Chapter 5

Carrying Capacity

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5.1 Application of Carrying Capacity in Different Areas of Research

The carrying capacity term has been studied in the subjects related to science that deals with nature - like botany, zoology, geography and more specifically in the general study of human ecology. Carrying capacity concept was derived from the work of plant physiologist Justus Liebig (1840) who showed that organism will be limited by materials that are in the shortest supply relative to their need, a relationship formulated into the "Law of the Minimum". Ecologist Victor Shelford (1913) carried Liebig's idea one step further in proposing the "law of tolerance". Shelford argues that animals could survive only under conditions that they could tolerate including temperature, sunlight and hazards, apart from availability of critical materials (Hardesty, 1977:196).

Moreover, several perceptions of carrying capacity were taken into consideration in the areas of anthropology (e.g. Bridsell, 1953; Adams, 1965; Rappaport, 1968; Douglass, 1971; Odum, 1971) and Geography (e.g. Stamp, 1958; Dickinson, 1966; Bose, 1967).

Carrying capacity as a concept has been there in the field of civil engineering for a long time. In its simplest term, it means determining the maximum capacity that a building, an infrastructure or a facility could sustain as regards the number of its users. The concepts were applied by urban planners, architects, builders or engineers for constructing structures and were mainly applied in terms of physical carrying capacity. However, the concept is no more confined to its above-mentioned usages alone. Many other disciplines started applying this concept as per their specific requirements and areas. Today, besides the physical carrying capacity we talk of ecological carrying capacity, socio-cultural carrying capacity and economic carrying capacity and all these are extremely relevant in the field of tourism.

Discussion on the carrying capacity concept probably dates back to the 1960s in the field of recreation management. Saleem (1994) has cited certain works demonstrating the use of carrying capacity approaches for recreation management strategies. However, according to him, the emphasis was on indicating the physical carrying capacity instead of taking into account "other derivatives such as the social carrying capacity or ecological

carrying capacity". It was used to determine the maximum number of users, which could be "accommodated at a given time by certain facility or a specific site" (Saleem, 1994).

5.2 Tourism Carrying Capacity: General Perception and Conceptualization

Perception of capacity employs the idea of limits or the thresholds beyond which development, growth or change cannot or should not occur. According to Pearce and Kirk (1986:3) threshold is a modified general definition most commonly utilized for tourism carrying capacity –"tourism carrying capacity is the physical, biological, social and psychological capacity of the tourist environment to support tourist development and activity without diminishing environmental quality or visitor satisfaction".

Romeril (1990) defines tourism capacity as "the threshold level of tourist use beyond which impacts exceed levels specified by evaluative standards, assuming a fixed and known relationship between levels of use on the one hand, and their impacts on the other".

Carrying capacity can be defined as the maximum number of people that a place, a resort, site or other area can sustain, before there is a reduction in the quality of the visitor experience or adverse effects on either the physical environment or the host community. "The concept is at the debate surrounding sustainable development" (Ray Youell, 1996). It is a difficult concept to put into practice, because people will have different threshold levels above or below which the quality of their experience will suffer. A particular kind of dis-amenity measurement that has been the subject of intensive research over the past ten years is the psychological tolerance of recreationists to crowing and/or interactions with people with different recreational values. Sagar Singh (1999) points out that "it has been beset with theoretical difficulties to the point that many have given up combating with it as a 'concept'. Mostly in planning approach and its applicability of a concept makes it ideal as a subject of researchers' interest, where managerial interest has nothing to say about it. It has long been studied by disciplines other than tourism, its limitations have led many to give it up as vague with regard to tourism - this, it may be argued, should be sufficient cause not to take up carrying capacity as a concept worthy of exploration. But the limitations of a concept are never reason enough to retire it, it may equally cogently be argued and that disciplines or scholars in search of a touchstone are for that reason disappointed".

"The conceptualization of tourism carrying capacity is at the same time static and dynamic, entailing a determination of perceived maximums or absolutes, as well as an

optimum. It involves assessment of various component and sub-component systems or environments, and their expression in quantifiable as well as qualifying terms. Tourism carrying capacity is thus seen as both a fixed quantity, which can be worked out through optimization techniques, and an indeterminate value or a range" (Sagar Singh: 1999).

Tourism carrying capacity came into play only after tourism emerged as a discipline or a subject of management in sixties. In India and abroad there has been continuing emerging interest evidence in various studies and subjects and surveys throughout the 80s and 90s (World Tourism Organization, 1984:30-36; UNEP, 1996; Government of India 1988; Wolters, 1991; Government of India 1992). Presently, interest shows that as a theoretical and planning / managerial tool, tourism Carrying Capacity is still existing. Concepts and themes rise and fall are subject of fashions and always dynamic. But the study of carrying capacity for tourism has "crossed the threshold" that separates fashionable trends from continuing and stable interests.

According to Preister, "The conceptual amalgamation that is tourism carrying capacity can act as a support to lift us into a fuller, interdisciplinary study of tourism. Even before planning issues, or in spite of them, it can bring scholars from different backgrounds together to help understand aspects of development and change with special regard to tourism". (Preister, 1989:16).

Tourism is a resource based industry and resource evaluation is important to identify areas for resource conservation to promote tourism vis-a vis other demands. It is also imperative to identify and designate the resource under various competing uses and further to arrive at the capacity that will be matched by the supply location wise and activity wise. The concept of carrying capacity is significant for scientific planning of tourism facilities and infrastructure, particularly in relation to sensitive tourist destination areas like the hill areas. It is the threshold of tourist activity, beyond which facilities are saturated (physical capacity), the environment is degraded (environmental or ecological capacity), or visitor enjoyment is diminished (perceptual or psychological capacity) (Sagar Singh, 1999). These concepts are now generally acceptable but difficult in measuring the thresholds (except perhaps physical and ecological capacity) as a planning tool.

Measuring carrying capacity

The population that a limited area of land – agricultural, historical or plain forested – could support was taken as the measure of carrying capacity. This boiled down

to the use of a single limiting factor: the amount of land required to grow, hunt or gather enough calories to feed one individual.

To correct for differences in land use, a factor was included in the calculation of carrying capacity.

It took the form of: $\frac{R+U}{U}$

where "R" is the number of consecutive years that farming land is allowed to rest or fallow, and "U" the number of consecutive years the farming land is used. Carrying Capacity was then calculated as:

$$K = \frac{\text{Total land available}}{\text{Individual annual need for land x (land use factor)}}$$

If total available land is 1,000 acres, individual need for land that can satisfy a person's average calorific requirement is 2 acres, and fields are used for 2 consecutive years and then rested for 1 (i.e., land-use factor is 10) then

$$\text{Carrying Capacity} = \frac{1000 \text{ acres}}{(2 \text{ acres / person}) \times 10} = \frac{1000 \text{ acres}}{20 \text{acres/ person}} = 50 \text{ persons}$$

(Source: Sagar Singh, 1999:20).

5.3 Nature of Tourism Carrying Capacity

The definition of carrying capacity fits in well with tourism development plans because these plans often attempt to impose some constraint on the ultimate level of development to prevent damaging impacts on the environment and society (John Fletcher 1993). However, even the expression of said carrying capacity is fraught with difficulties because it implies that the carrying capacity is some absolute limit. In reality, expose to stimuli brings with it acceptability and it is likely that carrying capacity, particularly from the social and cultural point of view, will increase over time as tourist presence becomes more expected and accepted.

Cooper, Fletcher, Gilbert and Wanhill (1993), defines Carrying capacity as "that level of tourist presence which creates impacts on the host community, environment and economy that are acceptable to both tourists and hosts, and sustainable over future time periods". It is to be noted that tourist presence is used rather than tourist numbers. Chris Cooper (1993) points out that, this is because it is necessary to adjust the absolute number of visitors to take account of a number of factors such as:

- The length of stay

- The characteristics of the tourists/ hosts
- The geographical concentration of visitors
- The degree of seasonality

It is important to measure tourism presence in some unambiguous manner. This could be done in terms of tourism 'units', where the number of visitor arrivals is weighted according to the above said factors in order to provide a standardized unit. However, there are difficulties in incorporating day visitors with those visitors who stay overnight. The former are likely to have a different impact per hour of stay than their staying visitor counterparts, largely because of the different sense of time budgeting and expenditure patterns.

Since tourism is associated with impacts on society, culture, environment and the economy, the carrying capacity threshold is likely to occur in one of these areas first rather than in all of them at once. Thus, a destination may find that tourism activity brings pressure to the local ecosystem before it creates any serious threats, to say, the social structure, culture or the economy. This means that the carrying capacity for this particular destination is determined by environmental considerations and that the other factors may be running below capacity level (David Gilbert 1993).

John Eberlee in an IDRC Report on *Managing Tourism with a Sustainable Carrying Capacity* (12th June, 1998) mentioned that "for tourism managers, one of the most challenging tasks is to estimate the carrying capacity of an attraction of destination – in other words, how many tourists are too many" (www.idrc.ca/reports). Indeed, the issue of carrying capacity is not just a major challenge but today it is also the most debated issue in tourism development. It is debated from many points of views some of which are very often contradictory.

Tourism activity has an impact on the social, cultural, environmental and economic character of a destination, together with the belief that these impacts grow in magnitude as the volume of tourist arrivals increases, which suggests that there may be some threshold level of visitor presence beyond which the impact becomes unacceptable or intolerable. Such threshold limits are best referred to as 'Saturation Limits' rather than 'Carrying Capacity' since the latter carries with it some notion of sustainability.

The carrying capacity is the dependent variable. The point to be noted is that, it is a variable and not a fixed value of tourist presence. Over time exposure to tourist

presence and changing local factors are likely to influence how much change the host community and visitors are prepared to accept.

It is the feedback over time, between carrying capacity and the local and alien factors, which will be responsible for increasing/decreasing the magnitude of acceptable tourist presence (carrying capacity). If the carrying capacity is exceeded with respect to any of the impact areas, the tourism development process will be hindered and irreversible damage may be experienced. The damage may be concerned with social, environmental or economic aspects, but the end result will be the same - the tourists will experience a reduction in visitor satisfaction (because of the resentment that will grow from the impact) and the destination will decline.

Every destination will be subject to carrying capacity: that is, a level of tourism activity that can be sustained into the long term without creating serious or irreversible changes to the destination. If the carrying capacity is exceeded, the destination will find that the negative impacts rapidly increase while the positive impacts diminish.

5.4 Prime Factors to Evaluate Carrying Capacity

To study carrying capacity in depth it is necessary to delineate the areas of study. The determination of carrying capacity can be shown as a function of a variety of factors which, following planning and regulation, generate an impact on the destination. However, the carrying capacity feeds back both to host (local factors) and to visitors (alien factors), and over time this influences the impact and consequently, the carrying capacity. The concept of carrying capacity is a dynamic rather than a static concept.

A. *Local factors*

Social structure

The social structure varies from location to location. The social structure of a cosmopolitan city is likely to be more absorbent of tourists than an exotic location. For instance, the nuclear social structure of Kolkata / Delhi is much more able to absorb and tolerate the presence of tourists than the extended family structure which exists in Pelling in West Sikkim.

Culture

The cultural characteristics of the destination play an important role in determining impact. The more unusual the cultural background, the more attractive a destination may

become, but the more likely it is to be affected by the presence of tourists. The results may be either a destruction of local culture or, more likely, the commercialization of cultural features and traditions, such as dances, costumes and the arts and crafts.

Environment

The environment will be charged by the presence of tourists. The environment can be either natural or man-made; generally the latter is (or can be made) far more resilient to tourism impact than the former. Environmental change is inevitable to take an extreme example, the moon has, to date, received only a few visitors, yet its landscape has been irrevocably altered by that presence. The more sensitively an environment is balanced, the greater is the irreversible environmental damage.

Economic structure

The economic structure will determine the benefits and costs associated with tourism activity. In general, the more developed and industrialized the economy, the more robust it will be. Such economics are able to secure the maximum benefits from tourism while incurring the minimum costs.

Political structure

The political structure often (but not always) reflects the ideas and beliefs of the host community, and can activity encourage tourism development or hinder it.

Resources

The availability of local resources (labour, capital, land, etc.) will have a major influence on the acceptability and desirability of tourism development and even on the form that development takes. Where local resources are scarce, competition for them will be high and the opportunity cost of using these resources for tourism will also be high. The local infrastructure is also part of the local resource base. If tourism development means that the infrastructure will be over utilized then this will generate resentment against tourism and bring the hosts and tourists into conflict. On the positive side, tourism development may result in improved infrastructure, which will be available to hosts as well as tourists and thereby will enhance the quality of life for the local residents.

B. *Alien factors*

Tourist characteristics (social)

The characteristics of the tourists are an important factor in determining the social and cultural impact of tourism on the host community. For instance, visitors who belong to the 'mass tourism' group are likely to have a much greater social and cultural impact than those who belong to the explorer and adventurer category. The former demand western amenities and do not adapt to the local norms and customers, whereas the latter derive enjoyment and satisfaction from taking part in them. In general, the greater the difference between the local and the visitor's social and cultural background, the greater the impact and consequent change. Tourist characteristics also include visitor expenditure patterns, mode of transport, party structure and size, age, educational background, income and purpose of visit. All of these factors will influence the nature and magnitude of the impact on the host community.

Type of tourist activity

The types of tourist activity will be closely linked to the characteristics of the tourists who take part in them. However, the presence of certain activities, such as gambling, can bring social impacts which are far greater in magnitude than those associated with the same groups of tourists undertaking different activities. Gambling can bring with it increased risks to the host community in terms of exposure to prostitution, drugs and crime.

It should not be forgotten that tourist presence, together with the effects of tourist presence on local factors, would influence the satisfaction rates of visitors. Thus, carrying capacity relates not only to how much tourist presence the destination can cope with at a sustainable level, but also to how much the visitor is prepared to tolerance.

5.5 Debate on Tourism Carrying Capacity

In the 1980s the term carrying capacity emerged out of the discussion on the negative impacts of tourism. The activities and processes that constitute tourism were homogenized and reduced to the volume of tourism. Mathematical models were developed, sociological models were developed and geographers attempted to measure the carrying capacity. Was it visible? Was it dependent on the resources base, tradition and culture? Was it related to an eco-system? The debate has never conclusively been able to demonstrate the best method of establishing and measuring carrying capacity

although modern tourism was certainly growing beyond its "carrying capacity" in many destinations. However, in the process of the debate, a number of interesting issues have emerged, like:

i.) Tourism data, which are increasingly used to demonstrate its importance, are often incompatible, inconsistent and not necessarily credible, even when they are put out by the WTO. Therefore do we see tourism as a means to end? For example, Government wants to use tourism for economic benefits and is concerned about volumes of arrival and expenditure. Communities want conservation, access to their leisure and recreational spaces and free use of their tourism resources. For them sharing their resources with tourists becomes a carrying capacity issue. Secondly, hospitality as a tradition and hospitality as an industry also view carrying capacity as an issue. To make accommodation, food and drink into commodities becomes an issue of what goes beyond the capacity of a destination.

ii.) Tourism planning and development requires trade-offs. This is a matter of allocating resources between users whose competing demands can create shortages. Land prices, goods and services can become expensive. All this leads to the emergence of carrying capacity issues. Tourism development often involves conflicting objectives. How do we build sustainable tourism and at the same time register growth, employment, and distribute it to the vulnerable sections of the resident population? Another carrying capacity issue emerges if we have to find answer to these questions.

iii.) Goals for effective tourism development for less developed countries are always concerned with the key issue of community participation and carrying capacity. What exactly does the term mean and has it been replaced by sustainability? Any destination must ensure that its tourism growth meets its socio-economic objectives and environmental needs and constraints. This must be done in consonance with the prevailing value system and cultural integrity and satisfy the perceptions of the local population regarding their needs and how they are to be satisfied.

iv.) Tourism which had been considered a soft option in the past decades is no longer so. It has become a very complex sector requiring a greater degree of expertise and professionalism. At least three disciplines converge to give us an understanding of sustainable tourism. Economics, which attempts to maximize welfare within the existing capital–labour-technology stock; ecology, which takes into account the ecological subsystem on which the economic system acts and sociology that identifies human beings as the key actors, who reflect their social structures when adapting their resource base to their current and future needs. Thus, tourism should not infringe these three disciplinary requirements in its development.

Carrying capacity has therefore emerged as a central principle. Broadly, it determines the maximum use of any destination or site without eroding its environment (visible), resources (economic, scientific, social), community (structures and their interdependence), economy (both distributive and profit oriented), and culture (individual, social, group, performative, artistic), and the value system, which has emerged from all these qualities that are interlinked.

The principle of carrying capacity therefore implies a limitation while at the same time becoming a criterion of sustainability. Carrying capacity, at all levels, defines how much tourism is permissible for positive gains and the point at which what was a gainful activity turns into a negative one. This is not so easy to establish as the theory suggests. The more composite the concept becomes the turning point becomes increasingly difficult to pin down.

Carrying capacity according to the WTO includes several elements:

1. *Physical* - related to space and its role in the touristic experience. The point at which a site can be viewed as overcrowded or congested and therefore requiring some management and control.
2. *Ecological* – again based on the volume beyond which unacceptable ecological changes will occur either from the establishment of infrastructure, services and facilities and tourists.
3. *Cultural* - representing the point at which unacceptable ecological changes will occur either from the establishment of infrastructure, services and facilities and tourists.

4. *Tourist satisfaction index* - the point at which man made, social and historical resources begin to deteriorate or transform due to visitor pressure.
5. *Residents' social tolerance* – the point at which the residents begin to become hostile to demonstration effect of tourism.

The pro-tourism advocates do not see carrying capacity as being an absolute criterion. Through planning and management it can become elastic and accommodate higher levels of visitation and activity. Zoning, restoring seasonality and tourist behaviour can all play a role in expanding capacity. Tourism policy should determine how carrying capacity is to function as a guideline. Today successful tourism development has to be concerned with a proper understanding of carrying capacity and policy support to develop methodologies to estimate the perfect balance between tourism and all the elements that go into its practice.

Carrying capacity operates in a dynamic system of change. In nature the timing is precise, through a seasonal cycle conditioned by the food and survival chains that link species together. Human behaviour often does not conform to the pace of nature. Thorough research and investigation are required before any changes are effected in the carrying capacity of a destination. To be economically and socially sustainable, tourism has to be environmentally and culturally sensitive. This requires longer time frames than have been considered by tourism planners. Zoning, clustering, integration, interdependence, pricing and closure that are the traditional methods to provide accessibility, elasticity, diversity and a cost-benefit analysis to determine carrying capacity have obviously not performed the function of sustainability.

Peter Dogse in an Electronic Conference on Research and Biodiversity raised some interesting points as regards the usefulness of tourism carrying capacity:

"Calls are often made to restrict tourism in places where it degrades, or threatens to degrade biodiversity in the line with the site's environmental 'carrying capacity' (e.g. the number of visitors and level of use a site can sustain without experiencing irreversible biodiversity impacts).

Assuming (a) that it is feasible to identify scientifically sound carrying capacity figures, and (b) that tourism flows actually are kept within the established carrying capacity limit, the question could still be asked: how useful is the carrying capacity concept as described above in tourism management?

This question is challenging for lot of reasons:

1. It is the most limiting factor that determines the "true" carrying capacity, which may not necessarily be biodiversity concerns. A destination may receive fewer tourists that the environment can support but more than its local population accepts. Allowing tourism flows up to the environmental carrying capacity while exceeding cultural or social limits would likely not be good tourism management.
2. Human values and perceptions change over time. Additional tourists might be welcome if more of their expenditures benefited local people. Due to natural fluctuations in ecosystem functions etc. biodiversity constraints can also suddenly become more limiting. Managing tourism flows based on outdated or static carrying capacity figures is therefore not efficient.
3. Investments can be made in order to increase a site's carrying capacity (i.e. in waste water recycling, establishment of green corridors for wildlife, tourist awareness campaigns etc.) Technological innovations or more efficient use of resources may also ease environmental limitations. The carrying capacity is subsequently a function of available financial, technological, human and natural capital. The environmental carrying capacity concept alone is therefore of limited interest in terms of identifying the 'optional' level of tourism where net tourism benefits are maximized (investing large sums in order to increase the carrying capacity marginally will for example often not make economic sense).

Potential Determinant

There are various potential determinants of tourism carrying capacity as propounded by N. Saleem:

- *Socio-economic environment*: economic multipliers,
- *Socio-cultural environment*: relative visitor density, and
- *Ecological and socio-psychological environmental*: related land use intensity.

In tourism, the determinants of carrying capacity are including areas like psychological carrying capacity, social carrying capacity, economic carrying capacity, environmental carrying capacity, etc. The entire issue is a complex one as each determinants affects the other and has a multiplier effect not only in terms of impacts but also in terms of the destination lifecycle and destination capacity. For example, the

tourism carrying capacity of a historical city mentions that the economic carrying capacity of a historic city relates to rise in property values, changes in land use, invasion of tourism oriented shops, etc. All these cannot be compartmentalized only in relation to the economic impact or economic carrying capacity as it changes social relations, social behaviour and affects the society as a whole. The economic carrying capacity according to Saleem "can be said to refer to the threshold points which provides the highest level of benefit or earning retention to the system".

The determinants of the economic carrying capacity can be related to economic activities like investment of foreign capital, labour conditions, imports, foreign exchange rates and earnings, inflation, rise in property values, profits and wages, leakages in the economy, etc. each of these can have a positive or negative bearing on the destination depending on the type and nature of tourism development that is taking place. Economic dis-benefits will lead to adverse socio-economic conditions which according to Saleem can be characterized as follows:

- Low-paid jobs and economic hardship for some, leading to social polarization,
- Competing migrants between the have and have-nots,
- Social tensions between the outside entrepreneurs and vendors by the locals,
- Perceived economic dis-benefits by the locals,
- High leakages of earnings from the system due to repatriation of profit/wage and imports of luxury goods,
- Inefficiency and effectiveness of the system in general.

Tourist numbers in terms of arrivals are closely related with the economic carrying capacity. There are many destinations in the world where tourist arrivals outnumber the resident population during the tourist season. All locals do not thrive on tourism income and the stress that this influx of tourists creates on the infrastructure very often creates hardship for the locals. Overcrowding of the destination and overuse of the infrastructure ultimately affects the destination lifecycle as the tourists also shy away from a degraded destination.

The tourist-host interaction affects the socio-cultural environment in terms of lifestyles, beliefs, values, imitation of tourist behaviour etc., puts a strain on the socio-cultural capacity of the destination. Similarly, carrying capacity in relation to the ecological factors is determined keeping in view or analysing the effects of tourism activity on the eco system of the destination as a whole. For example, how much visitors

a national park can have at a time? How much of the area of the national park is to be opened to the visitors? How many vehicles can be allowed inside the park? These are the questions that can be answered after taking into consideration various determinants in a national park. At times, even identifying these determinants is not an easy task because a lot depends on the visitors' behaviour and sensitivity.

5.6 Factors affecting Tourism Carrying Capacity

There are several factors that are directly related with tourism development in specific site or destination as a whole which affect tourism carrying capacity marginally and at the same time drastic also. Sagar Singh (1999) points out the following factors which have been seen to affect a proper determination of carrying capacity:

i. *Delimitation of area*

If the area to be assessed is not strictly delimited this is likely to affect an estimate; moreover, in considering for e.g., the attitude of the host population to assess one aspect of social carrying capacity, will the altitude of the larger region of which the locality is a part be taken into account; and will a recently settled migrant minority be excluded or included? This involves determination of geographic / administrative / social / cultural space.

ii. *Location*

Geographic and physiographic location of an area will differ with associated variation of climate, weather, and differences in ecosystems of capacity. This includes presence or absence of human habitation and accessibility.

iii. *Time*

Attitudes of both residents and visitors may change over time. The factors are also relevant with relation to peak visitor flow, which determines to a large extent an assessment of capacity. Time also relates to the stage of touristic development of a resort or destination. In the initial stages, when construction work is in full swing, air pollution due to

dust and traffic congestion - especially in areas in the developing world - is more likely, as well as other types of pollution such as aural, water scarcity and other factors will adversely affect the residents and their attitudes.

iv. *Non-Touristic use and development*

It is frequently difficult to separate use and developmental activities other than tourism and isolate the latter's impact on and resilience of the environment. This also affects a correct determination of capacity with regard to tourism alone.

v. *Political factors*

These factors include political and administrative will to conduct such an enquiry and freedom from vested interests. This is a major reason why determination of carrying capacity is so frequently restricted to assessment to facilities and infrastructure. Political pressure groups also figure in whether and how capacity is assessed.

vi. *Financial constraints*

These constraints limit the scope and feasibility of detailed assessment.

vii. *Managerial Attitudes and Perception*

Assessments are limited by negative managerial attitudes towards the concept, which are often seen as only attitudes towards such evaluation, too often seen as merely a perceptual problem, which is obviated by an objective Environmental Impact Assessment (EIA).

viii. *Tourist Activity and Tourism Development Types*

Different types of touristic activity have different impacts. The particular combination of pattern of use, intensity, frequency and duration may differ, with variety levels and complexity of impact. Similarly, De Kadt (1976) and others have maintained that the scale - one might add type - of development also affects impacts and consequently carrying capacity determination.

5.7 Establishing Tourism Carrying Capacities

Establishing carrying tourism capacities is based on the concept of maintaining a level of development and use that will not result in serious environmental deterioration, socio-cultural or economic problems, or be perceived by tourists as depreciating their enjoyment and appreciation of the area. Any development engenders some changes. Carrying capacity analysis typically is based on not exceeding the levels of acceptable change. It is now a basic technique being widely applied in tourism and recreation

planning to systematically determine the upper limits of development and visitor use and optimum utilization of tourism resources (WTO publication, 1994; 63).

Numerous tourism areas in the world show evidence of having exceeding their carrying capacities. This has resulted in environmental, social and sometimes economic problems, with a decrease in visitor satisfaction and consequent marketing problems.

To determine carrying capacities is often not easy or precise. It depends considerably on the assumptions that are made. Carrying capacities may change through time. However, it remains a very useful technique guiding planning for a sustainable level of development.

Carrying capacities can be established for both underdeveloped tourism area and those that are already developed, and perhaps even reaching or exceeding their saturation levels. It is often the developed destinations that are experiencing some problems of over development regions or areas based on environmental and socio-economic analysis. At these levels, carrying capacities can best be calculated for specific major attractions, such as national parks and archeological sites, and development areas such as resorts.

The measurement criteria presented here are for establishing carrying capacities primarily for tourist destinations (WTO Publication, 2000). The capacities of transportation facilities and services used by tourist traveling to their destinations are also important to analyse. Each area and its type of tourism are unique and must be specifically defined for the area, but some common criteria exist for virtually all places. Some criteria are quantifiable while others must be evaluated qualitatively. In determining capacities, the two major factors to be considered are described as follows:

I. The indigenous physical and socio-economic environment

This refers to the capacity of development and visitor use that can be achieved without resulting in damage to the physical (natural and man-made) environment and generating socio-cultural and economic problems to the local community, which is still benefiting the community and maintaining a proper balance between development and conservation. Exceeding saturation levels will lead to permanent damage of the physical environment or socio-economic problems or both. The criteria for determining optimum capacities include:

Physical

-Acceptable levels of visual impacts and congestion

-Point at which ecological systems are maintained before damaging occurs

-Conservation of wild life and natural vegetation of both the land and marine environments

-Acceptable levels of air, water and noise pollution.

Economic

- Extent of tourism that provides optimum overall economic benefits without economic distortions or inflation
- Levels of tourism employment suited to the local community

Socio-Cultural

- Extent of tourism development that can be absorbed without detriment to the life styles and activities of the local community.
- Level of tourism maintains that will help arts, crafts belief systems, customs and traditions without detrimental effects.

Infrastructure

- Adequate availability of transportation facilities and services
- Adequate availability of utility facilities and services of water supply, electric power, sewage and solid waste disposal and telecommunications
- Adequate availability of other community facilities and services such as those related to health and safety and of housing for employees in tourism..

II. The tourism image and product

This refers to the levels of development and number of tourists that are compatible with the image of the tourism product and the types of environmental and cultural experiences that the visitors are seeking. If the area exceeds saturation levels, the environment and attractions that visitors come to experience will be destroyed or degraded, tourist satisfaction will decline in quality and popularity. The criteria for determining optimum capacities include:

Physical

- Overall cleanliness and lack of pollution of the destination
- Lack of undue congestion of the destination including attractions
- Attractiveness of the landscape or town-scape including quality and character of architectural design

- Maintenance of the ecological systems and flora and fauna of natural attraction features

Economic

- Cost of the holiday and 'value for money'

Socio-Cultural

- Intrinsic interest of the indigenous community and culture
- Quality of local arts, crafts, cultural performances and cuisine
- Maintenance of archaeological, historical and cultural monuments
- Friendliness of residents

Infrastructure

- Acceptable standards of transportation facilities and services
- Acceptable standards of utility services
- Acceptable standards of other facilities and services

5.8 Criteria to Determine Carrying Capacities

Each area and its type of tourism are unique and the criteria for measuring carrying capacity must be specifically defined for the area (Inskeep, 1991). The evaluation of the carrying capacity based on the criteria selected will in some cases be measurable, for example, environmental pollutions and implement benefits and in certain cases absolute, for example limited water availability, but many criteria can only be assessed qualitatively, for example, impact on cultural traditions. The analysis of the final carrying capacity level must establish a balance which will bring optimum benefits to the country or region, the local population and the tourists themselves.

Seasonality is an overriding consideration in the concept of carrying capacity. The threshold or saturation level of visitor use of a destination usually is reached only during peak periods of use and not during the low season or on an average annual basis. In addition to the excessive visitor use, the physical facilities to handle peak season demands may become overdeveloped and generate problems during this period. The peak period must be considered in calculating carrying capacities, but policies must also be adopted to lesson the peaks.

Carrying capacity evaluation does not replace environmental and socioeconomic impact assessment of destination areas. Rather impact assessment should still be done as a complement to carrying capacity evaluation.

Capacity standards

The carrying capacity of a tourism destination is effectively at the threshold when negative factors start to operate. In statistical terms, it is the number of tourists who can visit a place at any one-peak period or over a year without loss of attraction or damage to the physical and socioeconomic environment. The criteria affecting capacity vary between those that are measurable statistically to those whose precise measurement are not possible but still must be evaluated. Their criteria and standards must be tailored to each area and a balance reached among all the factors to arrive at the final capacity is still a very important technique in providing guidelines for planning the optimum level of development.

It is impossible to consider all the carrying capacity standards, which have been investigated and applied. Only some of the commonly used standards can be indicated. The capacity of beaches is probably the most studied of all tourism capacity standards. Beaches are easily measured in relation to the length of sea frontage and the depth. In some countries, sophisticated techniques have been used to take into account other factors such as accessibility, the quality of beach and water and hinterland topography by a graded evaluation. (Inskeep, 1991).

Some standards for rural and recreation activities published in "Risks of Saturation or Tourism Carrying capacity overloading Holiday Destination" are as follows, expressed in visitors per day/ hectare:

- Forest Park up to 15
- Suburban nature park 15-70
- High density picnicking 300-600
- Low density picnicking 60-200
- Sports/team games 100-200
- Golf 10-15

Figure 5: BOTTLENECK IN CARRYING CAPACITY

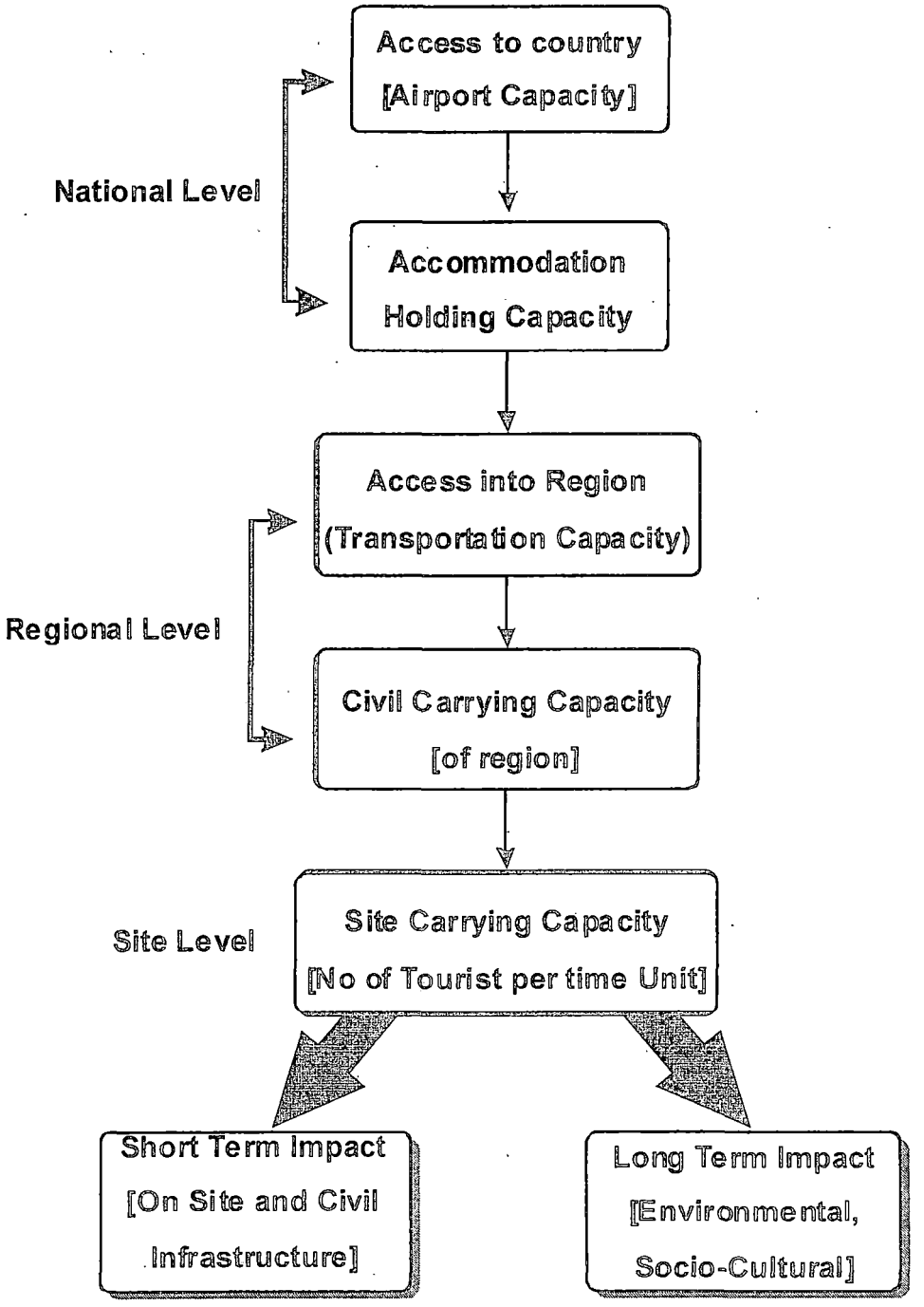
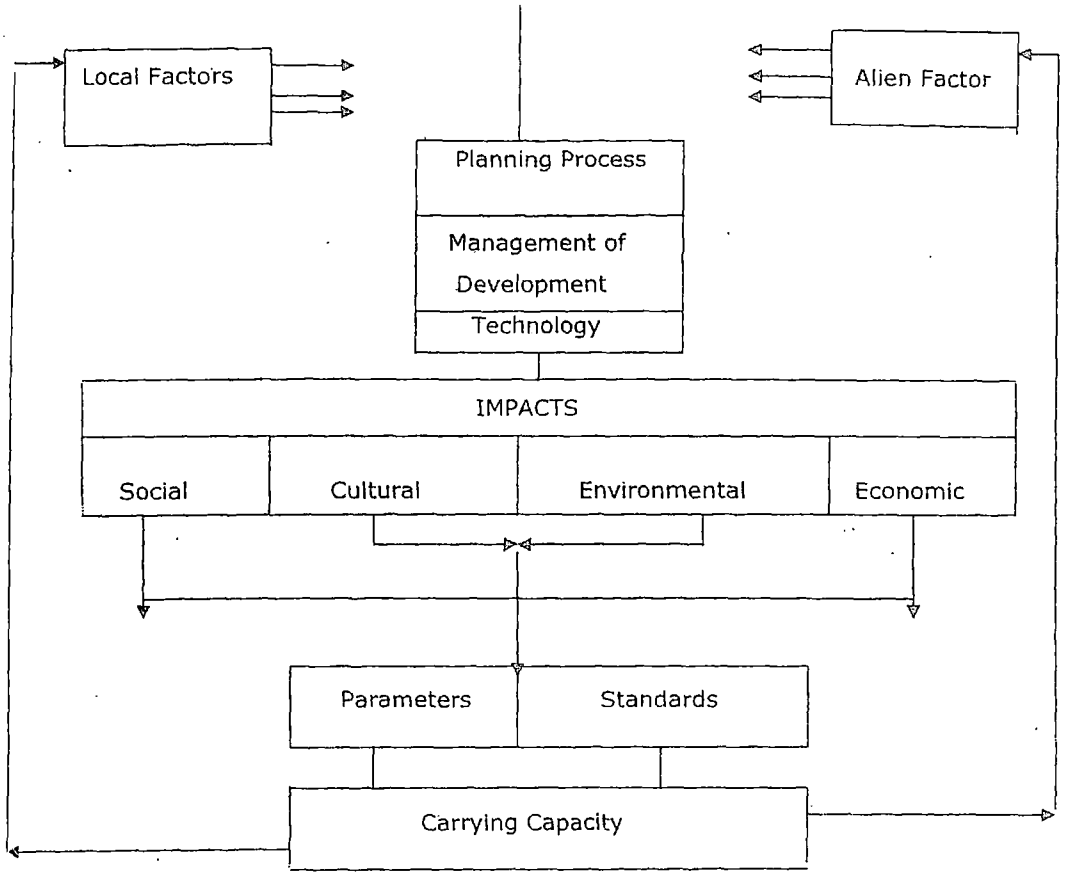


Figure 6: A systematic framework for determination of Carrying capacity



Source: Adapted from Atherton (1991) and Shelby (1984).

5.9 Conclusion

Carrying capacity has emerged as a center of focus. It determines the maximum use of any destination or site without eroding its environment (visible), resources (economic, scientific, social), community (structures and their interdependence), economy (both distributive and profit oriented), and culture (individual, social, group, performative, artistic), and the value system, which has emerged from all these qualities that are interlinked.

Various methodologies have been proposed, debated upon and in some cases pilot tests carried out in relation to measure the carrying capacities whether they are physical, social, economic or psychological. In case of environmental carrying capacity, scientific measures have been adopted. However, there have been extensive debates as regards the feasibility as well as the out come of such methodologies. The industry looks upon this concept from the market point of view and many researchers in this area confine tourism

carrying capacity to the market- driven approach meaning thereby the threshold 'when the visitor number approaches a point beyond which the destination fails to provide quality visitor experience' (S.C. Plog; Leisure Travel: Making it a Growth Market, New York, 1991). Similarly, Victor T C Middleton in his book on Sustainable Tourism, has mentioned that 'Sophisticated concepts such as tourism- carrying capacity, impeccable in theory, are immensely complex in practice and they cannot be applied in planning practice until the various measures of capacity can be routinely monitored and measured against different types of visitor demand. At the time of writing, although countries such as Australia, New Zealand and Switzerland are moving in this direction, there is no known major tourism destination country which has adequate measurement for tourism and its impacts at local level, or proven techniques for the simple collection and communication of such data for local visitor management purposes'.

In the free market model, carrying capacity is consumer- led rather than resource or community- led and it is here that problems may emerge. For instance considering a situation where monuments are closed on Mondays. Tourists may be in the town or city only for that day when all monuments are shut. On the other hand, in season, the souvenir sellers and catering establishments will also not have any business on the closed day. In attempting to balance use and overuse of sites, scientific analysis will also have to take into account such problems and not only numbers. Some mass tourism has reached predatory dimensions; the time has now come for all participants to pay serious attention to carrying capacity as the conceptual principle that will determine the future of tourism. We are likely to see a much more careful application of the limitations of carrying capacity when giving permission for the development of tourism projects. However, local participation is critical if the concept is to become useful as a tool for sustainable tourism. The codes of conduct and charters for sustainable development indicate that there is no place on earth where tourism is not taking place; that there is no ideal site; no perfect tourist spot; no ethical businessman/women; no government that looks to tourism as a tool for equity. With the various trends and agenda existing, carrying capacity requires local agency to inform and create tourism that fulfills the aspirations of different stakeholders.

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