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The study of development degree among the cities of Sistan and Baluchistan province

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Abstract

The first step in regional development planning is to identify the current status of the area in which the identification is required for the analysis of various sections including economic, social and cultural ones. In order to allocate funds and resources among different regions, identifying their position in the relevant section and rank them in terms of development potentials is necessary. There are different methods to rank economic, social and cultural sections that necessarily do not lead to the same answers. Among these methods, taxonomy analysis by combining the different indices of development, determines the development degree of the regions. The present study is ranking 10 cities of Sistan and Balochestan province according to several indicators such as education, health, agriculture, industry and mining, culture, population, and housing in separate and combined form in terms of development during the years 1996-2006 using 70 common indices. In 1996, Zahedan was the most developed city and Nikshahr was the least developed city while in 2006, Zahedan again was the most developed city in province and Sarbaz was the least developed city due to its newly established.

Keywords: development, regional development, taxonomic analysis, education, health.

Introduction

The study of economic imbalances and disparities between regions can be regarded as one of the issues that always has engaged the minds of researchers, economists, decision makers and program planners at the regional level. Need for more attention to the less developed and undeveloped regions for optimal use of the capabilities and the facilities of these regions requires the existence of scientific, accurate and reasonable knowledge of having and lacking dimensions in different regions.

Further, recognizing and understanding the differences between different regions in order to balance the level of regional development through the provision of economic and social programs to suit the characteristics of each region has high importance. Economic and industrial development revolves around productivity; therefore, it may provoke disparities and lack of coordination between different national territory areas, especially in developed countries. Indeed, in development programs, the space as a determining variable is often forgotten and they want to develop as quickly as possible to mobilize the national capital, assistance from abroad and become industrial and by reading rewarding statistics they provide planning results. But, economic balance and harmony between the regions does not exist and even the regional dichotomy has intensified. Inequality in creating opportunities and facilities for the development in different areas has caused imbalance growth.

For resource allocation among different areas, the position of each section should be identified in the area on one hand and different sections in different areas should be identified and prioritized in order to specify this position, on the other hand. Therefore, in this paper, we will prioritize cities in

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Sistan and Baluchistan province in terms of development by using development criteria, taxonomy methods and factor analysis.

Research background

In determining the level of areas' development and studying inequality between them, different research has been done inside and outside of Iran. Regarding international studies, we can refer to the research done in India and Portugal. Inequality between India's states was done by Nourbakhsh (2002, as cited in Salimifar, 2003) as human development and regional differences in India. Also, Batya-Ray (2004, as cited in Ahangari & Dalvand, 2005) using 23 indicators including 12 agricultural indicators and 11 infrastructure indicators with numerical taxonomy methods to determine the level of agricultural development of 380 blocks in 32 districts of India. Joe - Maria (2001, as cited in Ahangari & Dalvand, 2005), based on factor analysis method, ranked continental regions of Portugal during the years 1991 - 1995 in terms of development.

Some studies were done within the country in terms of development level, ranking, and disparities between them such as Khezri's (1997) Kurdistan province cities, Borzouei's (1995) study in Mazandaran province, Habibi and others' (1999, as cited in Salimifar, 2003) study in Qazvin province in both general and partial with methods of factor analysis and numerical taxonomy.

Further, Bakhtiari (2001) has ranked all Iran's provinces in terms of industrial development by using the above-mentioned method. Islami (1993) has also studied the level of development and inequality between rural areas of the country. Ahangari and Dalvand (2005) specified the development level in a general study during the years 1994 and 2003 in Lorestan province, in which the cities of the province were ranked in terms of development degree.

Methodology

Study area

Sistan and Baluchistan province with an area of approximately 187,502 square kilometers has allocated 11.5% of the country's total area. According to the latest divisions of the country, the province has 14 city, 36 urban centers, 40 districts, 102 rural district and 8,167 villages with inhabitants.

Zahedan is the capital of Sistan and Baluchistan province. The cities included in this province are Iranshahr, Chabahar, Khash, Delgan, Zabol, Zaboli, Zahedan, Zahak, Saravan, Sarbaz, Sib and Sooran, Konarak, Nikshahr, Hirmand.

According to the history and culture of this area, Toosi-Hakim's in Shahnameh expressed that Sistan is the eleventh territory which Ahura Mazda has created.

Historians have attributed the Sistan building to Garshasb descendant of Kiomars. The Sistan land was flourishing at the time of the Achaemenids. According to what was found by Inscription of Bisetoon and Persepolis, Sistan has mentioned as one of the Dariush eastern country. At that time, Sistan was one of the allies of Sasanian's government and then conquered by the Muslims. After Saffarids, Ghaznavids, Seljuk, Mongols, Timurids, Safavids and Afsharian and the rest had ruled the Sistan.

The oldest name is given to the land of Balochistan is Makamy. Also, in Dariush's inscriptions it was called Makya. But, the word of Balochistan added to the name of the area when the Baloch people were dwelling there, the area where the natives were living in it.

Balochistan is a land of history to 3000 BC. It is obvious that Cyrus has occupied Makran during the Indian campaign. Ferdowsi has spoken of baluch and migration battalion. During the caliphate of the second Caliph, the land was occupied by the Arabs. Then, Saffarids, Daylamyan, Seljuks and others have reigned over the land. During the reign of Muhammad Shah, Iranshahr area was captured and then gradually other areas of Balochistan were under the control of central government.

The province has about 1100 km common border with Afghanistan and Pakistan and around 300 kilometers maritime boundary on the northern coast of the Oman Sea. It has a dry climate, the province is arid and low rainfall and mean annual precipitation is about 100 mm. This minimal rainfall suddenly falls and causes flood and destruction. The difference between the minimum and maximum temperature is over 40 °C. The mean maximum is 32 °C above zero and the mean minimum temperature is 14.7 °C.

Data analysis method

In order to analyze the data collected for the purpose of this study, factor analysis was utilized. It is a general term for a number of different but related mathematical and statistical techniques in or-

der to investigate the nature of the relationships between variables in a given set. This method was first introduced by Pearson in 1901 and then it was developed by Hatling in 1922.

Harman and Hatling in 1941 (as cited in Williamson, 2000) developed circulation procedure in order to create core components. It is most used to determine the degree of relative development. Factor analysis is a technique in which the reduction of many interrelated variables will be possible into a smaller number of hidden dimensions. The main objective is the economy principle observance and saving by applying the smallest explanatory concepts in order to explain the maximum amount of common variance in correlation matrix.

Therefore, when a group of variables are highly correlated and or variables in other groups may have low correlation, it can be assumed that each group of variables show a compound or one under studying factor which shows the correlations in the observation.

Factor analysis steps can be summarized as follows:

- Specifying the number of hidden factors from a large set of main variables
- Select a suitable method to collect data and assess the main loads
- Circulating the main factor for obtaining the loads are easier to interpret
- Develop a proper interpretation of factors
- Gain factor scores

The most important part in the factor analysis to estimate model parameters is using the observations.

One of the most important methods of estimation is the principal component method. In some cases, after the estimation of parameters, fit interpretation of the factors is difficult or even not possible.

Numerical taxonomy method

Taxonomic analysis can be used to classify science and numerical taxonomy. Numerical taxonomy is a general name and refers to all the methods that separate similar cases from dissimilar cases and presents them into separate groups. This method is used to classify different topics such as regional, national, and cultural planning and also can be used to consider the economic dichotomy and study the members of a series of similar or homogeneous cases from dissimilar or heterogeneous cases. Meanwhile, the rest of the series are classified.

This method first suggested by Anderson in 1963 and in 1968 as a means for categorizing and International development was used by Professor Helving from economics college at UNESCO. In this method, in order to determine the units or different homogeneous topics in a three-dimensional vector space and without using of regression, variance and correlation analysis will be able to divide one series into more or less homogeneous series. Therefore, this method can be used as the criterion for recognizing a range of regional, social and economic development. Numerical taxonomy changes the variables into a standard form. Then, in order to calculate the distance between all cities based on all variables, the most similar city is specified in order to the shortest distance. In the next stage, heterogeneous cities will be specified and selected for further analysis.

Finally, ideal values are determined, homogeneous city distances are calculated from ideals values and then the degree and rank of the city are specified. Numerical taxonomy methods have a problem if the numbers of applied indicators used to assess are high because calculating the matrixes associated with the taxonomic method are difficult.

Therefore, in order to solve the above-mentioned problem, we should use factor analysis. By using factor analysis, the suggested indices for measuring city are limited to some factors. In addition, the factors which are introduced by factor analysis are not correlated in contrast with indicators. Using the taxonomy method, the following steps should be taken:

Step one: Index information matrix

We assume in a city, p indice of A_1, A_2,..., A_p by the size of the order X_1,X_2,...,X_p are measured, which X_{ij} is jth rank attribute indicator of city ith where i = 1,2, .., n and j = 1,2, ..., p . Therefore, we assume information matrix as follows:

$$IN = [x_{ij}] \quad (1)$$

Step two: Standard information matrix

We can see that each column of matrix is the size of the attribute. For example, a column includes number of agencies, investment rate, production volume and etc. These numbers, amounts, scales are different. Therefore, the size of each attribute can be changed to a standard value. If we consider column j values are X_{1j}, X_{2j},... X_{rj}. If these numbers mean is equal μ_j and standard deviation is equal σ_j these values can change to a standard value by the following relationship. By transforming column jth elements changes into z_{nj},...z_{2j},z_{1j} . If all elements of

the first column, second, ..., and p[th] of information matrix changed to a standard value, we would have the following standard information matrix which is called a standard matrix. Therefore any attribute in each column has zero mean and standard deviation equals to one.

Step three: Distance matrices and homogeneous city

Distance calculation between the cities is based on introduced indicators and is done in order to evaluate the cities homogeneity. These distances are obtained with respect to the values of information matrix. For this purpose, if a and b are regarded as two cities, city a and city b have standard indices as follows:

$$a:(z_{a1},....z_{ap}) \qquad b:(z_{b1},....z_{bp}) \tag{2}$$

Suppose two points in R p space to be consider as two cities a and b; that the distance between two cities is Dab:

$$D_{ab}=\sqrt{\sum_{j=1}^{p}(z_{aj}-z_{bj})^2} \tag{3}$$

Zaj = the standard value of j th element for city a

Zbj = the standard value of i th element for city b

Now we create a matrix in which the i th row is the distance of the i th city in order from all the other cities, which is called the composite distance matrix. In other words:

$$D:(D_{i1},....D_{in}) \tag{4}$$

It is clear that $D_{ii}=0$ and the second row is the distance of the second city from all other cities. This matrix is called the distance matrix which shows with *D*:

$$D=\begin{bmatrix} 0 & D_{12} & D_{13} & . & . & D_{1n} \\ D_{21} & 0 & D_{23} & & & z_{2p} \\ . & & & & & . \\ . & & & & & . \\ . & & & & & . \\ D_{n1} & D_{n2} & D_{n3} & . & . & 0 \end{bmatrix} \tag{5}$$

D also is a symmetrical matrix because we know, $D_{ij}=D_{ji}$ due to the city i distance from the city j is equal to the city j distance from the city i. Therefore, $D = D'$

Step Four: The determination of the shortest distance

Homogeneous city can be determined from the distance matrix *D*. For this purpose, the distance of each section can be considered from other sections. If the average distance in the first row is $\overline{D_1}$ and standard deviation of them is S_{D1} we have:

$$\overline{D_1}=\frac{1}{n}\sum_{j=1}^{n}D_{1j} \tag{6}$$

$$S_{D1}=\sqrt{\frac{1}{n}\sum(D_{1j}-\overline{D_1})^2} \tag{7}$$

In this case, consider the distance of all cities that have more than two standard deviations and or less than two standard deviations:

$$\forall k \rightarrow D^{+}_{1k} \succ \overline{D_1}+2S_{D1} \tag{8}$$

$$D^{-}_{1k} \prec \overline{D_1}-2S_{D1} \tag{9}$$

D_{IK}^{-} and D_{IK}^{+} cities are not homogeneous and ther cities having less distance than two standard deviations compared to mean value are homogeneous. This homogeneity can also be specified for each city.

Step Five: Optimum graph drawing

According to the previous step, all cities in row d of matrix D which they have maximum similarity (minimum distance) will be linked together by a vector. Vector direction has the same direction with the model city and the vector length is equal to the shortest distance between two cities. It is possible that all cities are not linked together based on shortest distance. In these cases, the second shortest direction will be considered and whole cities are linked together in a graph.

Step Six: Ranking cities in terms of development

If all cities are not placed in a homogeneous group, heterogeneous city is removed in this case and re-form a new information matrix and also new standard matrix will be created. Suppose there are m homogeneous city, p is an index of A_1, A_2...A_p the sizes to order X_1, X_2,..X_p and X_{ij} are measured. Information matrix for homogenized city is as follows:

$$INH=[x_{ij}]_{m,p} \tag{10}$$

Homogeneous information matrix will be a standard matrix again:

$$SINH = [Z_{ij}]_{m.p} \quad (11)$$

Therefore, each column element in information matrix related to homogeneous city shows a standardized attribute. If consider the greatest value of this attribute and do it for all matrix columns, a row is obtained which any element in this row is the maximum attribute. We should keep in our mind that if the index is negative (i.e., the amount of loss), invert it and thus a larger number shows less damage. Therefore, SINH matrix is changed into a new matrix with a new row. Therefore, we will have:

$$SINHO = \begin{bmatrix} z_1 & z_2 & \cdots & z_p \\ z_{11} & z_{12} & & z_{1p} \\ z_{21} & z_{22} & & z_{11} \\ \cdot & & & \\ \cdot & & & \\ \cdot & & & \\ z_{m1} & z_{m2} & \cdots & z_{mp} \end{bmatrix} = [z_{ij}]_{(m+1).p} \quad (12)$$

First row shows the attribute of an ideal city. Now, we find the distance of each city from the ideal city. Obviously, the shorter distance the closer to the ideal city. Distance of the ith branch from the ideal branch is obtained from the following equation:

$$D_{io} = \sqrt{\sum_{j=1}^{p} (z_{ij} - z_j)^2} \quad (13)$$

Here we assume that all indices are equally important. If we assume that important factor of any indices is C_i, we have:

$$D_{io} = \sqrt{\sum_{j=1}^{p} (z_{ij} - z_j)^2} \quad (14)$$

The cities are sorted in ascending order according to D_{i0} or CD_{i0}. In this case, we are able to divide all cities into a number of groups. In taxonomy method, by using major variables, they are calculated first, then using the taxonomy method, these variables are considered and then the classification will be done.

Table 1. Indices used in the study.

Code	Index	Sector
a_1	Education and training	The student's share of total
a_2		Coverage of primary education
a_3		Coverage of secondary education
a_4		Coverage of high school education
a_5		Elementary school teaching staff to student's ratio
a_6		Secondary school teaching staff to student's ratio
a_7		High school teaching staff to student's ratio
a_8		The classroom to elementary student's ratio
a_9		The classroom to secondary student's ratio
a_{10}		The classroom to high school student's ratio
a_{11}		Kindergarten for every 1000 people
b_{12}	Health and treatment	Physician for every 1,000 people
b_{13}		Dentist for every 10,000 people
b_{14}		Hospital beds per 1,000 people
b_{15}		Pharmacy for every 10,000 people
b_{16}		Laboratory for every 10,000 people
b_{17}		Clinic for every 10,000 people
b_{18}		Midwife and nurse for every 1,000 people
b_{19}		Nurse and nurse assistance for every 1000 people
b_{20}		Mortality percent under sixty-five years
b_{21}		Mortality percent under five years

b_{22}		Percentage of households with piped water
b_{23}		Percentage of households with sanitary bathroom
b_{24}		Percentage of households with hygienic fuel
k_{25}	Agriculture	Employed percent in agricultural section
k_{26}		Literate employees in agricultural section
k_{27}		Area under cultivation of Wheat and barley
k_{28}		Percentage of area under cultivation of irrigated wheat
k_{29}		Area under cultivation of industrial crops
k_{30}		Fodder cultivation area
k_{31}		Cereal cultivation area
k_{32}		Patch cultivation area
k_{33}		Irrigated wheat proficiency per hectare
k_{34}		Average carcass of a sheep and a lamb
k_{35}		Average carcass of a goat and a kid
k_{36}		Average carcass of a cow and a calf
k_{37}		Vegetable cultivation area
s_{38}	Industry	Percent of those employed in industry
s_{39}		The share of private sector employers in industry
s_{40}		Technical and professional students Share
g_{41}		Percent of Population
g_{42}	Population	Relative density
g_{43}		Percent of those employed for ten years and more
g_{44}		Reverse unemployment percent
g_{45}		Percentage of immigrant population
g_{46}		Reverse empty village percent
g_{47}		The public sector employees percent
r_{48}	Welfare facilities	Employees percent in water, electricity and gas
r_{49}		Employees percent in transportation and communication
r_{50}		Percentage of households with electricity
r_{51}		Percentage of households with telephone
r_{52}		Percentage of villages with electricity
f_{53}	Culture	Urbanization Percent
f_{54}		Literacy Percent
f_{55}		Literacy Percent among women
f_{56}		Percentage of service sector employees
f_{57}		Library for every 10,000 people
m_{58}	Housing	Percent of those employed in the construction sector
m_{59}		Percent of the wholesaler and retailer sector
m_{60}		Percent of financial services, insurance, legal and property employees
m_{61}		Percentage of households with personal housing
m_{62}		Percentage of housing built in the last ten years
m_{63}		Sustainable housing percent
m_{64}		Percent of owner households
m_{65}		Family size
m_{66}		Percent of active public phone (National and International)
m_{67}		Percent of villages have telephones as compared with province
m_{68}		Percent of active phones subscriber

m_{69}	Post office for every 10,000 people
m_{70}	Mailbox for every 10,000 people

Ranking the cities of Sistan and Baluchistan province

The first phase in 1996

Because of heterogeneity, Zahedan was the most developed city in 1996 and Nikshahr was the most undeveloped city with 5.89 Euclidean distance and ranked seventh. The cities are in two separate groups based on table 2: the first group includes Zahedan, Khash, Zabol which are called under developing cities; the second group consists of Saravan, Iranshahr, Chabahar and Nikshahr which they have placed in the group of undeveloped cities. The most important way to develop the cities is improving the quality of development indices in second group to reach the quality of development indices of first group.

The heterogeneity of the cities in 1996 has been affected by the following indices which are the most important factors: The low percentage of student population, the lower educational coverage in elementary, middle and high school, the low ratio of teachers to students in three levels of education, low level education and educational facilities, low educational level and low number of kindergartens and nurseries, number of doctors, dentists, pharmacies, labs, nurses and midwives, nurse assistance, center for physical therapy, radiology centers, increased household with bathroom, and sanitary water piping and fuel.

In agricultural section, important factors include an increase in under cultivation area of crops, an increase in literacy number of people through the development of education in villages, an increase in agricultural sector professionals by attracting and employing agricultural engineers and increase their wages and increasing number of private sector employers in this section, through credit and providing a greater range of investment areas.

The industry sector is affected by the factors such as an increase in the number of educated workers, especially professionals help to improve the performance in this sector, an increase in the number of students at vocational-technical institutes through developing these centers, training, developing technical schools and increasing the share of private sector employers through credit and removing barriers on the way of agreements in principle in operation phase.

Several factors have been effective in other sectors as it is clear in special vectors matrix. Geographical conditions and lack of access to facilities that have been absent in other parts of the province can be regarded as the reasons behind this fact that three cities including Zahedan, due to centralization of political and official offices, Zabul because of old history and Khash due to its proximity to the center of province are more developed than any other cities.

Table 2. Rank and distance of cities in Sistan and Baluchistan province in 1996.

City	Euclidean distance to city	Rank	Situation
Zahedan	Heterogeneous	1	Under development
Zabol	3/53	2	
Khash	4/34	3	
Saravan	5/09	4	Undeveloped
Iranshahr	5/12	5	
Chabahar	5/78	6	
Nikshahr	5/89	7	
Development line	4.80		

The second phase in 2006

Ranking in 2006 is the last period of the study. The selected cities were ranked by using data from the Census of Population and Housing from statistical Information Center of Statistics Center of Iran, using province statistical reports data in 2006 and letters of administration and statistical reports, and using 70 indices by compositing of Taxonomy method and factor analyses.

By analyzing and creating main indices, the above 70 indices were changed to eight major components. Eight created major components with 100 percent explanation of indices were known as a very

good representative for them. Based on cities ranking in the province, the city of Zahedan has the highest degree of development with Euclidean distance of 4.84 from an ideal city and Sarbaz city is the least developed city with Euclidean distance of 7.73 from an ideal city.

Based on division cities, Zahedan, Saravan, Iranshahr, Zabul and Zahak are among developing cities and Konarak, Khash, Chabahar, Nickshahr and Sarbaz are among the underdeveloped cities. Iranshahr is located in the industrial hub and centrality of industries in the Baluchistan area so it has reached the developed cities and from undeveloped group in 1996 has risen to developed group in 2006.

Table 3. Rank and distance of cities in Sistan and Baluchistan province in 2006.

City	Euclidean distance to city	Rank	Situation
Zahedan	4/84	1	
Saravan	5/57	2	
Iranshahr	5/60	3	Developing
Zabol	5/75	4	
Zahak	5/90	5	
Konarak	6/27	6	
Khash	6/31	7	
Chabahar	7/15	8	Undeveloped
Nikshahr	7/44	9	
Sarbaz	7/73	10	
Average	6.25		

Reference: Researcher computation.

Conclusion

In this paper, we have presented different problems in Sistan and Baluchistan province from different angles and possible strategies to develop the cities in province. Here are some suggestions for the future development of the province. The Sistan and Baluchistan as a unique body in national level is able to be planned in economic – social and cultural sections.

Because under developing is an epidemic phenomenon among all cities in the province, one of overall results of the research is the existence of homogeneous phenomenon that it is seen in all the years and all sectors under study; all cities in Sistan and Baluchistan province have been homogeneous.

Any change which is going to occur at the level of province, it may affect other cities by this phenomenon. Any development at the provincial level will result in other cities with weakness and strength cases. There are different reasons to express that the homogeneity is one of the most important characteristics of development. One of them is the underdevelopment of the whole province; homogeneous cities will pave the way for development programs in the province. Another aspect of this research is the high importance of some development indices which are brilliant in the development process and always had a high importance such as agricultural, cultural, education, and industrial indices which always have had a great importance.

The following indices have a role in development and they should be emphasized such as an increase in educational facilities and training at all educational levels, in the number of people with higher education, employees with higher education, in the number of doctors, dentists, lab, clinic, pharmacy, nurse, hospital bed, low rate mortality under 5 years and 65 years, in industrial workers in the number of private-industry employers, in academic and technical jobs and in the number of professionals in industry sector, etc. the area under cultivation of dry farming and irrigated wheat, in the number of private sector employers in the agricultural sector, in the production of wheat per head, in the percentage of urbanization, in the number of libraries in the cultural sector, reducing unemployment, an increase in post offices and postal agencies, in the number of telephone subscription, in the number of transportation employees, communications, power, water and gas and employees in the public sector.

Recommendations

According to the results, there are recommendations to the authorities and decision makers executives to reduce and eliminate underdevelopment in the province and create relative balance in these areas that are presented here as follows:

A) One of the results of this paper is the great increase inequality between the developed cities and underdeveloped cities. Therefore, we need a regional planning to reduce the disparities without causing any damage to the relative advantages of each region.

B) It seems that underdevelopment is associated

with the distance from capital and the center of the province. More facilities and investments in these areas can be reached by roads construction and other communication facilities which caused an increase in the development, and expedite the development program in these areas.

C) Lack of skilled, educated, and professional labors and lack of using professional labors in their exact and professional position is one of the development impasses in underdeveloped cities. Today, we see engineers or experts that there is no relation between their education and their professional job. This problem is very common in the province of Sistan and Baluchistan. Allocating more and better financial resources and equipment to the more underdeveloped cities, setting up short-term courses, emphasizing technical and professional trainings, assistance to make fruitful all hidden talents in these cities, will partly solve the problem of underdevelopment and provides background for boasting by native professional staff.

D) Increasing attraction for underdeveloped areas so that we can keep professional labors in these areas. The professional labors have an important role in underdevelopment elimination in these areas. Further, some policies such as coefficient tax reduction, an increase in the employment earnings, other facilities like home, etc. can enhance the development of these areas. An increase in tax exemption or tax discount in production sector such as agriculture, industry as well as low-interest loans can create more opportunity for investment, and production in these cities and give them higher degrees in development.

E) Ranking the cities, according to this article, can be served as a powerful and scientific tool to distribute funds among cities. Also, it can be used in decision makings. Administration offices such as the deputy planning governor, and agricultural jihad organization and other related organizations can proceed to distribute the more balanced credit, facilities and human power in these cities by applying indices used in this paper.

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