

CASE STUDY

Investigating the distribution of Tehran transportation services with emphasis on justice

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ABSTRACT

According to some experts, in order to establish justice a criterion should be defined for each benefit or area and transportation can be considered as one of these areas. The experts relate the formation of a city's texture to its transit network directly. An inequality in transportation distribution can form an unequal city. The purpose of this study is to investigate the formation of transportation services in order to find out to what extent the distribution of transportation services in Tehran city is based on justice and how can a better distribution be provided. In this study, five criteria of equal opportunity, difference, need, participation in public interest and entitlement were determined as the criterion. The use of these criteria was based on different theories. The numerical taxonomy was used to assess the status of Tehran metropolitan areas. The finding shows that, there are significant inequalities among the sectors and, on the other hand, the distribution of the facilities is not in favor of the deprived areas and benefits the advantaged regions. Finally, based on the results of the present research, transportation facilities should be distributed in such a way that the disadvantaged regions would receive more share than the advantaged regions. Establishing state-owned centers in less-developed areas can create demand for business trips. This will improve the situation of disadvantaged regions in terms of transportation services and advantaged regions in terms of some indexes like traffic, delays, waiting time at the bus stop, total travel time, crossing over capacity.

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INTRODUCTION

Transportation is recognized as one of the components of the region and one of the most basic sectors of the economy of a country. Given that this sector is effective on other sectors of the economy, its impact on the development of countries is wider as well. Plans and projects affect the various

sectors of the economy at micro to macro levels. At the micro level, their effects on household costs and, as a result, their income can be pointed out and at macro level, their effects on macro variables such as economic growth can be mentioned. Transportation is considered as an essential factor in the economic development of countries, especially developing countries. In other words, the lack of a well-developed transportation system is viewed as a serious constraint against the economic growth.

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Blakemore (2007), as one of the social policy thinkers, believes that improving the transportation network reduces social deprivation and / or reduces social deprivation and increases the welfare of poor social groups. In general, two important aspects can be emphasized in relation to the relationship between transportation and social issues in the city and society. One is transportation as a tool for creating the possibility of developing social relations in society and the other one is transportation as a device for building and strengthening social justice in society (Khaksari, 2013). It can be said that transportation is not only an instrument for strengthening justice, but also the advancement of transportation requires attention to justice, since it is said that progress without justice means poverty development. Justice and transportation are interconnected from a variety of perspectives, including transportation impacts on poverty reduction (The Central Bank of Iran, 2015). In this regard the importance of public and inexpensive transportation for poor groups, which provides access to markets and work centers from suburbs, has been mentioned in written sources because their lack of access to markets and work centers leads to their insignificant achievement in social services and economic opportunities (ESCAP, 2003). Transportation plays a significant role in shaping the structure and the city so that the experts relate the formation of a city's texture to its transit network directly. Urban form is a spatial pattern related to the pattern of urban development and human activity (Nedovic-Budic *et al.*, 2016). Several indicators represent urban form. Nedovic-Budic (2016), use street network design, land use mix and density as urban form indicators to illustrate the difference of urban development patterns (Bo *et al.*, 2017). Therefore urban transportation has a major role on city's form and inequality in their distribution can form an unequal city or exacerbate current unequal situation. This is especially important for public entities and services such as Tehran municipality. The intervention of these entities in income distribution and provision of services can lead to more balance of facilities and a reduction in class distance (Kalantari *et al.*, 2015). Blakemore (2007), a social policy thinker, even points to a reduction in crimes and delinquencies as a result of improving the transportation system: "With the improvement of public transport, we can see employment growth, access to health care and better

education, improve life quality for the elderly in society, reduce crimes and delinquency in the underdeveloped areas of the municipality's complexes" (Blakemore, 2007). On the other hand, considering the relationship between transportation and other sectors, it can be claimed that the scope of negative effects of unfair distribution of transportation services can be extended to other areas. For example, one of the negative effects is that "people often emigrate from areas with poor services, and economically the division is made between rural and urban areas." (ESCAP, 2003). It is said that "the city is an unequal distribution system of space, and intrusive policies are necessary to disturb this natural order. Measures and activities of urban management, in the form of distribution of services and facilities in the city are among the services that can lead to redistribution of income and reduce the gap between the poor and rich in the city. The fair distribution of urban facilities will increase the quality of life in the city and bring sustainable development in the long run" (Kalantari *et al.*, 2015). Therefore, the distribution of urban transportation facilities based on social dimensions of transportation such as justice not only realized more balanced distribution of resources and resources at the city level but also facilitate the realization of the objectives of the upstream plans and programs. This research seeks to analyze the status of justice in the distribution of transportation services based on the criteria in the perspective of justice and justice in transport. Since the supply and demand of private transport is largely dependent on the role of the market, the main focus of this research is on public transport which is specifically the Tehran municipality responsible for its fair distribution. Even in cases where per capita for people is mentioned, it means public transportation per capita. The main problem of the present research is the extent to which the distribution of transportation services in the city of Tehran is based on the justice criteria.

Transportation Equity

Transportation equity generally refers to the fair or just distribution of transportation costs and benefits, among current (and future) members of society (Bills, 2013). In this research, we use justice in transport interchangeably with transportation equity because these two words are equally used in different sources. For example, Litman (2002) points out that Horizontal equity also called social justice.

Types of Transportation Equity

Transportation equity can be defined along two primary dimensions: Horizontal and Vertical equity (Bills, 2013).

Horizontal Equity: Horizontal equity (also called fairness and egalitarianism) concerns the distribution of impacts between individuals and groups considered equal in ability and need. According to this definition, equal individuals and groups should receive equal shares of resources, bear equal costs, and in other ways be treated the same. It means that public policies should avoid favoring one individual or group over others, and that consumers should “get what they pay for and pay for what they get” from fees and taxes unless a subsidy is specifically justified (Litman, 2002).

Vertical Equity: With Regard to Income and Social Class Vertical equity (also called social justice, environmental justice and social inclusion) is concerned with the distribution of impacts between individuals and groups that differ in abilities and needs. By this definition, transport policies are equitable if they favor economically and socially disadvantaged groups, therefore compensating for overall inequities (Litman, 2002).

Vertical equity requires that disadvantaged people be identified and given special consideration in planning, to insure that they are not made worse off, and that their needs are accommodated. Litman describes the following steps:

1. Identify disadvantaged groups (minority, low income, car-less, disabled, single parents),
2. Identify disadvantaged geographic areas using census data (“Environmental Justice Areas”),
3. Identify degrees of disadvantage in each geographic area, with five levels of severity.
4. Identify location of important public services and destinations (transit, highways, employment centers, hospitals, daycare centers, etc.),
5. Evaluate specific transportation plans according to how they affect accessibility between disadvantaged communities and important destinations (Litman, 2002).

The Global Experiences

Martens and his colleagues (Martens et al., 2012) in a research entitled “A justice-theoretic approach to the distribution of transportation benefits: Implications for transportation planning practice

in the United States” used Walzer’s “spheres” approach to explore transportation justice. Some of widely defended justice criterion that he take into account are need, desert or merit which we called it entitlement in present study and finally differences.

Todd Litman (2002) introduce some indexes and measurements which significantly affect equity evaluation like Per capita, period travel and per peak-period trip. This Measurement used in current study in order to evaluate transportation equity. Litman also pointed out that there is no single way to evaluate transportation equity. Bajada and his colleagues (2016) in a research entitled “Accessibility as an indicator of transport equity. The case of public transport infrastructure in Malta, and its impact on the elderly” considers accessibility as a key indicator for transport equity and they define accessibility as something that provides the opportunity for people to move from an origin to a destination. Theirs study focuses on the case of Malta’s public transport system. They show that in Maltese case the transport policy and planning is not focused on equity. The research concludes with implications for policy related to public transport accessibility in a Maltese ageing society. Korshed (2014) in a case study of Bypass Stockholm use quantitative mapping of geographical distributions of social data in order to analysis planning practices. They find out that benefits from increased transportation opportunities created by the bypass will mainly benefit others than the exposed populations in these areas and the Bypass Stockholm project will mainly improve the socio- environments and (auto) mobility of privileged populations. A review of the mentioned research shows that in some studies, based on Harvey’s and Walzer’s theory, criteria such as need, help, and public interest have been considered. Whereas in some studies accessibility as something that provides the opportunity for people to move from an origin to a destination is taken into consideration. Some studies have reduced the concept of justice to the distribution of facility. In this research, five criteria were determined based on previous research and theoretical foundations for transport justice, and for each of the criteria, certain indicators were defined.

Social justice in transportation

Justice is a controversial concept, and no single definition of it has been accepted among scholars.

Therefore, there is no consensus on theories related to it, and various ideas have been proposed by thinkers in this regard too (Basari Parsa *et al.*, 2008). Here a brief description of the justice and related concepts is presented and then the views and opinions related to justice will be examined. Justice means the distribution of functions, services and facilities and access to centers of service and activity -location of facilities- without any discrimination and differentiation between residents of a city and urban areas (Behravan, 2006). Most of the definitions of urban and space justice are focused on concepts such as the distribution of interests, resources, facilities and services equally and fairly, for example: "Social justice in the city means maintaining the interests of various social groups in general and target groups in particular by optimal distribution of urban resources, incomes and expenditures" (Marsousi, 2004). "Urban justice" is summarized in "appropriate distribution of functions, services and access to the centers of service and activity, without discrimination and differentiation between citizens, city or region" (ShokuhiBidhendi *et al.*, 2012).

"David Harvey sees social and spatial justice in cities as a fair allocation of urban resources and facilities that can be conducted so that individuals meet their rights with the least gaps and objections and their demographic needs are fulfilled in different dimensions" (Berry, 1974). This kind of justice in relation to the distribution of effects between individuals and groups that differ in abilities and needs is related to income and social class. According to this definition, transportation policies are fair if they are in favor of deprived classes economically and socially. Policies that are in favor of disadvantaged groups are called "progressive", while those that place excessive costs on people who are deprived are referred to as retrogressive. This definition is used to support cost-effective practices, discounts, and social and economic services for disadvantaged groups to ensure that deprived groups do not incur excessive costs -pollution, accident risk, financial costs, etc. (Litman, 2002). Despite the fact that the philosophers' view may be less applicable in urban justice matters, but, as Feinstein (Campbell and Fainstein, 2012) points out, "contemporary philosophical discussions about justice deal with questions that matter to planners and can therefore extend to the evaluation of urban politics". In general, it would not be easy to provide

a general classification of views on justice one of the reasons of which is that even in a particular school there is a significant difference in the view of justice, like Liberalism. In this school Rawls (Rawls, 1958), raises the equal opportunity in the field of justice, and Nozick (Nnajofofor and Ifeakor, 2016) outlines the theory of entitlement but Hayek (Ikeda, 2016) considers the idea of justice nonsense. Most existing studies neither justify why observed inequalities in transport-related benefits and burdens should be considered unfair, nor offer any moral reasoning to guide us towards a fairer distribution (Pereira *et al.*, 2017). Examining the common points and the emphasis of various theorists can be a good basis for obtaining the agreed criteria for justice. Therefore, these common points are discussed here. One of the points emphasized by theorists is entitlement. "According to this criterion, the right should be given to its true owner -justice based right- (Dadashpur *et al.*, 2015). Among the views of ancient Greece to the present day, some views about entitlement are discussed. Aquinas refers to granting the right to the entitled person in his distributive justice. In liberalism's view, justice is a manifestation of the concept of right, although liberals regard the right as ownership. Nozick (Nnajofofor and Stephen Ifeakor, 2016) also states in his theory of desirability that if the principles of justice entitle an individual, the assets are based on justice. The second criterion, which has received a lot of attention, is equal opportunity. "The criterion of equal opportunity refers to the equal access to all opportunities, resources, facilities and information and is defined in contrast to the rents of particular groups of power (Tabibian *et al.*, 2010). Aristotle and the Stoics refer to equality among equal people; moreover, the socialist viewpoint has paid much attention to equality. Rawls, who has a liberal view, mentions equal opportunities and indicates that efforts to promote equality in freedoms and opportunities are the main means of achieving justice. In the capabilities approach proposed by Sen, capabilities are unbearable and non-interchangeable opportunities that should be given to each person. The "difference" is that if there is a difference in distribution, it is fair when it is in favor of the most deprived class that has been considered by Rawls, Litman, Aristotle and radicalists. In fact, based on "difference" principle if there is high inequality in wealth and income and people are eager to work for

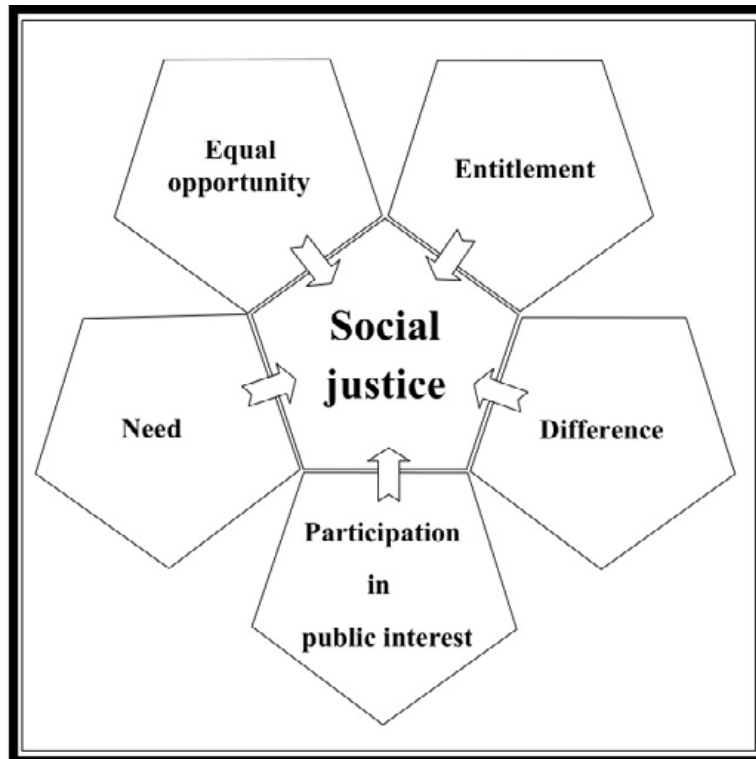


Fig. 1. Justice Criteria

a larger share of output, the existing inequalities must be efficiently beneficial to the most deprived people. Otherwise, Inequalities are not allowed (Rawls, 1958). Rawls points out in this regard that economic and social inequalities are justifiable when they are in favor of the most deprived class and maximize the wealth of the poorest class. Litman writes in a category of justice: “transportation policies are fair if they are for the benefit of deprived classes economically and socially. Policies that are in favor of disadvantaged groups are called “progressive”, while those that place excessive costs on people who are deprived are referred to as retrogressive” (Litman, 2002). Aristotle also considers one of the reasons behind litigation and complaints as the fact that unequal individuals receive the same or unequal shares. In addition, the radicalisms’ desired reform are also in favor of the poor and deprived. Another concept that is urged by theorists is the need. It means to make sure that the policies in place actually benefit those in need, and not others, such as elites and dominant groups also settled in the places targeted (Aparicio,

2018). The criterion means that “people have the same rights to exploit resources, but they do not have the same needs” (Tirband and Azani, 2012). Concerning the need, Marx while discussing the old belief that concerning the need, Marx) Habibi *et al.*, 2011) while discussing the old belief that “From each according to his ability, to each according to his needs” believes that justice is realized when society can meet the basic needs of the individuals. Believes that justice is realized when society can meet the basic needs of the individuals. Litman (2002) states that vertical equality with regard to mobility needs and capabilities means that transportation facilities and services are consistent with all users, especially those with special needs. One of the three criteria introduced by Wallzer (Martens *et al.*, 2012) is also ‘need’. Ultimately, participation in the public interest has been specifically considered by Harvey and defines it as “those who work for the benefit of more people are entitled to more rights than those who work for the benefit of less people” (Berry, 1974). But other views, such as the utilitarian perspective, can

be considered in this regard. Utilitarianists consider the requirements of justice to maximize prosperity or full satisfaction for society. If distribution based on humanitarian assistance is considered as a sign of distribution based on individuals' participation, then Marx's view that "everyone, must be expected as much as he can and everyone shall benefit terms of his help" is also a sign of the importance of the "participation in public interest" criterion. Accordingly, these criterias are considered as the basis of study the justice situation in Tehran metropolis as in Fig. 1.

MATERIALS AND METHODS

This research is in the field of applied research. "These types of studied emphasize on the most effective action and consider the causes less and, if done correctly, they will provide useful information on the planning and development of scientific practices in executive activities (Najafzadeh, 2013). Considering the fact that the transportation situation of Tehran metropolitan is studied in this research, this study is a case study. In order to do this research, the documentary method which is a non-intrusive method is used. The statistical population of this study includes all the documents and statistics that can be used to assess the state of justice in transportation at Tehran metropolitan level. In order to investigate the criteria of justice in Tehran metropolitan level, the applied statistics and documents were selected by targeted sampling. "The basic idea behind the judgmental or deliberate sampling is that the researcher can select cases that total represents the target population based on knowledge and judgment and adopting an appropriate strategy" (Saraei, 2009). In order to extract part of the required statistics the approved budget book of 2016 in Tehran Municipality which contains budget and transportation funds allocated to the regions, (Directorate of program and budget of Tehran municipality, 2016) documents related to the comprehensive plan of transportation and traffic, (Deputy of Traffic and Transportation of Tehran, 2015), (Directorate of Program and Budget of Tehran Municipality, 2014) and statistics Of Tehran Municipality were used (Tehran Municipality, 2016). Given the fact that the observed units are the part of the community in which information about them should be gathered, the observation units in this study are five parts of the Tehran metropolis. Also, the analytical unit is known as the one described and analyzed and the results

are attributed to it; accordingly the unit of analysis of this research is Tehran metropolis. In this study, the construct validity -compliance of the criteria and the views expressed in theoretical foundations- and the content validity - the consideration of experts' views- are used to study the criterion validity. Considering that the methods used in this research are standard and have been used in many studies in evaluating urban plans, it does not require any reliability and there is no need for repeated reviews. For example, in the research done about The Evaluating of Spatial Justice in Distribution of Rural Services in Isfahan, Taxonomy method has been used (Afrakhte et al., 2016). In other researches like "Evaluation of Social Justice in the Urban Landscape Design of the KhubBakht region, District 15 of Tehran Municipality" (Tabibian et al., 2010), "Conceptual Framework of Space Justice in Urban Planning, Focusing on the Concept of Justice in the School of Islam" (Dadashpur et al., 2015), "Distribution of urban amenities and services based on social justice (Yasuj case study)" (Tirband and Azani, 2012) the criteria of justice used in this research have been used. The taxonomy method was used to perform the analyses in this study. Taxonomy calculation steps are as follows:

- 1- Forming the initial matrix
 - 2- Calculating the distance of each region from other regions based on the total applied indicators.
 - 3- Specifying the homogeneous region/s (Kalantari, 2013).
 - 4- Calculating the combined distance of each region from the ideal region
- The Eq. 1, is used to calculate the combined distance of each district from the ideal district

$$C_{io} = \sqrt{\sum (Z_i - Z_o)^2} \quad (1)$$

Where

- C_{io} = The combined distance of each district of the optimal segment
 - Z_i = Values in the standard matrix
 - Z_o = The desired value of each column in the above matrix.
- 5- Calculating the level of development of sectors or regions:

The Eq. 2, is used to calculate the relative level of development of each sector or region L

$$\bullet \quad DL = \frac{C_{io}}{C_o} \quad (2)$$

- DL = Development level of each sector
- C_{io} = The combined distance of each district from the optimal district

Where:

C_o = is the mean C_{io} plus twice the standard deviation of the same column which is obtained by Eq. 3:

$$C_o = \overline{C_{io}} + 2 \quad (3)$$

6- Sorting districts or regions based on the relative level of development (Kalantari, 2013).

SPSS and GIS software programs were used for analysis. To measure the extent to which an index is distributed unevenly across districts, the coefficient of variation (CV), sometimes called the Williamson factor, was used. This method is used to examine the existing inequalities in development indicators across large areas (Kalantari, 2013). The coefficient of variation provides the relative proportions of dispersion where the dispersion is proportional to the mean (Washington *et al.*, 2010). The coefficient of variation is calculated by dividing the standard deviation of an index by the mean of the same index. The higher value of CV, indicates greater inequality in distribution (Kalantari, 2013).

The scope of research

The scope of this research includes Tehran metropolitan. Tehran has an area of about 730 square kilometers at 35°35'N 51°53'E (Tehran Municipality, 2016).

This study has been carried out in Tehran- Iran in 2017 (Fig. 2).

RESULTS AND DISCUSSION

The analysis of the results of the information analysis shows that the largest amount of public transportation credits were allocated to the central sector -related to the entitlement criterion-, and in terms of future allocated credits and facilities even though based on the criterion of difference, the deprived sectors should have a larger share of resources, more resources are allocated to the central sector. Although based on the criterion of participation in the public interest, regardless of its cause, the central sector is more appropriate, this part can be partly due to ease of access and hence improve access to the peripheral areas could also lead to an increase in public participation in the whole city. However, the adoption of policies such as increased means of transportation such as subway trains or buses can provide benefit to all sectors given that these lines cross different parts of the city. In general, the eastern part in terms of allocated credits, the western part in terms of risks and the central part in terms of transportation of people with disabilities, as well as indicators related to equal opportunity criteria, are considerably weaker than other districts. In connection with the coefficient of variation of the indices, the two indices of the length of adjusted

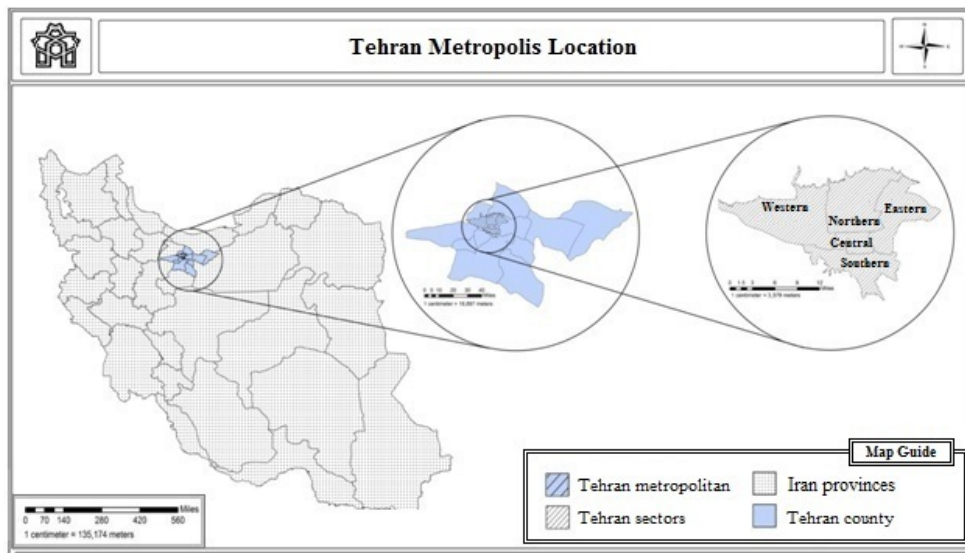


Fig. 2. Tehran Metropolis Location

The distribution of Tehran transportation services

Table 1. The Coefficient of variation in terms of the 1st criterion. Equal opportunity

Indicator No.	1 st criterion: Equal opportunity	The coefficient of variation (CV)
1	Average waiting time at the bus stop	0.404
2	Slow and critical percentage (peak hours in the morning)	0.499
3	Percentage of crossing over capacity	0.437
4	Percentage of total travel time delay	0.238
5	Percentage of delay in the route	0.239
6	Percentage of delay at the intersection	0.249
7	Average speed	0.331

Table 2. The Coefficient of variation in terms of the 2nd criterion. Difference

Indicator No.	2 nd criterion: Difference	The coefficient of variation (CV)
1	The average ratio of proposed credits for the development and organization of non-rail public and semi-public transportation to current credits	0.179
2	Average ratio of future credits intended for the construction of non-rail public transportation stations to current credits	0.139
3	Average ratio of credits intended for the acquisition of capital assets of transportation and traffic to current credits	0.111
4	Average ratio of future park space to the current park space range	0.414
5	The average ratio of proposed length of the recommended passage for disabled persons to the length of existing accessible passages for the disabled	0.647
6	The average ratio of the length of future bike paths to the length of the existing bike paths	0.519

Table 3. The Coefficient of variation in terms of the 3rd criterion. Need

Indicator No.	3 rd criterion: Need	The coefficient of variation (CV)
1	The ratio of credits spent for the passage of the disabled to the population of disabled and elderly people	0.540
2	Per capita transportation credits allocated to physically disabled people	0.363
3	Per capita transportation credits allocated to the blind and deaf persons	0.215
4	The ratio of length of available passageways for persons with disabilities to the total area of the district	0.855
5	The ratio of the number of accidents leading to damage to the total number of trips	0.527
6	The ratio of the number of accidents leading to injury to the total number of trips	0.272
7	The ratio of the number of accidents leading to death to the total number of trips	0.447

Table 4. The Coefficient of variation in terms of the 4th criterion. participation in public interest

Indicator No.	4 th criterion: participation in public interest	The coefficient of variation (CV)
1	The ratio of travel by subway to per capita amount of a metro station	0.613
2	The ratio of the average daily transaction of a bicycle to population × 100,000	0.658
3	The ratio of the production of bicycle trip at peak hours to the population × 100000	0.315

Table 5. The Coefficient of variation in terms of the 5st criterion. Entitlement

Indicator No.	5 st criterion: Entitlement	The coefficient of variation (CV)
1	Per capita credits for training and promotion of transportation and traffic	0.399
2	Per capita transportation costs	0.399
3	Per capita credits spent on construction of non-rail public transportation stations	0.417
4	Per capita credits spent on maintenance of non-rail public transportation stations	0.232
5	Per capita credits for the training and promotion of traffic culture	0.399

passages for the disabled proportional to the area of the district and the funds spent to facilitate the passage of the elderly and disabled population have high coefficient of variation which means significant inequality in the distribution of these two indicators. In addition, the lowest average coefficient of variation is related to the indices of difference criterion and the highest one is related to the criterion of participation in the public interest.

The relative levels of development of the sectors (their respective Development level of each sector-DLs) are presented in the Tables 6 to 11.

The DL values of Tehran metropolitan areas based on the criteria under study is illustrated in Fig. 3.

The Development Values of Tehran metropolitan areas based on the criteria under study (Fig. 4).

As Martens points out, transportation planning is inevitably political because interventions in the transportation system always affect different persons in different ways. However, in the everyday practices of transportation planning across the world, their political character often disappears into the background (Martens, 2016). Justice has always been a controversial issue and it is difficult to agree on its definition and dimensions. Michael Wallzer (Martens et al., 2012) believes that every area of justice must have its own standards, and transportation can be considered one of these areas. In a situation where

Table 6. Equal opportunity criterion

Rank	District	Cio	DL
1	West	64.86	0.55
2	South	66.36	0.56
3	East	79.61	0.67
4	North	89.03	0.75
5	Center	108.92	0.92

* The combined distance of each district from the optimal district; ** Development level of each sector

Table 7. Difference criterion

Rank	District	Cio	DL
1	West	1.50	0.21
2	South	4.47	0.63
3	East	4.81	0.67
4	North	4.92	0.69
5	Center	4.93	0.69

Table 8. Needs criterion- Disabled and Elderly

Rank	District	Cio	DL
1	West	0.92	0.19
2	South	1.36	0.29
3	East	2.18	0.46
4	North	2.99	0.63
5	Center	3.97	0.84

Table 9. Needs criterion- risks

Rank	District	Cio	DL
1	West	1.09	0.24
2	South	1.67	0.37
3	East	2.53	0.56
4	North	2.95	0.65
5	Center	3.81	0.84

Table 10. Participation criterion

Rank	District	Cio	DL
1	West	0.34	0.06
2	South	3.19	0.59
3	East	3.34	0.62
4	North	3.35	0.62
5	Center	4.42	0.63

Table 11. Entitlement criterion

Rank	District	Cio	DL
1	West	1.70	0.23
2	South	3.84	0.52
3	East	3.97	0.53
4	North	4.47	0.60
5	Center	6.40	0.86

The average coefficient of variation of the criteria

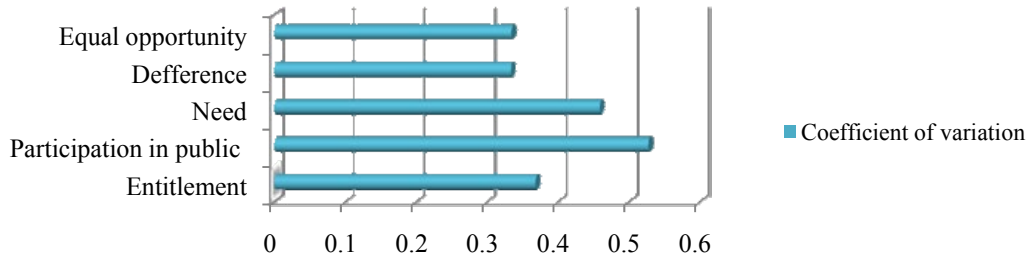
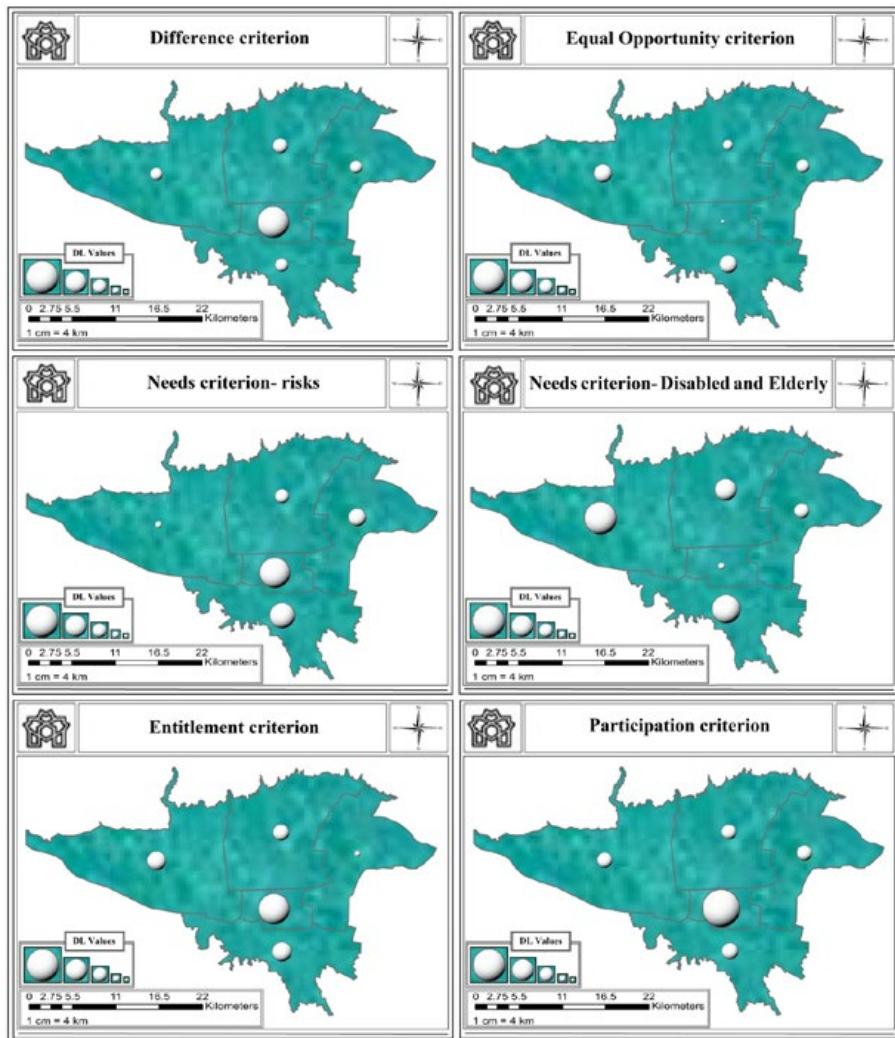


Fig. 3. The average coefficient of variation related to the justice criteria



* Development level

Fig. 4. The DL* Values of Tehran metropolitan areas based on the criteria under study

justice in the field of transportation is not considered as much as it seems necessary and many schemes in the field of justice have been put forward in the form of slogans in practice, it is difficult to assess the status of justice not only in the field of transportation, but also in other areas with limitations in theoretical dimensions. In this research in order to achieve a more complete theoretical basis it was tried to use foreign research and the studies that evaluated justice in urban services. Considering that transportation is also a municipal service, these studies could provide a good basis for the selection of justice criteria in transportation and, furthermore, since various criteria have been used in different studies, they provided the necessary validity to be applied. As it was observed, the distribution of transportation facilities and credits among the metropolitan districts of Tehran is not consistent with the justice criteria to a large extent the effects of which might be much wider than the field of transportation because considering the interactive relationship of transportation expansion and economic development, this unbalanced distribution can affect the economic and physical structure of the city. Also Friedman and Stuckey (Friedman and Stuckey, 1973) point out that transportation services may also act as the organizer of relationships in space, for example, patterns of residence, location of economic activities, and economic interactions. Metro is a cheap transportation mode and people in central areas have accessibility to the cheap transportation, while peripheral areas cannot achieve such a low-cost transportation. Considering that “low transportation costs, shared infrastructure, labor pooling, job matching, information sharing, and knowledge spillovers—produce centripetal forces that stimulate centralization and agglomeration” (Fujita, and Thisse, 1996), this policy will only lead to more centralism.

CONCLUSION

According to what has been discussed, three general policies can be considered to achieve justice in transportation in Tehran metropolitan area. The first approach is to develop transportation in such a way that a balance is made between the areas in enjoying transportation and infrastructures. This strategy has serious limitations due to some reasons. First of all the expansion of transportation is conditional on the creation of travel demand, in other words, transportation has little production power on its own,

and should be expanded when demand increases. The second reason is that expansion of transportation lines to less economically advantageous areas is not economically feasible and could lead to the imposition of the costs that would make further development of the transportation limited or impossible. Finally transportation of Tehran is faced with financial constraints in the current situation. Even if more balance is sought by pushing more costs on the current system, the unbalanced development of the city could neutralize all the activities because by creating a travel demand that is concentrated in a particular area, transportation development could be limited to a specific area. Despite all these limitations, the implementation of this strategy can play an important role in addressing the deprived areas, as the Transportation development Program, in particular, is common for the resolution of problems in the deprived regions. The second approach is that, given the fact that the expansion of transportation is dependent on the economic and physical development of the city, planning for the city's physical and economic development should take place in such a way that a balanced travel demand is formed. The third approach that can be considered is the simultaneous application of both of the two approaches. That is, both the physical structure of the city and the distribution of uses in the city as well as the transportation system would be justice based. Based on the results of the present research, transportation facilities should be distributed among the metropolitan areas of Tehran in such a way that the disadvantaged regions would receive more share than the advantaged regions as in the area of vertical justice, the less disadvantaged regions receive a higher share than other areas and groups. In other words, in the vertical justice, the realization of justice requires the creation of inequality. If the site selection of major cultural, economic, and social centers is made in such a way that the less disadvantaged regions receive a higher share of these centers, a higher reduction of inequality in the overall situation in these areas will be witnessed by creating this inequality. Although equality is not attainable in practice, or even functionalists believe that some degree of inequality is necessary, the reduction of the large gap between these regions by creating inequality will be a step towards the realization of justice. The site selection of a number of centers, such as economic centers, is affected by market performance, and the adoption

of planned and regulated policies, for example in case of the location of such activities it can have an adverse effect on the market situation and prevent the “market invisible hands” to have a minimum of freedom to act in balancing. Nevertheless, it seems that there is a possibility for the public, recreational, and educational centers’ site selection to be able to adopt and implement planned policies such that greater market autonomy is maintained. Establishing state-owned centers in less-developed areas has created demand for business trips that have made a significant contribution to urban travel in Tehran. Increasing demand for these trips in less-developed areas will provide affordable transportation facilities for these areas, and as a result, more facilities will be available in these areas. The expansion of educational, recreational and occupational centers will not only increase the number of educational, recreational and employment trips, but also enhances other trips, for example, increasing the training centers in one region can lead to increased shopping or leisure trips and as a result, enhances the vast amount of shopping and training trips along with the absorbed training trips.

Recommendations

1- It is suggested to transfer some land uses such as governmental departments and educational centers to the non-central parts of the city to prevent delays and traffic by reducing the travel demand to the central

districts. This will increase the savings caused by expanding the transportation system to the peripheral areas which is a win-win situation for both residents of the periphery and the inhabitants of the central regions.

2- It is suggested that the urban network of cities be developed in a Checkered form because this kind of network can play an important role in the more balanced distribution of facilities, it has no centrality and network development is unlimited, moreover, there is no congesting area anywhere in the city and everyone have equal access to the service.

3- The fact that most of the current and future subway lines are going through central areas, those travelers who wish to travel from one periphery to the periphery have to travel from one periphery to the periphery have to cross the central areas and as a result, the trains in these areas do not have the capacity to respond passengers during peak hours. As a result, the experts ‘and engineers’ strategy may be to increase the number of stations and lines in the central part, because it is said that generally the peak hours determine the maximum capacity required by the passenger transportation system. However, this strategy will lead to the focus of facilities at the center and more unfavorable condition of traffic indicators.

It is recommended to reengineer the subway lines under construction in Tehran Comprehensive Transportation and Traffic Project in such way that these lines instead of being implemented directly,



Fig. 5. Subway lines in Tehran

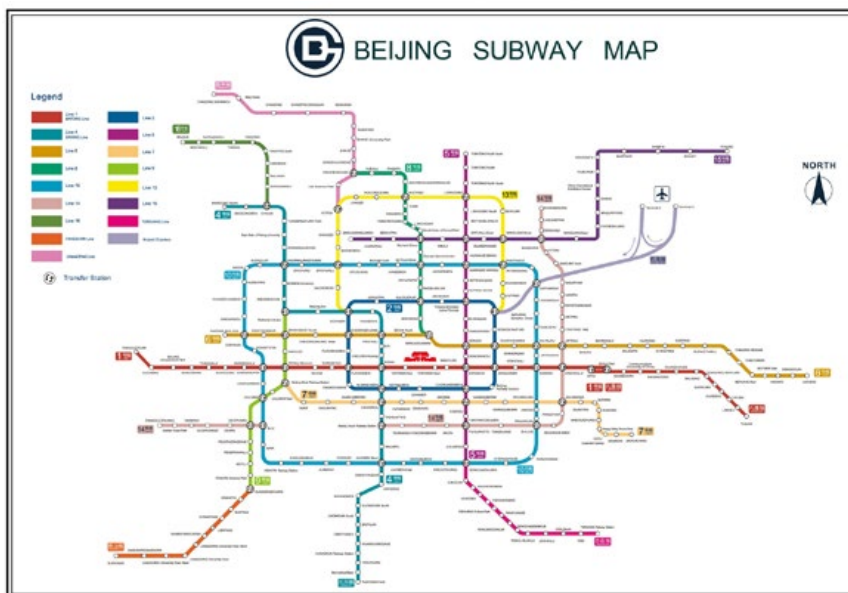


Fig. 6. Subway lines in Beijing

they are designed and constructed as arcs, semicircles, squares or rectangles around the central section and the current lines are used to link these centrifugal circuits to the central district. For example, Beijing's subway lines in addition to direct lines include a series of rectangular lines that unnecessary trips to the center can be removed by connecting the periphery areas. In this way, peripheral regions will be more accessible and the volume of traffic in the central part will be reduced, moreover, those who do not intend to travel to the central part will not enter this section and thus the possibility of better development of activities such as tourism required in the central part will be possible. Figs. 5 and 6 show the difference of subway lines in Tehran and Beijing.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this manuscript. In addition, the ethical issues; including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission,

redundancy have been completely observed by the authors.

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