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Research Article

Presenting traffic analysis zone method for origin-destination statistics operations in Iran

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Abstract

Traffic zoning has been studied less than other transport modeling processes. In network analysis and transport planning studies, a point is usually introduced as the center of a zone for each traffic area, and urban areas were considered as centers of gravity in the country's traffic zoning for the purpose of carrying out origin -destination studies. After determining the homogeneous centers, in this study, 5 criteria: load and passenger were produced and absorbed and the population was the factor of weighting cities, the boundaries of the regions according to the similarity, coherence, proportionality of the area, the facilitation of the statistical process, statistical access , presence of the gravity and the number of areas were determined. In the first step, based on weighting items (5 items in total), a preliminary list of cities was extracted. According to this list, seven scenarios were designed and prioritized to cities that were weighted in 5 items based on the data recorded in the bill of lading and the face of the situation in the Road Transportation Organization as well as the population in the Center of Statistics of Iran. Finally, according to the Pareto principle, centers of gravity were obtained. The four final scenarios were also studied considering the country's roads on provincial, city, district and rural scale. Finally, the boundary of the regions was determined on the basis of the boundaries of the cities. Then, considering and prioritizing the country's important shipping points such as terminals, mines, economic regions, customs, ..., the adjacent parts of these points were carried out with homogenous centers, aggregation and reduction of their number. According to these areas the country will eventually be divided into 124 districts, 776 stations were selected for the purpose of collecting the origin-destination data.

Keywords*: Iran's Traffic Zoning Area, Origin-Destination Statistics, Pareto Principle*

1. Introduction

The general purpose of origin-destination studies is to provide a complete overview of the flow of goods and passengers in the country's road network in order to investigate and identify the characteristics associated with the demand for road transport. The results of the processing of the data collected in the source-destination studies allow us to analyze the equilibrium between the supply of transport infrastructure and transport demand. It also serves as a reference point for predicting future transport demand by considering other factors such as macroeconomic factors, socio-economic factors, and agricultural and industrial growth. It is also used as an input for HDM evaluation and prioritization. Therefore, the general objectives of the country-of-origin studies of the country's road transport can be summarized as follows:

- Balance analysis between the supply of transport infrastructure and transport demand,
- Modeling transport demand and forecasting future demand for transportation, and
- Assessment and prioritizing investment in maintaining and developing roads.

The special purpose of studying the origin and destination of road transportation is to obtain knowledge about the geographic flows within the country as well as with neighboring countries and to formulate a travel matrix for the purpose of transport demand modeling. The trips that are considered in these studies are long-distance trips between each area. Therefore, the information collected in the source-destination studies is essential for creating travel and travel matrices, and the travel matrices generated are then used for modeling purposes.

Each journey has a source and a specific destination, which is generally different from the origin of the trips. In the planning of transport planning studies, the first step is to aggregate travel information. To achieve this, each area is divided into several traffic areas.

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Traffic zoning is a topic that has been studied less than other transport modeling processes. Designers generally use their practical experience to perform zoning. But there are rules and regulations that they are bound to obey, including respect for statistical boundaries and natural separators. The regionalization of traffic can be considered from a variety of aspects, including the size and number of areas and the shape and method of regionalization, and its effects on different stages of transportation planning studies. Different levels of regionalization of the studied area can lead to different results in a research, for example, the larger the area is, the larger the number of trips that will not be seen (intra-region trips), because when a bounded study area is zoned, only trips that cross the boundaries of the areas will be calculated. . In summary, some of the methods for forming statistical regions can be summarized as follows:

Use of 1-empirical methods, 2- Use of statistical units, 3- Use of four-zone zoning, 4- Based on defined limits, 5- Use of innovative methods.

Principles and trends of intraregional zoning are the same with out-of-town zoning, but the important and influential parameters in them are not the same. The basis of regionalization in both types of regionalization is the use and attention to socio-economic indicators. In the urbanization of the population, the representative of the social factors and the level of employment represent the economic factors. This issue is different in out-of-town studies, and this is the factor that distinguishes these two types of regionalization. In urban outskirts, the urban population is used instead of the population of inter-urban statistical blocks and the amount of load and passenger displaced is an indicator for economic factors.

Coherence, weighing, proportionality of area, facilitating the process of census, statistical availability, the existence of a gravity and the number of districts are important indicators in the area of a city or country for conducting traffic studies. Possibility to use the results of previous studies is another factor that should be considered in regionalization. It is also necessary to try to limit the political and traditional boundaries of the districts, towns, districts and cities to the border of traffic areas as far as possible. On the other hand, the number of areas should not be large enough to make calculations impossible.

2- Zoning review of literature

Table 1 Summary of reviewed worldwide studies

Study type	Title	Objective	Case study	Upgrading range	Year
Foreigner	National Listing of Personal Travel (NPTS)	Collecting daily trips by individuals and households over a 24-hour period	USA	Once in 5-7 year	1995
	United States Travelers Listing (ATS)	Collecting household information for journeys longer than 100 miles	USA	Once every three month	1995
	National surveys of household trips	A compilation of two items (NPTS) and inventory (ATS)	USA	-	2001
	Studying the Needs Assessment for Heavy trains - Georgia	Determine the need for lines for heavy vehicles	Georgia	-	2006
	Collecting information for Portland	Collecting cargo information including vehicle type, load type, load weight and ...	Portland	-	2005
Domestic	Studies of the comprehensive transportation plan of the country	Modeling the transport demand and forecasting the future demand for transportation	Iran	Once every 20 year	2006
	Initial origin-Destination Design Studies	Data collection - destination of road transport (cargo and passenger)	Iran	Once every 10 year	2004

Table 2: Summary of the Master Plan in the country and their regionalization information

Row	Study title	Date	Number		Number of districts
			Province	City	
1	Comprehensive studies of transportation and traffic in the country	2005-	30	385	56
2	Comprehensive studies of transportation and traffic in the country	1986-1991	24	195	54
3	Comprehensive Study of Ports of Iran	2004-2007	30	370	42
4	Comprehensive Freeway Studies in Iran	2006	24	195	51

2.1. Suburban zoning, Review of Literature

2.1.1. Comprehensive studies of country transportation

Comprehensive studies of transportation in the country are the strongest upstream document of this study, and a detailed study in each section can be helpful. Considering that in Iran, in the last 30 years, two comprehensive transportation studies have been carried out, a review of the regionalization strategy in them can be important. Apart from comprehensive studies on transport and traffic, other studies have also been carried out on ports and highways in the country. The following table summarizes the information provided by these studies.

Considering the number of provinces in different periods, almost every province is divided into two traffic areas. In the comprehensive traffic and traffic study of 2005, the country is divided into 56 traffic areas, and Iran has been considered as a district.

Methodology and statistics

Basically, the following criteria are used to define areas.

1) The district system should fit into administrative units (national divisions), especially in relation to population and production statistics. Therefore, the areas can be defined in this way. Collections of smaller units that can be aggregated in different studies in different ways, so that the results of these studies can be compared and consistent.
2) Areas must be as homogenous as possible. This is an easy task for urban areas because their areas are smaller and are defined according to the principle of congruence of areas or travel destinations. In inter-urban studies, this is somewhat difficult because it is larger and each of them includes different types of facilities or residents. Therefore, the convergence should be balanced according to the objectives of the study and based on the two variables of the size of the area and the divisions of the country.
3) It is not necessary to use main roads to determine the boundaries of the areas, and the origin and purposes of travel should not be located in the boundary of the area, as this creates problems for the process of allocating traffic in the modeling process.
4) The areas should reflect the natural range of influence and the sphere of influence of their center (Centroids) as well as the internal networks of the area. This should be seen in the outward appearance of the areas. It also shows the interior features of the area.
5) The areas should not necessarily be the same size, but their size should be commensurate with the travel time units. Therefore, denser areas should have smaller dimensions
6) Each area is characterized by a point of equilibrium or center of gravity (Centroids). Urban studies of the center of gravity are virtual points that indicate the average cost of travel to any other point in the area. Usually these points depend on a specific location, but this is not necessarily the case. These points are connected by a network interface, which represents the average cost of communication to a node in the actual network (road). In intergovernmental studies that use larger regions, the process is the opposite: first, the central point that represents the centers of production and travel attraction is determined. Then the boundary of the area is determined by the sphere of influence of the central point with respect to the sphere of influence of the central points of the adjacent regions.
7) In the regionalization process, consideration of socioeconomic characteristics is necessary and paying attention to these political parameters and boundaries is of great importance. In the area of regionalization of inland areas, the population is represented as a representative of the social features of the area and employment as representing the economic features of the project area. Considering the extent of studies in suburban areas and the influence of other factors in this context, it seems that other representatives of socioeconomic characteristics should be included.

In the comprehensive studies of transportation and traffic in the country, the amount of passenger displaced as an indicator for the social factor of the area (population) and the amount of displaced load as an indicator for the economic factor of the area (employment) is mentioned. Of course, one should pay attention to the fact that the most important factors affecting the area are attention to the political boundary and their natural attributes. For this reason, in current studies, the amount of cargo and passenger displaced, which ultimately enters and leaves the load and the passenger, is converted to every demographic spot, has been taken into account.

Basic vision for zoning

By examining the global literature on regionalization, the pattern of area distribution-the number of regions and populations-the number of regions, the number of provinces-the number of regions and the number of counties-the number of districts to provide an initial vision for the zoning of the study area can help. In this regard, the distribution of the shape follows the distribution of the area-the number of regions in the studied countries. As seen in Chart 1, the good fitness coefficient (R2) for this distribution is 0.42. By placing Iran's profile in this chart, it can be concluded that about 19 traffic areas are sufficient for the province. Although the information obtained is accompanied by errors, in general, one can only consider the area by considering that 19 traffic areas are sufficient for the study area.

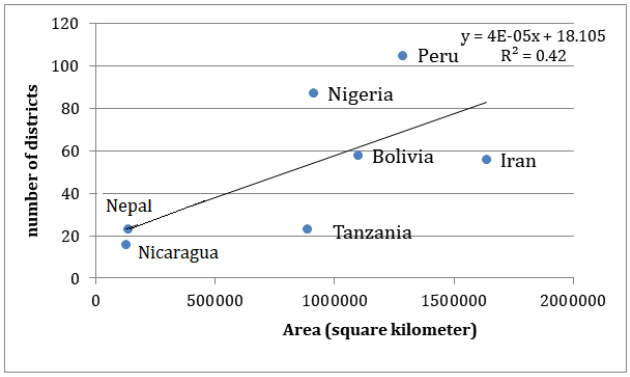

Diagram 1 Distribution of the area - the number of regions in the studied countries

Figure 2 shows population distribution - the number of regions in the studied countries. In general, by increasing the number of population, the number of districts also has an uptrend. By adding the population profile of Iran, we can conclude that 41 regions are suitable for Iran.

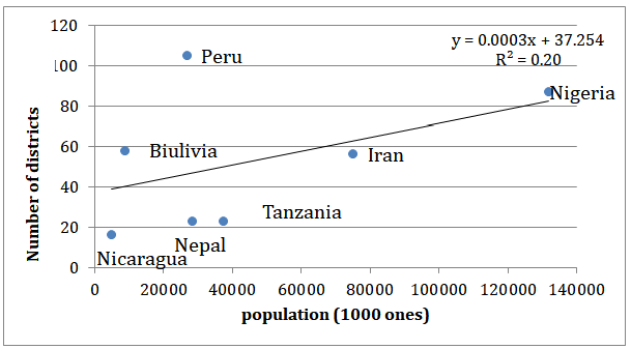

Diagram 2 Distribution of population - the number of regions in the studied countries

Figure 3 shows the distribution of province numbers - the number of regions in the studied countries. In general, by increasing the number of provinces, the number of districts has an uptrend. By adding the population profile of Iran, it can be concluded that 17 regions are suitable for Iran.

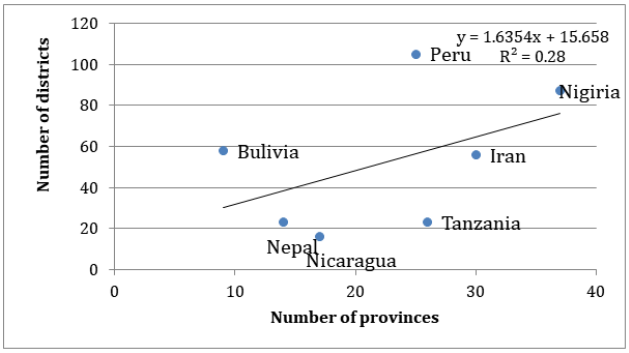

Diagram 3 Distribution of the province number - The number of regions in the studied countries

Figure 4 displays the number of counties - the number of regions in the studied countries. In general, with increasing number of population, the number of areas also has an uptrend. By adding the population profile of Iran, it can be concluded that 34 regions are suitable for Iran. It should be noted that the information obtained from these graphs is only informative and is not a deciding factor.

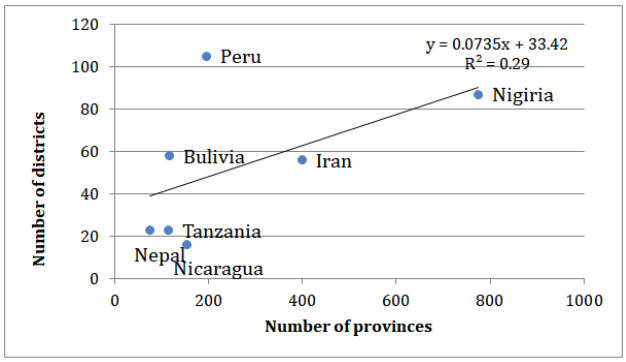

Diagram 4 Distribution of the number of cities - The number of regions in the studied countries

Table 3 shows a summary of the obtained analyzes based on the literature review with respect to the information placement of Iran. It can be seen that considering different parameters, the number of different regions for Iran can be considered. It is important to note precisely that the maximum number of proposed traffic areas in this study is 41 areas and the minimum number of 17 districts.

Table 3 Specifications of the study area

Range feature / Range name	Number of provinces	City number	Area (million square kilometers)	Population (million)
Iran	31	428	1.65	77.20
The number of districts according to the master plan	66	64	84	60

3. Methodology: Designed scenarios for the purpose of zoning the study area

Four scenarios are introduced considering the importance of observing the political boundaries of each area and examining the details of the areas. The first scenario is the study of the roads of the province in the county, in which approximately 400 districts in the city will be located.

The second scenario is a bit more detailed and shows the area smaller than the town. According to the political divisions of the country, after the city, the province is the largest unit of each division, and thus it can be said that the second scenario is the division of traffic areas into sections.

The third scenario is also deeper and more detailed and has smaller dimensions in terms of area. Considering the hierarchy of political divisions, it follows the rural sector. In this way, the third scenario is the survey of Iran's transshipment dimensions in the rural district.

The fourth scenario proposes a hybrid approach considering the strengths and weaknesses of each of the scenarios and considering the weight of each of the province's cities in the study. This city-centered scenario, and the determination of the weight of each of them, shows the traffic areas in the cities with respect to the political boundaries of the districts, districts or townships where they are located. Thus, each city has been seen in the study, and the political boundary has been respected.

In this section, information about the load and passenger traffic transmitted between Iran's cities for determining the weight was investigated according to the registration data of the road and railways transportation organization in 2014 and the population statistics of the country that was obtained from the Center of Statistics of Iran. In comprehensive traffic and traffic studies of the country, in order to determine the weight of each area, the amount of cargo and passenger has been generated and absorbed, as well as the population of each city has been investigated and their aggregate charts are drawn to determine the critical mass. . In this study, the Pareto principle, or the principle of 20-80, has been used. This means that in each system or collection 80% of the weight is 20% of the parameters. Another example, in a transshipment system, is 80 percent of the problem, or 80 percent of the traffic volume originates from 20 percent of destination originals. In the first step, based on the weighting items (load and passenger, produced and absorbed, and the population, totaling 5 items), a preliminary list of cities was extracted. The list includes cities that account for 20% of the total weight of each item.

The critical mass is in fact the determination of an initial threshold in order to integrate regions that are less weighted thresholds. For example, if it is assumed that the critical threshold for population in the city is 300,000, in this case, cities with a smaller population can be aggregated. Figure 2 illustrates the map of areas susceptible to synchronization based on Scenario 7.

In the current study, based on the combined scenario, there were seven scenarios that were as follows, based on Table 4, with the focus of these cities.

1. Scenario 1, cities weighing in every 5 items, and only has 20% of the weights.
2. Scenario 2, cities weighing 4 or 5 items, and only has 20% of the weights.
3. Scenario 3, cities weighing 3, 4 or 5 items, and only has 20% of the weights were.
4. Scenario 4, cities weighed in 2, 3, 4 or 5 items, and only has 20% of the weights were.
5. Scenario 5, cities weighing at least 1, 2 items, and only has 20% of the first weights.
6. Scenario 6, each city at least has a quartile of 2 weights.
7. Scenario 7, each city at least has a quartile of 3 weights.

Based on this scenario, 5 and 7, according to the adaptation of the areas obtained with major attraction and production centers of the country, including refineries, terminals and passengers, petrochemicals, industrial towns, cement factories, steel mills, sugar factories, wheat mills, mines , special economic zone and major power plants of the country were selected and based on the aggregation of the areas in order to equalize the points of attraction and production and optimization of the number of areas. Figure 1 shows an example of the dispersion of the country's most important shipping points. The number of districts with 124 areas was also operational and consistent with the comprehensive plan of the country. The 124 districts in the next stage were the basis for selecting the location of the stations. Figure 5 shows the number of districts in each of the provinces of the country, and Figure 3 shows the map of the zoning.

Table 4: Information on cargo and passenger, and the share of designated areas based on the best scenario in the whole country

Row	Province	City	share of produced load	share of absorbed load	share of produced passenger	share of absorbed passenger	Population share
1	Khuzestan	Abadan	0.002598	0.002506	0.005678	0.005338	0.004
2	Zanjan	Abhar	0.001786	0.002164	0.0034	0.003431	
3	East Azarbaijan	Azarshahr	0.001935	0.001387		0.001734	
4	Markzai	Arak	0.008533	0.007112	0.008374	0.005588	0.009134
5	Ardebil	Ardebil	0.00378	0.005941	0.006736	0.007184	0.009104
6	Yazd	Ardekan	0.002423	0.005043			0.001071
7	Western Azerbaijan	Urmia	0.005405	0.008539	0.011282	0.01149	0.012592
8	Kermanshah	Islamabad West		0.001445	0.005571	0.005005	0.001786
9	Tehran	Islamshahr		0.00135	0.00256		0.006372
10	Esfahan	Esfahan	0.0287	0.0473	0.0360	0.0371	0.0331
11	Mazandaran	Amol	0.0067	0.0074			0.0041
12	Khuzestan	Andimechak	0.001885		0.001962	0.001885	0.002392
13	East Azarbaijan	Ahar		0.001298	0.002524	0.002324	0.001747
14	Khuzestan	Ahvaz	0.0152	0.0290	0.0179	0.0179	0.0210
15	Sistan and Baluchestan	Iranshahr		0.002544	0.003478	0.002148	0.00183
16	Ilam	Ilam		0.002685	0.003635	0.004178	0.003249
17	Mazandaran	Babol		0.004168	0.002074	0.002429	0.00414
18	Kurdistan	Baneh		0.002193		0.001826	0.001607
19	North Khorasan	Bojnord		0.002797	0.006922	0.007883	0.003769
20	North Khorasan	Borazjan	0.002582	0.001473			0.001801
21	Lorestan	Boroujerd	0.002143	0.002248	0.005093	0.004689	0.00454
22	Chaharmahal va Bakhtiari	Broujen			0.003068	0.003372	0.000994
23	East Azarbaijan	Bostanabad	0.002633	0.001405		0.001636	
24	East Azarbaijan	Bonab	0.002918	0.004229			0.001507
25	Khuzestan	Bandar Imam Khomeini	0.0378	0.0144			0.0014
26	Guilan	Bandar Anzali	0.005344	0.002183	0.002302	0.001426	0.001355
27	Hormozgan	Bandar Abbas	0.0426	0.0767	0.0060	0.0069	0.0082
28	Khuzestan	Behbahan		0.001878	0.002896	0.002185	0.002026
29	Mazandaran	Behshahr		0.001785		0.001606	0.001684
30	Bushehr	Bushehr	0.008501	0.005009	0.005492	0.004353	0.003683
31	Western Azerbaijan	Boukan	0.004514	0.00215	0.004301	0.004784	0.003218
32	Kurdistan	Bijar	0.00521		0.001806	0.001298	
33	South Khorasan	Birjand	0.002116	0.004512	0.004545	0.004856	0.003358
34	Western Azerbaijan	Piranshahr		0.002928	0.002896	0.00321	0.001303
35	Qazvin	Takestan	0.003407	0.004205	0.001826		0.00147
36	East Azarbaijan	Tabriz	0.0091	0.0192	0.0274	0.0207	0.0277
37	Khorasan Razavi	Torbat		0.001529	0.00383	0.002369	0.001787
38	Khorasan Razavi	Torbat Heydarieh	0.003348	0.002478	0.003856	0.00222	0.002474
39	Tehran	Tehran	0.0616	0.0990	0.0017	0.0949	0.1538
40	Fars	Jahrom		0.002194	0.002332	0.001832	0.002152
41	Kerman	Jiroft		0.001705		0.001587	0.002095

42	Sistan and Baluchestan	Chabahar	0.002218	0.001759	0.003548	0.003414	0.001615
43	Mazandaran	Chalous		0.002179	0.003411	0.002751	
44	Khorasan Razavi	Chenarran		0.001368	0.003662	0.005423	
45	Lorestan	Khorramabad	0.001561	0.003051	0.009634	0.01019	0.00433
46	Khuzestan	Khorramshahr	0.001904	0.004515			0.002441
47	Central	Khomein			0.002445	0.002257	0.001321
48	Esfahan	Khomeini City	0.0050				0.0046
49	Khorasan Razavi	Khaf			0.0018	0.0013	
50	Western Azerbaijan	Khuy	0.003137	0.002737	0.003967	0.004023	0.003791
51	Fars	Darab	0.003387	0.001713	0.001771		0.001163
52	Khuzestan	Dezful	0.004141	0.003174	0.002923	0.002997	0.004685
53	Lorestan	Doroud	0.004346		0.002416	0.003032	0.001877
54	Mazandaran	Ramsar				0.001872	
55	Tehran	Robat Karim	0.002013	0.001783			0.001473
56	Guilan	Rasht	0.005827	0.009988	0.015926	0.009382	0.012072
57	Kerman	Rafsanjan	0.003778	0.002427		0.002379	0.002856
58	Guilan	Roodbar				0.002334	
59	Sistan and Baluchestan	Zabul		0.002508		0.002502	0.002598
60	Sistan and Baluchestan	Zahedan	0.00303	0.006693	0.009378	0.00852	0.010577
61	Kerman	Zarand	0.005082	0.001748			0.001089
62	Markazi	Zarandiyah					
63	Esfahan	Zarin Shahr	0.001925	0.003513	0.005257	0.003635	0.001134
64	Zanjan	Zanjan	0.004072	0.008482	0.006545	0.00475	
65	Mazandaran	Sari	0.005532	0.006076	0.004556	0.006146	0.005592
66	Central	Saveh	0.006669	0.008842	0.004664	0.004241	0.003782
67	Khorasan Razavi	Sabzevar	0.001817	0.002611	0.005487	0.00449	0.004368
68	Khorasan Razavi	Serakhs			0.00583	0.003744	
69	Kurdistan	Saqez		0.001473	0.004799	0.004038	0.002636
70	Semnan	Semnan	0.008625	0.003533	0.002886	0.002158	0.002899
71	Kurdistan	Sanandaj		0.004463	0.012382	0.010467	0.007055
72	Kerman	Sirjan	0.0225	0.0034	0.0022	0.0023	0.0035
73	Semnan	Shahrood	0.006681	0.002915	0.004272	0.003211	0.00265
74	Khuzestan	Shalamche		0.003417			
75	Kerman	Shahrbabak		0.001365		0.001304	
76	Esfahan	Shahreza		0.002126	0.002467	0.004489	0.002335
77	Chaharmahal va Bakhtiari	Shahrekord	0.001754	0.003004	0.018518	0.015245	0.003014
78	Khuzestan	Shushtar			0.003847	0.003715	0.002015
79	Fars	Shiraz	0.0120	0.0231	0.0261	0.0293	0.0246
80	North Khorasan	Shirvan		0.001845	0.00245	0.002712	0.001665
81	Bushehr	Asaluyeh	0.002391	0.00272	0.002733	0.002344	
82	Fars	Fasa		0.001242	0.002202	0.002119	0.001977
83	Esfahan	Foolad Shahr			0.003899	0.004605	0.001262
84	Fars	Firoozabad	0.003496	0.001745			0.001226
85	Tehran	Firoozkooh	0.005989				
86	Kurdistan	Ghorveh	0.002636		0.00241	0.002878	0.001344
87	Qazvin	Qazvin	0.008306	0.014402	0.013114	0.0114	0.007198
88	Qom	Qom	0.00689	0.014215	0.012817	0.014336	0.02026
89	Khorasan Razavi	Quchan		0.001589	0.004068	0.002796	0.001957
90	Fars	Kazeroon	0.002032	0.002265		0.00138	0.001692
91	Esfahan	Kashan	0.0032	0.0069	0.0049	0.0060	0.0052
92	Khorasan Razavi	Kashmar		0.001308	0.002766	0.002992	0.001702
93	Lorestan	Kuhdasht			0.00235	0.001881	0.001753
94	Alborz	Karaj	0.005532	0.018071	0.011083	0.005698	0.030458
95	Kerman	Kerman	0.012307	0.007355	0.012422	0.012788	0.010082
96	Kermanshah	Kermanshah	0.008502	0.008779	0.022086	0.020125	0.016061
97	Golestan	Gorgan	0.002625	0.004267	0.012319	0.014741	0.006216
98	Semnan	Garmsar	0.00181	0.001251	0.002057	0.001942	
99	Golestan	Gonbadakavos	0.002209	0.002675	0.007559	0.009036	0.002727
100	Guilan	Lahijan			0.003468	0.003606	0.001774
101	Khuzestan	Mahshahr	0.004824	0.001788	0.002177	0.002332	0.002901
102	Esfahan	Mubarak	0.0148	0.0090			0.0012
103	East Azarbaijan	Maragheh		0.001563	0.002678	0.003316	0.003061
104	East Azarbaijan	Marand	0.002193	0.001227	0.003713	0.003039	0.002345
105	Fars	Marvdasht	0.004562	0.002514	0.005143	0.005923	0.002615
106	Kurdistan	Marivan		0.003253	0.002746	0.002334	0.002084
107	Khuzestan	Masjed Soleiman	0.00225		0.00219	0.002593	0.00113
108	Khorasan Razavi	Mashhad	0.0197	0.0340	0.0656	0.0519	0.0511
109	Hamedan	Malayer	0.00389	0.001647	0.00412	0.003955	0.003015
110	Western Azerbaijan	Mahabad		0.001847	0.004743	0.004858	0.002778
111	Ilam	Mehran		0.005876	0.004402	0.00295	
112	Western Azerbaijan	Miandoab	0.002798	0.001609	0.00421	0.00443	0.002322
113	East Azarbaijan	Mianeh	0.002597	0.002114			0.001802
114	Yazd	Maybod	0.005452	0.00566			0.001262
115	Esfahan	Najaf Abad	0.0016	0.0022	0.0022	0.0016	0.0042
116	Western Azerbaijan	Naghadeh			0.003006	0.003062	0.001425
117	Hamedan	Nahavand	0.002786		0.003018	0.003154	0.001423
118	Fars	Noorabad			0.001967	0.002284	0.001153
119	Khorasan Razavi	Neyshabur	0.0040	0.0064	0.0059	0.0058	0.0045
120	Alborz	Hashtgerd		0.0017			0.0010
121	Hamedan	Hamedan	0.003764	0.009138	0.019654	0.015915	0.009918
122	Tehran	Varamin		0.0027			0.0041
123	Kohgiluyeh and Boyerahmad	Yasuj		0.001798	0.002718	0.001901	0.002047
124	Yazd	Yazd	0.013345	0.013919	0.006138	0.00562	0.009171

If the cell is empty, its value is zero.

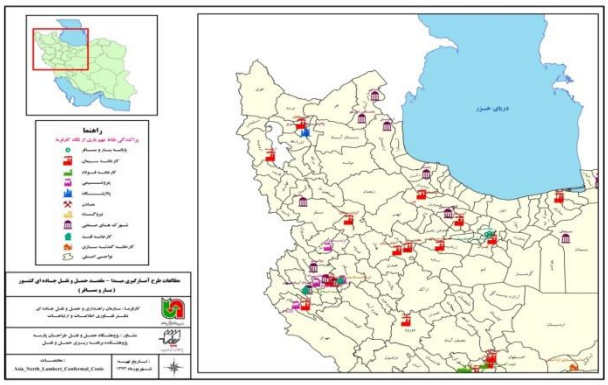

Figure 1 A sample map of the distribution areas of the country's cargo and passengers

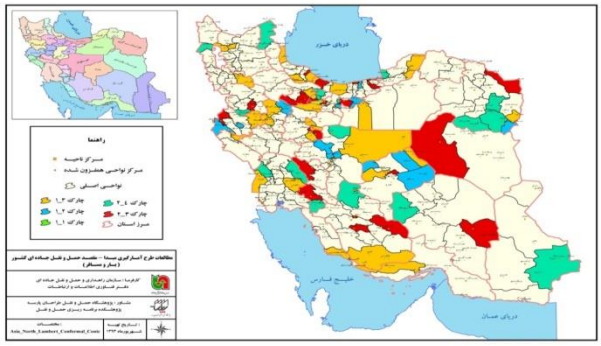

Figure 2 Areas prone to synchronization which are obtained from scenario 7

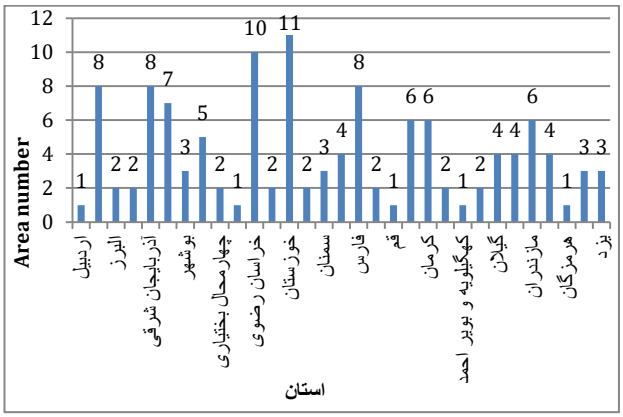

Figure 5 The number of districts in entire provinces of the country

Ardabil-Esfahan-Alborz- east Azarbaiijan-west Azarbaiijan-Booshahr- Tehran- Chamahal- south Khorasan-Razavi Khorasan-North Khorasan-Khuzastan- Zanjan- Semnan- Sistan o Baluchestan-Fars- Qazvin- Qom- Kordestan- Kerman- Kermanshah-Kohkiloyeh o Boyerahmad- Golestan- Gilan- Lorestan-Mazandaran- Markazai- Hormozgan- Hamedan- Yazd

Conclusion and Recommendations

In order to conduct field studies for the purpose of implementing the origin-destination sampling

operations in 2015, two main approaches were considered. The first approach is that the boundaries of the regions should be in line with the boundaries of the counties of the country, and the city is considered as the center of the area based on 5 criteria of load generation, load absorption, passenger production, and passenger attraction. The boundaries of the country's cities were determined by divisions of the Ministry of the Interior and were eventually used. In order to determine the center of the districts, the share of all the cities of the country that were located in the database of the Railways and Iran's Statistical Center on the basis of the five criteria mentioned above. Data related to the production and absorption of cargo and passenger and population were classified and then, according to the seven scenarios defined in the table below, the cities of the center of the area and subsequently the number of areas were determined. The proposed areas were studied individually and, with respect to the neighborhood of the homonymous regions, one of the criteria and the routes of the cities and the outlet and the entrance to them, were added to the area, and a city with more weight was selected as the center of the area.

Conducted scenarios	Number of proposed areas of the scenario
Scenario 1, cities weighing in every 5 items, and only has 20% of the weights.	48
Scenario 2, cities weighing 4 or 5 items, and only has 20% of the weights.	82
Scenario 3, cities weighing 3, 4 or 5 items, and only has 20% of the weights were.	121
Scenario 4, cities weighed in 2, 3, 4 or 5 items, and only has 20% of the weights were.	173
Scenario 5, cities weighing at least 1, 2 items, and only has 20% of the first weights.	298
Scenario 6, at least has a quartile of 2 weights.	87
Scenario 7, at least has a quartile of 3 weights.	242

After using scenario 5 and 7, 124 districts were finally selected and demarcated and based on them, 776 stations were identified and implemented. 124 is the optimal number of areas according to which the main target of the census and its secondary targets, such as short range trips without status and bill of lading, is obtained.

It is suggested that in future plans, in addition to the load and passenger information of the Railroad Organization, we should use the information from other institutions related to production and attraction in the country such as the Ministry of Industry and Mines. The optimal number areas should be obtained after determining the areas of refinement and multi-stage aggregation based on sub criteria.

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