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Conference Paper

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38th Congress of the European Regional Science Association: "Europe Quo Vadis? - Regional Questions at the Turn of the Century", 28 August - 1 September 1998, Vienna, Austria

Provided in Cooperation with:

European Regional Science Association (ERSA)

Suggested Citation: Correia, Antonia (1998) : The carrying capacity in Algarve, 38th Congress of the European Regional Science Association: "Europe Quo Vadis? - Regional Questions at the Turn of the Century", 28 August - 1 September 1998, Vienna, Austria, European Regional Science Association (ERSA), Louvain-la-Neuve

This Version is available at:

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The Carrying Capacity in Algarve

Essays to estimation

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ABSTRACT

The impacts of three decades of intensive growth in tourism place enormous stress on natural assets of industry.

The increasing tourism fatigue, the environment degradation, noise, congestion at airports and the negative socio-economic impacts have slowed down the rate of growth and brought a new concern with the environment and with its limits to growth.

In spite of concerns about the environment destruction will limit the further growth of tourism, this perspective should mean the most sustainable pattern of development, if the industry is to survive over the long term.

This paper is an attempt to estimate and analyse the Tourist carrying capacity in Algarve. The methodology was supported in a model that evaluated simultaneously the Tourist population and the index of consumption. The main indicators used were: Consumption index of transports, seasonally index, occupancy and activity taxes and capacity of Infrastructures

These indicators related to with some territorial indexes should indicate the economic , infrastructures, other services and resources constraints to a maximum level of tourism.

Some of the indicators used were suggested by the Tourism Mundial Organisation and by territorial plans at the region level.

The conclusion present some reflections about the limited capacity of some resources and the possible strategies available to a sustainable development of the sector.

Introduction

Tourism is a system that combines at the same time different dimensions where the territorial dimension presents a great influence on the consumer's decision.

A reflection on the dynamics of the tourist offer suggests the necessity to think about the impacts that the activity can produce in the existing resources and space, seeming indispensable to evaluate the capacity of reception of visitors in a way that the touristic exploitation doesn't break any fundamental balance.

An appropriate information, quantified and detailed is a basic instrument not only to evaluate the quality of life and environment of a specific touristic space, but also to take into account the concrete incidences of projects, plans and programmes of progress and touristic classification.

The concept of carrying touristic capacity aims to evaluate the number of visitors or tourists as well as the degree of the space utilisation liable to not have clearly aggressive consequences to the resources that constitute the tourist attraction.

Algarve, and in particular the seaboard, has been the target for great human activity, from urbanisation throughout of the coastline to the implanting of harbours, marinas and tourist and recreational activities.

Between 1970 and 1996, the number of overnights increased nine times. In what concerns lodging, one verifies the growth of units of the non-traditional kind, such as village's tourist apartments.

The pattern of the tourist progress based on the tourism of masses in an exponential search and free management of resources led to a tourist saturation point. The Regional Tourist Plan shows some principles of strategic tourism progress:

1. Correct management of the tourist resources, establishing load limits or tourist capacity;
2. Avoid and control the seasonal phenomenon;
3. Develop other ways of tourist product
4. Change the offer and demand structures according to the determiners of the natural and human resources.

The strategies mentioned above meet their support in the capacity to estimate in time and space the tourist search, tool, which can evaluate the carrying capacity and the risk of tourist saturation.

This text aims to clarify some concepts of saturation and of tourist capacity, taking concrete deductions to the Algarve region.

Much of the difficulty in assessing carrying capacities has estimated the touristic population and the stress that this population could cause on the infrastructures.

The text begins with an estimation model of the touristic population; in a second step we evaluate some carrying capacity indicators. We finish considering the main problems and limitations of such methodology.

1. An estimation model of the touristic population

The estimation of the touristic population assumes a concerted analysis of two different indicators: direct and indirect:

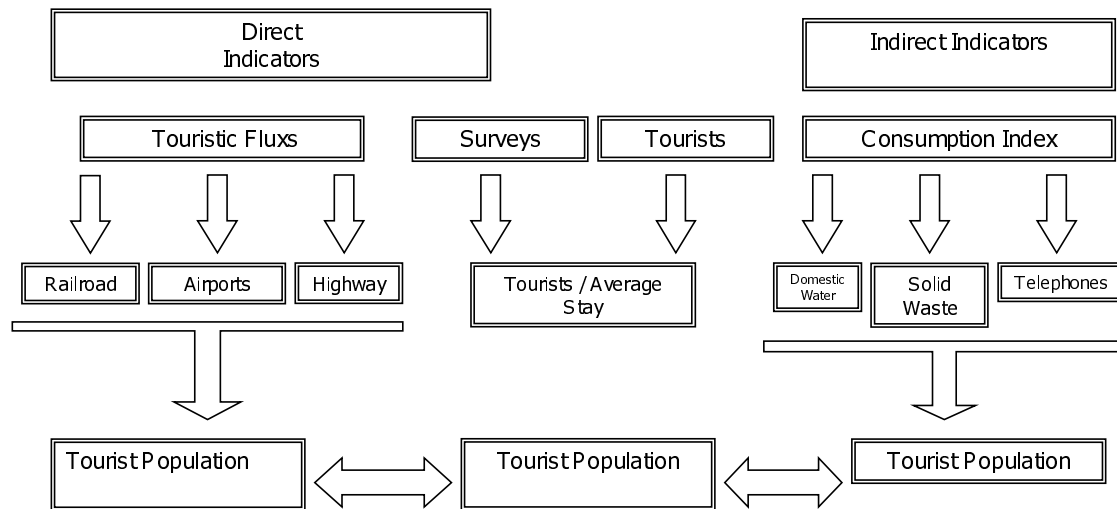
Direct indicators:

The tourist profile based on inquiries

Touristic population based on the research of the touristic fluxes entered in Algarve.

Indirect indicators:

Consuming indicators built based on its pattern values articulated with present population but not resident estimations, on a monthly basis for the Algarve region. The diagram which follows, establishes the relationship between these indicators:

Picture nº 1 Model of Estimation Tourist Population

Source: Univ. Algarve - UCEE,1998

a) *Touristic population (tourist profile)*

Estimation of the touristic population based on the following information and procedures: Tourism statistics, World wide tourist organisation (border inquiries done on the exit of the origin country) and from DGT¹.

Based on the hypothesis of an average staying and on homogeneous behaviour during the whole month. The touristic population present on a certain day results from the following formula:

$$P_t = \frac{h}{e * d}$$

P_t => Touristic population

h => Guests

e => Average staying

d => Number of days in a month

b) *Touristic population (touristic fluxes)*

Estimation of the touristic population based on the following information and procedures:

Tourism statistics and borders movements.

The estimation of the touristic fluxes will be done from the following information:

i) *inquiry of the tourists who entered the region by railway;*

The inquiry of these tourists assumes: - Information about the movements of passengers that enter the region by railway, (CP)².

Estimation of the railway mobility of the resident population; Approach to the touristic population by the indirect indicators method, through the analyses of the average movement of the resident population during the month with the absence of tourists.

ii) *inquiry of the tourists who entered the region by highway;*

The inquiry of these tourists assumes the analyses of the average traffic in Summer and Winter. We will have in mind the automobile park of the resident population for the reckoning of the average traffic of residents. By the indirect indicators method we will get the average traffic of cars potentially touristic, admitting an average occupation of 3,5 people, which will allow the estimation of the touristic population entered by this way.

On the other hand, the tourists entered by bus will be estimated by the indirect indicators method admitting an average occupation of 50 people by bus.

iii) *Inquiry of the entries movements at the airport of Faro and at the border of Vila Real de Santo António;*

These movements will be found out through the monthly statistics of aircraft and Customs Inspectors. The result between the average staying and the number of days of the month will allow us to get the rotation of entries per month. Using the following formula, we will get the present touristic population:

$$P_t = \frac{t_e \times e}{d}$$

Where: P_t => touristic population

t_e => Tourists that entered

e => Average staying

¹ Tourist Department (DGT)

$d \Rightarrow$ Number of days in a month

Finally, gathering the results obtained through the three analyses ways will allow us to get to know the touristic population entered in the region.

a) *Touristic population (Consuming)*

On the basis of this method, estimation of the touristic population, is the indirect indicators method, which is based on the definition of indexes relating the presences in the Region to changeable consuming factors which are clearly dependent from the present population.

The aim of this technique is to estimate the touristic population by the difference between the resident population and the floating one. The presupposition is the adoption by the tourist of a similar behaviour to the behaviour adopted by the resident.

Using this method assumes the previous regularisation of the consuming series, so we can eliminate aleatory and seasonal.

From the original series, it will be concluded the seasonable indices which multiplied by the annual consuming result allows us to find a regular series with a determined tendency and seasonability.

The indicators, which can be quantified and that best fit to the hypothesis of this method are the production of solid waste and the number of phone impulses. This method of consuming indicators assumes the following formalisation:

It is:

$C_t \Rightarrow$ monthly total consumption of the present population

$N \Rightarrow$ present population

$N_1 \Rightarrow$ resident population

$N_e \Rightarrow$ floating population (tourists)

$C_1^t \Rightarrow$ monthly total consumption of the resident population

With:

$$\frac{C_1^t}{N_1} = C_m \Rightarrow \text{average consumption per habitant}$$

Admitting a homogenous pattern in the present population consumption, we will have:

$$\frac{C_t}{C_m} = N \Rightarrow \text{present population}$$

knowing N e N_1 , we will get:

$$N - N_1 = N_2 \Rightarrow \text{floating population (tourists)}$$

The analyses of these consuming indicators assumes a previous statistic treatment of standardisation of the withdrawn series, as we are in presence of different units of reference.

The suggested model allowed to estimate the touristic population based on the traffic fluxes (plane, railway and highway), on the capacity of the total available lodging and on the analyses of temporary series of consuming indicators, and building, based on its pattern results, valuations of the present population but not resident throughout the year in the region. The interplay model and control of the results allow us to prepare some considerations about the demand profile in terms of means of transport and lodging used means and the evaluation and characterisation of the touristic population in time.

1. The obtained results

The analysis of the distribution of the touristic population shows a seasonal movement, which begins in June and finishes in September. The touristic fluxes during the high season represent more than 50% of the population that comes to the region during the year. The valuation of the population points towards an average flux of tourists of at least 433 thousand people and at the most 537 thousand on a specific day in August 1996.

Table 1 - Touristic population estimated in the region in 1996, by months

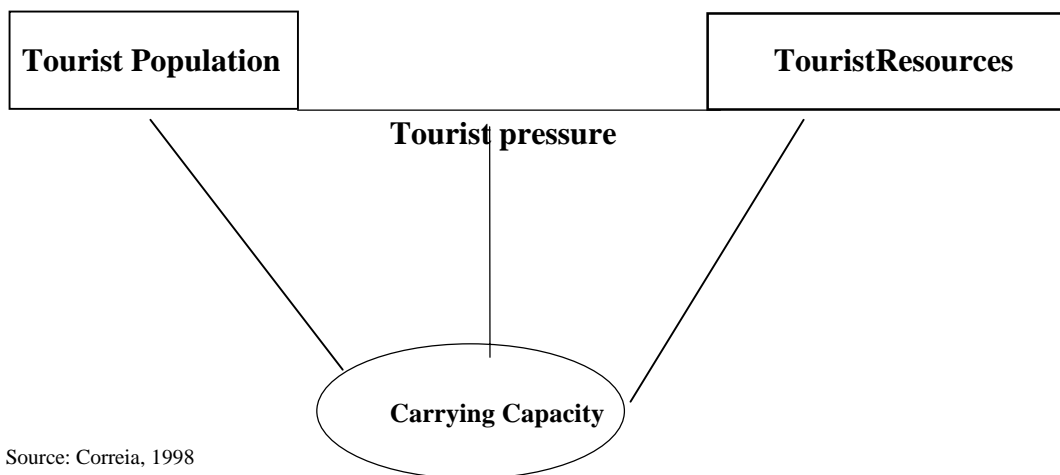
Unit: thousands

	Maxim	Minimum
January	78	0
February	101	35
March	126	47
April	187	48
May	156	76
June	309	134
July	466	204
August	529	433
September	386	200
October	207	56
November	99	15
December	114	10

Source: Univ. Algarve - UCEE,1998

3. Carrying capacity indicators

The evaluation of the carrying capacity assumes the combination of the touristic population movements with the installed capacity so we can evaluate the degree of use of the equipment and the potentiality



Source: Correia, 1998

The evaluation criteria of the carrying capacity defined in this work, although they are not exhaustive, they allow us to evaluate the touristic saturation in its measurable part.

- . Levels of the utilisation of the accessibilities (Railroad, highway and airport)
- . Rate of touristic occupation

- . Seasonability
- . Indices of domestic water consumption and production of solid waste
- . Rate of the touristic activity

This method to evaluate the carrying touristic capacity demands a previous rationalisation as concerns the comparable models used as reference parameter to the criteria or quantifiable factors and even to the most difficult quantifiable ones.

The definition of rules suitable for the tourism is a relatively recent matter and it is on an experimental phase. There aren't universal rules that can be transferred as strict goals to a specific touristic region.

The rules used as reference patterns in this study were suggested by OMT³ and in the cases where it was possible they were adapted by the fixed limits in the plan of the territory classification, (PROTAL,1990)⁴ and in the regional plan of tourism (PRTA,1993)⁵.

3.1. Rate of occupation and rates of touristic activity

The bed occupation rate is by definition the relationship between the number of overnights and the number of beds, that is, it represents the probability of utilisation of the same bed during a specific number of days throughout the year.

$$TO = \frac{D_m}{c \times 365dias} \times 100$$

Where:

$\frac{c}{c} = N \Rightarrow$ Bed occupation rate

$D_m \Rightarrow$ Number of overnights

$c \Rightarrow$ Number of beds

³ OMT World Wide Tourism Organization

⁴ Regional Plan for the Territory (PROTAL)

⁵ 1983, Rapport du Secretaire Generale sur l'execution du Programme general de travail pour la period 1982-83. Additif (B.4.2.2), OMT

The occupation rate allows us to evaluate the exceeding capacity of installed lodging and the predominance of a seasonal model.

The touristic activity rate can be defined as the relationship between the number of beds per tourist and the resident population,

$$TT = \frac{C * 100}{PR}$$

Where:

TT - touristic activity rate

C - Number of beds

PR - resident population

This touristic activity rate allow us to compare the potential of the touristic activity, measured by the capacity of total lodging and the real activity rate measured by the greatest lodging occupation.

Taking the capacity of lodging into account, Algarve presents a touristic activity rate much higher than the real one if we only consider the capacity used at the peak of the season.

Table 2 - Rate of occupation and Rates of touristic activity in Algarve, 1996

Potential touristic activity rate	191%
Real touristic activity rate	145%
Occupation rate	25 days

Source: Correia, 1998

3.2. Accessibilities and means of transport - traffic jam

Accessibility depends on the way that the access to the region takes place. In Algarve the main accessing means to the region by foreign clients is the airport, through charter flights, but we can't forget the enormous national fluxes that travel by car which bring traffic problems.

- **Airport**

The airport of Faro has a capacity to serve 38400 passengers per day, with chances of increasing to 52800 passengers per hour with the enlargement of the Check-ins.

- **Railroad and highway infrastructures**

Although there aren't official data of the carrying capacity (utilisation level), the following daily utilisation indices result from the evaluation of the touristic population:

Table 3 - Average Daily traffic of the touristic population

Train	117 376
Airport	60 180
Busses	4 229
Other cars	296 775

Source: Univ. Algarve - UCEE,1998

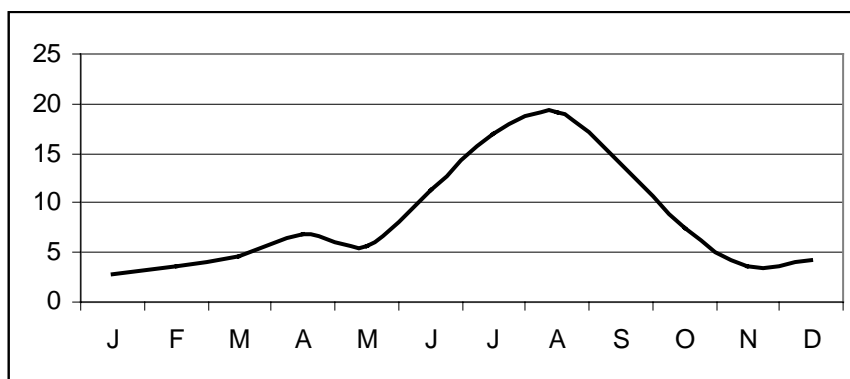
We must heighten the traffic jam that takes place in the accessing ways to the region, mainly the airport and the accessing roads to the touristics buildings.

The excess of people circulating on the roads, the ignorance of the dangers which they offer, worsen the highway accidents.

3.3. Seasonability rate

The touristic search in Algarve, estimated by the number of people present in the region shows the great concentration of tourism during the months July, August and September, confirmed by the seasonability rate of this population.

Chart n°1 - Seasonability index in Algarve, 1996



Source: Univ. Algarve - UCEE,1998

There is a high season (from May until September) which concentrates 64% of the annual demand; an average season (October, and from January until April) which concentrates about 26% of the annual demand and a low season (November and December) where the demand represents 10%.

The reasonability is a problem in a way it turns into difficulties to the hotel industry, in particular the rentability of the operations within a short period and the management of the human resources and also to the local authorities, who have more problems caused by a deficient structure of receipts and expenses, consequence of an effort in sub-used infrastructures.

3.4. The infrastructures limit capacity

- water-supply
- treatment of the residual waters
- production of solid waste

The limit capacity shows the number of visitors beyond which the existing resources will have to be reconsidered.

Taking into account the touristic population during August in 1996, which reached 529 000 individuals, the average consumption of the resident population, the capacity of the installed water-supply, the capacity of the treatment of the residual waters and the gathering of the solid waste (PRTA, 1993), we found the number of visitors that can use these services without the necessity to create a new infrastructure.

Table n° 4 Infrastructures limit capacity

	Tourist Population by day	Rate of coverage
Domestic Water Supply	598 028	113%
Treatment of residual waters	612 400	116%
Collect Solid Waste	388 667	73%

Source: PRTA,1993

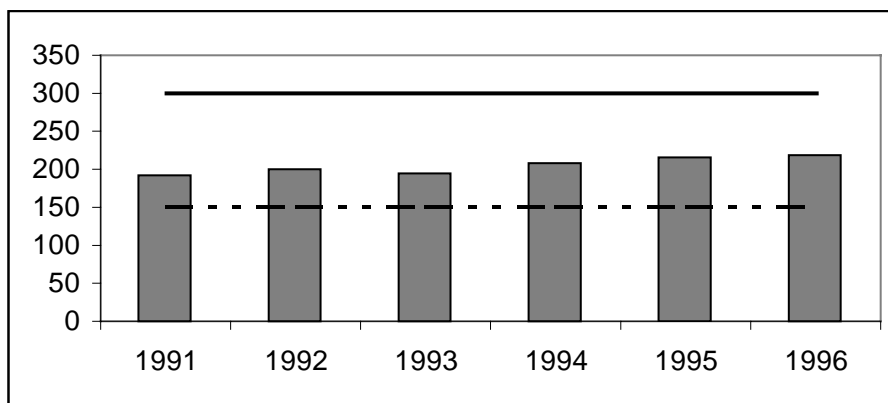
The main necessity relies on the gathering of the solid waste, though the system of water supply and treatment can be considered critical if we verify rates of lodging occupation of 100%.

3.5. Other indicators of the carrying capacity

a) Average lodging dimension

The average lodging dimension varies according to the kind of enterprise and region. The OMT considers acceptable an average lodging dimension of 150 to 300 bedrooms.

Chart nº 2 Average Lodging Dimension in Algarve, 1996



Source: DGT

The chart analyses shows that the lodging is about 200 beds per hotel, though the lodging tends to approximate the maximum number of beds foreseen by OMT. This shows the proliferation of smaller dimension hotels, with a management and services closer to the client.

b) Trade and services

A touristic region usually needs a combined commercial services.

Admitting that a shop is 100 m² and that a bed needs a commercial area of 0,67 m², we estimate the commercial necessities for the region:

Table nº 5 Commercial Equipment in Algarve, 1996

	1996
Commercial Necessities	3550
Existing Commercial equipment	6412
Cover Rate	180% ⁶

Source: Correia, 1998

⁶ Hypothesis: 149 beds by shop

If there were 100% occupation rates, the needs of commercial equipment would go up to 5167 shops, keeping an excess which guarantees a relevant safety in the non-saturation of these infrastructures.

a) Carrying capacity of the beaches

The carrying capacity of the beaches was estimated taking into account the Regional Plan of Tourism for the Algarve Area and the pattern values of the OMT, which considers that the quality standard capacity of a beach is 10 m² of beach area and 1 metre front per user. The carrying capacity was calculated taking into account that 30% of the resident population and 80% of the touristic population go to the beach simultaneously with a turnover equal to 2.

Table n° 6 Carrying capacity of the beaches in Algarve, 1996

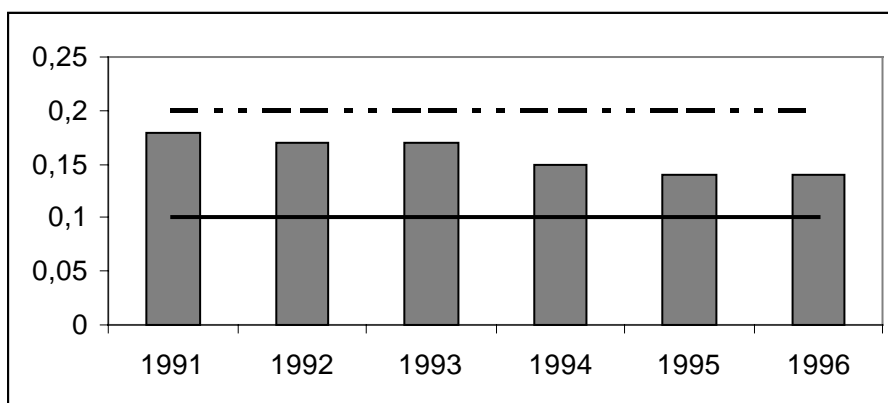
Limited capacity	273 493
Cover rate	80%

Source: Correia, 1998

In a whole the beaches in Algarve present an area per person inferior to the capacity considered as determiner of quality of the same.

a) Employment

Chart n° 3 - Ratio Employee by Bed



Source: INE

The number of employees per bed can change between 0,1 and 0,2, according to OMT. In Algarve this result is ensured in average terms at the peak of the beach season, decreasing substantially in the low season.

4. Conclusions

With the preparation of this document we wanted to elucidate two main aspects.

First, the estimation of the carrying capacity, measured in terms of touristic population on a monthly basis but that cannot be determined in the official statistics.

Second, the evaluation of the real dimension of the problem of the touristic saturation sustained by the valuation of the carrying capacity.

This essay intended to contribute to the characterisation and evaluation of the carrying capacity in terms of indices and levels of utilisation of the equipment and infrastructures in space and in time.

The evaluating model of the touristic carrying capacity, which is not exhaustive, intends to show the importance of the evaluation of the tourism impact in the region. The concept of touristic carrying should be considered as a dynamic and multidimensional concept, which varies according to the region, season and developed intensity.

The limits of carrying, which constitute an important effort to measure the consequences of the touristic activity in the resources of the region, should be understood on a good flexible basis, where the management shouldn't consubstantiate on the maximisation of the utilisation, but on a very good utilisation viewing an integrated quality.

In a touristic region very well developed as Algarve where the risks of saturation are pretty obvious, the priority should be the improvement of the management process where all the entities should be involved to diminish the touristic pressure and direct the demand to other products less seasonal.

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