

Threats and Challenges of island carrying capacity today: where we are heading?

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Abstract

Despite a substantial number of studies dedicated to the broadest sense of the carrying capacity concept, and a plethora of underlying theories and evaluation methods that have been reported over the past decades, one can argue that island carrying capacity as a tool for achieving effective sustainable development, is under-researched. Indeed, island carrying capacity, i.e., study at the island setting, is a largely different research theme due to the varied meanings, principles, emphasis, and implications and islandness. Against this background, this research is aimed at summarizing critical reviewing related studies on carrying capacity. Through an extensive literature review, this paper integrates the existing concepts of carrying capacity and sustainable development, reviews current research status, compares the pros and cons of related research methods, summarize knowledge gaps, and makes suggestions for planners and managers to ameliorate carrying capacity framework for achieving island sustainable development. It contributes to a better understanding of the link between carrying capacity and sustainable development. The discussion will inspire researchers to advance from the current status, and also provide clues to place managers and planners for developing appropriate strategies and actions to improve island planning and management.

Keywords: carrying capacity, sustainable development, islandness, insularity, islands

Extended Abstract

It is very probable that Covid19 pandemic is going to change several paradigms in various fields, including health, tourism, architecture, and the environment, just to name a few Howe et al. (2020). Even though – for now - there is a difficulty in assessing paradigm shifts and the long-term implications of the pandemic, one can understand that already fragile systems like islands will be in the spotlight and at the same time, any improvements and any updating of existing frameworks and models, are fundamental for producing contemporary policies that will effectively lead to ameliorating relevant decision-making procedures. In this present conference paper, the authors aim to focus on carrying capacity as a policy framework for decision-making because it has a specific importance for islands, given their transdisciplinary

research backgrounds. Islands are defined by their small size and population, by their regionality and isolation and by their rich but fragile natural and cultural environment (Spilanis, 2012). They have strictly defined boundaries and clear flows of people and goods as there are at most two types of entry and exit points - ports and airports. Therefore, the concept of carrying capacity is easier and more meaningful to be applied on islands and can be a useful tool in evaluating their sustainability. Through a critical literature review, this paper integrates the existing concepts of carrying capacity and sustainable development, reviews current research status, compares the pros and cons of related research methods, summarize knowledge gaps, and makes suggestions for planners and managers to ameliorate carrying capacity framework for achieving island's sustainable development. It contributes to a better understanding of the link between human activities' footprint, carrying capacity and sustainable development. The research findings aims to inspire researchers to advance from the current status, and also provide clues to place managers and planners for developing appropriate strategies and actions to improve island planning and management.

To begin with, it is necessary to address some relevant concepts, starting from those related to islands. The term *insularité* (insularity in English) was first developed and extensively used by geographers in the 19th century. The traditional view of insularity as a mere disadvantage, may stem indeed from unexploited opportunities deriving from a "lack of local coherence between natural resources, human capital and the institutional context" (Gloersen *et al.*, 2012). However, insularity is more than a mere geographical status, being a mixture of geographical features, the result of political decisions and several social, economic, and cultural conditions. Spilanis *et al.* (2011: 35 – 36) stress that islands can be thought of as objects 'of the mind' as well as 'physical' objects. They recognize four main characteristics that, seen in combination, define insularity. These are:

- **Small Size:** Often, islands are small both in terms of areal size and population compared to "mainland". Their small population results in a limited internal market and constrained local demand for commodities and services, as well as limited workforce. This, in its turn, limits scale and concentration economies. Concurrently, small size means that islands tend to have precious few -if any- land resources for competitive agriculture, whilst they also regularly lack key natural resources, including adequate water supplies, fossil fuels but also non-fuel minerals. In cases where raw materials may have been available in the past, these have now often been exhausted. The islands' small size has meant their environmental balance is regularly seriously endangered and this trait, in turn, makes environmental management a necessity.
- **Remoteness and isolation:** that result in high installation and operating costs for companies, households and the state.
- **Special experiential identity:** The particularities of insular space affect perceptions, behaviors and actions. As has already been mentioned, islands are 'objects of the mind' in addition to being physical objects and they are viewed in different ways by visitors – tourists and mainlanders – compared to long-term local inhabitants. While

for the visitor, islands can be places to 'escape' from everyday life and live 'utopias', local inhabitants may have highly different views.

- **Rich and vulnerable natural and cultural environment:** Because of their small size and their isolation many islands have witnessed the evolution of unique endemic species and, as a result, have valuable terrestrial and marine ecosystems. Additionally, numerous islands have a rich historic past due to their strategic position on the maritime routes, which is presently highlighted through monuments, settlements, and landscapes; many of these have been classified as national, European, or even world cultural heritage sites. This unique natural and cultural capital has been used till now mostly for the development of tourism - and in the case of the majority of Mediterranean islands mass tourism.

Moreover, in academia, islands are frequently shrouded in discourses and practices of exceptionalism. There is a debate within the *nissology* framework, i.e. the study of islands in their own terms, about the uniqueness of islands. Still others find islands 'living labs', central to understanding what happens subsequently on mainland territory. Islands are often viewed as "places [...] in need of saving; as places that must be improved and brought up to dominant continental standards" (McCall, 1994: 1). Indeed, islands have always been a bone of contention, either seen as paradise or hell. Ilan Kelman's (2020) "Islands of vulnerability and resilience," questions the discourse of risk, vulnerability, and resilience that often surrounds islands in both scholarship and the popular press. Kelman shows that, far from being objective characteristics, these concepts are cultural constructs with the power to influence island development choices and policy-making.

Thus, it is necessary to discuss the carrying capacity concept for achieving sustainable development within islandness framework. A plethora of studies have been focusing on tourism carrying capacity, often referring to islands as case studies because islands are popular tourist destinations (e.g. O'Reilly, 1986; Lindberg, McCool & Stankey, 1997; McCool & Lime, 2001; Kostopoulou & Kyritsis, 2006; Castellani, Sala & Pitea 2007; Butler, 2019; Faiz & Komalasari 2020; Mota, Franco & Santos, 2021). Indeed, nowadays – after many decades of the mass tourism model prevailing - sustainable tourism development is crucial for islands, especially given that tourism is a fundamental economic activity for a large number of islands not only in Europe but globally; this is due to the vulnerability that characterizes insular areas. The basic principle of sustainable tourism development lies in the preservation of ecological, socio-demographic, and economic-political dimensions, where the presence of human activities and processes represents the key factors (Hall, 2011). The past few years, before Covid19 pandemic, phenomena like overtourism (Wall, 2020) and climate change had brought again to the spotlight issues of carrying capacity being reached and surpassed in various cases. While tourism continuously evolves and puts pressure on places, societies and existing development strategies, more research is needed that includes and incorporates sustainability theories, models and tools. (Mitropoulou & Spilanis, 2020: 37).

In fact, it seems rather impossible to talk about islands without addressing issues of sustainability and carrying capacity because limitations of all kinds are in the core of islands' essence. Either because of objective features like land and water limitations or because of issues created by islands' relative conditions and dependence of the mainland, insular areas are the ideal laboratories for examining and testing models and tools for achieving sustainable development such as carrying capacity. However, current literature review reveals few research gaps focusing on that matter.

The concept of carrying capacity can indicate whether the pressure caused by the population and the economic activities developed locally overwhelm the recipient place or not. However, an accepted definition of the concept does not exist (Navarro Jurado *et al.*, 2012) and there are even those who question its usefulness (McCool & Lime, 2001). (Lindberg, McCool & Stankey, 1997) argue that carrying capacity definitions usually do not help with the adoption of practical policies. It is not possible to specify a carrying capacity when the evaluative criterion that reflects an objective is not precise. Most of the research on carrying capacity in human societies has focused so far on two main and complementary categories: the population carrying capacity and the carrying capacity for tourism.

But what exactly needs to be monitored on the islands? Do we have to calculate a global index as the ecological footprint and to compare it with the bio-capacity of the island or we need to examine every sub-sector separately? Is an approach that focuses exclusively on tourism sufficient? The authors of current paper argue that for carrying capacity to be a meaningful and practically useful tool, an integrated/ holistic approach should be applied.

Thus, they propose that the carrying capacity framework must take into account:

- The totality of the local activities; tourism activities should not be the mere exploratory activity for discussing carrying capacity on islands.
- How to achieve balance in all three sustainable development dimensions using the SDGs'.
- Examine separately the carrying capacity of every important component of the island system in order to be able to use the results for policy purpose; any attempt for a composite index is to be used only for comparison reasons.

The basic elements of great importance on an island are the following:

- What is the maximum water consumption that the island can handle without destroying aquifers obliging tankers transferring water from the mainland or desalination plants?
- What is the maximum amount of wastewater that the infrastructure of the island can support? And how is this infrastructure allocated on the island?
- What is the maximum amount of solid wastes that the island can handle without damaging the capacity of the soil to produce ecosystem services? And maybe more important, what type of solid waste cannot be handled by it?

- What is the maximum power that the electric network can handle without compromising its stability, especially for the non-interconnected islands?
- Is new land taken for urban use without creating severe fragmentation and without threatening biodiversity, water infiltration, soil quality and the other economic activities of the island? If yes, how much land and in which areas?
- What is the maximum amount of people (tourists and locals) that can simultaneously visit the island without impairing its socio-cultural environment and its economy?

It is very important to perceive carrying capacity not as some static limits to restrain growth but as a useful sustainability assessment tool that helps the local and regional authorities and stakeholders to perform a more efficient development plan. A water shortage on a touristic island can be a result of increased water consumption of both the tourism sector and the agriculture. The role of the scientist is to provide this kind of data in a holistic approach. Then it is up to the local stakeholders to decide how to respond and plan their strategy. It could be the implementation of limits in any of the economic activities, or initiatives to increase the efficiency of the water use or even the initiation of new infrastructure projects to increase the carrying capacity of the island.

All in all, the scope of this contribution to the specific conference is, based on the carrying capacity approach and by adopting the approach of studying islands on their own terms, to reexamine and discuss a methodology that aims at assessing island carrying capacity. Various carrying capacity theories and indexes that have been used over the past few years are included, and the authors are going to suggest incorporating new elements into the prevailing models by taking into account islandness and the need to balance all three dimensions of sustainable development: environmental, social and economic.

Keywords: carrying capacity, sustainable development, islandness, insularity, islands

References

1. Butler, R.W. (2019), "Tourism carrying capacity research: a perspective article", *Tourism Review*, Vol. 75 No. 1, pp. 207-211. <https://doi.org/10.1108/TR-05-2019-0194>
2. Castellani, V., Sala, S., & Pitea, D. (2007). A new method for tourism carrying capacity assessment. *WIT Transactions on Ecology and the Environment*, 106, 365-374.
3. Faiz, S. A., & Komalasari, R. I. (2020, November). The assessment of tourism carrying capacity in Lombok Island. In *IOP Conference Series: Earth and Environmental Science* (Vol. 592, No. 1, p. 012002). IOP Publishing.
4. Gloersen, E., Michelet, J. F., Corbineau, C., Giraut, F., Price, M. F., Borowski, D., and Schuiling, R. (2012). *GEOSPECS-European perspectives on Specific Types of Territories*.

5. Hall, C. M. (2011). Policy learning and policy failure in sustainable tourism governance: From first-and second-order to third-order change?. *Journal of Sustainable Tourism*, 19(4-5), 649-671. <https://doi.org/10.1080/09669582.2011.555555>
6. Howe, D. C., Chauhan, R. S., Soderberg, A. T., & Buckley, M. R. (2020). Paradigm shifts caused by the COVID-19 pandemic. *Organizational Dynamics*, 100804. doi: [10.1016/j.orgdyn.2020.100804](https://doi.org/10.1016/j.orgdyn.2020.100804)
7. Kelman, I. (2020). Islands of vulnerability and resilience: Manufactured stereotypes?. *Area*, 52(1), 6-13. <https://doi.org/10.1111/area.12457>
8. Kostopoulou, S., & Kyritsis, I. (2006). A tourism carrying capacity indicator for protected areas. *Anatolia*, 17(1), 5-24. <https://doi.org/10.1080/13032917.2006.9687024>
9. Lindberg, K., McCool, S., & Stankey, G. (1997). Rethinking carrying capacity. *Annals of tourism research*, 24(2), 461-465. [https://doi.org/10.1016/S0160-7383\(97\)80018-7](https://doi.org/10.1016/S0160-7383(97)80018-7)
10. McCall, G. (1994). Nissology: A Proposal for Consideration, *Journal of the Pacific Society*, 17 (2-3), pp. 1-14.
11. McCool, S. F., & Lime, D. W. (2001). Tourism carrying capacity: tempting fantasy or useful reality?. *Journal of sustainable tourism*, 9(5), 372-388. <https://doi.org/10.1080/09669580108667409>
12. Mitropoulou, A. & Spilanis, I. (2020). From Insularity to Islandness: The use of place branding to achieve sustainable island tourism, *International Journal of Islands Research*, 1 (1), pp. 31- 41 Available at: <https://arrow.tudublin.ie/ijir/vol1/iss1/5>
13. Mota, L., Franco, M., & Santos, R. (2021). Island tourism carrying capacity in the UNESCO Site Laurisilva of Madeira.
14. Navarro Jurado, E., Tejada Tejada, M., Almeida García, F., Cabello González, J., Cortés Macías, R., Delgado Peña, J., . . . Solís Becerra, F. (2012). Carrying capacity assessment for tourist destinations. Methodology for the creation of synthetic indicators applied in a coastal area. *Tourism Management*, 33(6), pp. 1337-1346. <https://doi.org/10.1016/j.tourman.2011.12.017>
15. O'Reilly, A. M. (1986). Tourism carrying capacity: concept and issues. *Tourism management*, 7(4), 254-258. [https://doi.org/10.1016/0261-5177\(86\)90035-X](https://doi.org/10.1016/0261-5177(86)90035-X)
16. Spilanis, I., Kizos, T., Biggi, M., Vaitis, M., Kokkoris, G. et al. (2011). *The Development of the Islands – European Islands and Cohesion Policy* (EUROISLANDS). Final report. Luxembourg: ESPON & University of the Aegean. Available at: https://www.espon.eu/sites/default/files/attachments/inception_report_full_version.pdf (Accessed: 07 December 2020)
17. Spilanis, I. (2012). *European Islands and Political Cohesion*. Gutenberg.
18. Wall, G. (2020), "From carrying capacity to overtourism: a perspective article", *Tourism Review*, Vol. 75 No. 1, pp. 212-215. <https://doi.org/10.1108/TR-08-2019-0356>