ECONOMIC IMPACT OF TOURISM DEVELOPMENT – A LINEAR PROGRAMMING APPROACH

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Introduction

Economic impact studies of tourism are growing in popularity for a variety of reasons. First, as tourism activities develop, environmental (both social and physical) side-effects may occur (Foster, 1964; Greenwood, 1976; Cohen, 1978). In fact, economic development activities rely on the use of natural resources and usually have significant effect on environment. Development of the industry is considered technologically appropriate in a labour surplus country like India. Given its almost inexhaustible source of touristic attraction, employment generation can be fostered by tourism at a low cost since it does not require resources with a high opportunity cost. More over, being located in the remote place, some tourist spots may act as catalytic agent for local growth. Consequently, municipalities and other local bodies find it important to conduct economic impact studies. Second, impact studies can restrict or counter the industries wishing to influence legislation through lobbyists by documenting economic viability of an industry. Third, it helps in identifying the sources and extent of revenue to the local administrations. Municipal and regional planning officials are often faced with making decision on alternative tourism developments. While this may be good for the economy, the community in question may still wish to place some constraints on the use of its limited sources. These constraint on choice can be presented as a set of linear inequalities.

Toward Linear Programming

The problem as we proposed in our study is basically to maximise a linear objective function given a set of linear inequalities. The best technique to solve such a problem would be LP model formulated according to our objective. Choice faced by the planners can be formulated as an objective function and constraints on choice can be presented as a set of linear inequalities. In this study the main objective is to maximise the revenue from different sources of earning (eg accommodations, parks etc). But, in the case of an activity like tourism, which requires natural resources of limited nature and calls for sustainability, we can not take it granted that these limited sources or activities can be exploited in unbounded manner. Hence, for maximization of our objective through empirical exercise, the best method to handle this problem is LP.

One advantage of LP is that a problem can be modeled to represent choices among types of firm or recreation centres. In any planning exercise relating to tourism, these may be important considerations. Another advantage is that a variety of constraints such as limited resources, maximum capacities etc can be included to represent realistic situations.

For some time now, LP has been sued for solving problems involving private enterprise. But in the case of tourism, an obvious objective would be to maximise benefits including things like gross income, tax revenue or number of tourists. Kottke (1987) applied this technique in New London country situation in 1982.

One useful assumption of such LP approach is that an actual existing situation can provide an appropriate benchmark from which a proposed change in development might occur. An LP framework based on these assumptions can give economic planners at the local level an opportunity to monitor on-going development.

In order to test the applicability of LP for studying economic impact of tourism, a model can be constructed in such a way that it is representative of community's tourism industry and at the same time allows opportunities for controlled development.

Given these requirements, the following model can be formulated with the objective:
To maximise

$$Y = \sum_{j=1}^{n} C_j X_j + \sum_{k=1}^{p} P_k V_k$$

subject to

$$\sum_{j=1}^{n} a_{ij} Xj + \sum_{k=1}^{p} a_{ik} V_k \leq B_i \qquad (i = 1,\ldots M)$$

$$X_j = R_j \qquad (j=1,\ldots,n)$$

$$X_j \geq 0$$

$$V_k \geq 0$$

where
Y = total gross income attributed to tourism
C_j = gross tourism income per bench mark firm
X_j = number of bench mark firm of type j
P_k = gross tourism income per new firm
V_k = number of new tourism firm
A_{ij} = input coefficient per new firm
B_i = quantity of resources available for use by the tourism industry or projected levels of tourists visits.
R_j = number of existing tourism firms by type j

Area of Study

Digha is a popular beach resort of West Bengal. It has sufficient ingredients necessary to be a success in tourist industry. It offers a clean town, mile after mile hard flat beach. The gently rolling sea is almost screened from the town by thick Casuarina forest. The character of Digha's tourism has been shaped by the nearness of the country's largest metropolis Calcutta. Being a small place with 2300 resident population and three per cent demographic growth rate, it attracts about 15 lakh visitors a year. Average annual visitors' growth is 16 per cent between 1977 and 1988. Tourism as an industry from sun- sand sea has also paid off financially at Digha. The gross economic turn over as estimated in 1988-89 was Rs. 155.4 million (Chattopadhyay, 1995). More over, tourism development at Digha coincides with the growth in urban development of Calcutta. With a fixed physical supply of land including beach and forests, careful economic planning of future development is therefore, important.

Projected Growth Situations

The benchmark situation was designed around Digha in 1988-89. It consisted of 230 tourism firms or enterprises. Of these firms, 126 accommodation units; 50 eating and drinking places; 5 local transport; 4 recreation units' 25 shopping and souvenir centres and 20 other support business units were identified.

A total of 1575 acres of land was used for tourism development. Of these, 225 acres of beach area was estimated with assumption of the availability of half the breadth between high tide and low tide water. Over 15 lakh tourists were estimated for benchmark situation. Of these, 9 lakh visits were at halting places and 6 lakh were day trippers.

In applying the model to the benchmark situation, five activities, three constraints and one transfer equation were included. It is to be noted that the benchmark situation was not

intended to be an optimal solution. Rather, it was to serve as a base for comparing projected solutions.

Most of the data required for applying the model to the benchmark situation are provided in Table 1. Here, B_i values are shown for land, labour and visitor constraints.

Table 1
Benchmark Situation for The Digha Tourism Industry

Name of Activities/Constraints	Quantity	
Recreation Centre of Support Business Activity	**Number of Firms**	**Average Gross Income per Firm (000 Rs)**
Accommodation	126	200.00
Food and Drinks	50	320.00
Camping Sites	6	10.00
Parks	6	12.00
Local Transport	10	72.00
Land (acres)		
Coastal Urban		1575
Coastal Rural		5006
Total		
Employment		
Full Time		3800
Seasonal		1200
Total		
Visit by Tourist (numbers in thousand)		
At Accommodation Centres		900
At Support Business		
Total		1400.9
Gross Income		42052000

The process of tourism development at Digha can be divided into three phases. Phase one being an incipient period continued upto 1980. The eighties may be identified as transitional phase ranging up to 1990. During this period, Digha began to experience new wave of summer tourism. Certain promotional measures also took place and what is more, non-regional owners of various tourism related activities started to show their interest in opening new units. Finally, the mass stage might have begun in nineties with the completion of proposed railway link with Calcutta. In addition to these evolutionary background, a planning agency engaged in impact study with future projection can not ignore the question of survival or sustainability of the industry.

Environmental considerations thus, become important at the regional level where a range of spatial strategies are proposed to be implemented. It is observed that concentration has been favoured in some coastal regions where a prime objectives has been to avoid ribbon development. Here, the proposed technique is to relieve pressure on fragile areas by encouraging development elsewhere or by redirecting tourist traffic. Following so called 'honey pot' strategy access may be given to another forest or camping site. In a locality like Digha, where such redirection is not possible for natural or geographical limitations, the planners are left with the task of restricting visitors to maintain the maximum carrying capacity. Acceptable

level of crowing appear to differ from one society to another. While some studies observed 1000 persons per hector or 10^2m per person as a measure of over crowding a beach, other estimate the magic figures as 15^2m per person considering the first 50 meters from the water edge (Pearce, 1981).

Besides the reasons mentioned above, we also considered the aspect like soil condition, land use pattern (given by the state department of town and country planning), silting and marine erosion (laid down by the Geological Survey of India and department of Geology, Presidency College, Calcutta) and santitational constraints (mentioned by DDS). We have specified three projected growth situations for the purpose of testing the applicability of the model (Table 2).

Table 2
Projected Growth Situations With Limitations and Time Period

Projected Growth Situations	Projected Growth In tourism Visits (%)	Upper Bound of Accommodat ion Units	Plan Period (years)
A	50	Nil	10
B	50	50	10
C	25	50	10

It is observed from table 3 that if we do not fix upper bound in the number of accommodation units, 103 such units and 17 food and drink shops could be added, given the limits imposed by the projected level of resource constraints. Gross income would then increase by about 62 per cent and these would be obtained by using 50 per cent more land, 20 per cent more employment and 25 per cent tourist. Results of two other situations are also given in the same table.

Table 3
LP Solutions for Situation A, B, C as Proposed in The Study

Name of Activities and Constraints	Quality in Number			Percentage change from Benchmark		
	Situations			Situations		
	A	B	C	A	B	C
Solution						
Accommodation	130	50	50	81.7	40	40
Food and Drink	17	26	9	34	52	18
Constraints						
Land use (acre)	650	650	650	50	50	50
Employment	1000	1000	1000	20	20	20
Number of Tourist	700000	700000	350000	50	50	50
Gross Income	26040000	18300000	1288000	61.92	43.57	30

Summary and Conclusion

The purpose of this study was to construct and LP model and test its applicability for estimating the potential economic impact of tourism growth at Digha. There are many cases where tourist spots were developed for reasons other than tourism. In other words, tourism was an after though. But, spots like Digha were developed with primary reason, tourism. A scientific planning is there, imperative for the development of both tourism and Digha.

In order to provide planning officials with a method of obtaining answers to such questions like what would be the most suitable types of tourism income. Growth of tourism was assumed to be constrained not only by limited availability of additional land, labour and projected levels of tourists, the opportunities for new accommodation firms were also restricted for sustainability of the industry.

The merit of the study can by challenged on many grounds. The benchmark situation with which the projected situations were compared is quite old. Upper bound fixation is subjective. The fishing industry, an already existing activity is also ignore. Nevertheless, the model shows promise of being an operational procedure for evaluating alternative tourism development proposals at a practical level.

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