TOURISMOS: AN INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF TOURISM
Volume 13, Number 1, pp. 143-162
UDC: 338.48+640(050)

DETERMINING THE EFFICIENCY OF TOURISM INDUSTRY IN CHABAHAR FREE ZONE BY USING DATA ENVELOPMENT ANALYSIS (DEA) METHOD

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Basically, many developed any developing countries need to expand tourism activities for accessing to the goals of national economic development and attracting foreign funds, therefore evaluating the efficiency of tourism industry can have significant help in recognizing the existed tourism potentials. The Chabahar zone in spite of numerous potential abilities in attracting domestic and foreign tourists and despite the fact that it is known as one of the important poles of tourism in Iran, but it is not so successful in attracting tourists. The present research has been provided to access to the efficiency of tourism industry in this area. For analyzing the information, the Data Envelopment Analysis Method (DEA) have been used. According to the results, the technical, management and scale efficiencies are 0.58, 0.69 and 0.84 percent respectively. It is suggested to strengthen the marketing, advertising and doing appropriate transportation infrastructure by employing manpower and efficient and expert management.

Keywords: *Tourism, Efficiency, Data Envelopment Analysis, Chabahar.*

INTRODUCTION

Tourism is considered as worldwide industry which includes hundreds of millions people who travel at both national and

international levels each year (Mason, 2015, p.4). Tourism is a phenomenon with different social functions which plays a crucial role in many aspects including environment, culture and economy (Saukkonen, Honkanen, Ritola-Pesonen, 2013, p.264). Tourism dominates overall dimension of our society. There is a close connection between tourism and other academic matters like geography, economics, history, language, psychology, marketing, business and law, ets beside its considerable importance on economic boost, human socio-cultural movements and environmental development (Tourism and Hospitality Studies, 2013, p.11). Todays, domestic and international tourism are considered as an essential way for fostering the use of goods and services of local businesses besides providing job opportunities for them (Huang, Chen, Ting, 2017, P.).

The estimation of the world economy through tourism industry was US$7.6 trillion (10.2% of global GDP) and creating 292 million jobs (1in 10 jobs on the planet) in 2016. Accordingly, international visitors reached a peak at 1.2 billion in 2016 which had an enormous climb of 46 million between 2016 and 2015. The upward trends in tourism are expected to continue rising in the following decade (The travel and Tourism Competitiveness Report, 2017, P.3). Not only tourism industry can create economic stability but also can provide many jobs opportunities (Bui, So, Kwek & Rynne, 2017, p.47)

Currently, Asia has become one of the most attractive regions for tourists compared with other areas (Cohen & Cohen, 2015, Bui & et al, 2017, p.47). In Iran, income from tourism between 2014 and 2015 was more than 32 billion dollars, which 19 million and 900 thousand foreign tourist entered the country during this time. According to the World Tourism and Travel Council (WTTC) , tourism in Iran will grow well in 2017 and the number of incoming tourists with a growth of 11.6% will increase to 5,531,000. Based on the report, number of tourists entering Iran will exceed 10 million in 2027, while according to domestic plans, Iran will have to reach 20 million tourists by 2020. According to the WTTC, the direct contribution of tourism to Iran's GDP in 2016 reached $11.9 billion, which is about 209 percent of the country's gross domestic product. Also it is predicted that in 2017, the tourism sector will face a growth of 7.5 percent, with an average annual growth of 2.6 percent over the next decade, reaching $ 16.6 billion, a figure that is about 2.7 percent of GDP in the country in 2027. This decline, despite the growth of tourism, indicates that other

sectors in Iran will grow more than tourism, one of which is oil (Statistics of Central Bank of the Islamic Republic of Iran, 2016).

Whereas tourism is considered as a dynamic and competitive industry because of its desired results, tourism development has become a main aim to improve quality of life especially in developing countries.

As tourism is a popular development strategy in each country, productivity and efficiency in this field can be a useful way to improve different sub-sections in this industry. One of the useful tool to measure efficiency and performance is Data Envelopment Analysis (DEA) which is known as emerging topic and an essential mathematical tool and it has been considered in various management parts (Emrouznejad & Yang, 2017, p.2).

A non-parametric method which is used to analyze the relative efficiency of operating units that have the identical goals and objectives is Data Envelopment Analysis (DEA) (Charnes et al. 1978, Wober, 2007, p.92). DEA is very useful and popular for many reasons; first, there is no requirement for functional form, thus; it can manage different inputs and outputs. Second, the simple version of DEA does not need the input of the price data (Anderson, 1999, p.48). DEA which is a non-parametric method has two main advantages: one is that considering a functional form for the production technology is not essential; two, dealing with multi output production technologies is possible (Corne, 2015, p.92). CCR and BCC models are the two most popular DEA models which were developed by Charnes, Cooper, and Rhodes (1978) and Banker, Charnes, and Cooper (1984) respectively.

DEA is considered as a programming-based method for measuring the performance of organizational units regarding their peers. Handling many inputs and outputs and not requiring a production function can be regarded as the main benefit of DEA. Because of this, DEA has been popular among readers. Mainly, the DEA models which are used in tourism articles assumed that the inputs were transformed to the outputs through one production process (Chang, 2017, p.79). DEA from the lenses of tourism destination management not only highlights the best performance of destinations, but also considers a stage for practices of the performance improvement (Barros, 2005; Pestan et al., 2011, p.141).

Therefore, in the present research, analyzing the tourism efficiency of the Chabahar free zone as one of the southeastern tourism areas in Iran and connected to free waters is considered. This area has special potentials in tourism indicators, but because of inappropriate management, it does not have high efficiency and necessity of examining this issue is important. Particularly, the innovation of present research is just analyzing the efficiency of the mentioned area using the Data Envelopment Analysis method for the first time.

In this study, we try to answer this fundamental question that does the tourism industry of Chabahar with all available facilities have the capability and flexibility that we can increase the tourism rate in it and with the same input, get more output? Can the Chabahar tourism industry be considered as an efficient industry considering the inputs provided for it and the amount of output that can be achieved? For answering the considered fundamental questions and due to the capabilities of the data envelopment analysis method, this method was used to answer the fundamental questions.

LITERATURE REVIEW

Reviewing the background of the research demonstrates that studying tourism efficiency in different parts of the world was considered by many researchers and this point indicates the importance and status of the subject.

After the end of the second world war, researchers have provided a great deal of interest in studying and analyzing issues related to efficiency and productivity and in this regard, in 1957 the famous Solo article was published about these issues and reviewing them. From 1957 onward, the efficiency issue was seriously discussed and analyzed among economists and foundation of new methods for studying the productivity and efficiency at the micro level was established in practice. Generally, new perspectives focused on the following two issues:

1. The way of defining the efficiency and productivity
2. The way of calculating and measuring the efficiency and productivity

The main assumption in this field was that production firms may work inefficiently that this itself referred to the concept of frontier

production function for measuring the efficiency (Kumbhakar et al, 1991).

There are 10,300 DEA-related papers in the literature in the last four decades (1978-2016). Particularly, the numbers of articles has acceded to just about 1000 published works in each year in the last three years (2014, 2015 and 2016). Generally, the development status of DEA-related articles can be classified into three stages: (1) from 1978 to 1994, the growth of DEA-related articles was slow in numbers ; (2) from 1995 to 2003, the growth of DEA-related articles was stable and the average number of published articles was relatively 134 in each year ; (3) from 2004 to the present, the number of DEA-related articles represent the "exponential" increase and the average number of articles accedes about 680 per year. The latest ones display relatively1000 papers per year (Emruznejad & Yang, 2017, p.2).

There are different sub-categories for tourism industry, for example hospitality, transportation, tour operators/travel agencies, etc. Since the 1990s, many scholars intended to examine the measurement of tourism efficiency and a great deal of researches have used production frontier models (Barros, Botti, Peypoch, Robinot, et al., 2011; Botti, Briec, & Cliquet, 2009; Corne, 2015, p.92). Based on Wober (2007) "efficient frontier techniques have been used extensively in the past, but now tourism researchers have discovered DEA to investigate the efficiency of their industry". Indeed, the contribution of tourism is estimated only 1.34% of all the DEA application articles (Liu, Lu, Lu, & Lin, 2013).

Pestana etal (2011) used the Data Envelopment Analysis (DEA) two-stage procedure for assessment and comparison of French tourism destinations. Firstly, efficiency score were measured and then bootstrapped truncated regression model was used for the second stage. The significance of this kind of analysis in the context of France was highlighted, particularly when the country faced with a decline in the field of tourism competition. This article offered an analysis of D-attraction and E-attraction besides policy recommendations.

Huang, Chen and Ting (2017) developed an approach to evaluate the performance for promoting tourism. The significant difference in this study in comparison to the previous DEA models is that multiple efficiencies were evaluated in a single DEA implementation and overall efficiency was assessed in a ratio index. Additionally, Cultural

tourism promotion was considered as a basis to formulate the empirical evaluation about variables. The data were gathered from twenty regions in Taiwan to analyze the proposed model.

Change et al (2017) explained the main reasons for different results of three cruise lines operating incomes and net incomes. They evaluated the efficiency of the top three cruise lines to form a network DEA model for analyzing the cruise performance at two stages named operating and non-operating stages. Additionally a bootstrapped-truncated regression model was used to examine the determinants of the efficiencies. In general, the efficiency of cruise lines was illustrated, however, they were diverse in the efficiency of the non-operating stage. Since there were heavy interest payments coming from the great debt-to-capital ratio, the attempts of Cruise lines to expand the capacity were ineffective. Furthermore, the financial risks which are related to the neglected hedging policy increased its ineffectiveness.

At first Hruschka (1986) and Banker and Morey (1986a) applied DEA to the hospitality industry in general, and to the restaurants in particular. Then, Bell & Morey (1994, 1995) employed DEA to determine the best ways for participating of the travel agencies. Anderson (1999) used a stochastic frontier method to estimate managerial efficiency levels in the hotel industry. The two-stage DEA models for analyzing the tourist hotel industry was used by Yu and Lee (2009), Chiu and Huang (2011), and Lin, Chiu, and Huang (2012), Oukil, Channouf, Al-Zaidi (2016); The concept of intermediate input and output was added into the two-stage model by Chiu, Huang, and Ma (2011), Chiu, Huang, and Ting (2011), Chiu, Huang, and Chen (2012); and Yu and Lin (2008), Yu (2010), Hsieh and Lin (2010), Wang, Lu, Huang, and Lee(2013), Huang, Ho, and Chiu (2014), Huang, Chiu, Fang, and Shen (2014), and other scholars rectified the two-stage into a network framework.

The hierarchical category Data Envelopment Analysis (DEA) model was used by Corne (2015) to improve the understanding of the French tourism paradox. Pestana & et al (2011) tried to assess and compare the performance of French tourism destination through the two-stage procedure of Data Envelopment Analysis (DEA). A novel system was presented by Alzua-Sorzabal (2015) to confirm the efficiency of the internet as an important marketing channel by using Data Envelopment Analysis. A nonparametric technique (DEA) was

used by Sigala & et al.(2004) to suggest a new way of assessing ICT productivity.

METHODOLOGY

The efficiency has a very comprehensive concept and it has been discussed and analyzed mostly in three fields of engineering, management and economics. Pharrell is one of the people who has more activities in the field of efficiency and he also proposed a method for its evaluation. He defined the efficiency as producing an output enough, more than a given amount of input (Bjurek et al, 1990).

Different methods of measuring the efficiency which were presented by various researchers can be divided into two categories of parametric and nonparametric. The parametric method is the method in which at first a particular form is considered for the production function. Then, with one of the methods of estimating functions which are common in statistics and econometrics, the unknown coefficients (parameters) of the function are estimated. And the most important of them are as follows (Coelli et al, 2002):

- ✓ Deterministic Frontier Production Function Method
- ✓ Deterministic statistical Frontier Production Function Method
- ✓ Stochastically Frontier Production Function Method
- ✓ Profit Function

One of the methods in order to evaluate the efficiency is the nonparametric method, in this method using the mathematical programming techniques, the efficiencies of the firms are evaluated, in this method there is no need to estimate the production function. If the desired firm has several different outputs, this method will not have any problems in evaluating the efficiency. The data envelopment analysis method can be introduced as one of the nonparametric methods and in this method using the mathematical programming technique, the desired units are evaluated using the $DEAP_{2.1}$. According to Figure 1, it is assumed that a firm produces the product Y using the two inputs X_1 and X_2 and under the condition of constant return to scale.

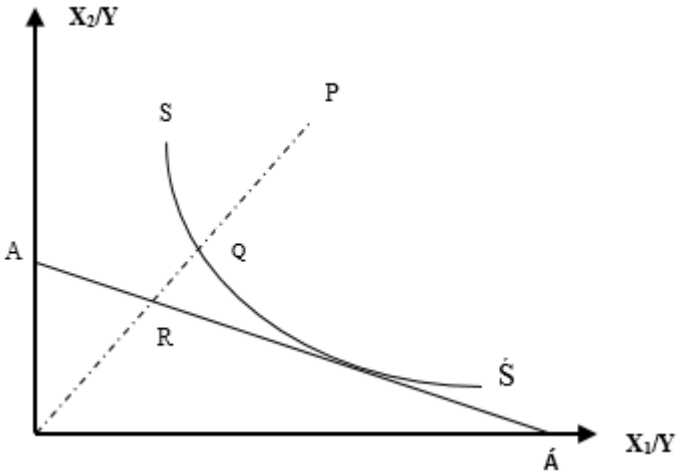

Figure 1: the technical, economic and allocative efficiencies

Knowing that SŚ of the curve represents the similar production of an entirely efficient firm. The firm has no technical efficiency at point P, this inefficiency is related to some of the inputs which can be decreased relatively, without reducing the product. Usually this amount of reduction in inputs is expressed as a percentage. Here, the amount of input which can be reduced to achieve the full technical efficiency is equal to the QP / OP ratio, which represents a decreasing percentage in inputs in order to achieve the full technical efficiency in production. Generally, the technical efficiency is shown as follows (Cooper et al, 2000):

$$TE_i = \frac{OQ}{OP} \qquad or \qquad TE_i = 1 - \frac{QP}{OP}$$

The values of the aforementioned ratio are between (0 and 1), the value one represents the full efficiency. As an example, the point Q in the diagram of Figure 1 represents the full efficiency, because it is on the entirely efficient frontier of similar production. All the points located on this frontier are quite efficient technically. If the ratio of the input price is represented by means of the line slope of the similar price AÁ, the allocative efficiency can be obtained for the mentioned

firm. For this purpose, the allocative efficiency for a firm that produces at the point P is obtained from the following equation:

$$AE_i = \frac{OR}{OQ}$$

It should be considered that the distance RQ represents the decreasing prices in the production, without reducing the amount of production. By combining the technical and allocative efficiencies, the total efficiency (economic efficiency) is obtained. The economic efficiency is shown as follows:

$$EE_i = \frac{OR}{OP} \Rightarrow \qquad EE_i = TE_i \times AE_i = \left(\frac{OQ}{OP}\right) \times \left(\frac{OR}{OQ}\right) = \frac{OR}{OP}$$

The values of all three types of efficiencies are in range (0 and 1) (Coelli et al, 2002).

Data envelopment analysis method (DEA)

The data envelopment analysis method uses the input and product data of each production unit for constructing a nonparametric production frontier, in this case all the observed units are placed on or under the envelopment frontier. Hence, the efficiency of each production unit to the efficiencies of all production units are measured in the sample. In this method, the units are not compared with a predefined standard level or a well-defined and distinct function, but the evaluation criterion is the performance of decision-making units that they provide similar activities under the same conditions. In this method, instead of determining the frontier production function, the performance of firms with the highest output to input ratio are considered as the efficiency frontier. So, the relative efficiency of the studied firms is the result of comparing the studied firms with each other. The benefit of linear programming method is the point that there is no need to specify the form of the function, but in this method, random impulses are not considered and all deviations from the efficient frontier are considered as inefficiencies (Bjurek et al., 1990).

The models of data envelopment analysis can be product-oriented or input-oriented. In product-oriented models, the goal is to maximize production according to a given amount of inputs, but in input-oriented method, the goal is to use the minimum input according to a given level of the product. Data envelopment level (both product-oriented and input-oriented) can have the constant return to scale or variable return to scale (Bjurek et al, 1990).

Constant return to scale model (CRS)

This model is an input-oriented model which was proposed by Charnes et al (1978). The CRS pattern is expressed as follows:

$$
\begin{aligned}
&MIN_{\vartheta,\lambda} \quad \vartheta \\
&s.t. \qquad -yi + Y\lambda \geq 0 \\
&\qquad \vartheta x_i - X\lambda \geq 0 \\
&\qquad \lambda \geq 0
\end{aligned}
$$

θ is a number, λ the vector $N \times 1$ of the constant value, X_i column vector of inputs for the i^{th} firm, y_i column vector of outputs for the i^{th} firm, X the matrix $K \times N$ of inputs, Y the matrix $M \times N$ of outputs, K number of inputs, M number of outputs and N is the number of firms. The value of θ demonstrates the technical efficiency rate of the i^{th} firm which is less than or equal to one. The value of one represents a firm with full technical efficiency. The above linear programming problem should be solved for each firm in N order in the sample. Regarding that in nonparametric data envelopment analysis method, it may face a problem because of the parallel part of efficiency frontier with axes, because if a firm is located on the parallel part of efficient frontier with axes after correcting the efficiency, it will still be possible to reduce inputs without reducing production (if the analysis is input-oriented) which is called input slack. A similar interpretation can also be provided for product-oriented analysis, but in this method in spite of efficiency, the amount of product can still be increased and it is called output shortage. The input slack problem for the i^{th} firm will be eliminated considering the condition $\theta xi - X\lambda = 0$ and the slack value will be zero, also product

shortage is considered to be equal to zero concerning the constraint $Y\lambda - y_i = 0$ that these assumptions were provided in the relation (4-1) and there is no need to correct the model (Cooper et al, 2000 and Coelli et al, 2002).

Variable return to scale model (VRS)

The assumption of constant return to scale model is only appropriate when all firms act in an optimal scale, but some factors such as incomplete competition, limitation of financial resources and so on are the causes that a firm cannot act in an optimal scale. Therefore, Bunker et al (1984) used the CRS model to measure the return of technical efficiency measurement using the CRS model when all the firms do not act in optimal scale and because of scale efficiency, they encounter some problems and the technical efficiency achieved from this way is not pure and it is in company with scale efficiency. Hence, for separating technical efficiency from scale efficiency, the VRS model is used to measure the pure technical efficiency. By adding the constraint $N\acute{I}\lambda = 1$ to the CRS model, the VRS model is expanded to variable return to scale (VRS):

$$
\begin{aligned}
&MIN_{\vartheta,\lambda} \quad \vartheta \\
&s.t. \qquad -y_i + Y\lambda \geq 0 \\
&\qquad \vartheta x_i - X\lambda \geq 0 \\
&\qquad N\acute{I}\lambda = 1 \\
&\qquad \lambda \geq 0
\end{aligned}
$$

$N\acute{I}$ is the vector $N \times 1$ of the number one. If there is a difference between the values of technical efficiency of the firm in both CRS and VRS methods, it will show that there is a scale inefficiency and the value of scale inefficiency is the difference between the technical efficiency of both CRS and VRS methods (Cooper et al, 2000 and Coelli et al, 2002). So, the scale efficiency is obtained from the following relation:

$$SE = \frac{TE_{CRS}}{TR_{VRS}}$$

TE_{CRS}: the technical efficiency obtained from the constant return to scale model.

TE_{VRS}: the technical efficiency obtained from the variable return to scale model.

Non-increasing return to scale model (NIRS)

$$MIN_{\vartheta,\lambda} \quad \vartheta$$
$$s.t. \qquad -y_i + Y\lambda \geq 0$$
$$\vartheta x_i - X\lambda \geq 0$$
$$N\acute{I}\lambda \leq 1$$
$$\lambda \geq 0$$

Despite the scale efficiency of the above models, it cannot be understood that the desired firm has a constant, increasing or decreasing return to scale. This problem can be eliminated by solving the non-increasing return to scale model. The NIRS model is obtained by correcting the VRS model by substituting the constraint $N\acute{I}\lambda \leq 1$ with $N\acute{I}\lambda=1$ in the relation of the variable return to scale model. Determining the type of inefficiency to scale (increasing or decreasing) for each firm is done by comparing the values of technical efficiency of both NIRS and VRS models. If the technical efficiency values obtained from two mentioned models are not equal, the increasing return to scale of the firm will be confirmed and if the technical efficiency values obtained from two models are not equal, the decreasing return to scale will be confirmed (Cooper et al, 2000 and Coelli et al, 2002).

Free trade-industrial-tourism zone of Chabahar with an area of 140 square kilometers is located in the southeast of Iran in the Sistan and Baluchestan province and it is located in the latitudes of 25 degrees and 20 minutes of north latitude and 60 degrees and 27 minutes of east longitude in the east of Chabahar gulf and near the Oman sea. This city with an area of 13162 square kilometers covers

about 7 percent of the total area of the Sistan and Baluchestan province. Figure 2 represents the geographical location of the studied area.

Figure 2: The geographical location of Chabahar in the Sistan and Baluchestan province.

CONCLUSION AND DISCUSSION

For obtaining the efficiency of the tourism industry of the desired zone, a series of inputs and outputs are required; the input is, in fact, what is at the disposal of that industry and the industry uses them to produce the output or outputs of the tourism industry. Therefore, in this analysis, the costs spent in the tourism industry of the area and number of employees in this industry and the output in this study are as follows: number of tourists and the incomes earned from tourism industry in the Chabahar zone. The needed statistics and information were selected from 82 people through a questionnaire by random sampling method. In Table 1, the average of technical, management and scale efficiencies were shown.

Table 1: The rates of efficiency types in tourism industry of Chabahar zone

	Maximum	Minimum	Deviation	Average
The technical efficiency with constant return to scale (CRS)	1	0.08	0.18	0.39
The technical efficiency with variable return to scale (VRS)	1	0.26	0.35	0.58
Management efficiency	1	0.11	0.41	0.69
Scale efficiency	1	0.03	0.85	0.84

The source: research findings

According to the results of Table 1, it can be noticed that the zone has the decreased potential in 61 percent of inputs and it demonstrates that the inputs can be reduced without reducing the values of outputs and with the point that the capacity and potential of tourism in the area will not be reduced. Also, the pure technical inefficiency is 42 percent and scale inefficiency is 16 percent. It means that by omitting the scale inefficiency, technical efficiency will increase from 0.39 to 0.58. In Table 2, the frequency distribution of the efficiency was represented.

Table 2: The frequency distribution in different levels of scale efficiency in Chabahar area

Levels of scale efficiency (percent)	Number	Percent
Less than 30	11	13.42
30-40	9	10.98
40-50	7	8.54
50-60	10	12.19
60-70	7	8.54
70-80	5	6.09
80-90	15	18.29
90-100	18	21.95

The source: research findings

According to the results of Table 2, the highest efficiency is between 90-100 percent and the lowest frequency is between 70-80 percent.

Suggestions

According to the obtained results, the following suggestions are provided in order to improve the efficiency in the tourism industry of the Chabahar zone:

- One of the main reasons of weakness of the Chabahar free zone in the tourism sector is the lack of efficient and capable management and employing people unrelated to tourism at the head of decision-making and executive affairs. So, it is suggested to use efficient manpower and management in this field.
- Due to low efficiency, the main reason of this separation can be the long traveling distance to the area and lack of appropriate transportation infrastructure such as: airport, railway, the road and finally high traveling cost, weakness of advertising and marketing tourism and the tourist capabilities of the area are unknown and lack of proper tourism management. For improving the efficiency of manpower, (specializing the activities) determining the working tasks of each person, providing a proper working environment, developing the educational programs and creating a proper reward mechanism with the efficiency are necessary.
- Solving the problems and weaknesses of communication infrastructures of the area due to the remoteness of the Chabahar zone from the major population centers of the country and being located at the end of the southeastern part of the country and the necessity of creating communication and transportation infrastructures is sensed.
- The weakness of advertising and identifying potentials and capacity of attracting tourist to this area is one of other factors which decreased the efficiency of tourism industry of the area, therefore it is recommended to do the necessary actions in this field.

- People participations in planning and performing tourism programs can attract tourist and perform the related programs successfully.
- Coordination between the managers of the free zone and other organs and institutes related to the tourism of the Chabahar zone.
- Proper investment in cultural sections and training the local people in order to provide appropriate communication with tourists, by providing educational courses.
- Introducing the relative benefits of Chabahar in the field of tourism investments by the managers of the area for the applicants of investment.
- Planning appropriately to reduce the costs for tourists by: creating group tours, providing special discounts by means of airline and traveling companies and hotels and offering exceptional discounts to foreign tourists for attracting more of them to this zone.
- Maintaining and recreating tourism attractions in the area in order to have sustainable development.
- Providing different festivals during the year especially in the seasons of tourism and holidays.
- Using the rich ethnic and regional culture in the tourism industry.

Defining and providing new services according to its demand and improving the quality of services are the effective factors of improving the efficienc.

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