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## **Performance of Tourist Centres in Uttar Pradesh: An Evaluation Using Data Envelopment Analysis**

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### **Introduction**

Tourism has been pivotal to social progress as well as an important vehicle for widening socio-economic and cultural contact throughout human history. Both a cause and consequence of economic development, it facilitates business contacts, widening of markets, broad-based employment and income generation. The tourism industry is a major contributor to the gross national products of many nations (Reige and Perry, 2000). It is one of the fastest growing industries in the world. Today, the marketing of tourist destinations and tourism service products is a widely recognized phenomenon.

Investment in tourist infrastructure spurs economic growth, catalyzes generation of income and employment, which in turn leads to further growth in demand for tourism, and stimulates a subsequent round of investment in a virtuous circle. Tourism expenditure generates multiple effects with extensive outreach along its value chain. Adding to the demand for a variety of goods and services, tourism offers potential to associated sectors as well.

The development strategy for tourism can, by itself, be an agenda for sustainable economic and social progress. Tourism promotes social cohesion and community bonding. By adding value to culture, heritage, nature, environment and ecology, it promotes preservation and conservation.

Gilmore, Carson and Ascencao (2007) discuss sustainable tourism marketing in the context of a world heritage site. They contend that a strategic marketing approach for the development of sustainable tourism is vital to the management of a world heritage site. The tourism industry has some specific

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characteristics that impact upon any tourism marketing management activity. Both public and private sector companies are involved in the planning, management and delivery of tourism services (Font and Ahjem, 1999); and small companies often provide many fundamental services within tourism regions (Go, Milne and Whittles 1992; Dewhurst and Thomas, 2003). The industry is an amalgam of companies and organizations with different purposes and agendas, and this has an influence on the overall tourism offering.

It is widely recognized that the tourism industry is fragmented. Many scholars of tourism have asserted the need for some form of a cooperative arrangement between stakeholders (Butler, 1991; D'Amore, 1992; McKetcher, 1993; Bramwell and Lane, 1999; Boyd and Timothy, 2001). Integrated, coordinated tourism is seen to be desirable, if not essential, for the implementation of sustainable tourism (WTO, 1993).

### **Indian Tourism Industry**

India has a large bouquet of visitor attractions that it can boast of. Its enormous diversity has always attracted both foreigners as well as its own citizens to explore the mirth and gaiety that India has to offer the world. Every nook and cranny of the country offers exquisite as well as exclusive tourism resources, which echo the heritage as well as the tradition of that particular area. There is hardly any country in the world that offers such a wide variety of tourist attractions. Tourism in India has registered significant growth in recent years. In 1951, international tourist arrivals stood at just around 17,000; this figure increased to 5.54 million in 2008. In 2009, 5.64 international tourists arrived in India. The upward trend is expected to remain firm in the coming years. International arrivals to the country are expected to cross 6.3 million by 2011. The average annual growth rate in international arrivals to India is expected to be 5.85 per cent during 2007–2011 ([www.incredibleindia.org/ataglance2009n.pdf](http://www.incredibleindia.org/ataglance2009n.pdf), Asia Pacific Tourism Forecasts 2009–11).

Tourism is the third largest net earner of foreign exchange for the country, recording earnings of US\$ 1,174 million in 2008—a growth of 9.5 per cent over 2007. During 2009, India's foreign exchange earnings from tourism were US\$ 1295 million, registering a growth of 10.3 per cent over 2008; the foreign exchange earnings crossed the US\$ 1,400 million mark in 2009 ([www.incredibleindia.org/ataglance2009n.pdf](http://www.incredibleindia.org/ataglance2009n.pdf), <http://www.tourism.nic.in/statistics>). It is also one of the sectors which employs the largest number

of people. The first ever *Tourism Satellite Account for India* (2006), commissioned by the Ministry of Tourism and compiled by the National Council for Applied Economic Research (NCAER) for the year 2002–03, showed that tourism employed 38.8 million persons, directly and indirectly; this worked out to 8.3 per cent of the total employment in the country, contributing 5.8 per cent of the GDP ([www.Tourism.gov.in/survey/TSAI.pdf](http://www.Tourism.gov.in/survey/TSAI.pdf)). These figures are estimated to have increased to 41.85 million employed in 2003–04 with a GDP contribution of 5.9 per cent. Various studies have also shown that tourism generates the highest employment per unit of investment for the skilled, the semi-skilled and the unskilled.

According to the *Travel & Tourism Competitiveness Report 2009* brought out by the World Economic Forum, Blanke and Chiesa (2009), the contribution of travel and tourism to gross domestic product (GDP) is expected to be at US\$ 187.3 billion by 2019. The report also states that real GDP growth for the travel and tourism economy is expected to achieve an average of 7.7 per cent per annum over the next 10 years. Export earnings from international visitors and tourism goods are expected to generate US\$ 51.4 billion (in nominal terms) by 2019. The travel and tourism sector, which accounted for 6.4 per cent of total employment in 2009, is expected to generate 40,037,000 jobs, i.e., 7.2 per cent of total employment by 2019 (<http://www.ibef.org/industry/tourismhospitality.aspx>). The World Travel and Tourism Council (WTTC) has identified India as one of the foremost growth centres of the world in the coming decade ([http://www.indiandata.com/travel/travel\\_demand.html](http://www.indiandata.com/travel/travel_demand.html)).

India's share in international tourist arrivals increased from 0.85 per cent in 2008 to an estimated 0.97 per cent in 2009. Its share in world earnings from tourism has increased from 1.48 per cent in 2008 to 1.71 per cent in 2009. There is also a significant growth in the domestic sector—the number of tourists increased from 466.23 million in 2008 to an estimated 562 million in 2009 (Ministry of Tourism, Govt. of India, 2009).

While the growth in tourism has been impressive, India's share in total global tourism arrivals and earnings is quite insignificant. It is an accepted fact that India has tremendous potential for the development of tourism. The diversity of India's natural and cultural richness provides the basis for a wide range of tourist products and experiences, which embrace business, leisure, culture, adventure, spirituality, eco-tourism and many other pursuits. Apart from acknowledging the traditionally recognized advantages of

developing tourism for the promotion of national integration, international understanding, earning of foreign exchange and vast employment generation, tourism can play a major role in furthering the socio-economic objectives of a nation.

The Ministry of Tourism adopted a multi-pronged approach in order to achieve this growth. Providing a congenial atmosphere for the development of tourism, strengthening tourism infrastructure and hospitality-related services, adopting an integrated approach to the development of identified destinations and circuits, promoting local culture and clean civic life, marketing of tourism products in a focused manner along with a branding exercise, positioning India as a high-value destination in the new key markets, and giving thrust to human resource development activities have been the hallmarks of this strategy. The focus of product development in the states also underwent a change by enhanced outlays for 'destination development' up to an amount of Rs. 50 million and 'circuit development' up to an amount of Rs. 80 million ([http://tourism.indiabizclub.com/info/tourism/scheme\\_of\\_rural\\_tourism/scheme\\_for\\_integrated\\_development\\_of\\_tourist\\_circuits](http://tourism.indiabizclub.com/info/tourism/scheme_of_rural_tourism/scheme_for_integrated_development_of_tourist_circuits)). A new proposal was moved to allocate up to Rs. 500 million for individual destinations with high tourist footfalls in order to totally redesign the experience of the tourist through better organization and provision of civic facilities.

The following important initiatives were taken by the Government of India to improve the flow of foreign tourists into the country and thereby increase the country's share in the world tourism:

- Developing cruise tourism by an international shipping firm.
- Directly reaching out to consumers through the electronic and print media via the Incredible India/Colours of India Campaign (<http://www.incredibleindiatourism.com/>).
- Creating world-class collaterals.
- Centralizing the electronic media campaign.
- Launching an integrated campaign in South-East Asia to promote Buddhist sites in India.

### **Tourism in Uttar Pradesh**

The state of Uttar Pradesh, situated in the northern part of the country, is one of the most fascinating states of the Union of India. Owing to its rich and

varied topography, vibrant culture and captivating festivities, monuments, ancient places of worship and *viharas* (Buddhist monasteries), Uttar Pradesh offers immense tourism delights and an endless array of attractions to visitors coming to the state. Agra, Fatehpur Sikri, Allahabad (Prayag), Sarnath, Gorakhpur, Varanasi, Lucknow, Kanpur and Mathura combine religious and architectural marvels.

Recently, the Uttar Pradesh Tourism Department, after reviewing the existing policy, has finalized the new Tourism Development Policy for the state ([www.up-tourism.com/policy/new\\_policy.htm](http://www.up-tourism.com/policy/new_policy.htm); [planningcommission.nic.in/plans/stateplan/upsdr/vol-2/Chap\\_b5.pdf](http://planningcommission.nic.in/plans/stateplan/upsdr/vol-2/Chap_b5.pdf)). The objectives of the policy are:

- Providing economic benefits to the local population and enhancing employment opportunities.
- Improving and diversifying the tourism products base, with a focus on adventure, religious and monument-based travel.
- Increasing the hotel capacity of the region.
- Increasing the visitation number.
- Enhancing investment in the tourism industry.
- Increasing the revenue per visitor through a superior visitor profile, better facilities and value addition to the tourism products.

UP's tourism policy envisages the following strategies for development:

- Development of basic infrastructure, to be undertaken by government bodies.
- Planning tourist circuits through a master plan.
- Enhancing and encouraging the participation of the private sector in the state government's efforts at providing the necessary facilities to domestic and international tourists.
- Dovetailing development funds from different sources.
- Improving the product diversity to attract a range of tourists.
- Coordination between various government departments.
- Proper restoration of heritage properties and their publicity.
- Providing cheap, clean and satisfactory facilities to tourists in matters of transport, accommodation, food and recreation.
- Organizing cultural shows at fairs, festivals and seminars with a view to attracting more tourists.

- Setting high standards and quality benchmarks for the tourism sector.
- Extensive and effective marketing of tourism products and services.

As per the AC Nielsen ORG-MARG “Collection of Tourism Statistics for the State of Uttar Pradesh” report (<http://www.tourism.gov.in/survey/up.pdf>), the total number of tourists visiting Uttar Pradesh during April 2008–March 2009 was 23.8 million. Out of this, 7.5 million were domestic overnight visitors, 2.5 million were foreign overnight visitors and 13.8 million were day tourists. Domestic overnight visitors spent 9.3 million bed nights and foreign overnight visitors spent 1.37 million bed nights in this period at various accommodation units in the state. Overall, the major expenditure heads for the visitors to the tourist centre were accommodation services, food and beverage services, and transport and equipment rentals.

### **Objectives of the Study**

The objective of the present study is to make a productivity assessment of various tourist centres in Uttar Pradesh. This comparative assessment of the performance levels of the centres will throw light on those performing inefficiently so that corrective actions may be taken. Data envelopment analysis (DEA), a non-parametric production frontier approach, has been employed for this performance analysis. Further, DEA information may also be useful for improving the operating efficiency of the centres by setting realistic targets for underperforming tourist centres.

### **Data Envelopment Analysis (DEA)**

Data envelopment analysis (DEA) (Charnes, Cooper and Rhodes, 1978; Banker, Charnes and Cooper, 1984) has been established as one of the most advanced methodologies for measuring the efficiency of many homogenous entities, termed as decision-making units (DMUs), in various contexts. This is one of the most sophisticated techniques to benchmark institutions and to determine relative performance amongst competing units. DEA is suitable as a method for comparing the relative efficiency and performance of units for the following reasons:

- It simultaneously handles multiple inputs and outputs.
- It does not require the assignment of predetermined weights to input and output factors to be used in the linear programming model.
- It emphasizes individual observations rather than statistical estimates.

Igor and Boris (2002) purported that DEA is an appropriate method for comparing and analyzing the efficiency and managerial performance of different performing units. The most important advantage of DEA over traditional regression analysis is that it is a non-parametric method. That means it does not require a priori assumptions regarding the analytical form of the production function. DEA models have been effectively applied for measuring the relative efficiency of DMUs in many fields (Norton, 1994; Dyckhoff and Allen, 2001; Ramanathan, 2001; Wen, Lim and Huang, 2003). There is a lack of research related to the application of DEA to performance measurement in the field of tourism and hospitality. Nozick, Borderas and Mayberg (1998) have used DEA to evaluate travel demand measures and programmes.

### **Methodology**

DEA was initiated by Charnes, Cooper and Rhodes (1978). The DEA model, also known as the Charnes, Cooper and Rhodes (CCR) model, is used to estimate the gross efficiency of a DMU. It measures and explains overall total efficiency (OTE), which comprises technical efficiency (TE) and scale efficiency (SE). OTE is a measure by which decision-making units are evaluated for their performance relative to other DMUs. Technical efficiency describes the efficiency in converting inputs to outputs. Scale efficiency quantifies the effect of the presence of variable returns to scale (VRS) in the DMUs. Scale efficiency recognizes that economies of scale cannot be attained at all scales of production/operation; and that there is one most productive scale size (MPSS), where the scale efficiency is maximum at 100 per cent. However, the value of OTE is influenced by SE. Banker, Charnes and Cooper (1984) developed a second DEA model, which is known as the BCC model, based on the variable returns to scale (VRS) assumption. This model is used to separate OTE from SE. The BCC model takes into account the variation in efficiency with respect to the scale of operation, and hence measures pure technical efficiency.

These techniques identify efficient and inefficient DMUs by the benchmarking approach and also suggest the sources of inefficiencies. The results obtained can then allow policy-makers to formulate performance-based policies that can assist the relatively inefficient DMUs to improve their performance.

**Mathematical Programming Aspects of the CCR-DEA and BCC Models**

*CCR-DEA Model*

$$\text{Max. } \theta_m = \sum_{j=1}^J V_{jm} * Y_{jm}$$

Subject to constraints

$$\sum_{i=1}^I U_{im} * X_{im} = 1$$

$$\sum_{j=1}^J V_{jm} * Y_{jn} - \sum_{i=1}^I U_{im} * X_{in} \leq 0$$

$$V_{im}, U_{im} \geq \epsilon$$

*CCR-DEA Model (in matrix form)*

$$\text{Max } \theta_m = \underline{V}_m^T * \underline{Y}_m$$

Subject to constraints

$$\underline{U}_m^T * \underline{X}_m = 1$$

$$\underline{V}_m^T * \underline{Y} - \underline{U}_m^T * \underline{X} \leq 0$$

$$\underline{V}_m^T, \underline{U}_m^T \geq \epsilon$$

*BCC DEA Model*

$$\text{Min. } \theta_m$$

$$\text{Min. } \theta_m$$

$$\theta, \lambda$$

Subject to constraints

Subject to constraints

$$\sum_{n=1}^N Y_{jn} * \lambda_n \geq Y_{jm}$$

$$\underline{Y} * \underline{\lambda} \geq \underline{Y}_m$$

$$\sum_{n=1}^N X_{in} * \lambda_n \leq \theta_m * X_{im}$$

$$\underline{X} * \underline{\lambda} \leq \underline{\theta} * \underline{X}_n$$

$$\lambda_n \geq 0$$

$$\underline{\lambda} \geq \underline{0}$$

$\theta_m$  unrestricted (free)

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$n = 1, 2, \dots, N$  (number of tourists destination centres)

$i = 1, 2, \dots, I$  (number of inputs used in each centre)

$j = 1, 2, \dots, J$  (number of outputs from each centre)

Where,

$\theta_m$  = Efficiency of the  $m^{\text{th}}$  tourist destination centre

$Y_{jm}$  =  $j^{\text{th}}$  output of the  $m^{\text{th}}$  centre;  $V_{jm}$  = Weight assigned to  $j^{\text{th}}$  output (by DEA)

$X_{im}$  =  $i^{\text{th}}$  input of the  $m^{\text{th}}$  centre;  $U_{im}$  = Weight assigned to the  $i^{\text{th}}$  input (by DEA)

$Y_{jn}$  =  $j^{\text{th}}$  output of the  $n^{\text{th}}$  centre;  $X_{in}$  =  $i^{\text{th}}$  input of the  $n^{\text{th}}$  centre

$\lambda_n$  = Weight assigned to the  $n^{\text{th}}$  centre (by DEA)

### Data and Variables

Seven main tourists centres in Uttar Pradesh have been identified as DMUs. Data for the study has been collected from the Dept. of Tourism, Govt. of Uttar Pradesh, and as per the AC Nielsen ORG-MARG “Collection of Tourism Statistics for the State of Uttar Pradesh” report (<http://www.tourism.gov.in/survey/up.pdf>). Six inputs and seven outputs have been considered to evaluate the relative efficiencies of different tourist destinations (see Table 1).

Table 1: Inputs and Outputs Considered for the Study

<i>Inputs</i>	<i>Outputs</i>
<p><b><i>Accommodation facility</i></b></p> <ul style="list-style-type: none"> <li>• Number of hotels</li> <li>• Number of rooms (beds) available</li> </ul>	<p><b><i>Number of visitors</i></b></p> <ul style="list-style-type: none"> <li>• Foreign overnight</li> <li>• Domestic overnight</li> <li>• Day visitors</li> </ul>
<p><b><i>Transportation facility</i></b></p>	
<p><b><i>Number of staff involved for tourism purpose</i></b></p> <ul style="list-style-type: none"> <li>• Permanent</li> <li>• Temporary</li> </ul>	<p><b><i>Number of bed nights spent</i></b></p> <ul style="list-style-type: none"> <li>• Foreign tourists</li> <li>• Domestic tourists</li> </ul>
<p><b><i>Number of places of visitors' attraction</i></b></p> <ul style="list-style-type: none"> <li>• Grade A, Grade B, Grade C</li> </ul>	<p><b><i>Evaluation of visitors' attraction and satisfaction</i></b></p> <ul style="list-style-type: none"> <li>• Foreign tourists</li> <li>• Domestic tourists</li> </ul>

Among the input variables, transportation facility and number of places of visitors' attraction are taken as proxy variables for capital inputs; accommodation facility as representative of the material input; while number of staff involved in tourism operations represents labour inputs. Among the output variables, number of visitors (foreign overnight, domestic overnight and day visitors) represents a demand-side measure; while evaluation of visitors' attraction and satisfaction (on a scale of 100) and number of bed nights spent (foreign and domestic) represent supply-side measures. In DEA, performance measurement is generally assumed to be based on quantitative data; but here, one output variable (visitors' attraction and satisfaction) is qualitative. The rationale for this is that tourism being a service industry, it is essential to take into account factors like visitors' attraction and satisfaction while evaluating the performance of tourist centres.

Regression analysis has been carried out to know the extent of the relationship between the input and output variables, which reveals that all the output variables have a significantly high correlation with the input variables (see Table 2). This substantiates the validity of considering these variables for performance evaluation.

Table 2: Relationship between Output Variables and Input Variables

<i>Output Variable</i>	<i>Value of R Square</i>	<i>Value of Adjusted R Square</i>	<i>Sig.</i>
Visitors (foreign overnight)	.582	.531	.040
Visitors (domestic overnight)	.688	.632	.019
Visitors (day)	.661	.601	.022
Visitors' attraction & satisfaction	.694	.658	.000
Bed nights (foreign)	.702	.665	.000
Bed nights (domestic)	.529	.503	.027

**Note:** Input variables: number of hotels, number of rooms, permanent staff, temporary staff, transportation facilities and number of places.

## **Empirical Results**

### ***Productivity Assessment***

DEA analysis has been carried out using both CRS and VRS assumptions. The performance-efficiency scores of various tourist centres, along with their ranks, are shown in Table 3. These scores show which centres are on the efficiency frontier (efficiency score=100), and which are inefficient relative

to the best performing tourist centres, under the CRS and VRS assumptions. The lower the score, lower is the relative efficiency of that centre and, consequently, higher the requirement for improving the performance. The table also shows that there is a very high correlation (correlation coefficient = .986) between the efficiency scores under the CRS and VRS assumptions, indicating that there is substantial consistency between the scores obtained from these two assumptions. As expected, VRS scores are higher than CRS scores because of the assumptions associated with the two scores. The average efficiency score under the VRS assumption is 76.57 per cent, with three centres falling short. The average efficiency score under the CRS assumption is 72.71 per cent, with four centres falling short. So, around 50 per cent of the tourist centres in Uttar Pradesh are operating at below-average efficiency levels (see Table 3).

The average value of technical efficiency is .727 (from the CRS model) and of pure technical efficiency .766 (from the VRS model). These values reveal that there is scope for improvement in the operations of the tourism industry in the state. The results imply that on an average, 27.3 per cent (under the CRS assumption) and 23.4 per cent (under the VRS assumption) of the potential of tourist centres in Uttar Pradesh is not in use. So, we can safely assume that on an average, tourist centres in Uttar Pradesh can operate on the existing level of performance with about 27 per cent less infrastructure and facilities. Hence, there is potential for an increase of around 37 per cent in tourist inflows (and related activities) if the tourist centres function at an optimum level.

Table 3: DEA Efficiency Scores of Tourist Centres

<i>Centre</i>	<i>Score (CRS)</i> <i>(per cent)</i>	<i>Rank (CRS)</i>	<i>Score (VRS)</i> <i>(per cent)</i>	<i>Rank (VRS)</i>
Agra & Fatehpur Sikri	98.0	2	100.0	1
Allahabad	67.0	4	73.0	3
Kanpur	50.0	7	61.0	4
Lucknow	82.0	3	86.0	2
Mathura & Vrindavan	60.0	5	60.0	5
Varanasi & Sarnath	100.0	1	100.0	1
Gorakhpur & Kushinagar	52.0	6	56.0	6
<b>Average</b>	72.7	–	76.6	–

Table 3 shows that two tourist centres (Agra and Fatehpur Sikri, and Varanasi and Sarnath) are performing efficiently (with an efficiency score of 100 per cent) under the VRS assumption and can be termed as best practicing DMUs. These centres convert their inputs into outputs effectively irrespective of their scale size (scale of operations). Whereas, only one centre (Varanasi and Sarnath) is operating efficiently under the CRS assumption and is situated on the efficiency frontier. Hence, Varanasi and Sarnath have the highest ranking on efficient performance under both CRS and VRS assumptions.

While Agra and Fatehpur Sikri are efficient under the VRS assumption, their efficiency is 98 per cent under the CRS assumption. This can be interpreted to mean that this centre is not operating at its most productive scale size (MPSS). In other words, though Agra and Fatehpur Sikri are converting their inputs into outputs efficiently, they have the disadvantage of unfavorable scale (size being too large); that is why the centre is falling short of 100 per cent efficiency under the CRS assumption. Other centres have substantially low efficiency scores, except for Lucknow, which has an efficiency score of 82 per cent (under CRS) and 86 per cent (under VRS). Two tourist centres have efficiency scores as low as 50 per cent, i.e., they are utilizing just the half their resources/inputs. These tourist centres are relatively inefficient as compared to the best practising centres in Uttar Pradesh.

It is necessary to test the validity of the CRS and VRS assumptions a priori to the performance analysis of tourist centres using DEA. The figures in Tables 5.1 and 5.2 show that efficiency scores (CRS or VRS) are not influenced significantly by the volume of operation. Hence, only the efficiency scores under the CRS assumption have been considered in the DEA analysis hereafter.

### ***Gap Analysis: Sources of Inefficiencies and Targets for Inefficient Tourist Centres***

The DEA analysis provides important information about the sources of inefficiencies of under-performing tourist centres. These sources of inefficiencies are identified by comparing the inefficient centres with the efficient ones (Varanasi and Sarnath). For an inefficient centre, the input-output level in the following equations can be used as the basis for setting its target so that the centre can improve its performance:

$$x_m = \theta_m^* X_m - S_m^{-*} = \underline{X}^* \lambda$$

$$y_m = Y_m + S_m^{+*} = \underline{Y}^* \lambda$$

Where,

$x_m$  and  $y_m$  = Target inputs and outputs, respectively, for the  $m^{\text{th}}$  centre

$X_m$  and  $Y_m$  = Actual inputs and outputs, respectively, for the  $m^{\text{th}}$  centre

$\theta_m^*$  = Optimal efficiency score of the  $m^{\text{th}}$  centre

$S_m^{-*}$  and  $S_m^{+*}$  = Optimal input-slacks and output-slacks of the  $m^{\text{th}}$  centre

Normally, in a DEA analysis of production units, the performance targets are in the form of the reduction required in inputs to achieve the given outputs. In the case of performance analysis of tourist centres, the targets mentioned are in the form of improvements required in outputs. Output targets would be more meaningful as the centres would try to achieve them, using their available resources/inputs, in order to become efficient. Table 4 gives the targets, specifying the amount of outputs required to be achieved if that centre is to be rated as efficient, i.e., the extent of improvement needed for each tourist centre. For example, if we consider Lucknow, the percentage improvement required in different outputs are: 21.8 per cent in domestic overnight visitors; followed by 20 per cent in foreign tourists' attraction and satisfaction; 18 per cent in domestic tourists' attraction and satisfaction; 14.5 per cent in day visitors; 11.2 per cent in foreign overnight visitors; while bed nights spent by both foreign and domestic tourists require little improvement (see Table 4). So, Lucknow should try to increase the number of domestic overnight visitors on a priority basis as it is an area that requires maximum improvement.

It can be further observed from Table 4 that on an average, an underperforming tourist centre in Uttar Pradesh may reach the efficiency frontier (become efficient) if it is successful in increasing foreign overnight tourists by 27 per cent, domestic overnight tourists by 23 per cent, day tourists by 13 per cent, bed nights spent by foreign tourists by 27 per cent, bed nights of domestic tourists by 21 per cent, and level of attraction and satisfaction of foreign tourists by 35 per cent and of domestic tourists by 27 per cent. Thus, for overall improvement of the tourism sector in Uttar Pradesh, the most important variable is visitors' attraction and satisfaction, which requires maximum improvement and focused attention on a priority basis. For optimum productivity and sustainable growth of the tourism sector, the management of the tourist centres needs to decipher and understand the components constituting 'attraction' in the tourists' perception, create that

‘visitors’ attraction’ and then deliver it. Consequently, tourists will find that centre ‘attractive’ and be satisfied.

The second most important variable is increasing the inflow of foreign tourists and greater persuasion for long duration stays. This would bring in foreign capital. Also, because of the superior visitor profile and higher paying capacity, these tourists are willing to purchase high-end tourism packages, increasing the revenue per visitor. Though the targets for domestic tourists (both number and bed nights spent) come lower in the hierarchy (at the third place), they effect a substantial percentage improvement in the performance and may contribute significantly to improving the overall performance of the centre (see Table 4).

Table 4: **Target Values of Output Variables for Inefficient Tourist Centres**

<i>Tourist Centre</i>	<i>Overnight Visitors (in thousands)</i>		<i>Day Visitors in thousands)</i>	<i>Bed Nights Spent (in thousands)</i>		<i>Visitors’ Attraction &amp; Satisfaction (on a scale of 100)</i>	
	<i>Foreign</i>	<i>Domestic</i>		<i>Foreign</i>	<i>Domestic</i>	<i>Foreign</i>	<i>Domestic</i>
Agra & Fatehpur Sikri	848 (0)	209 (2.0)	1130 (0)	444 (0)	1240 (0)	99 (10.1)	91 (4.2)
Allahabad	518 (27.4)	5.6 (12.3)	805 (0)	16 (30.1)	851 (19.0)	96 (39.7)	93 (22.5)
Kanpur	356 (31.9)	.72 (54.0)	101 (40.8)	1.7 (37.6)	781 (52.5)	89 (49.5)	82 (56.0)
Lucknow	587 (11.2)	1.3 (21.8)	404 (14.5)	2.1 (5.0)	785 (1)	96 (20.0)	88 (18.0)
Mathura & Vrindavan	307 (38.7)	1.2 (26.3)	2958 (0)	2.7 (35.1)	408 (21.8)	90 (47.7)	85 (24.0)
Gorakhpur & Kushinagar	195 (50.4)	13 (20.6)	70 (24.5)	28 (55.5)	326 (32.0)	81 (51.6)	86 (40.1)
<b>Average</b>	469 (27.2)	385 (22.8)	911 (13.2)	82.4 (27.3)	73.2 (20.8)	92 (35.2)	88 (27.3)

**Note:** Figures in bracket are the percentage improvements in corresponding outputs to make a particular centre efficient.

### ***Effect of Non-Discretionary Factors on Efficiency Scores***

The basic DEA models assume that all inputs and outputs are discretionary (controllable). These variables may be modified/alterd only by the management of the DMU so as to achieve efficiency. However, in reality, there may be circumstances when some of the inputs or outputs are beyond the control purview of the managements of tourist centres. So, the efficiency

scores obtained using the DEA models described so far should be more appropriately termed *gross efficiency scores* because they include the effect of certain variations in the uncontrollable inputs and outputs. Ray (1991) has used the regression approach while comparing the efficiencies of some schools in USA. Majumdar (1997) also employed the regression approach to study the effect of several factors on the efficiency scores obtained for the telecommunications industry in the United States.

In the present paper, the regression-based approach is employed to study the impact of some non-discretionary factors that are likely to affect the performance of tourist centres and, in turn, impact the DEA scores of the centres. The factors considered for the regression analysis are: air connectivity, presence of good shopping opportunities, law and order condition, land transport connectivity, volume of operation, population density of the location, entertainment facilities, electricity supply to that centre, and the propensity to avail of packaged tours. The results of the regression analysis show that factors like good shopping opportunities, volume of operation, population density, entertainment facilities and the propensity to avail of package tours are not statistically significant; hence, they might not affect the performance efficiencies. Factors that have a significant impact (at level of 5 per cent significance) are listed in Table 5.2.

Table 5.1: **Model Summary**

<i>Model</i>	<i>R</i>	<i>R Square</i>	<i>Adjusted R Square</i>	<i>Std. Error of the Estimate</i>	<i>Durbin-Watson</i>	<i>Sig.</i>
1	.885	.832	.692	.533	1.78	.042 (a)

Table 5.2: **Coefficients**

<i>Regressor</i>	<i>Un-standardized Coefficients</i>		<i>Standardized Coefficients</i>	<i>t</i>	<i>Sig.</i>
	<i>B</i>	<i>Std. Error</i>	<i>Beta</i>		
(Constant)	88.221	3.473	–	12.657	.000
Air connect	2.709	.321	.474	3.057	.017
Law & order	-9.318	.261	-.699	-3.994	.014
Land transport	7.452	1.821	.538	3.642	.021
Electric supply	6.724	2.602	.418	2.981	.034

The results (see Table 5.2) show that air connectivity, electricity supply and land transport connectivity have significant positive regression coefficients,

which signify that on increasing the level of these variables, the performance efficiencies will increase. The law and order situation has a significant negative regression coefficient, which indicates that with the decrease in the number of criminal cases (i.e., with an improvement in the law and order situation), the efficiency score of the centre will increase. Though these factors are not directly under the control of the tourism department, it should be ensured that they are dealt with effectively by their respective departments, working in coordination with the department of tourism. Ensuring proper law and order at the tourist destination (standardized regression coefficient =  $-.699$ ) is of paramount importance in increasing the productivity of the tourism sector. For this purpose, there needs to be close coordination between the tourism department and the law-enforcing agencies. Tourist centres should have appropriate and effective air and land transport connectivity with various major cities and tourist destinations. State tourism departments should ensure uninterrupted power supply for the comfort of tourists. Requisite improvement in these significant non-discretionary factors may be useful for augmenting the performance levels of the tourism department in general and of the centres in particular.

### **Conclusions and Managerial Implications**

This paper discusses the use of data envelopment analysis (DEA) in productivity assessment and performance comparison of various tourist destinations in Uttar Pradesh. Here, efficiency analysis (using DEA) is performed to estimate the current level of efficiency and to provide methods for removing inefficiency by obtaining benchmarking information.

Different efficiency scores revealed that there is scope for improvement in the tourism sector of the state and that most of the tourist centres are not performing at their optimum levels. The analysis focuses on segregating efficient centres from inefficient ones. The comparison has been made on the basis of an internal benchmark, created from within the reference set. The segregation identifies the tourist centres with lacunae in their performance.

DEA also identified the sources of inefficiencies for various under-performing tourist centres. Hence, appropriate improvement packages with concrete measures can be designed for these centres to substantially improve their performance and efficiency. On the aggregate level, substantial improvement in the visitors' attraction and satisfaction level is of paramount importance for optimizing the performance of the tourism sector in the state. This is

followed by the need for focused strategies aimed at increasing the inflow of foreign tourists and the duration of the stays.

The analysis has identified the effect of some non-discretionary factors that have a significant impact on tourism productivity of the centres. Such factors should be managed with effective coordination among the respective departments and agencies. Maintenance of law and order is found to be the most important non-discretionary variable, followed by appropriate air and road connectivity.

The purpose of the DEA analysis of the tourism sector in Uttar Pradesh is to give the management of tourist centres insights into their efficiency levels and areas of improvement. DEA will aid managers and administrators in taking more informed and customized decisions for continuously upgrading their tourism facilities and services, thus contributing to the overall growth of the tourism industry in the state.

The study has important managerial implications. It can empower UP tourism with information that can be used for improving the efficiency of various centres and strengthen tourism promotion activities. Decision-making authorities in the tourism department can also assess the information provided by the study to appropriately bridge the gaps between the current level of performance and the desired level by formulating corrective action plans. Such corrective actions will ensure a differentiable competitive advantage vis-à-vis other tourist destinations in the country.

Although the present study has exclusively focused on the performance evaluation of various tourist destinations in Uttar Pradesh, the issues and concerns it has addressed are common to the management of other tourist destinations as well. Hence, the findings of this paper can be successfully applied by the tourism authorities of other state/national environments. Further, this technique is generalizable and can also be applied to analyze the performance of other sectors of the economy. This can be done by incorporating the necessary changes in the services aspects in accordance with the socio-economic environment.

### **Technique Validation: Some Considerations**

There are several decision aspects that are important while applying DEA. These aspects relate to the choice of DMUs, selection of inputs and outputs, and the specific DEA model (Ramanathan, 2001; Golany and Roll, 1994; Dyson et al., 2001; Mostafa, 2007).

- ***Selection of DMUs:*** The DMUs under consideration must be homogeneous units. They should perform the same tasks and have similar objectives. The inputs and outputs characterizing the performance of various DMUs should be identical, except for the differences in volume and intensity. The number of DMUs to be compared is a crucial decision. As the number of DMUs increases, the probability of obtaining high performance units that determine the efficiency frontier will also be high and more inputs-outputs may be incorporated for better comparison. However, the homogeneity of DMUs must be maintained while increasing the number of DMUs.
- ***Selection of inputs and outputs:*** While deploying DEA, one needs to be careful about the choice of inputs and outputs. The efficiency scores are very sensitive to changes in the data and are heavily dependent on the number and type of input and output factors considered. All inputs and outputs should be relevant to the comparison, i.e., they should have a bearing on the performance of DMUs. They may be quantitative or qualitative. This technique works equally well in either case. However, caution needs to be exercised because DEA being a non-parametric method is more sensitive to possible measurement errors (which may affect the efficiency scores).
- ***Choice of DEA model:*** A variety of models have been applied in varied situations: input maximization or output minimization, CRS or VRS, multiplier or envelopment models, etc. The selection of an appropriate model is based upon a number of criteria. If inputs are inflexible (not fully under control), the output model is more appropriate. In situations where outputs are decided by the goals of the management rather than by extracting the best possible performance from DMUs, the input-based method is preferable. The multiplier approach is used when inputs/outputs are emphasized in an application, while the envelopment approach is used when relations among DMUs are emphasized. When the performance of DMUs is independent of the scale of operation, CRS is the preferred technique. In most other cases, VRS is better. Similarly, when one thinks of comparing the performance of DMUs over time (time series mode), window analysis or the Malmquist Productivity Index may be employed.

There is scope for further research in this area. Future studies may attempt to measure relative changes in the efficiency scores of various tourist destinations over time. Here, the Malmquist approach is recommended because it uses panel data to calculate the indices of total factor productivity performance change (a productivity measure involving all the factors of production and performance), technological change, technical efficiency change and scale efficiency change. Further, for inefficient tourist centres, the target models approach (Golany and Roll, 1994) can be employed. Such models seek to project inefficient DMUs onto the efficiency frontier. This approach aims at assisting them to find the most suitable target areas for improvement.

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