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Survey of Spatial Justice Between the 22 Regions of Tehran Metropolis

[1]Mehran Madani and [2]Zohreh Davoudpoor

[1]Islamic Azad University of Qazvin, Iran
[2]Academic member of Islamic Azad University of Qazvin, Iran

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Abstract: Tehran metropolitan is an area equivalent to 650 km with a population of 8 million with 22 city districts. Lack of balance in services and facilities among the areas with unbalanced distribution of population and stock, has caused the spatial justice or unbalance development occurrence among regions in this city. Extreme differences per stock services, green spatial, employment opportunities, rate of family size an literacy has led also to get away from these areas to the growth and development toward even increased difference in quality of life and eventually this imbalance to the whole Metropolis. In this paper, we have also tried to identify essential development indexes in Tehran, to determine the position of each region in terms of relieving these outline indexes. Because of this reason, at first we balance all indexes, which have different characteristics with the use of numerical taxonomy methods for equalization and find position of each area for its given development aspects (For program planning in coming years this method was applied in the population prediction in view of Tehran-1400) and then we apply productivity factors of each region, which indicates. The growth plan area in the view of this plan. At the end of each stage, by using Arc GIS Software we have produced homogeneous Development Map of districts of Tehran.

Key words: Spatial Justice · Regional Development · Tehran Metropolis · Numerical Taxonomy

INTRODUCTION

Tehran as the largest metropolitan city of Iran, despite the structural complexity and relationships and lack of attention to issues and problems, commute gradually to an unbalanced city in terms of social, economic, physical, security and especially environmental problems. For example, safety discussions against natural disasters, especially earthquakes according to experts, if an earthquake strikes in Tehran, one of the biggest human tragedies will arise for the first time ever. But despite the efforts and planning, probably because of boredom and repetitive problems, not only there is no effort to find an effective solution for it, but also it seems that flows of the physical trend moves are to intensify crisis possibilities in Tehran.

Uncontrolled expansion of Tehran and high speed growth of this metropolitan, create non-integrated management, plus different society levels and different cultures in the Metropolis caused the pathology and finding a suitable treatments for this city to be impossible in the result of that [1].

Tehran is a city with an area equivalent to 650 km and a population of about 8 million people with 22 urban areas. Lack of balanced distribution services and facilities among these areas with unbalanced distribution of population and capital has been the cause of spatial injustice in Tehran or imbalance in region development [2]

Extreme differences in services per capita, green spatials, employment opportunities, rate of household size, literacy and etc. in addition to development separation and growth of these areas from each other it also increases the difference in life quality in these areas [3].

Up to this moment, two comprehensive plans and a reorganization plan have been prepared for the Metropolis in years 1343, 1371 and 1385. The purpose of each of these projects has been to improve the role of Tehran city in the country and then in the region at the end and to introduce Tehran as livable city with such quality and desirability to meet international standards. To achieve this we must first start from Tehran districts, to prevent accumulation of capitals in certain regions and their fungus type growth by balancing them.

Corresponding Author: Mehran Madani, Islamic Azad University of Qazvin, Iran.

Strategic- structural plan in 2006 in Tehran for balancing and establishing justice in areas with a general order and standard per capita tried to resolve this problem, but for this project to be successful it must first classify Tehran areas from the point of development and life desirability factors so by presenting some useful strategies, desired goals can be achieved.

In this paper we tried to specify development indicators in Tehran, determine the position of each region in terms of its ability to possess these indicators. Since there are multiple indicators in viewing progress of development and quality of life in areas and not having access to desired information, it has been tried by considering the most fundamental indicators which was written in previous documents, we reach the correct evaluation of development rate in Tehran.

Theoretical Foundation: In this section we will try to review theoretical foundations, development literature, spatial justice and the comments about this field.

When the benefits of particular groups of people supply by means of unequal facilities in the city, the injustice has occurred [3]. This benefit has been charged by other groups living in the city that suffered more than all.

Spatial justice in the city means to protect benefits of all regions in general and target groups in particular, by the optimum distribution of urban resources, revenues and costs. Therefore, the main goal of urban planners should be achieve equitable distribution of public resources. In The allocation of resources we must continually attention to these two questions: Which areas are paying the costs? And which region brings what and where? Until equitable distribution of resources follow fair and proper paths and possible not only all, but also social target groups must be considered to eliminate discrimination and establish urban balance.

At first, to determine the rate of development must have definition about indicator and its variants and then review the effective indicators on the development.

Research Background: Various organizations and designs have introduced different indicators to determine development of countries, cities and regions, including the global Bank, ASEAN organization and.... In the following we'll mention to examples of the indicators that used in the process of urban development determination.

Global Bank (2012): World Bank has done different researches in years 1995, 2001, 2002, 2007, 2008, 2012 in order to achieve development indicators. In 1995 the indicators determined and on the other years the indicators have reviewed again. These important indicators are size of settlements, Transportation status, rate of Labor, rate of natural resources, rate of poverty, rate of housing construction, rate of energy prices, investment in health sector, Population infrastructure, population rate of growth, percentage of people with literacy [4].

ASEAN Development Indicators (2001): rate of public health, people with literacy, rate of public participation in government, rate of Poverty, rate of employment, rate of energy prices [5].

ASEAN Development Indicators (Jakarta 2003): Rate of health, rate of people with literacy, rate of immunization against certain diseases, rate of sexual ratio, rate of Employment, rate of unemployment, rate of poverty, quality of stable development, Access to technology, Internet and phone usage [6].

Tehran Strategic - structural plan (2006): Family size, density of household, residential per unit, rate of residential Per capita, rate of sexual ratio, number of literate, rate of employment, rate of Industrial spatial Per capita, average of household income, rate of employment, rate of unemployment, rate of administrative Per capita, rate of educational statistic, rate of health care Per capita, rate of urban facilities and equipment Per capita, rate of Trade Per capita, Rate of cultural spatial per capita, rate of religious spatial per capita [2].

BBC: Within a wide research in all over the world, BBC introduced the social development indicators as 4 main indicators: Life Expectancy, birth rate, adult literacy, infant mortality.

World Bank Urban Development Indicators (2011): Rate of health development, number of vehicles per 1000 person, number of passenger of vehicles per 1000 person, number of people living in cities, rate of urban contamination, Price of different kind of fuel, Energy consumption per captia, Diesel fuel consumption per captia, Number of vehicles per 1Km road Poverty gap and poverty headcount ratio at urban poverty line [4].

Table 1: Research background

Cultural	Structural	Economic	Social	Year	Producer	
-	Size of settlements, Transportation status	rate of Labor, rate of natural resources, rate of poverty, rate of housing construction, rate of energy prices, investment in health sector	Population infrastructure, population rate of growth, percentage of people with literacy	2012	Global Bank development indicators	1
-	-	rate of Poverty, rate of employment, rate of energy prices	rate of public health, people with literacy, rate of public participation in government	2001	ASEAN Development indicators (Manila)	2
Access to technology, Internet and phone usage	-	rate of Employment, rate of unemployment, rate of poverty, quality of stable development	Rate of health, rate of people with literacy, rate of immunization against certain diseases, rate of sexual ratio	2003	ASEAN Development indicators (Jakarta)	3
Rate of cultural spatial percapita, rate of religious spatial percapita	rate of administrative Percapita, rate of educational statistic, rate of health care Percapita, rate of urban facilities and equipment Percapita, rate of Trade Percapita, rate of transportation and storage Percapita, rate of green garden Percapita, rate of passages network Percapita, rate of recreational- sports percapita, rate of parking percapita	rate of Industrial spatial Percapita, average of household income, rate of employment, rate of unemployment	Family size, density of household residential per unit, rate of residential lPercapita, rate of sexual ratio, number of literate, number of illiterates, rate of employment, rate of unemployment,	2006	Tehran Strategic - structural plan	4
-	Number of vehicles per 1000 person, rate of vehicles per the streets	Price of fuel	Rate of health Development, number of passenger of vehicles, number of people living in cities, rate of urban contamination	2008	global Bank Urban Development Indicators	5
-	number of vehicles per 1000 person, number of passenger of	Price of different kind of fuel, Energy consumption per captia, Diesel fuel consumption per captia,	Rate of health development, number of people living in cities, rate of urban contamination, Poverty gap and poverty headcount ratio at urban poverty line	2011	World Bank Urban Development Indicators	6
		Household living in less than 3 rooms, Population under Komite-Emdad protection, People living in more than 6 rooms.	Unemployment Population, simple labors, Dependency ratio, Illiterate population, Rate of Death Professional population, Educated people, Literacy population,	2004	Nafiseh Marsousi- 1383 (Tehran Research Planning)	7
	Transportation, Infrastructure,	Household expenditure, Housing toprovision, City product per	Resource management, Socioeconomic indicators, Local government, Groundwork indicators, Land use, Population, Population growth rate, Household size average, Household ratio, Birth rate, Death rte, Emigration rate, Tenure type.		Zainuddin Bin Muhammad (A Malaysian Initiative)	8

Fig. 1: Model Research of Tehran Master Plan Indicators

Dr Nafiseh Marsousi, 1383 (Tehran Research Planning): Unemployment Population, simple labors, Dependency ratio, Illiterate population, Household living in less than 3 rooms, Rate of Death, Population under Komite-Emdad protection, Professional population, Educated people, Literacy population, People living in more than 6 rooms.

Zainuddin Bin Muhammad (A Malaysian Initiative): He defined some main indicators and then for each of them he defined the following criteria. So the main indicators are : Transportation, Resource management, Infrastructure, Socioeconomic indicators, Local government, Groundwork indicators including : Land use, Population, Population growth rate, Household size average, Household ratio, Income distribution, City product per person, Birth rate, Death rte, Emigration rate, Household expenditure, Housing toprovision, Tenure type.

Model Research: In research on a topic, identifying components and elements of the subject and the importance of hierarchical position of each element is in the process of research is necessary [1] This is possible through the definitions, dimensions, components and indicators; and through the reviewing the possibility of these hypotheses and their evaluation and finally achieves the objectives of scientific and practical research methods.

In this paper we use 20 indicators that have role in development rate of regions in Tehran, these indicators of characteristics are mainly social, economic, cultural and economic, which are shown below in the table. Most of these indicators have been extracted within the comprehensive plan of Tehran in 2005. It is worth mentioning that another important criteria and indicators play an essential role in regions developing, but due to unavailability of data, this article is not using them.

Recognition: At this stage, has been tried to express the measured indicators which have been discussed in this paper and then specify portion of each 22 regions for having these indicators than the entire city of Tehran, by means of maps produced by GIS. To evaluate the rate of development indicators distribution all over the city, first, average of each indicators should be calculated on the whole city of Tehran and then we'll calculate the portion of each area. It should be mentioned that because of negative nature of some indicators Due to the development, we used their reverse [8-29].

Methodology

Taxonomy Model: This method is collection of ranking methods that proposed for the first time by Adansoun in 1763 and used for development ranking of different countries in 1968 by Professor Zignet Halowin. This method has a high efficiency at rating of various items by tent to their determining factors and indicators. Operational stages of this method are:

First Stage: Factors and indicators that show characteristics of candidate places should be described.

Second Stage: Quantitative amounts of the above factors and indicators for each location would be calculated.

Table 2-a: Indicators of Tehran Master Plan (2006)

Region	Official per captia	Educational per capita	Sanitary and remedial per capita	Urban installation and equipment per capita	Trading per capita	Transport and stock per capita	Green and garden per capita	Crossing network per capita	Industry and workshop per capita	Cultural per capita
1	1.19	3.6	1.2	3.2	3.4	0.34	3.8	18.07	5.88	0.17
2	0.82	1.34	0.53	4.6	2.8	0.36	21.53	27.8	4.76	0.21
3	0.34	1.15	0.36	3.5	3.5	1.14	18.85	22.55	4.16	0.24
4	2.2	4.4	3.2	4.3	2.3	1.5	12.1	22.4	3.33	0.3
5	8.5	7.2	6	3.8	4.5	2.1	9.8	20.7	0.83	1.2
6	7.68	7.08	2.4	3.07	3.65	0.89	3.22	25.99	1.58	0.63
7	2.04	7.1	16.2	5.2	3.2	59	36	30.5	0.14	7
8	1.08	1.66	0.36	0.22	2.04	0.21	2.23	34.67	27.77	0.036
9	0.6	0.8	0.2	0.2	0.2	3.3	1.4	12.2	0.57	0
10	5.3	2.01	1.08	4.3	4.3	2.1	5.8	8.1	0.31	3.2
11	2	8.7	6.1	2.6	8.8	9.6	11.2	7.9	0.166	6
12	17.3	92.1	5	5.6	15.2	4	81	19.2	0.83	1.2
13	0.17	0.54	0.31	0.95	0.53	0.53	1.74	12.33	33.33	0.03
14	0.18	0.7	0.08	0.26	0.99	0.17	2.43	9.96	20	0.05
15	0.35	1.13	0.16	0.46	0.89	2.06	9	0.11	6.25	0.16
16	0.86	1.59	0.3	1.35	1.36	11.13	5.74	11.61	2.04	0.49
17	0.05	3.2	0.3	0.87	1.58	0.62	1.5	8.18	3.33	0.3
18	0.8	1.35	0.8	0.6	4	9.6	8.5	14.4	16.66	0.06
19	1.02	1.02	0.09	3.4	1.4	4.5	9.6	3.3	0	0.2
20	0.7	1.5	0.9	36	6.1	4.4	4.2	7.13	0	0.11
21	2.1	1.01	1.9	9.1	2.01	3.27	58.32	2.48	0	0.21
22	2.4	3.4	1.3	3.3	0.82	6.58	127.66	55.45	0	0.17

TABLE 2-b: Indicators of Tehran Master Plan (2006)

Region	Residential percapita	Sport and entertainment percapita	Parking percapita	Family dimension reverse	Family income	Number of hospital per 100000 persons	Family density in residential unit reverse	PSI
1	35.44	3.57	0.34	0.263	551	0.10	0.99	0.02
2	32.34	0.48	0.0018	0.30	345	0.13	0.98	0.019
3	21.3	0.44	0.1	0.28	255	0.04	0.98	0.011
4	30.3	2.1	0.05	0.31	244	0.07	0.98	0.023
5	20.1	1.3	2.1	0.27	309	0.01	0.99	0.04
6	28.7	1.33	1.5	0.25	900	1.16	0.96	0.008
7	21.1	16	0.4	0.23	635	0.27	0.97	0.008
8	19.6	0.53	0.7	0.3	575	0	0.83	0.012
9	19.73	0.5	0.07	0.24	1197	0.05	0.88	0.016
10	32	2.3	0.9	0.22	654	0.12	0.83	0.009
11	38.1	2.5	0.29	0.13	895	0.47	0.91	0.008
12	19.3	3.12	0.77	0.12	844	0.40	0.56	0.007
13	18.37	0.69	0.04	0.30	874	0.08	0.83	0.01
14	15.99	0.31	2.6	0.28	433	0.02	0.99	0.011
15	13.11	0.47	1.9	0.02	336	0.01	0.96	0.019
16	12.36	1.67	0.45	0.25	663	0.09	0.85	0.0107
17	14.11	16.8	0.74	0.24	820	0.03	0.87	0.0133
18	13.7	2	0.9	0.30	575	0.05	0.93	0.025
19	20.1	6.8	2.7	0.25	842	0	0.53	0.0138
20	4.34	9	1.7	0.25	624	0.02	0.53	0.017
21	27.29	12.8	10.81	0.25	1251	0	0.93	0.064
22	28.87	13.3	0.06	0.24	1904	0	0.45	0.08

Third Stage: To identical the computational factors and indicators units, the values of factors and indicators would be set by using the following formula on the unit scale. (Factors and indicators turned to normal standard).

$$Z_{ij} = \frac{X_{iJ-}\overline{X_{ij}}}{S_J}$$

AS:

Xij = Amount of j's determinant indicator and factors in i's place.

$\bar{\times}$ = j's determinant factor and indicator average in i's place.

SJ = j's determinant factor and indicator scale deviation.

Zij = j's commuted values and normalized standard indicators in i's place.

Fourth Step: The distance or difference between the two locations in terms of determinant indicator and factors would be calculated, so if a and b are two places we have:

$$d_{ab} = \sqrt{\sum_{j=1}^{n}\left(Z_{aj} - Z_{bj}\right)^2}$$

j = studied determinant indicator and factors.

dab = distance or difference between two locations a and b in terms of studied indicator and factors.

Obviously dbb = 0 and daa =0

Fifth Stage: Calculated distance values at the fourth stage (other than zero) match with per volunteers places with normal distribution a = 5% for all locations. If voided the calculated distance from range of lower formulated this place is evaluated as a place where non-homogeneous and non-comparable with other places in terms of efficient factors in site selection and must be deleted necessarily.

$$\bar{d} - 2s_d \prec \ldots \prec \bar{d} + 2s_d$$

$\bar{d}$ = Calculated distances average.
Sd = Scale deviation of the calculated distances.

Sixth Step: In acceptable homogeneous places, estimated according to the fifth stage, the ideal amount of each location determinant indicator and factor which discussed maximum amount of values and indicators, would be determined. Then, the distance from any location by terms of these indicators with ideal value would be determined:

$$C_{i0} = \sqrt{\sum_{j=1}^{n}\left(Z_{ij} - Z_{0j}\right)^2}$$

Z_{ij} = Highest values of j indicator considered as ideal.
C_{i0} = Distance of any i's place by terms of indicators and factors with their ideal values.

Seventh Stage: in this stage, the highest and most possible amount of distance for ideal values C_0 by normal distribution assumption and with a=5% based on the following relationship is obtained.

$$C_0 = \overline{C}_{i0} + 2S_{j0}$$

$\overline{C}_{i0}$ = Average of C_{i0}
S_{i0} = Standard deviation

Now prorate of C_{i0} to place of C_0 shows the priority of choosing i's place. In other words, if value of this ratio for i's place is less, this place have higher point and priority for selection as the optimal location.

Analyeses: After identifying the desired indicators to use in this paper that calculated in the previous step for each region separately, now, by using numeral taxonomy method we determine the development status of each zone of Tehran. It should be mentioned, all indicators assumed as the same value in this paper and also coefficient of importance for all of the indicators calculated one. Now the steps of 1 to 3 by order in this section are:

Step 1: Assimilate the calculation units and indicators by the normalization-formula.

Step 2: Determine the distances or the differences between the two places in terms of indicators and determined ingredient in of each region.

Step 3: In this step maximum possible distance would be calculated with 5% normal distribution and the results would be arranged by order of distance in all areas.

As you can see in the table below, by the means of mention to the selected indicators in the previous step, among the 22 regions of Tehran zones 7, 12, 21, 11 and 6 respectively, have the highest amount of development. This affair can be occurred due to the high level of green and open spatial in zone of 7 with low air pollution indicator (PSI). About zone 12 of Tehran can be pointed to campus governance and the Traditional Bazars of Tehran and this affair increases per capita of office section, commercial and green spatials. Also, Zone 21 of Tehran Municipality due to Chitgar Park and several streets and roads aligned with the main gate of Tehran, stand in this group. Maximum number of ministries, Iran's oldest universities, also the highest number of hospitals compared to other areas of Tehran, caused the zone 6 to be one of the development areas of Tehran.

In this study, underdevelopment zones, respectively are southern regions of Tehran, such as 16,15,9 and 19. It should be mentioned again that the division is based on a limitation series of indicators. Which it is less mentioned in it to life quality indicators, housing, economic and all of them have the same value.

Vision Plan: Tehran 2006 Master Plan, approved by the High Council of Urban Planning and Architecture, has considered year 2021 as the vision of this plan. For this purpose, to find the amount development of areas at target year, predicted population of each area produced by consulting engineers applies in each existing usage and calculating new per capita by using numerical taxonomy method and recognize the regions by thence development in the vision plan. It should be mentioned in this section, all the indicators assume fixed and changes applied only on the basis of rate of population.

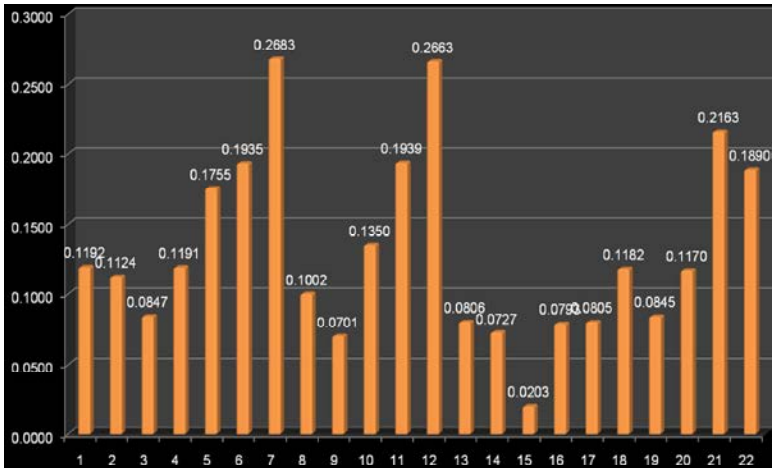

Fig. 2: Tehran regions development on 2006

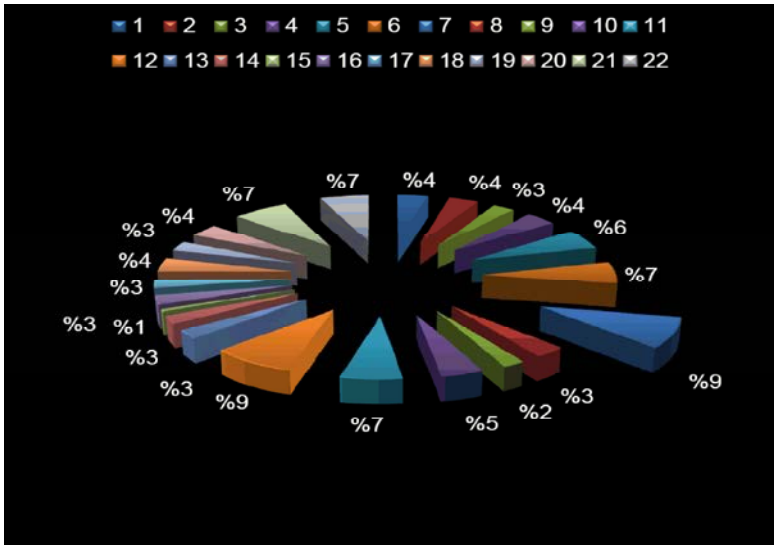

Fig. 3: The Portion of Each Region in Total (2006)

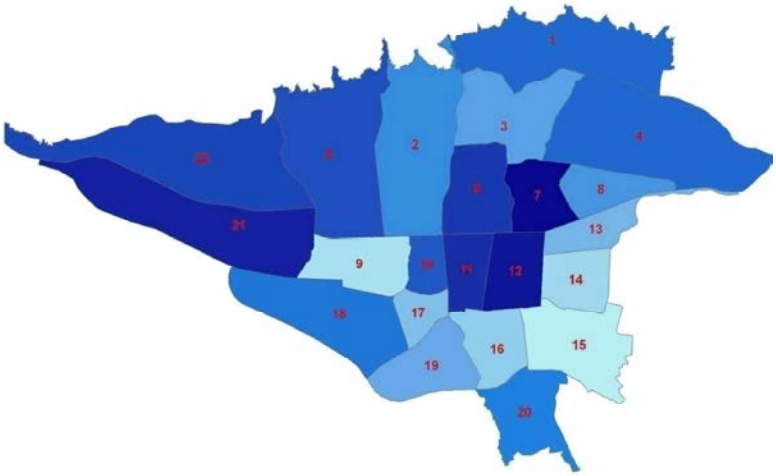

Fig. 4: The GIS Map of Tehran Regions Development (2006)

Table 3: Tehran Regions Population on Habitancy Capacity

		Population (2026)	
Region	2006	Tehran Master plan	habitancy capacity Rating
1	379962	330000	520000
2	608814	610000	730000
3	290726	270000	320000
4	819921	920000	1050000
5	679108	730000	1100000
6	237292	250000	260000
7	310184	350000	380000
8	378725	410000	425000
9	165903	150000	165000
10	315619	250000	280000
11	275241	280000	300000
12	248048	275000	340000
13	245724	300000	360000
14	483432	490000	550000
15	642526	650000	730000
16	291169	350000	380000
17	256022	220000	220000
18	374000	550000	670000
19	247815	265000	360000
20	335634	430000	480000
21	159793	240000	300000
22	108647	350000	500000
Sum total	7854305	8670000	10420000

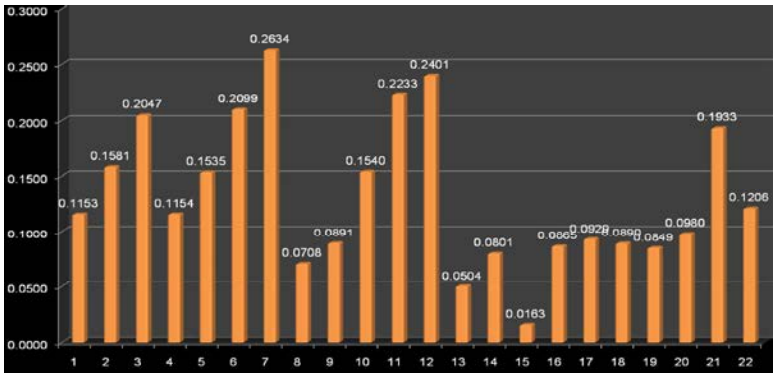

Fig. 5: Tehran regions development on 2021

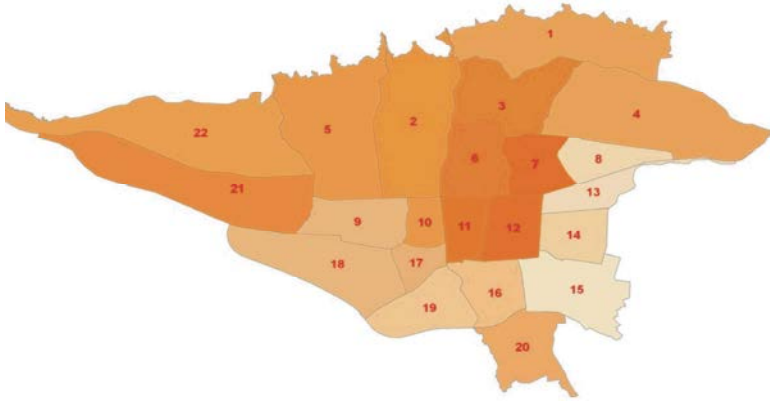

Fig. 6: The GIS Map of Tehran Regions Development on 2021

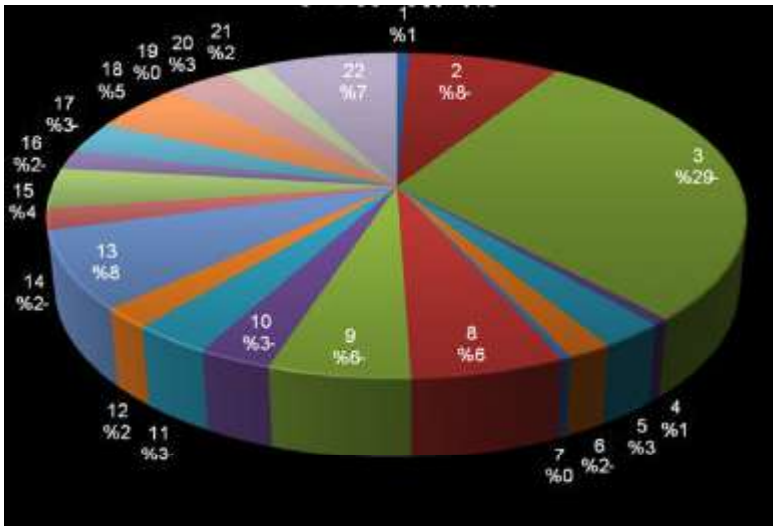

Fig. 7: The Portion of Each Region of Productivity Factor

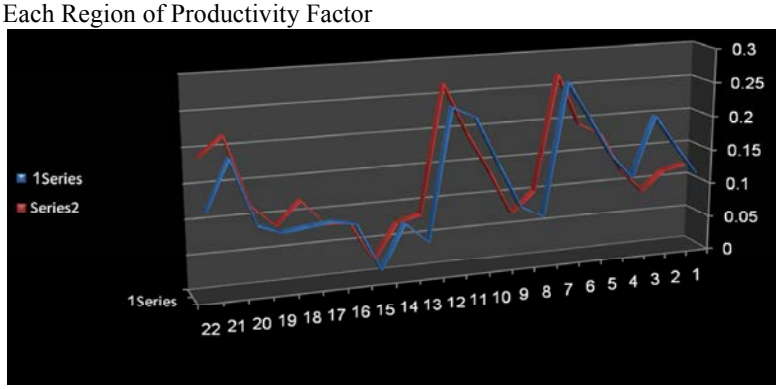

Fig. 8: The Compare of Tehran Region Development between 2001 & 2006

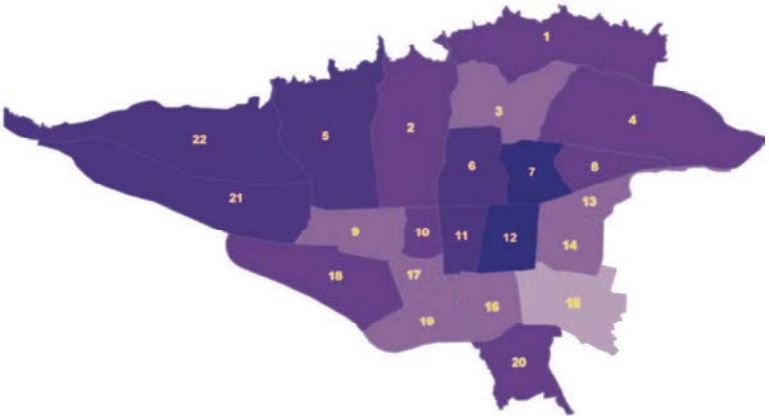

Fig. 9: The GIS Map of Tehran Homogenous Region

Prudoctivity Factor: At this stage of the paper we notice to set the highest growth rate among the regions of Tehran, with the help of this stage results, the best zone for investment in the future would be clear. To find the highest developing rate in 15 years we use productivity factor formula. The system of using this formula is to subtract the development coefficient in existing situation from the vision plan in each region and intersect to development coefficient in existing situation.

As in the table below is observed, the most efficient in the plan possesses to zone 3 with 26%, this represents appropriate development in this region in the future and it's considered as the best spot for investment in the city.

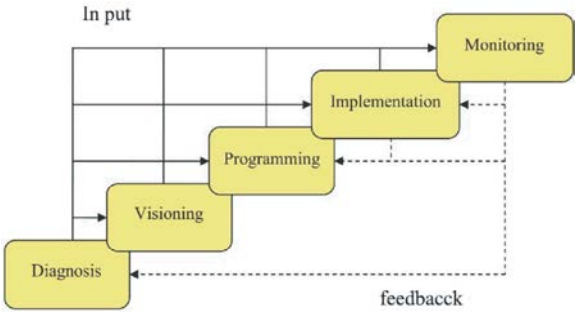

Fig. 10: feedback

Homogenous Regions: Whereas the distance from both regions was determined it's time to find a solution for spatial justice in this city. In order to planning we use homogeneous regions way. This method has two advantages:

- By using this method we can recognize the correction of work and steps. In this manner, if some regions from the point of development has been given a tolerance level were together, it means that our calculations were correct, otherwise our work would encounter with the problem.
- To planning, it is less needed to time and we can do the same planning for different groups.

CONCLUSIONS AND RECOMMENDATIONS

In this paper it has been tried to use Strategic Plan, this means that first with the recognizing the position, paid to pathology. Then after recognition the position of each region in terms of development, we found the vision plan and then with the aid of factor productivity and facilities of Tehran, we pay to the solutions off balance between the regions considered in Tehran.

Now considered the facilities of Tehran we try to offer 2 solutions in order to omit the unbalances in Tehran city:

- Expression the pattern of region development, in order to eliminate the problems of the projects on the horizon:

In Tehran 2006 Master Plan approved by Commission of Article 5 of the Municipal, to special justice between 22 regions of Tehran, certain consultant of each region, prepared Development Model, which these models have been written according to deficiencies of each region and replying to the region potential and try to eliminate the problems of each region and setup the special justice all over the Tehran city.

- To use the saved lands in the each region to compensate the deficiencies the 7-fold in region :

  These lands that are different in size according to the region position in Tehran, are one of the most important opportunities to increase the quality and quantity levels of life in each region. These lands with the suggestion of municipal of region and approval of city council, are employed to non-residential uses in each region in order to developing the region.

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