The Journal of International Scientific Researches
2020, 5(3)

"Spatial Efficiency" Towards Sustainable Development; Case study: Provinces of Iran

Sürdürülebilir Kalkınmaya Yönelik "Mekansal Verimlilik"; Örnek Olay: İran İlleri

Abstract

Geographical spaces need to avoid environmental deterioration, and simultaneously meet economic and social demands. Therefore, the integration of different dimensions of development is necessary for economic growth, understanding environmental conditions, and social justice and equality. "How can the conflicting dimensions of sustainable development be reconciled?" is one of the issues that can rise in the implementation of sustainable development. The present study takes an effective step in applying the concept of "spatial efficiency" (That concept is evolving). The spatial efficiency approach to development sustainability combines socio-economic values and environmental considerations as well as leading to development. Development sustainability of the Provinces of Iran in the form of space efficiency approach has been compared by covering multiple components of spatial enjoyment (economic, social, and environmental) for each unit of pressing components (pressures on the living environment and human habitats). According to the overall results, the average efficiency of the provinces is 0.961, and in the meantime, Isfahan province, with a numerical value of 0.759, has the most unsuitable situation in efficiency. Most of the border and side provinces are efficient in terms of sustainable development, and it is the central provinces that need to revise the development indicators. The present article suggests that development policies need to be reconsidered.

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Article Type / Makale Türü
Research Article / Araştırma Makalesi

Keywords
Provinces of Iran, Conflict of Development Dimensions, Data Envelopment Analysis, Sustainable Development, Spatial Efficiency

Anahtar Kelimeler
İran İlleri, Kalkınma Boyutları Çatışması, Veri Zarflama Analizi, Sürdürülebilir Kalkınma, Mekânsal Verimlilik

Submitted: 15 / 08 / 2020
Accepted: 13 / 10 / 2020

Öz

Coğrafi alanların çevresel bozulmadan kaçınması, aynı zamanda ekonomik ve sosyal talepleri karşılaması gerekir. Bu nedenle; ekonomik büyüme ve çevresel koşulları anlamanın yanı sıra sosyal adalet ve eşitliği sağlamak için farklı kalkınma boyutlarının entegrasyonu gereklidir. "Sürdürülebilir kalkınmanın çelişkili boyutları nasıl uzlaştırılabilir?" sorusu, sürdürülebilir kalkınmanın uygulanmasında ortaya çıkabilecek durumlardan biridir. Bu çalışma, "mekansal verimlilik" kavramının uygulanmasında etkili bir adım atmaktadır (bu kavram hala gelişmektedir). Kalkınma sürdürülebilirliğine mekânsal verimlilik yaklaşımı, sosyoekonomik değerleri ve çevresel düşünceleri birleştirirken kalkınmaya da yol açar. İran illerinin mekânsal verimliliği yaklaşımı biçimindeki kalkınma sürdürülebilirliği, her bir baskı bileşeni birimi (yaşam ortamı ve insan habitatları üzerindeki baskılar) için çok sayıda mekânsal değerler bileşenini (ekonomik, sosyal ve çevresel) kapsayarak karşılaştırmalı ele alınmıştır. Bu doğrultuda elde edilen sonuçlara göre illerin ortalama verimliliği 0.961 olmakla birlikte sayısal değeri 0.759 olan İsfahan Eyaleti, mekânsal verimlilikte en uygun olmayan duruma sahiptir. Sınır ve çevre illerin çoğu sürdürülebilir kalkınma açısından önemli potansiyele sahiptir. Kalkınma göstergelerini gözden geçirmesi gereken idari üniteler, merkezi illerdir. Bu çalışma söz konusu yerlerin kalkınma politikalarını tekrar gözden geçirmesi gerektiğini göstermiştir.

Introduction

The world has become increasingly urban with the vast population of people living in urban areas, and about 1.5 million people are included in the global urban population every week (Musaa et al, 2018: 28 quoted from United Nations, Department of Economic and Social Affairs, 2014). Urbanization places huge demands on infrastructure, services, job creation, climate, and environment. Though, urbanization also offers significant opportunities, with vast potential for cities to act as powerful and inclusive development tools. Cities have been recognized as playing a

crucial role in fostering economic activities and human development as it has been forecasted that 69 % of the world population will be living in urban areas by 2050. At the same time, the social and economic activities and interactions that take place in a city may create stress on the natural environment and resources both at a local level (e.g., on water resources, land use, local air quality), and national and international level (e.g., on the climate) (Yang et al. 2015: 4493).

On the other hand, for most cities, the transformation of land use is required to meet the needs of life and economic development. Under the influence of various interacting factors, such as economy, society , environment, and culture, the natural environment may suffer the most direct and serious impacts , including reduced habitat diversity or quality, the depletion of water resources, increased surface runoff , a rise in the surface temperature of the earth, and increased carbon dioxide emissions. However, although it will cause an impact on the environment, such land transformation will also provide income, employment, and other economic benefits to the city and its residents, with a concomitant improvement in living conditions (Kuo and Tsou, 2012: 28). Therefore, a systemic understanding of the conditions is an undeniable necessity to overcome the issues of urban development and urbanization.

Environmental change has become an important consequence of development. In fact, since its formation in Brundtland Commission in 1978, the concept of sustainable development has become an important issue. Thus, sustainable development has been accepted by governments, international institutions, organizations and commercial enterprises, scientific and academic institutions, and nongovernmental groups. The emergence of sustainable development as an international issue and norm is accompanied by a challenge that addresses its dimensions: the need for economic development of developing countries and poverty alleviation in them, spatial inequalities between industrialized and developing countries (Fukuda-parr & Muchhala, 2020: 2) and inland areas, increasing the impact of climate change and urbanization. Rapid development in developing countries is one of the challenges to sustainable development. It is worth mentioning that geographical spaces need to avoid environmental deterioration and simultaneously meet economic and social demands. This is where space efficiency comes into play.

The evaluation of the product of the development process in Iran is worrying in economic, social, cultural and environmental dimensions. During nearly seven decades of experience in planning for development, only economic growth has been achieved, which is not commensurate with the natural, financial, social and human resources invested in this direction. However, considering the economic, cultural and political realities of Iran today, it indicates that the indicators of economic and physical enjoyment have increased but real and sustainable development must be based on criteria such as inclusive social justice and environmental considerations.

Integration of different dimensions of development is necessary for economic growth, understanding environmental conditions, and social justice and equality. The present study takes an effective step in applying the concept of "spatial efficiency" (That concept is evolving). The spatial efficiency approach to development sustainability combines socio-economic values and environmental considerations as well as leading to development.

1. Research Literature

Data envelopment analysis is a non-parametric method for estimating the technical efficiency of a set of decision units from a database including input-output (Gonzalez et al, 2015: 374), and due to its unique features, it has penetrated into various fields of science. Therefore, DEA method is used in various fields such as education systems, health, agricultural products, transportation, and military procurement (Bray et al, 2015: 188). Hence, in measuring the efficiency of spatial boundaries, we envision a vast realm for evaluating performance. Studies in this field include; Development Sustainability Assessment (Barandak and Karimi, 2016) (Barandak & Mohammadi asl ajirlo; 2016) (Barandak, 2019); Assessment of Human Development in Countries (Chansarn, 2014); Ranking of provinces in terms of human development indicators (Azar and Gholamrezaei, 2006); Also, evaluation of the performance of development programs (Mehrabani, 2008); Urban Line Evaluation (Fancello et al. 2012), (Ghavami et al. 2011); Efficiency of urban development projects (Askari &

Baghdadi 2016), (Asghari et al. 2013); And economic efficiency of local governments in Belgium (Borger & Kerstens, 1996) Economic efficiency of local governments in Australia (Worthington, 2000) Efficiency of Swedish municipalities in public education (Waldo, 2001) Economic efficiency of Finnish municipalities (Loikkanen & Susiluoto, 2004) Technical efficiency of Brazilian municipalities (Sousa & Stosic, 2005) The impact of financial assistance on the efficiency of German municipalities (Kalb, 2008) Technical inefficiency of local governments in Flemish municipalities (Geys & Moesen, 2009) Public sector efficiency in German municipalities (Geys et al, 2010) The role of city managers and external variables in the efficiency of Finnish municipalities (Loikkanen et al, 2011) Economic efficiency of Turkish municipalities (Kutlar et al, 2012) Technical efficiency Italian Municipalities (Settimi et al, 2013) Efficiency of South African Municipalities (Monkam, 2014) Green Development Efficiency of Chinese Municipalities (Yang et al, 2015) Relative Efficiency of South African Municipalities in Providing Public Health Services (Mbonigaba & Oumar, 2016) Public spending efficiency in Tuscan municipalities (Dinverno et al, 2017) Economic efficiency in Spanish municipalities (Narbon-perpina et al , 2018).

Bapat (2006) in his book "Spatial Efficiency in Geography" refers to 6 types of spatial efficiency: - Spatial efficiency in the position of central location - Spatial efficiency in the position of roads and movement - Spatial efficiency in locating industry - Spatial efficiency in shapes and areas Spatial - Spatial efficiency in urban land use and - Spatial efficiency in agricultural land use. The spatial efficiency proposed by Bapat is the ratio of performance or spatial activity to spatial distance. In this regard, spatial efficiency is proposed with the aim of maximizing some space activities such as land use or resources, moving in space, distributing people, etc. against minimizing the distance. But one of the studies that have led to a more evolved description of the concept of spatial efficiency has been conducted by Kuo and Tsou (2012). It can be said that the spatial efficiency proposed by Kuo and Tsou has a spatial inclusion and is more evolved than the concept proposed by Bapat. Because Bapat`s spatial efficiency is a mere emphasis on spatial distance as a factor influencing spatial performance or activities (input factor in the ratio between output and input of the performance model). Kuo and Tsou emphasize the totality of the factors influencing space activities. Yang et al. (2015), by selecting data envelopment analysis method and Malmquist index, evaluated the efficiency of green development of 31 regions and municipalities in China between 2008 and 2012. Zhao & Yang (2017) in a study entitled "Towards green growth and management: Relative efficiency and gaps of Chinese cities " evaluated the green performance of Chinese cities and regions under a data envelopment analysis approach.

2. "Spatial Efficiency" and Sustainable Development

Development is a concept that has been transferred from the natural sciences to the social sciences (Attar: 2012: 126). It is related to words like growth and modernization. Everyone has now come to the conclusion that development is more than just modernization and economic growth, and goes beyond social material well-being, social justice, and values. The pursuit of economic growth as the prime development goal has been roundly discredited for both developed and developing nations alike. It is widely accepted that successful development planning and decision-making require an integrated approach that balances all of the sustainability dimensions; the social, the environmental, and the economic. Recently, development actors have begun to refer to more nuanced objectives of green economy, green economic development, low carbon development, sustainable development and / or climate compatible development. The modern concept of sustainable development was first introduced by the Brundtland Commission report " Our Common Future ", and since then, other variants have emerged (Luukkanen et al, 2019: 819). In general, it should be said that there are conflicts among the dimensions of development, and the mission of sustainability is to establish a balance between these dimensions of development.

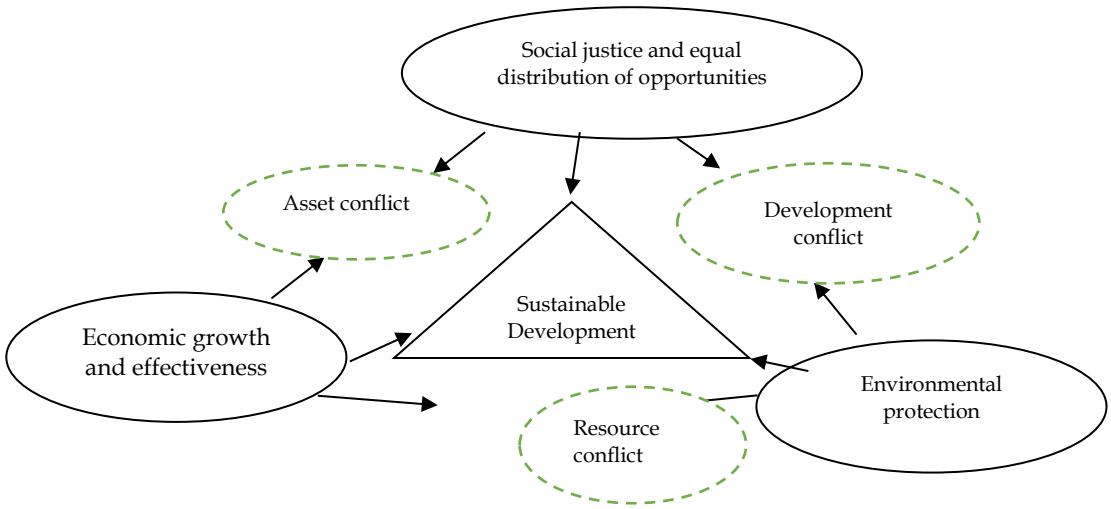


Figure 1. Mission of Sustainability Theories: Balancing in Dimensions and Contradictory Development Goals
(Source: Yarihesar et al., 2011: 94)

Sustainability assessment is one of the key components of sustainable development (Moldavska and Welo, 2015: 621) and the most important tool for changing the situation in the direction of sustainable development. Using the concept of "spatial efficiency", the present study tries to evaluate the sustainability of development with a conflict resolution approach. Thus, spatial efficiency is a new approach to sustainable development. Spatial efficiency is associated with the "ecological" and "socio-economic" perspectives.

From an ecological perspective, if the following conditions can be met, it will be possible to achieve sustainable spatial development: A- The rate of productivity of resources (matter and energy) is less than the rate of its reproduction and restoration. B- The emission rate of pollutants is less than their absorption capacity by the environment. From the socio-economic perspective, the emphasis is on the proper distribution of resource opportunities for all people in a city, region or world, and with the differences between social groups or different countries, in other words, with unbalanced economic growth, we cannot hope for sustainable development. Therefore, while the issue of sustainability was considered with emphasis on natural resources and ecological aspects, its correlation with economic and social dimensions was quickly realized. In many cases, the issue of fair access to resources and organizing the demands of different segments of society and different nations in the face of environmental problems and scarcity of resources has become much more important (Jafari, 2008: 50). Spatial efficiency makes development indicators in the form of an interactive system. Therefore, following two ecological and socio-economic approaches, a new approach to development sustainability in the form of the concept of "spatial efficiency" is proposed.

Efficiency in the general sense means the degree and quality of achieving the desired set of goals. In general, efficiency is the achievement of a goal with minimal resource consumption (Corro and Vera, 2014: 63). As (economic) efficiency is defined as an equation with an output-to-input relationship; Spatial efficiency, like its structure, is considered as an equation in which positive and influential factors on the spatial development process or developmental characteristics are defined as output, and negative factors and demand-creating process on the spatial development process are defined as inputs. According to the definition of spatial efficiency, its formulated relation is presented as the following relation (Kuo and Tsou, 2012: 30):

$$E = \frac{I_1(\text{positive Impact})}{I_2(\text{negative Impact})} = \frac{\sum_{j=1}^{n} O_j}{\sum_{i=1}^{m} I_i} \quad , \ j = 1, \dots, n \ , i = 1, \dots, m$$

SE = Spatial efficiency

O = Positive effects of the accumulation of changes in the state of life and the economy; Which indicates the benefit of spatial (urban) development.

I = Negative effects due to the accumulation of status changes in related environmental resources and ecological environment.

Yang et al (2015), Zhao & Yang (2017) and Fang et al (2013) have emphasized the placement of indicators in measuring spatial efficiency. Development sustainability of the Provinces of Iran in the form of space efficiency approach has been compared by covering multiple components of spatial enjoyment (economic, social and environmental) for each unit of pressing components (pressures on the living environment and human habitats).

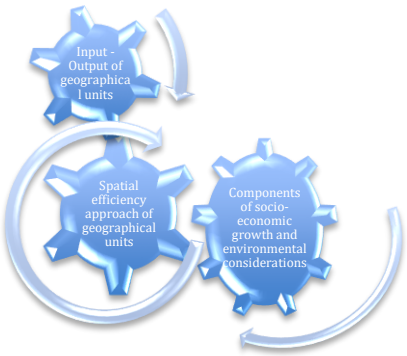


Figure 2. Spatial efficiency in the direction of development sustainability

3. Methodology

3.1. Method

The present applied research evaluates the spatial efficiency of the provinces of Iran (in 2017) to achieve sustainable development with descriptive-analytical method. The techniques used in the present study are data envelopment analysis and Anderson-Peterson Model (A&P). DEA is a non - parametric method to estimate the technical efficiency of DMUs from a database contains input - output; and by virtue of its unique features, it has penetrated in different fields of science. The assessment has relative efficiency in DMU (decision - making units) of polynomial input and polynomial output. In 1978, three operation research specialists (Charnes, Cooper and Rhodes) practically measured performance through linear programming, which became known as the DEA, and later became known as the CCR model. The general model of the mentioned model is as follows:

$$\mathrm{MAX}_{W_P} = \sum_{r=1}^{S} u_r y_{rp}$$

$$\text{ST:}$$

$$\sum_{i=1}^{k} v_i x_{ip} = 1$$

$$\sum_{r=1}^{S} u_r y_{rj} - \sum_{i=1}^{k} v_i x_{ij} \le 0 \qquad j = 1, \dots, n$$

$$u_r \ge 0 \quad r = 1, \dots, s$$

$$v_i \ge 0 \quad i = 1, \dots, k$$

In this model, w_p is the relative efficiency of the decision unit. x_i and y_r, respectively, represent the "k" input and the "s" output for the "n" units under consideration. The vectors v and u also represent the weights of the inputs and outputs, respectively. The first constraint is actually the denominator of the primary objective function of the fraction, through which the model can be solved in the form of a linear programming. The second limitation ensures that under the selected set of weights, the efficiency score of any decision unit does not exceed 1.

The main models of DEA cannot be compared to efficient units (Alam Tabriz et al., 2009: 146). In 1993, Anderson and Peterson proposed a (Super-Efficiency) method that is suitable for ranking efficient units, and with the help of which the units that have maximum efficiency can be compared and separated (Kiani Moghadam et al., 2013: 76). This model is one of the techniques for ranking work units, which allows an efficiency 'p' unit to achieve a value greater than one, and this is done by removing the 'p' constraint in the initial model (Ketabi et al., 2011: 15).

$$MAX\ W_p = \sum_{r=1}^{s} u_r y_{rp}$$

$$St: \sum_{i=1}^{k} v_i x_{ip} = 1$$

$$\sum_{r=1}^{s} u_r y_{rj} - \sum_{i=1}^{k} v_i x_{ij} \leq 0 \qquad j = 1, \dots, n \text{ ، } j \neq p$$

$$u_r \geq 0 \qquad r = 1, \dots, s$$

$$v_i \geq 0 \qquad i = 1, \dots, k$$

It should be noted that to solve the problem of linear programming in the present study, Lingo software and DEAP software- which was written by Tim Coelli- were used.

3.2. Data

Selection of appropriate indicators in DEA applications is important since different datasets can lead to different results and implications for assessment (Zhao & Yang, 2017; 482). Currently in Iran, the most pressing issues concerning spatial development are; industrial concentration in the growth centers of the country such as Tehran, Tabriz, Mashhad, Isfahan and Shiraz (Ghanbari and Mousavi, 2011; 50), deprivation of health sector development in some border provinces (such as Sistan and Baluchestan and Lorestan) and its concentration in some central provinces (such as Isfahan, Semnan and Yazd) (Sepehrdoost, 2011; 258), lack of employment, especially in border areas (such as Sistan and Baluchestan, Kurdistan and Khuzestan) (Zangiabadi et al, 2013; 122), the rule of the center-periphery system in relative deprivation of the border provinces and relative development (albeit unsustainable) in the center of the country (Sheikhbiglou & Taghvaei, 2013; 155).

Therefore, according to the following items, the indicators have been selected from the statistical yearbook of Iran (2017):

- Research literature.
- Important issues of development in Iran.
- The need to pay attention to the environmental issue according to the mission of the theory of sustainable development.
- Pay attention to all three sectors of the economy, society and environment.
- The number of indicators should be 10. One of the principles of data envelopment analysis model is to observe the number of data according to the number of units. Accordingly, the number of decision units (n) and the number of inputs (m) and outputs (s) must be a function of the relation n≥3 (m + s). Failure to comply with this principle will cause many units to be on the edge of efficiency (Barandak, 2019; 19).

The research selects n (n = 31) Provinces as DMU, and each DMU has s (s = 5) kinds of output indicators: GDP, Job opportunity, Hospital, and Forest Areas. These indicators represent the positive effects of the accumulation of changes in the state of life and economy, which indicates the benefit of spatial development. k (k = 5) has several kinds of input indicators: industrial workshops, natural gas consumption, deep water well, building permit issued in urban areas, and road. These indicators represent the negative effects due to the accumulation of status changes in related environmental resources and ecological environment (Table 1).

Table 1. Research Variables

Functional variable	Unit	Variable type
Industrial workshops	number	input
Natural gas consumption	Annually / million cubic meters	input
Deep water well	Annual discharge / million cubic meters	input
Building permit issued in urban areas	Annual / Item	input
Road	Kilometers	input
GDP	Annually / billion rials	output
Job opportunity	Annual / Number	output
Hospital	Number of beds	output

Forest areas	Hectares	output
Industrial added value	Annual / million Rials	output

The decision-making units in evaluating the efficiency of the present problem are 31 provinces of Iran (East Azarbaijan, Western Azerbaijan, Ardabil, Isfahan, Alborz, Ilam, Bushehr, Tehran, Chaharmahal and Bakhtiari, southern Khorasan, Razavi Khorasan , North Khorasan, Khuzestan, Zanjan, Semnan, Sistan and Baluchestan, Fars, Qazvin, Qom, Kurdistan, Kerman, Kermanshah, Kohgiloyeh and Boyerahmad, Golestan, Gilan, Lorestan, Mazandaran, Markazi, Hormozgan, Hamedan, and Yazd).

Results and Discussion

Descriptive statistics of applied variables in evaluating the spatial efficiency of the provinces show that Tehran province, in most variables (industrial workshops, natural gas consumption, GDP, job opportunity, hospital, and industrial added value), has the most. This enjoyment does not necessarily mean higher efficiency of the province because this region has the highest numerical value both in terms of development component and development pressing component. Kohgiloyeh and Boyerahmad provinces have the lowest rates in 4 indicators (industrial workshops, deep water well, hospital, and industrial added value). This does not necessarily mean low performance. Because lower costs require less development.

Table 2. Descriptive statistics

	Industrial workshops	Natural gas consumption	Deep water well	Building permit issued in urban areas	Road	GDP	job opportunity	Hospital	Forest areas	Industrial added value
Average	978	6132	1064	4420	7060	473537	8917	5201	461905	56593397
maximum	7009	22194	4494	19339	17943	3510176	39906	36234	2218925	3.66E+08
minimum	82	523	95	1233	1321	76902	224	871	1441	1728343
variation range	6927	21671	4399	18106	16622	3433274	39682	35363	2217484	3.64E+08
Standard deviation	1343	5690	1188	4469	4207	665841	10678	6571	477893	75760627

However, in evaluating the spatial efficiency of the provinces according to the DEA-CCR method, it should be noted that the efficiency of the spatial zones is in the range of zero and one, which is determined by the location of the zones at the efficiency limit by obtaining a numerical value of one. By moving away from this value, the efficiency of the units decreases. The inefficiency of the provinces means that a unit has not been able to improve development facilities in proportion to the costs incurred per space unit (in relative terms and in comparison, with other space units). The average efficiency of the provinces is 0.961, and in the meantime, Isfahan province, with a numerical value of 0.759, has the most unsuitable situation in efficiency.

In the data envelopment analysis model, to reach the efficiency limit of inefficient units, a virtual unit is proposed by combining the coefficients of the proposed patterns together in a modeling process, and new coordinates are created for the inefficient unit that makes the unit efficient. Therefore, introducing reference units is one of the advantages of data envelopment analysis method through which inefficient units can achieve efficiency by modeling them

Table 3. Efficiency, Super-Efficiency, Virtual Unit and Virtual Unit Coefficients

	Efficiency value	Super-Efficiency	virtual unit	virtual unit coefficients
East Azarbaijan	1	1.22	-	-
Western Azerbaijan	0.905	0.905	Mazandaran, Ardabil, Fars, Tehran, Ilam	0.277, 0.371, 0.147, 0.027, 0.108
Ardabil	1	1.61	-	-
Isfahan	0.759	0.759	Qazvin, Bushehr, Alborz, Tehran, Mazandaran	0.105, 0.497, 1.160, 0.142, 0.589
Alborz	1	2.21	-	-

Ilam	1	1.41	-	-
Bushehr	1	6.11	-	-
Tehran	1	6.23	-	-
Chaharmahal and Bakhtiari	0.856	0.856	Fars, Tehran, Ilam, Sistan and Baluchestan, Kermanshah	0.009, 0.021, 0.618, 0.017, 0.093
southern Khorasan	1	1.089	-	-
Razavi Khorasan	0.881	0.881	southern Khorasan, Fars, Hamedan, Tehran	0.102, 0.306, 1.120, 0.171
North Khorasan	0.761	0.761	Ardabil, Fars, Khuzestan, Ilam, East Azarbaijan	0.027, 0.023, 0.067, 0.695, 0.007
Khuzestan	1	1.26	-	-
Zanjan	1	1.02	-	-
Semnan	1	1.096	-	-
Sistan and Baluchestan	1	1.46	-	-
Fars	1	1.17	-	-
Qazvin	1	1.18	-	-
Qom	0.779	0.779	Mazandaran, Tehran, Ilam	0.149, 0.058, 0.080
Kurdistan	0.994	0.994	Mazandaran, Chaharmahal and Bakhtiari, Kermanshah, Fars, Ilam, East Azarbaijan, Ardabil	0.013, 0.009, 0.427, 0.012, 0.156, 0.002, 0.190
Kerman	0.915	0.915	Zanjan, Bushehr, Tehran, Ilam, Ardabil	0.524, 0.219, 0.025, 0.855, 0.886
Kermanshah	1	1.097	-	-
Kohgiloyeh and Boyerahmad	1	3.85	-	-
Golestan	1	1.05	-	-
Gilan	1	2.63	-	-
Lorestan	1	1.14	-	-
Mazandaran	1	2.1	-	-
Markazi	1	1.098	-	-
Hormozgan	1	1.5	-	-
Hamedan	1	1.12	-	-
Yazd	0.938	0.938	Bushehr, Alborz, Hormozgan, Markazi, Tehran	0.006, 0.206, 0.105, 0.239, 0.054

Most of the border and side provinces are efficient in terms of sustainable development, and it is the central provinces that need to revise the development indicators. Due to climatic conditions and distance from maritime centers, the central provinces of the country should review their development policies. Attention to environmental components in the central provinces of the country is well evident from the spatial efficiency maps in the present study (Figures 4, 5, 6). In evaluating Super-Efficiency (Figure 5), Tehran province has the highest level of spatial efficiency. Environmental conditions, proximity to water resources and economic-political relations are among the conditions for Tehran's superiority in Iran. With market forces, Tehran has taken advantage of economic conditions, attracted a lot of manpower and created a lot of economic added value compared to other provinces.

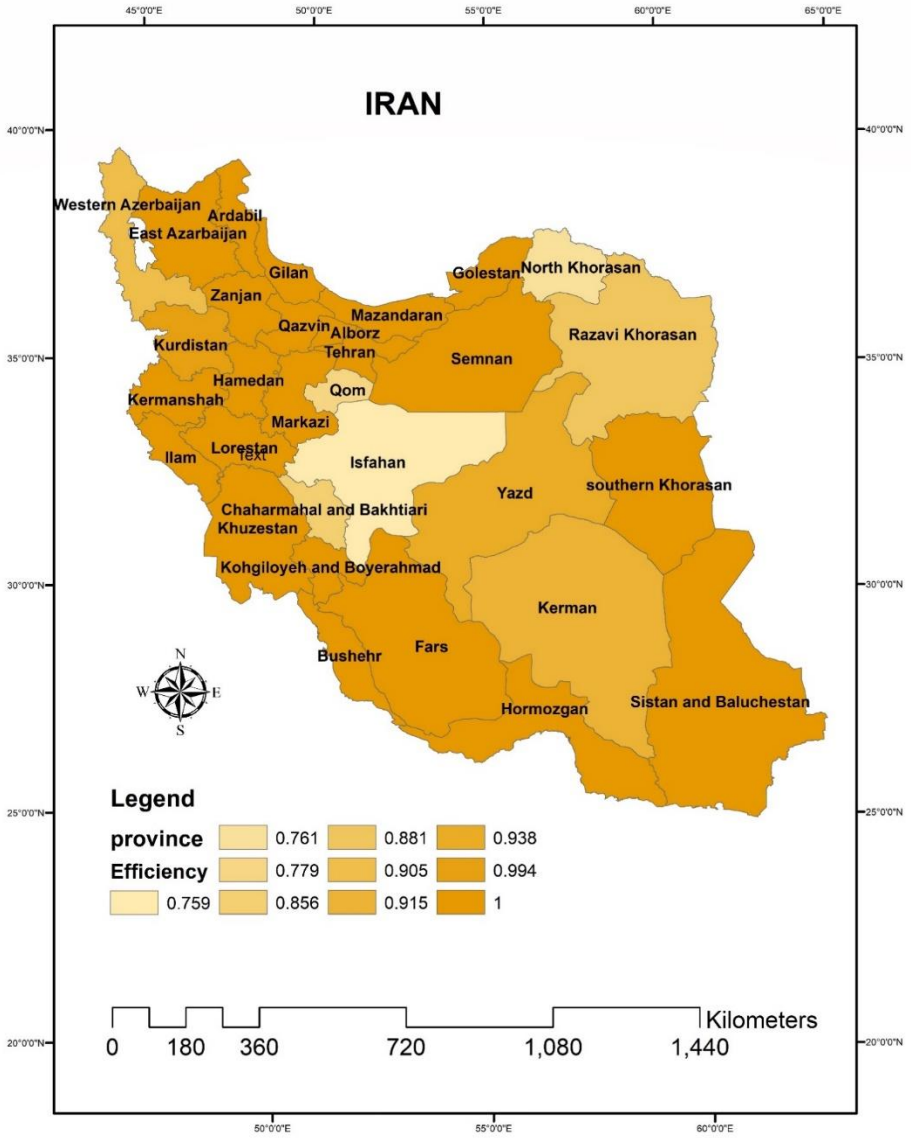


Figure 4. Efficiency of Provinces

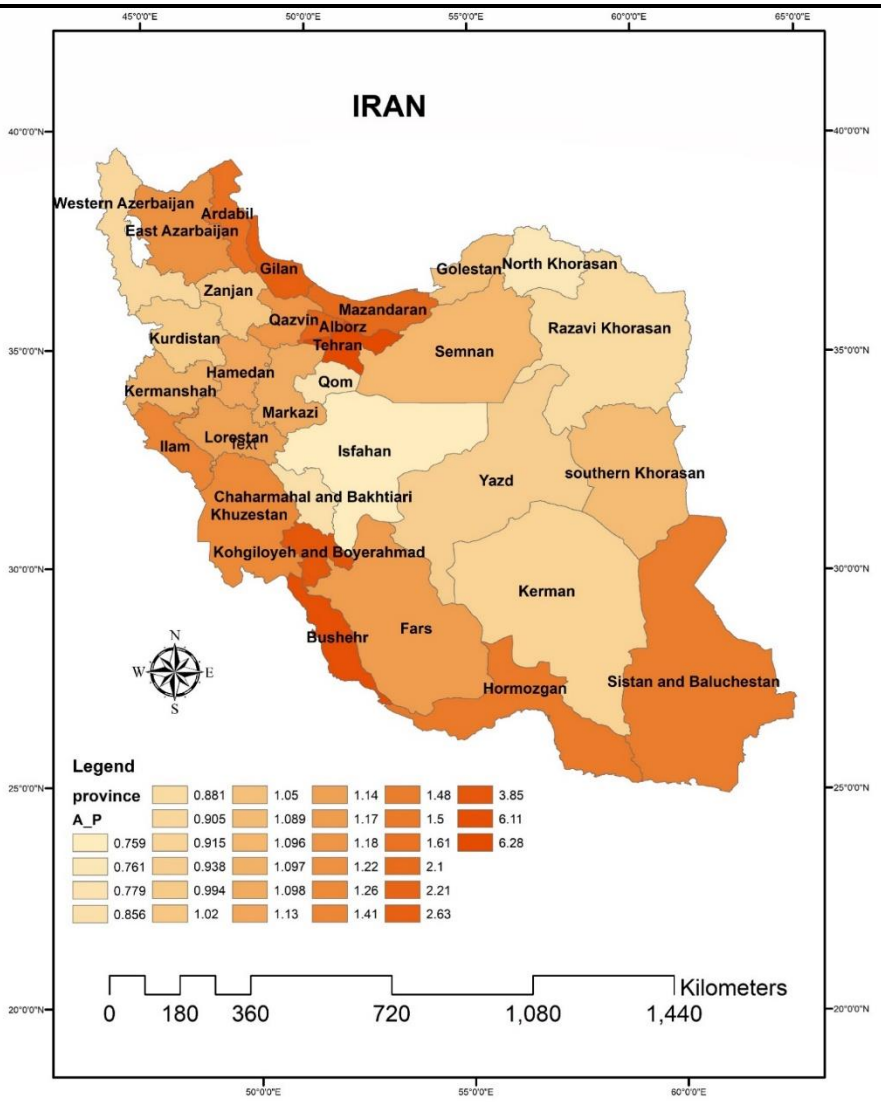


Figure 5. Super-Efficiency of Provinces

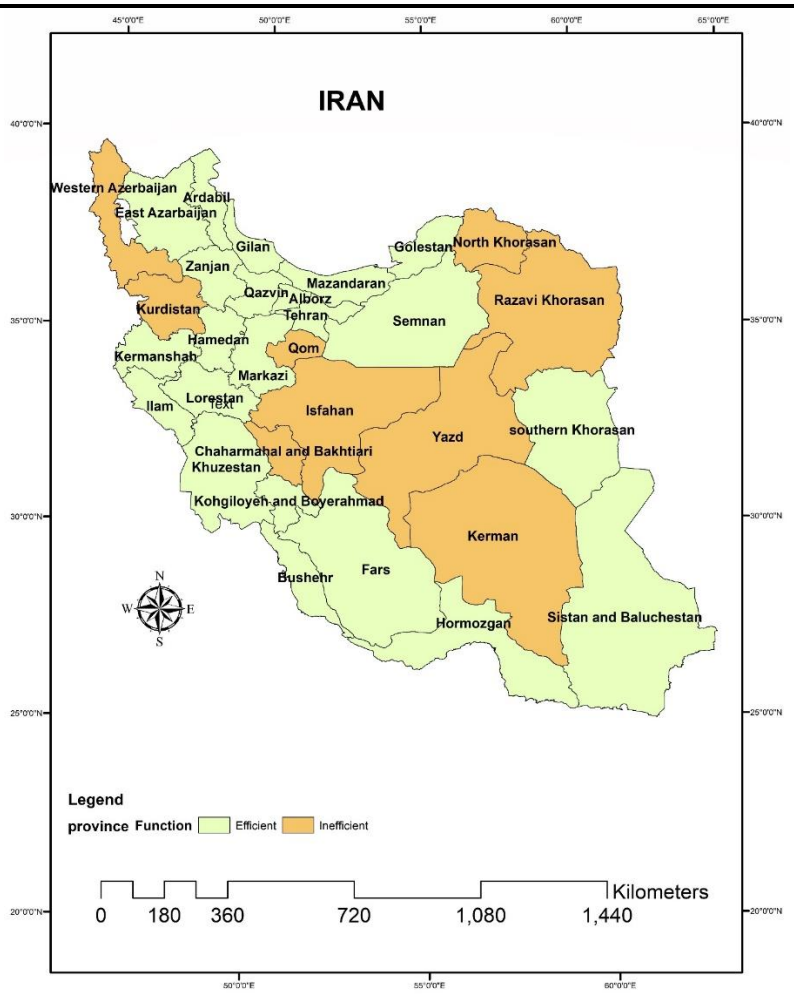
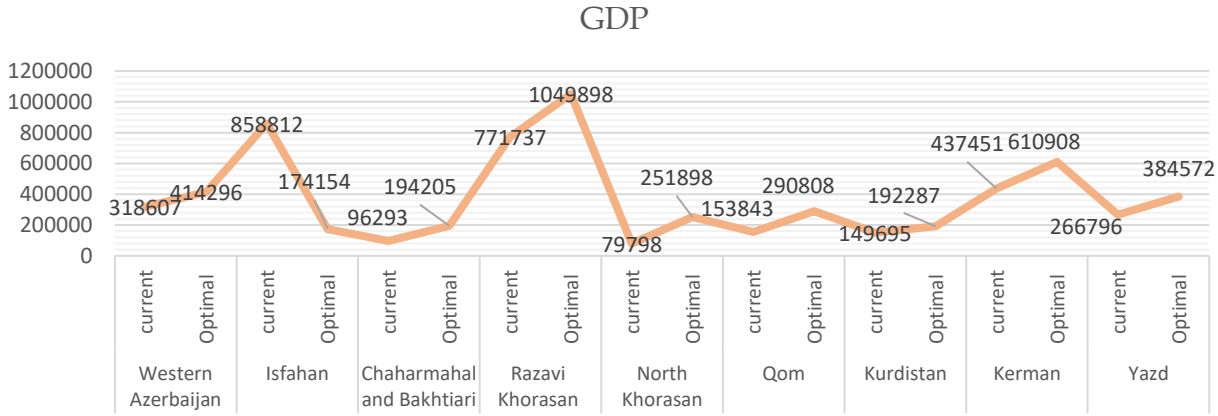


Figure 6. Efficiency Performance of Provinces

Relative comparison of the performance of the regions based on the approach of data envelopment analysis and estimation of relative inefficiency between them leads to an operational proposal to reach inefficient units. Inefficient provinces should have more outputs due to the inputs obtained. The provinces with the longest distance to the efficiency limit have the greatest challenge in achieving spatial efficiency (Figure 7).



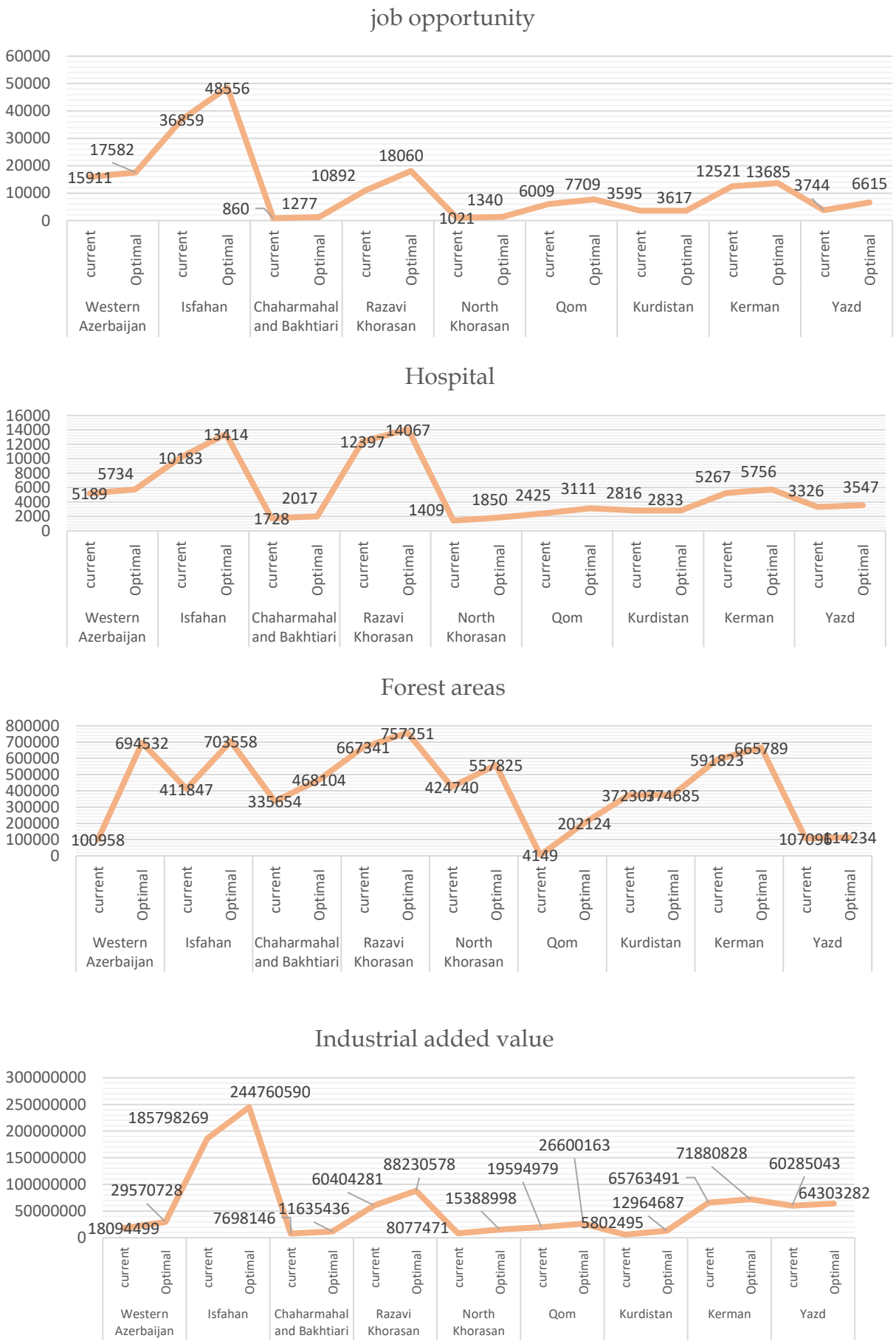


Figure 7. Current and Optimal Situation of Inefficient Provinces in Output Indicators

Economic-political relations of space and efficiency of Iranian provinces

In Iran, Tehran province dominates the currents of political action and decision-making. Tehran province has the most members of parliament and is the center of the establishment of the political system and the establishment of national decision makers and planners. Therefore, it has the hegemony of political power (Afrakhteh and Hajipour, 2015; 98). On the one hand, it pursues development policy in its favor, and on the other hand, due to the availability of the ground, it provides industrial efficiency in the province. This factor has triggered immigration to Tehran province. In the last 5 years (2013-1017), about 20% of 4300988 immigrants in the country have moved to Tehran province (Statistical Yearbook of Iran, 2017). If unilateral industrial development in Tehran province is not stopped, we may see a decline in spatial efficiency in this province. Because on the one hand, we will see an uncontrolled increase in population in the province, and on the other hand, some components of spatial efficiency such as deep wells and the amount of forest land are decreasing.

The efficiency of Bushehr province, which is known as the second in terms of spatial efficiency in Iran, mostly results from industries (especially oil). So that Tehran and Bushehr provinces have about 30% of industrial value added in Iran. Although the relationship between the components of parliament and spatial efficiency, and the relationship between voters in elections and spatial efficiency in Iran are positive, the different performance of Bushehr province has weakened those relationships (Figure 8). Therefore, the economic aspect is the second aspect of the spatial efficiency of the provinces in Iran.

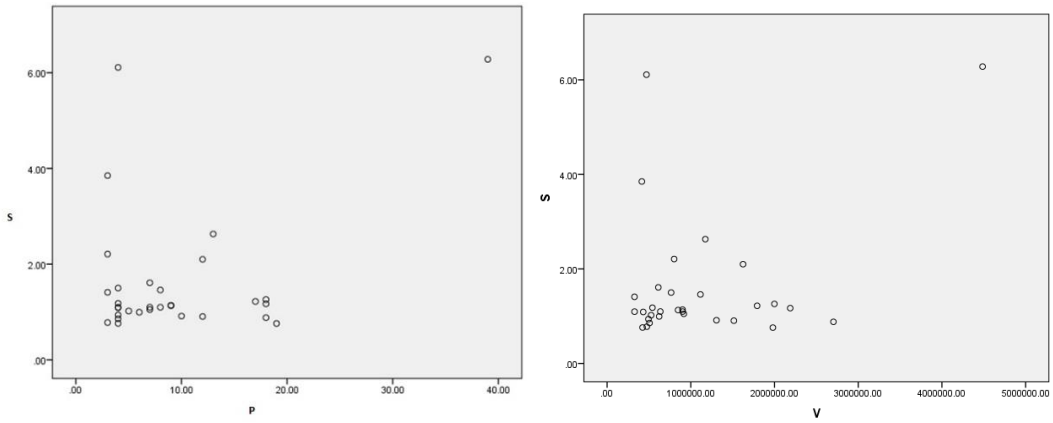


Figure 8. The Relationship between Parliament and Spatial Efficiency (P&S), and Voters in Elections and Spatial Efficiency (V&S)

The three industrial provinces of Isfahan, Razavi Khorasan and Kerman have different conditions than Tehran and Bushehr provinces. Isfahan province, which is the most inefficient province in Iran in terms of spatial efficiency, has a high industrial added value, but due to exceeding of the natural and environmental resources, it is in the last rank of spatial efficiency. The amount of building permits issued in urban areas of this province is 3 times the national average. Also, the use of deep wells, road construction, gas consumption, and industrial workshops in this province is higher than the national average. On the other hand, the amount of forest areas and job opportunities in Isfahan province is less than the national average. The inefficient provinces of Razavi Khorasan and Kerman have similar conditions with Isfahan province. That is, despite the higher industrial value added than the national average, they impose a higher cost of resources (Figure 9).

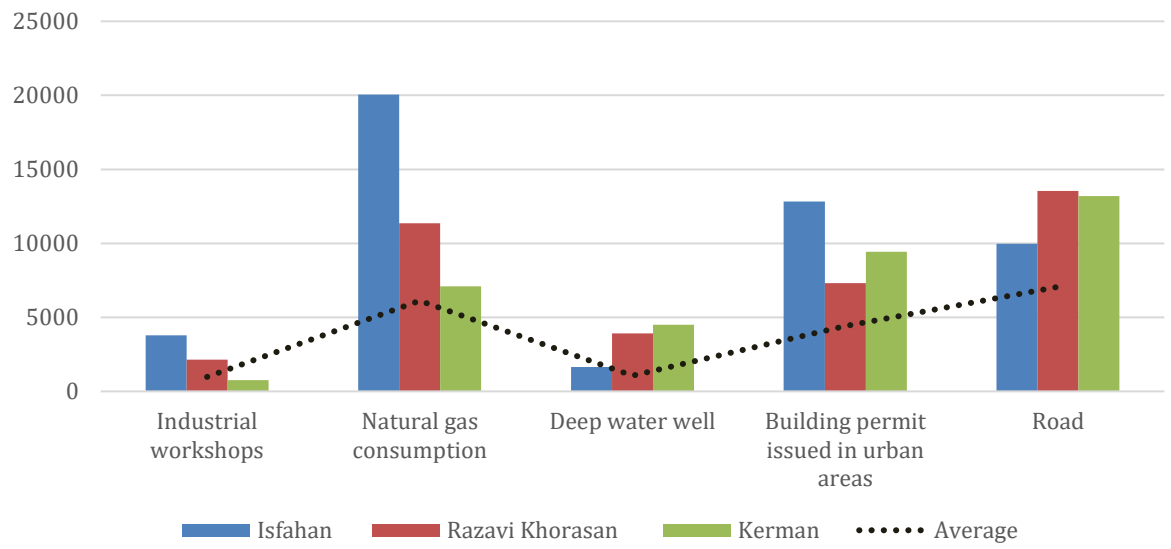


Figure 9. Performance of Isfahan, Razavi Khorasan and Kerman Provinces in Pressing Variables

The reason for the inefficiency of other inefficient provinces of Iran is the unfavorable relative conditions of development indicators, especially in terms of GDP and per capita industrial value added.

Conclusion

The emergence of sustainable development as an international issue has been accompanied by a challenge to its dimensions (economic growth, understanding environmental conditions and social justice and equality). Geographical spaces need to avoid environmental deterioration and simultaneously meet economic and social demands. The present study takes an effective step in applying the concept of "spatial efficiency" (That concept is evolving). The present article, along with the research of Yang et al (2015), Zhao & Yang (2017) and Fang et al (2013), recounts spatial efficiency measurement system for sustainable development. The spatial efficiency approach to development sustainability combines socio-economic values and environmental considerations as well as leading to development. The present applied research evaluates the spatial efficiency of Provinces of Iran to achieve sustainable development with descriptive-analytical method. In fact, development sustainability of Provinces of Iran in the form of space efficiency approach has been compared by covering multiple components of spatial enjoyment (economic, social and environmental) for each unit of pressing components (pressures on the living environment and human habitats). According to the overall results, the average efficiency of the provinces is 0.961, and in the meantime, Isfahan province, with a numerical value of 0.759, has the most unsuitable situation in efficiency.

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