

EVIDENCE BRIEF

The **Social Sciences and Humanities Research Council** in collaboration with the **Natural Sciences and Engineering Research Council** and the **Canadian Institutes of Health Research**

SSHRC's Imagining Canada's Future initiative mobilizes social sciences and humanities research to address emerging economic, societal and knowledge needs for Canada, and help guide decision-making across all sectors toward a better future. This evidence brief addresses the Future Challenge Area of: **Living Within Earth's Carrying Capacity**

Uses of carrying capacity measures to guide coastal governance systems for sustainability

About the project

Coastal systems provide multiple ecosystem services like food, accommodation, recreation and protection. Abundant with life-supporting services, coastal systems have historically attracted people, although overuse of these services means ecosystems are degrading. With a growing population in coastal areas, it is increasingly important that the limits of coastal ecosystems, especially in supporting human populations, are known.

Carrying capacity measurement is a common tool for estimating the capacity of an ecosystem to accommodate human demand for ecological resources and services. In coastal areas, carrying capacity measures are shaped by the interactions between finite resources, services available from a coastal system and the consumers (humans and non-humans alike) of these services and resources. Methods for measuring carrying capacity vary across different sectors, such as aquaculture and tourism. Methods for measurement

also outline how carrying capacity and coastal systems are conceptualized. These sectoral and conceptual differences can result in confusion when interpreting the outcomes of measurements, leading to uncoordinated efforts among policy-makers, practitioners and other actors involved in coastal system management.

To fill this gap, it is important to develop a conceptual, methodological and analytical overview of carrying capacity measurements and their applications in various coastal systems worldwide. It is also important to illuminate what actions are being suggested in existing scientific literature for coastal management systems to maintain coastal biophysical, social and ecological carrying capacities. This project analyzed selected research studies to highlight key findings and identify areas for further study, knowledge mobilization activities, scholarly communication and knowledge dissemination.

Key findings

A scoping review-based synthesis of contemporary carrying capacity studies reveals that carrying capacity measurement has gained momentum in recent years, although some limitations remain in its application. The temporal, spatial, ecological and sectoral distributions of the studies are highly skewed, with most studies having been conducted in the last decade (as of 2020), in developed nations (not including the cluster conducted in China), often focusing on beach ecosystems and mostly concentrating on the tourism sector. Moreover, the conceptual and methodological foundations of coastal carrying capacity measures are still under development, which can be considered an opportunity to improve this tool, making it more system-based and policy-oriented. Furthermore, there appears to be a lack of studies on non-beach/tourist coastal ecosystems and urban areas, despite growing interest in coastal studies in those areas.

The conceptual clarity of "coast" and "coastal carrying capacity" also needs to be achieved, as many studies do not clearly explain how they conceptualize these terms. A lack of conceptual clarity may impede the application of these studies toward a system-based management approach. This approach can be facilitated by improving conceptual and methodological tools for measuring carrying capacity, and through the creation of a list of indicators that can be used across sectors and carrying capacity categories.

Coastal carrying capacity measurement considers several categories including ecological, economic, social and physical capacities, all of which have different levels of importance in decision-making. However, the indicators used for measuring each category show considerable overlaps. Thus, it can be summarized that a single categorical measurement is not sufficient for sustainable coastal system management.

Policy implications

In addition to using different categories and indicators, carrying capacity measurement also adopts different frameworks for suggesting policy-specific recommendations. While most of these frameworks are environmental assessment-related, system-based frameworks like ecosystem service or social-ecological systems frameworks have not been adopted. System-based frameworks could be adopted to understand how interactions among different system components can be potentially modified to strengthen the maintenance of coastal carrying capacity.

Although carrying capacity-related studies have made significant contributions that allow us to better understand how to enhance coastal sustainability, policy recommendations made in these studies need to include operational and action-oriented strategies that can be adopted and practised by coastal policy-makers and practitioners.

This study concludes that:

- Carrying capacity should be widely adopted for developing coastal management policy, as it provides a specific conservation target for policy-makers. However, this measure could better be understood and applied if its conceptual and methodological ambiguities are clarified.
- Research into carrying capacity measures across sectors is needed to bridge the knowledge-practice gap. Specifically, further research on carrying capacity measures should be system-based and aim to contribute to the development of policy strategies and management practices.

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FURTHER INFORMATION



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