$

This decision-making method has a strong mathematical backing. The underlying assumptions of this method are:

— Each indicator should be uniformly incremental or decreasing.

— Indicators should be in such a way as to be independent of each other.

— The distance between the options is calculated from the positive ideal and negative ideal as Euclidean distance.

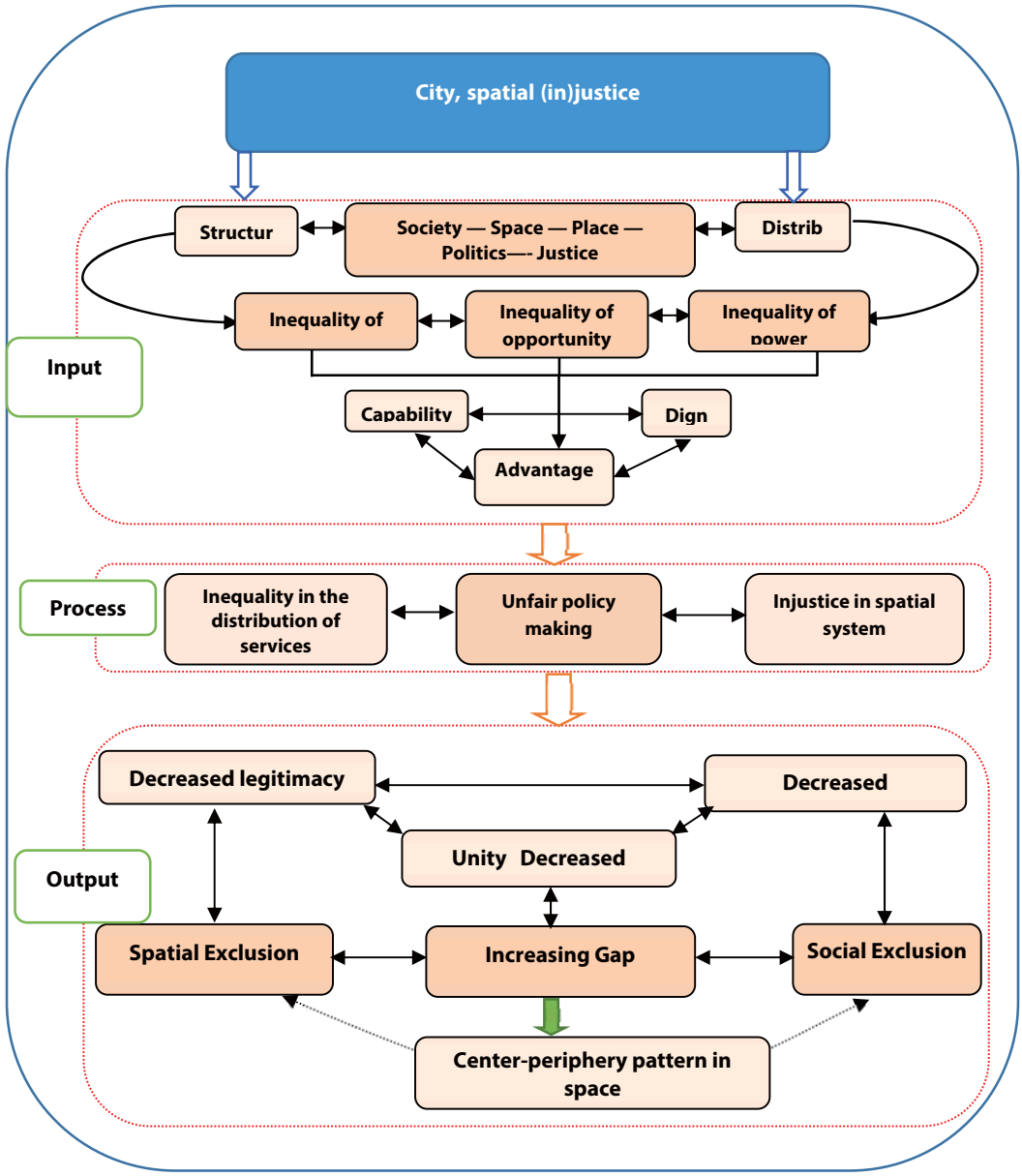

Fig. 3. *Unfair urban spatial organisation is the mainstay of spatial social gaps*

6.2. Steps to Perform TOPSIS Technique in Analysis of Tehran's districts

Step 1: Formation of the data[1] matrix based on the *M*-option (22 districts) and the *N*-criteria.

In this matrix, A represents the districts of Tehran, x_j represents the criteria and A_{mn} is the numerical value obtained from the *i* option of *j* (point intersection *i* and *j*).

Considering that the matrix indices have different dimensions, some positive and some negative, comparison or combination of indicators in this condition is difficult or impossible. Therefore, indices need to be descaled. So, all the indicators have been positive before starting the TOPSIS process.

Step 2: Standardisation of data and the formation of standard matrix through the following relationship:

$$\frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}}. \quad (2)$$

Step 3: Determination of the relative importance of the criteria based on their relative weight. There are several methods such as AHP, ANP,

[1] Data Sources: Statistical Center of Iran, Tehran Municipality Renovation Organisation, Statistical Yearbook of Tehran Municipality, Human Resources Development Dept., Data Software Information Tehran, Firefighting and Safety Services, Tehran Municipal Solid Waste Management Organisation, Green space of the municipality of Tehran, Deputy of Transport and Traffic of Tehran Municipality, Municipal Cultural Arts Organisation, Tehran Municipality Protection Unit, Department of Urban and Environmental Services.

Shannon entropy, expert and modified weighting used for this purpose. The decision matrix has several indicators and knowing the importance or weight of each of these indicators is necessary for decision-making. The weight of each indicator indicates its relative importance to other indicators. The conscious and correct selection of weights is a great help in achieving the goal. Therefore, weighing the factors can be done in three ways:

A. Use of Experts:

Data knowledge is based on the knowledge of experts.

B. Use of Data Knowledge:

Data knowledge is based on the information contained in the problem itself. In this method, we can determine the weight of each factor by using the solutions in the problem and calculating the dependence of each of the factors to the solutions.

C. Modified method (use of expert knowledge and data knowledge simultaneously):

In these methods, according to the results, each factor is weighed.

In this paper, in order to reduce the probability of uncertainty, it was decided to use a hybrid method, including Shannon entropy weighing, expert and modified methods. Indicators weighing is shown in Table 1, as given below.

Then the weighted matrix is formed. In fact, the matrix (v) is the product of the standard values of each index in its own weights.

$$v_{ij} = \begin{bmatrix} w_{1r_{11}} & \cdots & w_{nr_{1n}} \\ \vdots & \ldots & \vdots \\ w_{1r_{m1}} & \cdots & w_{nr_{mn}} \end{bmatrix}. \quad (3)$$

Step 4: Identification of the positive and negative ideal solution.

Determine the distance of i-th alternative from the ideal alternative (the highest performance of each indicator) that it represents with (A^*).

$$A^* = \left\{\left(\max_{v_{ij}} \mid j \in J\right), \left(\min_{v_{ij}} \mid j \in J\right)\right\},$$

$$A^* = \left\{v_1^*, v_2^*, \ldots, v_n^*\right\}. \quad (4)$$

Determine the distance of i-the least alternative (the lowest performance of each indicator) that it represents with (A^-).

$$A^- = \left\{\left(\min_{v_{ij}} \mid j \in J\right), \left(\max_{v_{ij}} \mid j \in J\right)\right\},$$

$$A^- = \left\{v_1^-, v_2^-, \ldots, v_n^-\right\}. \quad (5)$$

Step 5: Identification of the distance between each option from the positive and negative ideal.

Determine the distance criterion for the ideal alternative and alternative for at least d_j^+, d_j^-.

$$d_j^+ = \sqrt{\left(\sum m_j = 1 v_{ij} - v_j^+\right)^2},$$

$$d_j^- = \sqrt{\left(\sum m_j = 1 v_{ij} - v_j^-\right)^2}. \quad (6)$$

Step 6: Determination of the relative closeness of each option with the ideal solution

$$CL_1 = \frac{d_j^{--}}{d_j^- + d_j^+}. \quad (7)$$

Rating options: Any option the larger the CL is, the better. The CL value is between zero and one. The closer this value is to 1, the closer to the ideal answer.

The ranking of Tehran's districts shows that there is a significant difference in geographical distribution of indicators. This is illustrated in Table 2 after evaluation in the form of selected models.

In the preliminary study of the 38 indicators obtained in 22 districts of Tehran, the following results are observed:

— The per capita budget of districts 17 and 18 is less than the per capita budget of district 2;

— 10 and 17 have the lowest per capita and 4 and 2 have the highest per capita in term of green space;

— Daily markets and fruit and vegetable centres are presented less in the 11, 13 and 19 districts;

— Districts 14, 8 and 15 are the largest producers of garbage, and districts 12 and 22 produce the least garbage.

Figure 4 shows the strong fluctuations in utility rates between Tehran's districts. In fact, the imbalance in the level of utilisation has caused many social, economic, physical and spatial disparities, as shown in Figure 4 below.

In order to analyse the spatial distribution of urban services in 22 districts of Tehran and to show the stability of the districts, the value of the TOPSIS of each district has been determined from the urban services indicator and has been evaluated in the form of spatial distribution maps. Eventually, by combining the indicators, the level of utilisation is determined from the total of indicators.

Analysis of the quality of the indicators for each district has demonstrated that some indicators have the highest importance and some indicators have the least importance. All districts had strengths and weaknesses and no district had better conditions than the other one; but in some indicators, such as the green space, only a few specific districts were in good condition.

Table 1

Indicators weighing for decision-making

Indicators	Modified		Experts		Shannon entropy	
	Region Rank	Weight	Region Rank	Weight	Region Rank	Weight
Mayor Service Area	3	0.092829	12	0.0385	2	0.082239
Population	19	0.010294	14	0.0345	28	0.010177
Total number of licenses issued for the construction of vacant land	2	0.095223	5	0.0588	5	0.055236
Total number of licenses issued for the demolition and renovation	30	0.001793	32	0.00765	34	0.007995
Per capita income approved by the municipality	6	0.061597	8	0.0458	7	0.045872
Number of male and female health stations	33	0.00144	20	0.0246	38	0.001996
Number of police stations	34	0.001401	33	0.00489	31	0.009769
Average selling price of one square meter of residential land	29	0.003271	25	0.00945	23	0.011806
Number of hospitals in each districts	5	0.077172	3	0.0589	8	0.044689
Area of squares and daily markets	9	0.022211	18	0.0278	15	0.027251
Number of fire stations	13	0.014321	6	0.0496	30	0.009848
Urban waste	35	0.000919	34	0.00365	33	0.008586
Household size	11	0.017893	2	0.059	26	0.010344
Public Gardens	4	0.083151	3	0.0589	6	0.048151
Number of 137 messages	36	0.000239	37	0.000948	32	0.008591
Number of parks	17	0.011642	19	0.0265	20	0.014984
Noise pollution stations	25	0.007312	21	0.0135	19	0.018473
Number of air pollution stations	31	0.001667	29	0.00848	35	0.006704
Video surveillance camera	12	0.014738	16	0.0342	21	0.014699
Smart Control Light	27	0.005486	24	0.00947	18	0.01976
Production of travel	16	0.013082	9	0.0436	27	0.010234
Travel attraction	10	0.019722	7	0.0465	22	0.014466
Cost of art programmes	15	0.013439	10	0.0412	25	0.011125
Number of municipal police missions	32	0.00151	38	0.000828	3	0.062185
Number of cultural centres	37	0.00019	35	0.00131	36	0.00494
Area of libraries	23	0.008266	22	0.0125	16	0.022554
Dedicated for fixed assets	24	0.00769	25	0.00945	13	0.027757
Cash earned	22	0.008749	23	0.00973	12	0.03067
Distressed area	18	0.011266	28	0.008911	10	0.043124
Number of taxis per area	8	0.043052	17	0.0338	9	0.043444
Number of flower and newspapers kiosks	28	0.00526	31	0.00796	17	0.022539
Civil Education Funding	1	0.242828	1	0.079	1	0.10484
Health centres	38	0.000172	36	0.00125	37	0.004695
Development Project Budget	20	0.010188	14	0.0345	29	0.010072
Elementary and literacy	14	0.013451	11	0.04	24	0.01147
PhD and post-doc courses	7	0.060671	13	0.0365	4	0.056694
Religious education	26	0.00664	30	0.00823	14	0.027517
Master and PhD	21	0.009227	27	0.00912	11	0.034507
		1		1		1

In general, the districts 1, 22, 4, 6, 2, and 5 are "most utilised", respectively and districts 3, 15, 18, 12 and 7 are classified as "utilised". Districts 19, 20, 11, 21, 16 were in the semi-utilised sector. Finally, districts 14, 8, 10, 17, 13 and 9 have the lowest levels of utilisation. Districts where the density of residential units is much higher than in other areas have the lowest level of utilisation. Districts where traders, industrialists, politicians and senior military personnel live are in better condition than other districts. In fact, privileged urban classes have been inhabiting the districts of Tehran where the quality of service and urban environment is better than in other areas.

Table 2

Utilisation of districts from total indicators

Modified		Experts		Shannon entropy	
Ranking of districts	Level of utilisation score	Ranking of districts	Level of utilisation score	Ranking of districts	Level of utilisation score
1	0.688551	1	0.598086	1	0.573532854
5	0.175791	5	0.323325	5	0.272664011
7	0.147065	7	0.273101	7	0.211703231
3	0.213017	3	0.370645	4	0.290719551
6	0.16141	6	0.301678	3	0.299305255
4	0.190512	4	0.335548	6	0.235461207
11	0.090353	10	0.209549	12	0.136787876
19	0.040093	19	0.135635	18	0.079023668
21	0.021526	20	0.124014	22	0.047369471
20	0.037173	21	0.120718	20	0.056667602
14	0.067802	11	0.197757	14	0.09286366
10	0.0929	9	0.243944	11	0.139596604
17	0.041971	16	0.150608	15	0.086664147
18	0.040702	18	0.139943	17	0.079581725
8	0.121737	8	0.248114	10	0.155532888
16	0.056709	15	0.155534	13	0.104634456
22	0.014625	22	0.108123	21	0.04765423
9	0.11006	12	0.188234	9	0.181964305
12	0.079327	14	0.163753	16	0.084994164
13	0.07445	13	0.173533	8	0.203409232
15	0.063157	17	0.146926	19	0.077568066
2	0.321325	2	0.386928	2	0.423759723

Table 3

Levels of utilisation of districts from total indicators

Modified		Experts		Shannon entropy		Level of utilisation score
Ranking of districts	Final Wight	Ranking of districts	Final Wight	Ranking of districts	Final Wight	
1	0.688551325	1	0.598086321	1	0.573532854	Highest Utilisation
22	0.321325395	22	0.38692828	22	0.423759723	
4	0.213016576	4	0.370644979	5	0.299305255	
6	0.190512235	6	0.335547825	4	0.290719551	
2	0.175790866	2	0.323324999	2	0.272664011	
5	0.161409973	5	0.301677677	6	0.235461207	
3	0.147065066	3	0.273100701	3	0.211703231	Utilisation
15	0.121736974	15	0.248113733	20	0.203409232	
18	0.110059851	12	0.243944356	18	0.181964305	
12	0.092900188	7	0.209548561	15	0.155532888	
7	0.090352602	11	0.19775709	12	0.139596604	
19	0.079326982	18	0.188233549	7	0.136787876	Semi Utilisation
mi20	0.07444964	20	0.173532984	16	0.104634456	
11	0.067801606	19	0.163752938	11	0.09286366	
21	0.063157406	16	0.155534264	13	0.086664147	
16	0.056709232	13	0.150608269	19	0.084994164	
13	0.041971241	21	0.146925713	14	0.079581725	Lowest Utilisation
14	0.040702373	14	0.139942978	8	0.079023668	
8	0.040092898	8	0.13563491	21	0.077568066	
10	0.037172764	9	0.124014472	10	0.056667602	
9	0.021526255	10	0.120718302	17	0.04765423	
17	0.014625466	17	0.108123447	9	0.047369471	

Table 4

Classification of level of utilisation from perspective of spatial justice

Classification	Density	Area (%)	Area(square kilometre)	Pop (%)	Pop	Districts
most utilised	9089	52	372.4	38.51	3384892	1, 22, 4, 6, 2, 5
utilised	16283	16.91	119.5	22.13	1945835	3, 15, 18, 12, 7
semi utilised	11642	18.15	128.3	16.99	1493685	19, 20, 11, 21, 16
lowest	17288	12.22	86.4	22.35	1964592	13, 14, 8, 10, 9, 17

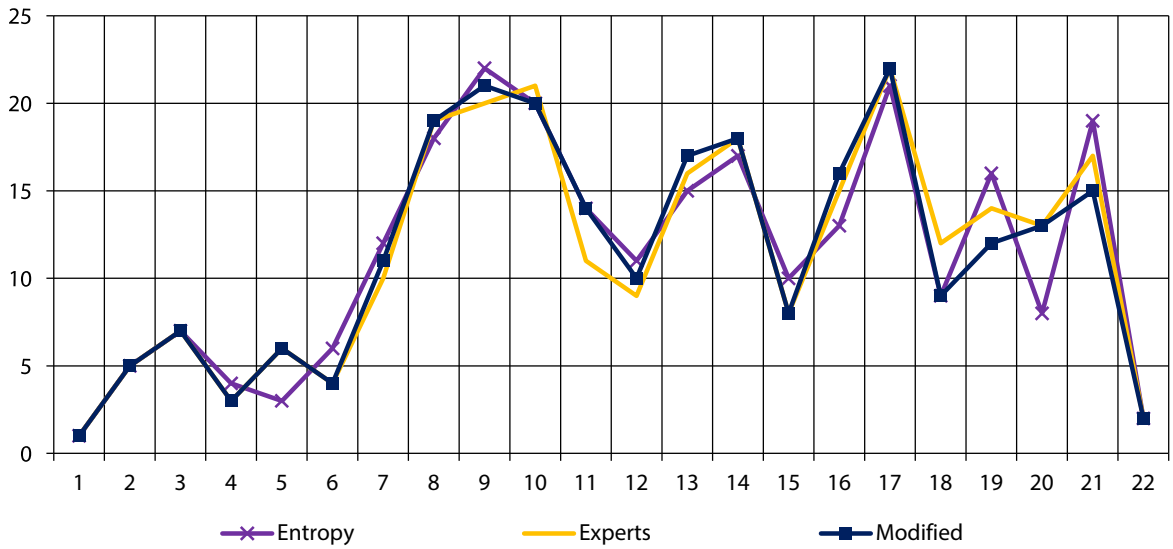

Fig. 4. *Spatial distribution of urban services in Tehran in terms of spatial justice*

Figure 5 and Figure 6 illustrate the population density pattern of Tehran and the spatial distribution of urban services from the perspective of spatial justice.

According to the above, the spatial structure of Tehran is unbalanced in terms of spatial justice. In order to further explain what has been said, the distribution of the districts in terms of population percentage, urban area percentage and population density are presented in Table 4, as shown below.

7. Conclusions

In urban planning, in order to achieve minimal spatial justice, different uses should be allocated in such a way to ensure balanced distribution of per capita. Otherwise, unfair distribution of uses can strengthen a district and undermine other districts. Disregarding the balanced distribution of uses per capita (including educational, health, cultural, water & sanitation and sporting/recreational) can lead to an increase in class divi-

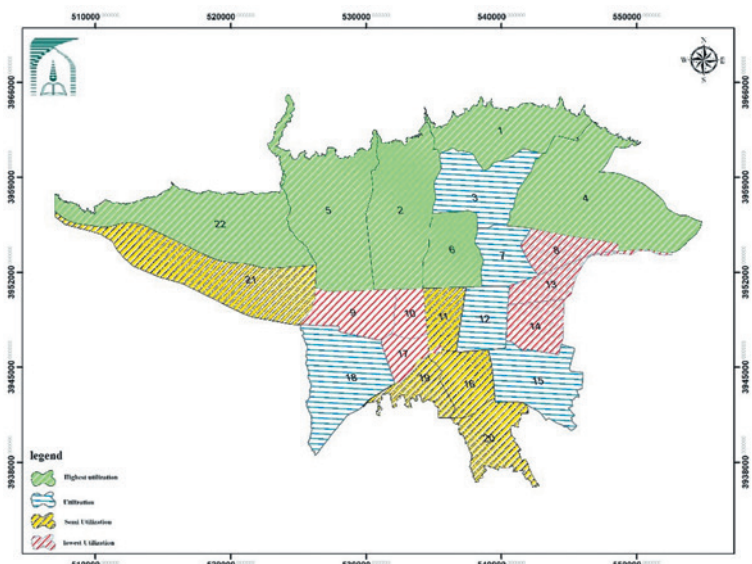

Fig. 5. *Spatial distribution of urban services in Tehran in terms of spatial justice*

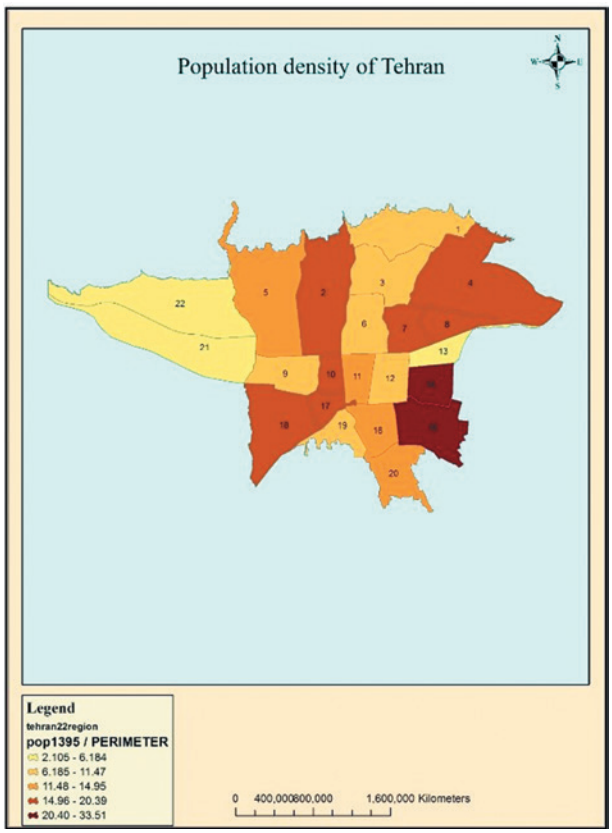

Fig. 6. *Population density of Tehran*

sions in the city. On the other hand, paying particular attention to the poor districts (in terms of services and facilities) can provide an opportunity to poverty reduction for future generations of these strata. The research shows that the actions of the Tehran municipality and the allocation of resources for the realisation of spatial justice have not yielded any result. Also, the indicators indicate unequal distribution of facilities.

District 1 is the most utilised district. It has an area about 4,661 hectares, with more than 487,000 inhabitants. District 1 after district 2 has the most educated people. The following elements have distinguished this district from other districts:

— Most important centre of natural, historical and social tourism; Residential utility;

— Establishment of Tajrish market; centres of higher education and medical institutions; existence of important shrines in Tehran (Emamzadeh Saleh, Emamzadeh Ali Akbar and Emamzadeh Qasem); Centre for International Diplomatic Activities.

Districts 10, 9, 17 have the lowest facilities and services, respectively. District 17 is affected by north and south faults in Tehran. Many factors have contributed to the lack of development of this region: the transit of two important inter-urban railways and military uses, over-crowding and construction, the old-age buildings and urban texture of the district, inadequate facilities and services, cultural poverty of the inhabitants, dispersion or inappropriate concentrations of commercial and economic activities, inadequate public participation in urban affairs, inadequate access to highway networks, non-compliance with standards and construction laws, low per capita income of residents, incompatible uses and presence of industries and unwillingness to investment. According to the results of the research, this district has the few educated people.

Senior military and political officials live in district 4, which has led to the development of this district. District 4 is located in the valley of Lar Dam, Latian and the green valleys of Fashem, Oshans, Meigon, Darbandars, Shemshak and Abali, which has raised the value of this district. This district has the largest urban green space (14,226,371 square meters); it is the most important district of Tehran in terms of issuing construction permits.

The results show that urban services are not distributed equally and there is a huge difference between districts. The districts 1, 22, 4, 6, 2, 5 have the highest level of service with a large number of centres and service activities. It is worth noting that increasing the services have a direct impact on land and housing prices.

Districts 13, 14, 8, 10, 9, 17 have the lowest level of urban services and 22.35 % of the population live in these districts. The price of land in these districts is lower than in other districts, which leads to a difference in the value of property and intensifies the polarisation of the city.

The inequality of distribution of services in Tehran as an outcome of spatial injustice has led to significant differences in Tehran. This level difference contributes to differences in livelihood, population density, and quality of life of citizens in different parts of the city. The results showed that the failure in the distribution of urban service centres was the most important consequence of the rapid urbanisation and physical development of Tehran in the past decades, which caused the city inequality. The rapid growth of the urban population and inability to meet the growing needs of the population and lack of integrated urban management in Tehran metropolis are the starting point for inauguration of inequalities in Tehran's urban space. Hence, spatial inequalities primarily reflected in the quality of life of citizens affects the distribution of opportunity, wealth and power in the city. Therefore, the rapid development and unplanned growth of Tehran over the past few decades has caused injustice in Tehran.

Spatial injustice stems from voluntary factors (urban management and policymaking) and invol-

untary factors that provide the basis for citizens' seclusion. As a result of seclusion, people do not have an effective partnership in the social, economic, and cultural affairs and do not participate in society. The isolation will make people live in the wilted areas and they will be recognised as a disruptive force in the urban sustainable development process. Generally, violent groups, as well as oppositions, grow in the light of such conditions. Therefore, trying to achieve "equal opportunity" is the most important mission of urban planners and managers. In this way, different groups will have access to urban services and inequalities in education, health, service and other opportunities will be reduced. In this regard, observance of the principle of equality and equal access to existing opportunities are the basic priorities.

8. Recommendations

— Priority development of metropolitan areas of Tehran should start in the low-wealth areas

— Consideration of the extent of municipal facilities and services necessary to achieve space justice and create a relative balance in their distribution;

— Priority of investment in low-wealth areas;

— Paying attention to urban smart growth strategy to reduce the volume of travel at the regional level and neighbourhoods in the Tehran metropolitan, and consequently decrease pollution;

— Examination of the hierarchical urban pattern of redistributing utilities and services in low-wealth areas;

— The necessity of familiarising urban managers with the role and place of spatial justice in urban space;

— Integration of urban management;

— Strengthening and enhancement of the role of NGOs aimed at the empowerment of citizen participation;

— Replication of this model in other cities of Iran;

— Institutional arrangements for ensuring sustainability of this model;

— Monitoring and evaluation of services.

Future studies should also pay attention to following questions. What are the main reasons for spatial injustice in Tehran's urban services distribution? What is the role of Tehran political management in creating spatial justice and injustice?

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