Compromising between Coastal Conservation and Tourism: An Introductory Guide

By Jill Oestreich, October 2019

Excessive tourism can gradually destroy the very places, with its local cultures, ecosystems and attractions that it is built on. It often leads to impacts such as reduced water and air quality, noise and light pollution, littering, natural habitat loss, loss of biodiversity and enhancement of climate change effects. There is already a vast amount of literature on the topic and many proposals for solutions. This guide will serve as an overview over existing management approaches, small practices that could be helpful and where to find more in-depth research on specific problems. Planning for controlled development helps to make choices between conflicting uses or ways to possibly make them more compatible. It is crucial to begin with planning for tourism development early, so that expensive mistakes can be prevented and deterioration of essential resources for tourism can be avoided. However, it should be noted that in places that have already become very popular tourist destinations there is no other way to safe the surrounding ecosystem, but to reduce tourism and diversify the destinations economic pillars so that it does not solely depend on tourism. So far, the lack of proper planning and management has resulted in the degradation or destruction of many attractions, ecosystems and places of cultural interest.

Why Conserve?

For people to participate in coastal conservation they first need to understand why conservation efforts are crucial to the future of the environment as we know it and how they can contribute. Coastal regions are often rich in biological diversity and contain plant communities and species that are rare. In the Huron-Kinloss guide for beach stewardship they calculated the monetary value of the ecosystem services that dunes deliver. If the 15km dune system in Huron-Kinloss were to be replaced with conventional shore protection the costs would amount to roughly 30 million dollars, simply as shore protection. This value does not include the touristic, aesthetical, recreational or ecological value of the dunes. It is important to realize that by protecting a coastal area a municipality is protecting a multi-million dollar asset.

Conservation efforts are not solely the responsibility of the government, but a combined responsibility of municipalities, residents and visitors to the area. Education and awareness

around the importance and vulnerability of coastal ecosystems are essential to the long-term success of conservation projects.

Marine spatial planning

Marine Spacial Planning (MSP) is a promising solution to take control of when and where human activities take place, in an attempt to make them as efficient and sustainable as possible. By analyzing and allocating the spatial and temporal distribution of human activities that take place in marine areas they can be managed to better meet ecological, economic and social goals.

What are the benefits of marine spatial planning?

When developed properly, marine spatial planning can have significant economic, social, and environmental benefits. Table 2 below shows some of the most important benefits of marine spatial planning.

Ecological/ Environmental Benefits	Identification of biological and ecological important areas
	Biodiversity objectives incorporated into planned decision-making
	Identification and reduction of conflicts between human use and nature
	Allocation of space for biodiversity and nature conservation
	Establish context for planning a network of marine protected areas
	Identification and reduction of the cumulative effects of human activities on marine ecosystems
Economics Benefits	Greater certainty of access to desirable areas for new private sector investments, frequently amortized over 20-30 years
	Identification of compatible uses within the same area of development
	Reduction of conflicts between incompatible uses
	Improved capacity to plan for new and changing human activities, including emerging technologies and their associated effects
	Better safety during operation of human activities
	Promotion of the efficient use of resources and space
	Streamlining and transparency in permit and licensing procedures
Social Benefits	Improved opportunities for community and citizen participation
	Identification of impacts of decisions on the allocation of ocean space (e.g., closure areas for certain uses, protected areas) for communities and economies onshore (e.g., employment, distribution of income)"
	Identification and improved protection of cultural heritage
	Identification and preservation of social and spiritual values related to ocean use (e.g., the ocean as an open space)

Figure 1: UNESCO MSP

Smart planning can lead to optimal use of the coastal zone. Possibilities for ecological improvements could be to mark areas that aren't used a lot by people as human free zones or to remove any installations on the beach such as food stands, bars or sunbeds during the offseason, so as to give the environment time to recover. Determining what regions are important to humans for recreational use, which zones are essential to nature and where there is a need and possibility compromise is crucial in the future development of coastal regions. For

more information on Marine Spatial Planning please consult the UNESCO guide on how to implement MSP called "Marine Spatial Planning – A Step-by-Step Approach towards Ecosystem-based Management".

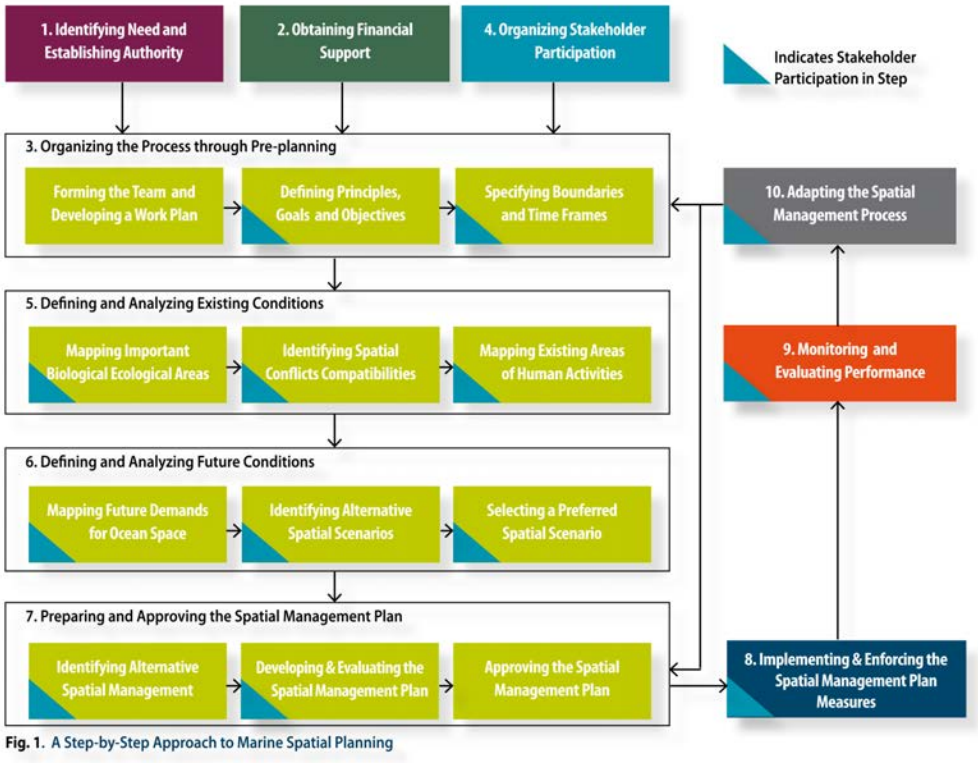


Figure 2: A Step-by-Step approach to Marine Spatial Planning

Carrying capacity

Tourism that exceeds the carrying capacity of an ecosystem and lacks effective management and planning results in the destruction of the very resources on which it is founded. Therefore, proper management of tourism is essential for its longterm development. In the paper 'Beach Carrying Capacity Analysis for Sustainable Tourism Development in the South West Coast of India' four different types of carrying capacity are mentioned:

1. Physical carrying capacity – the limit of a site beyond which wear and tear will start taking place or environmental problems will arise.
2. Psychological (or perceptual) carrying capacity – the lowest degree of enjoyment tourists are prepared to accept before they start seeking alternative destinations.
3. Social carrying capacity – the level of tolerance of the host population for the presence and behaviour of tourists in the destination area, and/or the degree of crowding users (tourists) are prepared to accept by others (other tourists).

4. Economic carrying capacity – the ability to absorb tourism activities without displacing or disrupting desirable local activities.

Determining the carrying capacity of a coastal ecosystem can be helpful in setting a timeframe and general guidelines for all possible conservation projects. Knowing where the limits of a system are is important so they won't be exceeded, and the beach can be used and managed sensibly.

For more detailed information on carrying capacity please consult the paper called 'Beach Carrying Capacity Analysis for Sustainable Tourism Development in the South West Coast of India' by Brilliant Rajan, Vincy Mary Varghese and Anakkathil Purushothaman Pradeepkumar.

Beach Stewardship

People need to learn about the environment they are in and the way their behavior can negatively impact it. Beaches are mostly public places that often face the 'tragedy of the commons', which is when a public good gets overused because everyone wants to benefit from it and no one is protecting it. A possible way to lower the effects of the tragedy of the commons would be to have trained people on location that can mitigate the interest of the environment and human interests, inform people about how to best behave and take action or report to local authorities when things get out of hand. The idea is to have someone represent and defend the interest of the environment to keep it from being overexploited. A beach steward could also serve to collect information on tourist preferences, spatial data and inform beach guests on the proper usage of the beach and local rules.

Interpretive Walks

In order to involve the local community and promote the conservation efforts, interpretive walks could be organized. Local volunteers could be trained in conducting educational walks to inform other people about the significance of the beach ecosystem, its local attributes and any other important information about the local coastal region. This way local municipalities can work together with the community and heighten citizen's sensitivity to the importance of their beach ecosystem and its economic, social and environmental value.

Sand management

Current problems

Sandy shores provide a wide range of ecosystem services, many of which are fundamental in their functions for human uses of sandy coasts. The most important ecosystem services

according Silva et al. include sediment storage and transport, wave dissipation and associated buffering against extreme events (storms, tsunamis), dynamic response to sea-level rise (within limits), breakdown of organic materials and pollutants, water filtration and purification, nutrient mineralization and recycling, water storage in dune aquifers and groundwater discharge through beaches, maintenance of biodiversity and genetic resources, nursery areas for juvenile fishes, nesting sites for turtles and shorebirds, prey resources for birds and terrestrial wildlife, provision of scenic vistas and recreational opportunities, supply of bait and food organisms and functional links between terrestrial and marine environments in the coastal zone. It is a long list of services provided by the beach ecosystem, showing just how crucial it is to make sure that the system functions well.

Human intervention in the natural sand budget and ecosystem services can a wide range of impacts such as the limitation of water circulation and therefore the slow dispersal of pollutants and other materials, destabilization of the dunes as a result of changes in the dune vegetation, disruption of beach food webs by removal of organic marine inputs and changes in biodiversity through disturbance of nesting areas. The common practice of drift line removal by machines hinders the formation of natural vegetation and takes away the food basis and natural habitat for small lifeforms. This lack of vegetation also makes the sand less stable, making it easier for it to be blown away by wind. On beaches where there are many people walking around the sand gets compacted, leading to reduced biodiversity of plants and animals. Visitors to the beach unknowingly take a lot of sand with them in their shoes and bags when accumulated over thousands of people.

All around the world sea levels are rising, while human populations are expanding on land. This development leads to coastal squeeze where the beaches are trapped between erosion and rising sea levels on one side and urbanization on the other, leaving little space for normal sediment dynamics. Coastal squeeze could become a problem in many regions in the future so it would be wise to start looking for solutions now.

For more information on problems concerning the sandy beach environment please consult the paper ‘Threats to Sandy Beach Ecosystemss: A Review’ by Defeo et al..

Management strategies

The sediment budget analysis as proposed in ‘The future of insular beaches: Insights from a past-to-future sediment budget approach’ by Silva et al. could pose as a helpful tool in managing sand flows. Understanding and managing coastal evolution drivers is essential to the future of coastal ecosystems and their varied uses.

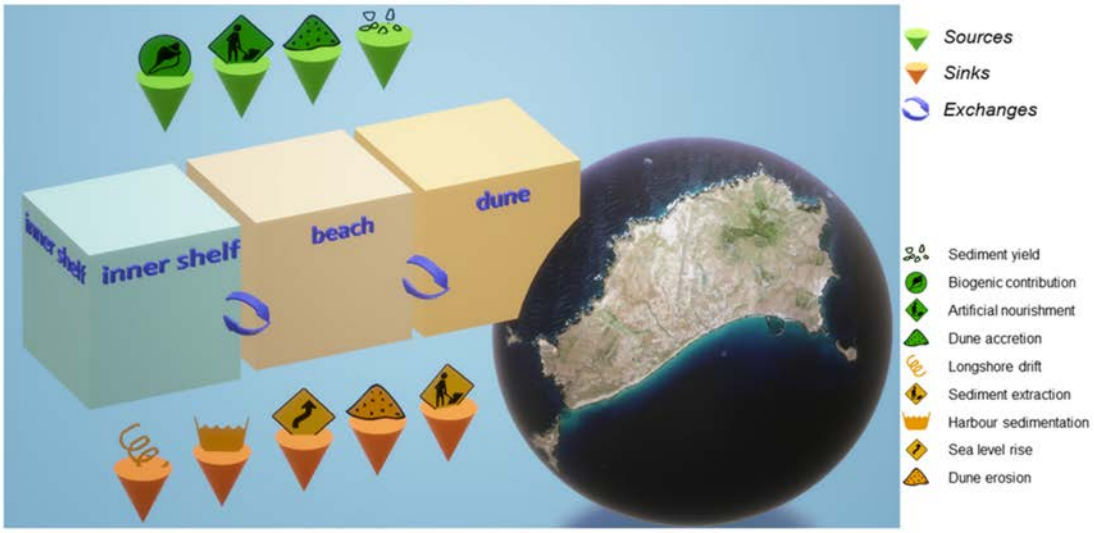


Figure 3: Sediment budget framework with relevant sources and sinks from Silva et al.

Beaches and dunes are independent yet highly connected. When sand gets blown landwards by the wind it accumulates on the dunes, building them up. In turn beaches 'borrow' sand from dunes when storm waves transport sand back to the shore. A crucial player in this rebuilding process is the presence of dune vegetation that can keep sand from blowing further landwards by stabilizing it along the waterfront. Vegetation reduces the windspeed leading to grains of sand depositing along the dunes. Therefore, a possible management strategy would be to plant local beach vegetation and protect some beach areas with a lot of vegetation from trampling.

Figure 4: Lake Huron

Sand fences are a simple way to mitigate beach and dune erosion. A good material to use for the fences is wood, as it is robust, natural and doesn't negatively impact the aesthetical value of a beach. Fences slow onshore wind velocities, which leads to sand collecting behind the fence. Sand accumulations will take place in an area behind the fence measuring roughly eight times the height of the fence. Sand fencing alone should not be considered a long-term solution. The

accumulated sand is loose and still vulnerable to wind erosion. Only vegetation can provide the necessary structure and stability for beach dunes. Sand fencing should therefore be combined with planting of dune vegetation and used only until the planted vegetation itself has become established enough. Another benefit of sand fencing is can possibly keep people away from freshly planted areas and therefore prevent trampling.

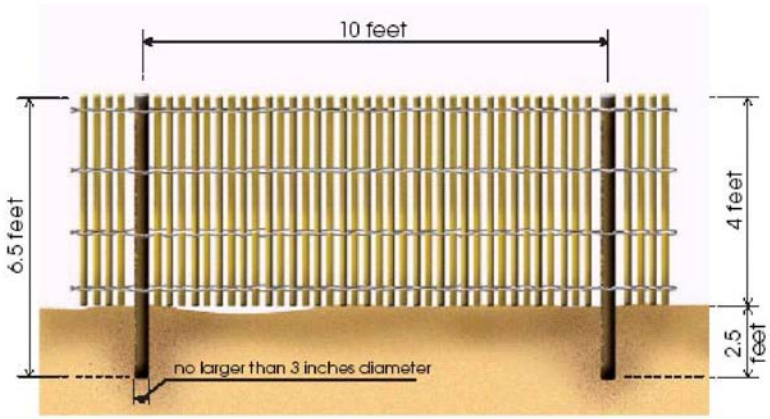


Figure 5 Lake Huron Sand Fencing

For a more detailed guide on how to implement sand fencing and planting of beach vegetation consult the 'Beach Stewardship Guide for the Township of Huron-Kinloss' by the Lake Huron Centre for Coastal Conservation.

Vehicle Access

The use of vehicles, including cars, beach cleaning vehicles and sand mobiles among others can have a profound negative impact on beach ecosystems. Vehicle traffic on beaches leads to the beach sand compressing at depth, while the surface sand gets loosened and therefore more prone to wind and/or water erosion. Furthermore, vehicles can destroy existing vegetation, break underground rhizomes and crush seedlings of seasonal and young plants. Recreational vehicles should therefore be prohibited from entering the beach area if possible. Vehicles that for some reason need access to the beach should only enter and operate in designated areas. Local municipalities should educate the community about why the above measures are being taken. This can be done by posting notices throughout the beach about the prohibition and its reasons.

Apart from the direct damage that cars can bring to the beach their placement when they are not needed creates another problem. Parking takes up a lot of space and when not planned properly people often leave their cars anywhere on the side of the road, on the sand or in nearby forests, damaging the soil. Parking should not be free. The proceeds could be used to invest into ecosystem management. It is an easy way to both get people's attention and let

them know the rules of the beach, control the amount of people that access the beach and finance conservation efforts.

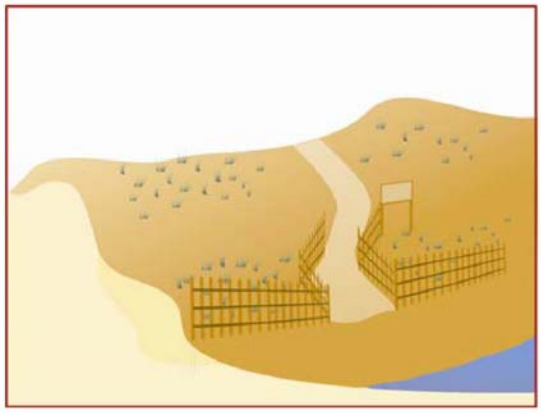
Beach Cleaning

Many people perceive natural drift lines containing wood, algae and sometimes human waste such as plastic as bothersome and unaesthetical. However, the removal of such takes away the natural habitat of a number of species, mostly small invertebrates, which are themselves food for birds. Many municipalities are now cleaning their beaches on a regular basis using various heavy machines. This inhibits the natural formation of beach vegetation, destroys small corridors in the sand that animals use to live and hide in and dislodges many animals in less frequently used areas. A research team in Zingst, Germany found that the number of individual beach animals were double the amount in fall and spring compared to the summer season (Borcherding et al. 2019). Especially in areas that were frequently used by people (walking, sunbathing) some of the common local species would go completely missing during the summer season pointing to a negative human influence to the beach ecosystem.

While not being a satisfying ecological solution, a proposed mitigation approach for very frequently used beaches would be to remove the drift line as quickly as possible. While this would remove most life from the beach it would also keep flying insects to settle down on these areas and then get killed later on. Ideally the social perception of algae on beaches as ‘dirty’ would change and the drift line just left as is. Furthermore, sand compaction should be kept to a minimum by creating access pathways for people to walk on instead of letting them walk all over the beach and by cleaning the beach manually (if at all) instead of using big, heavy machinery.

Beach Access

Sufficient access to beaches is important to people using the beach. The design and maintenance of beach access points can influence the quality of a beach. Access pathways that are at a right angle to the shoreline are more prone to wind erosion. Pathways that form a ‘S’ shaped curve can help preventing winds from blowing away too much sand.



Beach access pathways should be as narrow as possible to minimize the surface area exposed to wind. By making the pathway and "S" shape,, exposure of the path to wind scour and erosion is greatly reduced.

Figure 6: From the Lake Huron Beachstewardship Guide

In the paper "Beach Carrying Capacity Assessment: How important is it?" by Carlos Pereira da Silva it was observed which region of the beach gets used most by humans and by which factors this is influenced. The results showed that main factors are available parking area and distance from the waterfront. It was clearly shown that there were areas where people rarely ever choose to reside. This information is valuable as it could be used to create pathways that lead to the regularly occupied areas and disburden some beach regions from trampling. The maximum sustainable capacity of an area requires the careful planning of geographically separated access points.

Waste management

At beaches where a lot of people choose to spend their free-time a lot of garbage is produced and left behind. This poses an important management issue as debris can choke, poison or entangle wildlife. Beach access pathways should be equipped with waste bins and a code of conduct placed at public beach access points to promote appropriate behavior at the beach. Sanctions should be implemented for the case that people do not follow the code of conduct.

A common issue are cigarette buds that are left in the sand, as they contain a high number of toxic components that get released into the environment. At local kiosks and tabaco stores paper ashtrays could be sold that people can use while on the beach and then throw away in a nearby garbage can. There is a variety of designs for such ashtrays on the market, some are even used as marketing gifts.

Faulty sewage disposal systems are another source of pollutants that end up in the beach ecosystem. This is clearly an issue where the responsibility lies with the local government to

install appropriate systems and maintain them. Beach water quality analysis should be conducted on a regular basis.

Summary

The beach ecosystem is undergoing massive changes in many regions and it is important to raise awareness and start planning and management efforts as soon as possible to reduce negative impacts and costs. While generally it would be best to leave beaches mostly untouched and unchanged, they are a favorite destination for tourism and therefore suitable compromises need to be found. St. Tropez has set a great example by renaturalizing one of its famous beaches in an attempt to meet both tourist's expectations and conservation efforts, showing that it is possible (Republik 2019).

For anyone interested in the topic of beach conservation it is highly advisable to read the 'Beach Stewardship Guide for the Township of Huron-Kinloss'. The guide provides information on the functions of the beach-dune ecosystem, how people can impact it both positively and negatively and individual and collective practices to conserve beaches while continuing to enjoy them.

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