# ECONOMIC AND SOCIAL DUALITY IN IRAN (USING FUZZY TOPSIS DECISION-MAKING)

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## ABSTRACT

*One of the planners and policy-makers' aims on the one hand is optimum allocating and distributing of credits and facilities among regions and on the other hand is providing and compiling a suitable model aiming at achieving economic and social equity as well as creating reasonable and real economic growth. Paying attention to the balanced regional development, decreasing regional and district duality and inequities, regional policy-making and planning for achieving objectives, which change according to structural characteristics, facilities and limitations of each region require studying and identifying of each region according to its position in the whole province. In this study, economic and social duality means differences among provinces of Iran in relation to each other that are determined with four indices of per capita income, export's relation to production, unemployment rate and Gini coefficient. Fuzzy Topsis Decision-making method for the year 2013 has been used owing to the existing complexities in the development indices.*

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**Keywords:** Economic and social duality, Development indices, Iran's provinces, Fuzzy topsis decision- making.

## Contribution/ Originality

This study compared provinces in Iran based on sustainable development indices of per capita income, export's relation to production, unemployment rate and Gini coefficient through Fuzzy Topsis system in 2013. The results revealed that a significant difference still exists between Iranian provinces.

## 1. INTRODUCTION

The objectives of the third millennium development are only achieved that they are meaningful, different and clear for billion of people who constitute the achieving aim for the

objectives. These objectives should be converted to the national realities and be tangible and clear-cut for the interested groups namely people and governments. Achieving these objectives requires the existence of powerful and efficient governments in the countries that are able to put their developmental commitments into practice and have a justly performance. Today, expanding justice is among the main indices of good performance of governments and steady development, which was explained with the concept of environment's stability once upon a time, has expanded to the concept of equitable and balanced development. In this view, if countries' socio-economic development results in the expansion of caste split and the creation of economic poles, and if the poor will be remained poor and the rich will have benefited from economic gifts exclusively, this problem is worrying when it results in the serious retardation of these provinces compared with other provinces with the insufficiency of social income owing to the less access to the government-sector provided goods and service. As a result, these provinces' retardations have a permanent effect on the poverty of social income. Iran is not an excepted one in this regard. Regional inequities in Iran have resulted in problems such as emigration and its relevant problems from undeveloped to more wealthy provinces. In spite of considerable attempts aiming at decreasing regional imbalances at the country level as well as different conducted studies in this regard, sill economic dimensions of inequities and their causes are unknown. No doubt, that determination of national development level and awareness of the cause of these inadequacies or the excess of these abilities are mainly bonded with the classification of each region and province.

## 2. REVIEW OF THE RELATED LITERATURE

Balance and inequity in the different regions of countries have been of great importance for socio-economic planners and researchers in recent decades. This subjectivity, which has been formed from the early of 1960 owing to a kind of decentralization in the administrative and developmental affairs, has laid the ground for widespread administrative measures in the different provinces of Iran. Studies concerning identifying deprived provinces and studies regarding comprehensive development of different provinces have been conducted in recent years and have resulted in some of wide administrative measures in certain limitations. In this regard, one of the conducted studies regarding grading provinces is by Tala Minai (1974) titled "an Analysis of Regional Characteristics in Iran" through factor analysis method. The overall result of the above study indicates that if investments are made irrespective of active sectors in each region, not only do not solve the region's problem, but also it may overshadow many of industries in the region. Regional planning office of Management and Planning Organization of Tehran conducted a study from 1982 to 1988 titled "a Preliminary Plan for Identifying deprived regions of Iran" using taxonomical method. This study considering three main indices of education, health care and rural development that are converted into 11 sub-indices indicted that 15% of provinces in Iran has not an acceptable situation and the other provinces live in privation. International organization such as the World Bank, have graded the world's countries according to the national per capita production. According to this gradation, the World Development Bank has classified the world's countries

respectively from low-income countries into high-income countries. Rasul Veisi (1991) has conducted a study titled "Examining Countries' Development Level and Iran's Position" using Morries' imbalance index method. The results show that none of these indices alone indicates being developed or undeveloped level of a country, but the mean of these indices shows the split of being developed or undeveloped. In the above study, Iran is the thirteenth one among fifteen countries. Different regions of Iran have been grouped owing to the official divisions such as province, city, district and rural district as well as owing to the natural divisions such as watershed fields. Planners attempt to classify these regions according to their position sometimes classified by poverty criterion and sometimes by modernism and traditionalism, but variables such as prosperity and modernism always are not directly measurable due to lack of necessary information or the kind of variables. Tofigh (1993) conducted a study titled "Factor Analysis or Integration of Regional Indices" using factor analysis. In this study, Iran's provinces are divided into six groups, Tehran in the first group and Kohgiluyeh and Boyer-Ahmad in the sixth group. In the geographical studies, in the regional levels, the study of these phenomena and characteristics is impossible alone owing to the variety of local phenomena and various characteristics, because financial and temporal limitations as well as human force make such a work impossible and will not bring about the desired result. Thus, the first step to study local phenomena with various characteristics is classifying them in similar groups. Therefore, classification is a tool for organizing different information for easier understanding of the subjects. Rahnama Mohammad (1994) conducted a study titled "the Gradation of Urban System and Regional Development: Case Study: Khorasan province Using Factor Analysis and Cluster Method". The results show that the cities of Khorasan province are in seven groups. The gradation of places and geographical limitations are conducted with the consideration of the concept of development relativeness. Although, it is possible that not all located places in a particular restricted region generally would be considered developed, the most developed ones can be selected. If we consider being developed as an abstract and definite phenomenon, we can never discuss concerning the most developed or undeveloped ones of them. Accepting the above result, grading and measuring the rate of being developed in the different regions of a certain restricted region will have obtain more logical and scientific aspect to itself and require justifiable reasons. Moshrefi (1995) conducted a study titled "Measuring Development of Iran's provinces in the Three Periods of Time including 1976, 1988 and 1993 Using Factor Analysis. The results show that in these three periods, provincial groups are divided into five groups in 1976, seven groups in 1988 and 8 groups in 1993. Tehran is the first one among the three provinces, but the second and third provinces in the two periods of 1988 and 1993 are changed and distances were shorter and more homogenous in 1976 and in the next years, distances were more heterogeneous and greater. However, after Keynes, government's interference in the market mechanism was accepted, regional imbalance was not considered by the economists so that gaining growth rate higher than 6 and 7 % was among the major goals of governments in the developing countries to achieve economic development. This goal was encouraged and recommended by the UN, but the performance of considerable number of the mentioned countries indicated that

achieving the above goal not only has not resulted in providing welfare and reducing poverty and caste differences in these societies, but also has resulted in converse effect in some cases. Therefore, since 1950s subsequently, the discussion of balanced growth was considered among economists and gained an important position in the economic development texts. Salimifar (1997) conducted a study titled "Regional Economic Heterogeneousness in Iran" using dispersion coefficient in two periods of 1971 and 1991. In this study, six indices of economic and social development are used. The results show that inequities have increased in 1991 in relation to 1976.

The particular position of Iran from the viewpoint of vastness, climatic variety and its particular topographical position require further attention to the role of different regions in the economic dimensions. Hosseini and Atusa (2000) conducted a study titled "The Gradation of Iran's provinces from the Standpoint of Socio-economic Indices" using taxonomical method. This study using two major developmental, fundamental and social variables which each of them are divided into 22 and 31 sub-indices respectively, shows that from the viewpoint of the variable of development, Tehran, Esfahan, Kerman and Markazi are placed in the first to the fifth positions and Kurdistan, Elam, Bushehr, Kohgiluyeh and Boyer-Ahmad are placed in the last rows of table respectively, but from the standpoint of fundamental facilities, Tehran, Esfahan, Semnan, Yazd and Gilan are placed in the first to the fifth rows and Lorestan, Hormozgan, West Azerbaijan, Ardabil, Kurdistan and Sistan and Baluchestan are placed in the last rows. In recent decades, economically development degree of countries refers to the desirable and optimum usage of existing sources and facilities in order to achieve their economic goals. This issue indicates the particular position of productivity in the solutions of economic development of the country at micro and macro levels. khodaparast Shirazi (2001) conducted a study titled "A Comparative Analysis of the Productivity of Total Production Factors in the Industry" using production function of Cobb and Douglass and Divisia Index graded Iran's provinces from the viewpoint of employing sources. The results show that work force attractiveness in Mazandaran is the lowest and in Kerman is the highest and capital attractiveness in Gilan is the lowest and in Markazi is the highest. In order to attempt regarding compiling an appropriate model of regional development for better assignment of allocation of credits and facilities as well as the achievement of a steady regional growth and development, it is necessary that planners have complete knowledge of the quality and rate of being developed or undeveloped. Kiani and Khosravi (2003) conducted a study titled "The Gradation of Development in the Cities of Kurdistan during the First and Second Development Program". The used method in this study was the analysis of the main factors and numerical taxonomy. The results show that during the First Program (1989-1994), inequities between cities of Kurdistan have increased and during the Second Program (1994-1999) have decreased. Measuring development rate is at issue more than a half century. Many years ago, in 1954, a UN report concerning social policy-making and planning presented particular recommendations against using economic indices as the only development standards. Following this report, particularly in 1970s, an extraordinary series of different writings was presented in search of substituting standards for human welfare and development, writings that attempted to provide socio-economic indices for comparing

development levels in the different countries. Noorbakhsh (2003) conducted a study titled "Human Development and Regional Inequities in Iran: A Model for Policy-making" with 16 indices for 26 provinces. In this study, analyzed Human Development Index (HDI) called "RMHDI" is used. The results show that the difference between Tehran with other provinces is huge and the distance between three provinces of the second to the fourth provinces (Qom, Esfahan and Yazd) with other provinces is relatively high. Determining a number as gradation indicating being undeveloped or imbalance of a region for making balanced developmental policies is extremely important. To determine this grade, there are many socio-economic and cultural variables. In economic issues, the inputs of the model can be reduced and unnecessary calculations can be reduced using combined indices or determining correlation rate among some of the variables. Moosavi Mohseni and Mazda (2004) conducted a study titled "the Determination of Development and Balance in Iran's provinces Using Fuzzy Logic" using four indices. The results indicated great distance in Iran's province so that Tehran is the best with 84% and Sistan and Baluchestan has the lowest balance among provinces with 2%. The necessity to paying attention to the people's role and different regions of a country in balanced development and developing their capacities for satisfying basic needs, make us to compile a particular plan for each region. This issue will be impossible without people's participation and irrespective of the predispositions of that region. Thus, employing a participatory solution in the regional development makes development process internalized and brings about justice-seeking and environmental compatibility. The continuation of the measures of regional development in higher levels and the necessity of cooperation of gatherings with each other internalize regional level. Regional development is the common section of the low of the regional and human gatherings with the movement from the top of national-governmental institutions in a consistent system that results in mutual balance and energizing. This is not for superiority, but it is in search of finding a common way for achieving steady and widespread development. Pardazi Moghadam and Bijan (2006) conducted a study titled "Multivariate Analysis Methods and Their Application in Grading Iran's provinces" in this study, the steady development level of Iran's provinces are introduced by integrating the definition of steady human development and regional development of suitable indices as well as optimum method for measuring the difference that totally are divided into 47 groups (indices). Cluster analysis method is then employed to grade the distance and similarity of provinces. The results show that Tehran in all indices has the first grade except air pollution and Sistan and Baluchestan as well as Kohkiloye and Boyerahamd have the last grade except air pollution. Regional planning process is constituted from two national, basic, distinct and consistent phases. The first phase includes the analysis of the past socio-economic system, status, problems, existing dilemmas and future development perspective. The second phase includes diagnosis, evaluation and section of plans of economic and social development compiled to solve present problems and the future of region. One of the most common methods for evaluation the development level of each region is using the suitable method for the selected indices. This method includes selecting appropriate indices from the different parts of society and economy of the region and comparing indices with regional or state indices as well

as with objectives and standards determined for some of the sectors. Although, there are some regions that are superior due to benefitting from particular natural sources, economic savings and external factors or even historical reasons that should be taken into consideration in making plans, but they are not effective in many indices of regional capacities and social justice should be implemented which is the same optimum distribution of public resources and facilities for promoting provinces and regions that are lower than the state mean. Furthermore, some compatible decisions should be made to remove deprivation and regional imbalance. A widespread study titled "The Gradation of Iran's provinces Based on the Quantitative Indices of the Fourth Program" by Mahdavi (2006) who graded provinces using selected indices method that includes 57 indices. The results indicate that the status of provinces during the fourth program will not be towards balance among them and inequity regarding many of the indices will be existed among provinces and in some cases, even it has been also intensified.

## 3. STATISTICAL FOUNDATIONS

In this study, four indices of per capita income, the relation of export to production, unemployment rate and urban Gini coefficient of 31 provinces are used. Furthermore, to obtain Gini coefficient, urban family costs of provinces are used.

### 3.1. TOPSIS as an Approach for Decision Making in Group Fuzzy

In this research, group decision making theory in a fuzzy environment is used. By supposing there is an n possible switch $F = \{f_1, f_2, ..., f_n\}$ from decision making k, $p_k (k = 1, 2, ..., K)$ which are selected based on criterion m $X = \{x_1, x_2, ..., x_m\}$, actively and functional. Here, experts determine criterion priorities and switch values based on language variables. Language variables are explained through trapezoidal fuzzy numbers.

Switches include 31 country provinces (n=31). Criteria are divided into 4 groups of income, urban Gini coefficient, exports to gross production ratio and unemployment rate. In this research, ranking country provinces is for group decision makings. Suppose that switch value of $F = \{f_1, f_2, ..., f_n\}$ in criterion of $X = \{x_1, x_2, ..., x_m\}$ is equal to $p_k (k = 1, 2, ..., K)$ by $p_k (k = 1, 2, ..., K)$ decision maker. Hence, a group fuzzy decision making is in a matrix could be explained:

$$\tilde{Y}^k = (\tilde{f}^k_{ij})_{m \times n} = \begin{bmatrix} \tilde{f}^k_{11} & \tilde{f}^k_{12} & ... & \tilde{f}^k_{1n} \\ \tilde{f}^k_{21} & \tilde{f}^k_{22} & ... & \tilde{f}^k_{2n} \\ . & . & . & . \\ \tilde{f}^k_{n1} & \tilde{f}^k_{n2} & ... & \tilde{f}^k_{nm} \end{bmatrix} k = 1, 2, ..., K$$

Three experts' ideas are used in this research. (k=3) Their Ideas are in Table 2. Similarly, we assume that criterion value of $X = \{x_1, x_2, ..., x_m\}$ is shown as $\tilde{w}^k_i = (\alpha^k_i, \beta^k_i, \gamma^k_i, \delta^k_i)$ by $p_k (k = 1, 2, ..., K)$ decision makers.

Criterion and switch values are calculated as:

$$\tilde{w}_i = \frac{\tilde{w}_i^1 + \tilde{w}_i^2 \oplus ... \oplus \tilde{w}_i^K}{K} = (\frac{\sum_{k=1}^{K} \alpha_i^k}{K}, \frac{\sum_{k=1}^{K} \beta_i^k}{K}, \frac{\sum_{k=1}^{K} \gamma_i^k}{K}, \frac{\sum_{k=1}^{K} \delta_i^k}{K})$$

and,

$$\tilde{f}_{ij} = \frac{\tilde{f}_{ij}^1 + \tilde{f}_{ij}^2 \oplus ... \oplus \tilde{f}_{ij}^K}{K} = (\frac{\sum_{k=1}^{K} a_{ij}^k}{K}, \frac{\sum_{k=1}^{K} b_{ij}^k}{K}, \frac{\sum_{k=1}^{K} c_{ij}^k}{K}, \frac{\sum_{k=1}^{K} d_{ij}^k}{K})$$

Experts' views are in Table 1.

**Table-1.** Experts view based on data and indexes

|  | **Expert 1** | **Expert 2** | **Expert 3** | **Views conclusion** |
|---|---|---|---|---|
| Per Income | VH | VH | EH | 0.73, 0.83, 0.87, 0.93 |
| Provinces Urban Gini Coefficient | G | M | M | 0.43, 0.53, 0.57, 0.67 |
| Exports to Gross Production Ratio | L | L | M | 0.27, 0.37, 0.43, 0.53 |
| Unemployment Rate | G | G | G | 0.5, 0.6, 0.7, 0.8 |

Based on the foregone discussions, FMAGDM problem as the following decision making matrix:

$$\tilde{Y} = (\tilde{f}_{ij})_{m \times n} = \begin{bmatrix} \tilde{f}_{11} & \tilde{f}_{12} & ... & \tilde{f}_{1n} \\ \tilde{f}_{21} & \tilde{f}_{22} & ... & \tilde{f}_{2n} \\ . & . & . & . \\ \tilde{f}_{n1} & \tilde{f}_{n2} & ... & \tilde{f}_{nm} \end{bmatrix}$$

Since criterion may be measured by various methods, decision making matrix of $\tilde{Y}$ needs to be normalized. Linear scale changing is used for the normalization.

$$\tilde{r}_{ij} = (\frac{a_{ij}}{d_i^{\max}}, \frac{b_{ij}}{d_i^{\max}}, \frac{c_{ij}}{d_i^{\max}}, \frac{d_{ij}}{d_i^{\max}}) \ (f_i \in F^1)$$

and,

$$\tilde{r}_{ij} = \begin{cases} \left( \frac{a_i^{\min}}{d_{ij}}, \frac{a_i^{\min}}{c_{ij}}, \frac{a_i^{\min}}{b_{ij}}, \frac{a_i^{\min}}{a_{ij}} \right) & (a_i^{\min} \neq 0) \\ \left( 1 - \frac{d_{ij}}{d_i^{\max}}, 1 - \frac{c_{ij}}{d_i^{\max}}, 1 - \frac{b_{ij}}{d_i^{\max}}, 1 - \frac{a_{ij}}{d_i^{\max}} \right) & (a_i^{\min} = 0) \end{cases} \quad (f_i \in F^2)$$

That,

$$d_i^{\max} = \max_{1 \le j \le n} \{d_{ij} \ | \tilde{f}_{ij} = (a_{ij}, b_{ij}, c_{ij}, d_{ij})\} \text{ and } a_i^{\min} = \min_{1 \le j \le n} \{a_{ij} \ | \tilde{f}_{ij} = (a_{ij}, b_{ij}, c_{ij}, d_{ij})\}$$

In brief, $\tilde{r}_{ij}$ is shown as $\tilde{r}_{ij} = (\mu_{ij}, \eta_{ij}, \rho_{ij}, \lambda_{ij})$. Fuzzy decision making matrix of $\tilde{Y} = (\tilde{f}_{ij})_{m \times n}$ is normalized to

$$\tilde{R} = (\tilde{r}_{ij})_{m \times n} = \begin{bmatrix} \tilde{r}_{11} & \tilde{r}_{12} & ... & \tilde{r}_{1n} \\ \tilde{r}_{21} & \tilde{r}_{22} & ... & \tilde{r}_{2n} \\ . & . & . & . \\ \tilde{r}_{n1} & \tilde{r}_{n2} & ... & \tilde{r}_{nm} \end{bmatrix}$$

Considering the importance of each criterion, the normalized could be transformed into weighted normal fuzzy decision making of $\tilde{V}$ :

$$\tilde{v}_{ij} = \tilde{w}_i \otimes \tilde{r}_{ij} = (\alpha_i \mu_{ij}, \beta_i \eta_{ij}, \gamma_i \rho_{ij}, \delta_i \lambda_{ij})$$

$$\tilde{V} = (\tilde{v}_{ij})_{m \times n} = \begin{bmatrix} \tilde{v}_{11} & \tilde{v}_{12} & ... & \tilde{v}_{1n} \\ \tilde{v}_{21} & \tilde{v}_{22} & ... & \tilde{v}_{2n} \\ . & . & . & . \\ \tilde{v}_{n1} & \tilde{v}_{n2} & ... & \tilde{v}_{nm} \end{bmatrix}$$

Where $\tilde{v}_{ij}$ will be represented as trapezoidal fuzzy number of $\tilde{v}_{ij} = (\sigma_{ij}, \xi_{ij}, \upsilon_{ij}, \tau_{ij})$ .

$f^+$ as fuzzy positive ideal answer and $f^-$ as fuzzy negative ideal answer are defined as $\tilde{a}^+ = (\tilde{a}_1^+, \tilde{a}_2^+, ..., \tilde{a}_m^+)$ and $\tilde{a}^- = (\tilde{a}_1^-, \tilde{a}_2^-, ..., \tilde{a}_m^-)$ , respectively, in which $\tilde{a}_i^+ = (1,1,...,1) = 1$ and $\tilde{a}_i^- = (0,0,...,0) = 0$ .

$f_i$ distance from $f^+$ and $f^-$ are retrieved from:

$$D(f_i, f^+) = \sum_{i=1}^{m} d_2(\tilde{v}_{ij}, \tilde{a}_i^+) = \sum_{i=1}^{m} \sqrt{\frac{(1-\sigma_{ij})^2 + 2(1-\xi)^2 + 2(1-\upsilon)^2 + (1-\tau_{ij})^2}{6}}$$

and

$$D(f_i, f^-) = \sum_{i=1}^{m} d_2(\tilde{v}_{ij}, \tilde{a}_i^-) = \sum_{i=1}^{m} \sqrt{\frac{(\sigma_{ij})^2 + 2(\xi)^2 + 2(\upsilon)^2 + (\tau_{ij})^2}{6}}$$

Hence, the closeness coefficient for each $f_i$ could be calculated through:

$$C^*(f_i) = \frac{D^*(f_i, f^-)}{D^*(f_i, f^+) + D^*(f_i, f^-)}$$

Based on the above closeness coefficients for each province is calculated and put in Table 2.

**Table-2.** Country's provinces ranking

| Rank | Provinces | Deviation coefficient $C^*(f_i)$ | Rank | Provinces | Deviation coefficient $C^*(f_i)$ |
|---|---|---|---|---|---|
| 1 | Markazi | 0.50 | 17 | Alborz | 0.29 |
| 2 | Qazvin | 0.44 | 18 | Ardabil | 0.29 |
| | | | | | *Continue* |

| 3 | Kohgiluyeva Boyer Ahmad | 0.43 | 19 | Ilam | 0.29 |
|---|---|---|---|---|---|
| 4 | Khuzestan | 0.42 | 20 | KhorasanRazavi | 0.28 |
| 5 | Tehran | 0.38 | 21 | Gilan | 0.28 |
| 6 | Zanjan | 0.38 | 22 | ChaharMahalvaBakhtiyari | 0.26 |
| 7 | Kerman | 0.37 | 23 | Semnan | 0.25 |
| 8 | Bushehr | 0.36 | 24 | Kurdistan | 0.24 |
| 9 | Hormozgan | 0.36 | 25 | Golestan | 0.22 |
| 10 | Isfahan | 0.35 | 26 | Lorestan | 0.22 |
| 11 | Yazd | 0.34 | 27 | Kermanshah | 0.17 |
| 12 | Mazandaran | 0.32 | 28 | Hamedan | 0.17 |
| 13 | East Azarbaijan | 0.32 | 29 | North khorasan | 0.16 |
| 14 | West Azarbaijan | 0.31 | 30 | Sorth khorasan | 0.15 |
| 15 | Fars | 0.31 | 31 | Sistan and Baluchistan | 0.15 |
| 16 | Qom | 0.29 | | | |

## 4. CONCLUSION

In this study, Iran's provinces are compared and graded from the viewpoint of some economic and social development indices in 2013 using fuzzy Topsis Decision-making system method. The results show that, as previous studies also confirm, great differences exist among Iran's provinces. According to the results, Iran's provinces can be divided into four groups. The first group is Markazi, Ghazvin, Kohgiluyeh and Boyer-Ahmad and Khozestan that Kohgiluyeh and Boyer-Ahmad and Khozestan are placed in this group according to their oil export. The second group is Tehran, Zanjan, Kerman, Bushehr, Hormogan, Esfahan, Yazd, Mazandaran, East Azerbaijan, West Azerbaijan and Fars. The third group includes Qom, Ardebil, Elam, Razavi Khorasan, Gilan, Choharmahal and Bakhtiari, Semnan, Kurdistan, Golestan and Lorestan. The fourth group is Kermanshah, Hamadan and Sistan and Baluchestan. It can be mentioned that homogeneity has become greater, but the difference between the first and fourth group is great. This difference in considerable in being developed and unfortunately some of provinces are placed in the last of table permanently. As it was expected and previous studies show social income resulted from less access to goods and services provided by the government has increased provinces' retardation. These differences among provinces have a heavy cost for people and the government, because with one program and plan, the set goals in the five-year development programs (as programs' performance shows) and goals of perspective cannot be achieved. As a result, these distances will be intensified and greater costs and time would be needed fro reducing such distances.

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