Carrying Capacity Calculation

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Physico-ecological carrying capacity

$$PCC = \frac{A}{A_u} \times R_f$$

(Equation (1)

where PCC is the physical carrying capacity,

A is the size of the study / visited area,

Au is the area available per user and

Rf is the rotation factor or number of visitors per day.

real carrying capacity

$$RCC = PCC \times (cf1 \times cf2 \times cf2 \times \ldots cfn)$$

(Equation (2)), where RCC is the real carrying capacity, PCC is the physical carrying capacity and
cf1…….cfn are the correction factors, determined using the Equation

$$Cf_x = 1 - \frac{Lm_x}{Tm_x}$$

(Equation (3)), where Cfx is the correction factor of variable x, Lmx is the limiting magnitude of variable x and
Tmx is the total magnitude of variable x.

correction factors

- Considering that tourism is dependent upon environmental attributes, six were considered for this study: rainfall, strong winds, absence of sun, beach erosion and temporary closure, all selected because of their limiting power in the tourism activity, facility of analysis and because of enabling the measurement of the sustainability level of a tourist destination

Rainfall

- Four months are of particular interest in the climatic pattern of the southern tip of Portugal affecting mainly the coastal zone:
- November, December, January and February with the highest rain patterns with more than 400 mm on average (MAOT, 2000).
- The limiting magnitude for this parameter was determined as 120 days / year,
- while the total magnitude was the total days of the year (assumed as 365). Therefore, the correction factor for rainfall was determined as 0.6712 or 67.12%.

Strong winds

- This factor was included as it can largely influence the recreational satisfaction of people on the beach by transporting large amounts of sand and or by creating strong waves that can reduce
- satisfaction of many beach users (except beach surfers that might enjoy these times). In the Algarve region, four months are of particular importance as a result of the eastern winds (June, July, August and September). The limiting magnitude was determined as 122 days / year for Faro Beach with the total magnitude remaining all days of the year (365 days). The corrective factor for this parameter was 0.6658 (66.58%).

Sunshine

- This can be the most important factor for beach tourism as without sunshine few people go to the beach for recreational activities. Considering MAOT (2000), the Algarve region having
- 3000 h of sun per year means that for around 5760 h there is no sunshine. The limiting magnitude for the absence of sunshine was determined as 5760 h and as a result, the correction factor of this parameter was determined as 0.3425 or 34.25%.

Temporary closure

- According to the Act 44/2004 of 19th August, the bathing season for Faro Beach is established from 1st June to 30th September. This parameter means that the beach is officially closed for the entire eight months of the year (January, February, March, April, May, October, November and December). The limiting factor for this parameter was determined as 243 days, the total magnitude was 365 days and as a result, the correction factor was calculated as
- 0.3342 (33.42%).

Beach erosion

- This parameter is of great importance for beach tourism, as it reduces available space for recreation. Considering results provided by Dias et al (2004) and Ciavola et al. (1998), Praia de Faro faces an erosion index of 1.7 m/year. Using this parameter and ignoring beach nourishment, it may be assumed that Faro Beach loses 3060 m2/year (1.7 m width 1800 m long). Therefore, the limiting factor was determined as 3060 m2, the total magnitude was the total area of the beach (90,000 m2) and the corrective factor was
- calculated as 0.966 (96,6%).

effective carrying capacity

- The effective carrying capacity is a result of the combination of the real carrying capacity with the management capacity of the area, as described by the Equation

$$ECC = RCC \times Mc$$

(Equation (4)), where ECC is the effective carrying capacity, RCC is the real carrying capacity and Mc is the management capacity. This last parameter was determined using infrastructure and equipments available, assessed by means of beach users' perception and evaluation during the survey period with results showing an overall capacity of 83.8%.