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# Legislation and policy options for conservation and management of seagrass ecosystems in India

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ABSTRACT

Seagrass meadows are recognized as one of the most productive ecosystems in the coastal zone supporting a wide variety of keystone and ecologically important marine species from diverse trophic levels. This paper examines existing policies and legislations that can help in the protection, conservation and threats to seagrass ecosystems. The paper i) reviews the key legislations with provisions to conserve seagrass ecosystems in India such as the Coastal Regulation Zone (CRZ) Notification (2011) issued under the Environment (Protection), Act 1986, the Wildlife (Protection) Act, (1972), Biodiversity Act, 2002 and the Marine Fishing Regulation Acts of different coastal states in India; ii) identifies threats to the seagrass meadows and iii) suggests measures for enhancing conservation of seagrass.

## 1. Introduction

Seagrasses are marine flowering and submerged plants occurring in shallow oceanic and estuarine habitats (Barbier et al., 2011), colonizing soft substrates, especially in wave-sheltered conditions. Seagrass meadows are recognized as one of the most productive ecosystems in the coastal zone (Duarte et al., 2010; Short et al., 2011). The extent, diversity and health of seagrass beds are declining at an alarming rate throughout the world, largely due to intense anthropogenic activities such as discharge of industrial wastes, river runoff, nutrient loading, land reclamation, port construction, fisheries and unplanned aquaculture practices (Duarte, 2002; Orth et al., 2006; Short et al., 2007). Further, global climate change is predicted to have deleterious effects on seagrass, both directly and indirectly (Waycott et al., 2009), a growing challenge for coastal management. In general, sea level change, increased temperature, UV-radiation exposure, or increased storm activities are likely to restrict seagrass habitat, growth, distribution and diversity (Short and Neckles, 1999; Björk et al., 2008).

In India, the total seagrass cover is estimated as 517 $km^2$ (Geevarghese et al., 2016) with major seagrass meadows in Palk Bay and Gulf of Mannar along the southeast coast of India; the Andaman & Nicobar Islands in the Bay of Bengal; the Gulf of Kachchh in the west coast; and in the lagoons of the islands of the Lakshadweep in the Arabian Sea. These ecosystems are of high importance to the local fisheries and as habitat for endangered species such as the *Dugong dugon* and sea turtles.

There are two aspects to the protection of seagrass ecosystems: (i) explicit protection granted to the ecosystem (or its entities) and (ii) is addressing the threats that cause degradation of seagrass ecosystems. This paper examines the available options in terms of legislation and policy under both the aspects for the protection and conservation of seagrass ecosystems in India.

## 2. Protection and conservation of seagrass ecosystems

The National Environmental Policy (NEP, 2006) of the Government of India, highlights the importance of mangroves, coral reefs, estuaries and coastal forests; but seagrass ecosystems have not been considered. However, the National Policy on Marine Fisheries, 2017 (NPMF, 2017) clearly emphasizes the importance of seagrasses, (along with mangroves and coral reefs) as an integral part of the coastal marine ecosystems that provide a range of ecosystem services, including habitation for many fish species and marine mammals (e.g. Dugong) and therefore shall be protected from anthropogenic impacts.

Although an exclusive policy or legislation for protection of seagrass ecosystems does not exist currently, there are various laws that can be effectively used to protect and conserve these ecosystems (Fig. 1). The Wildlife Protection Act, 1972, the Notifications under the Environment (Protection) Act, 1986 and the Biological Diversity Act, 2002 are a few key legislations that are relevant to the conservation and protection of seagrass ecosystems are discussed in detail below.

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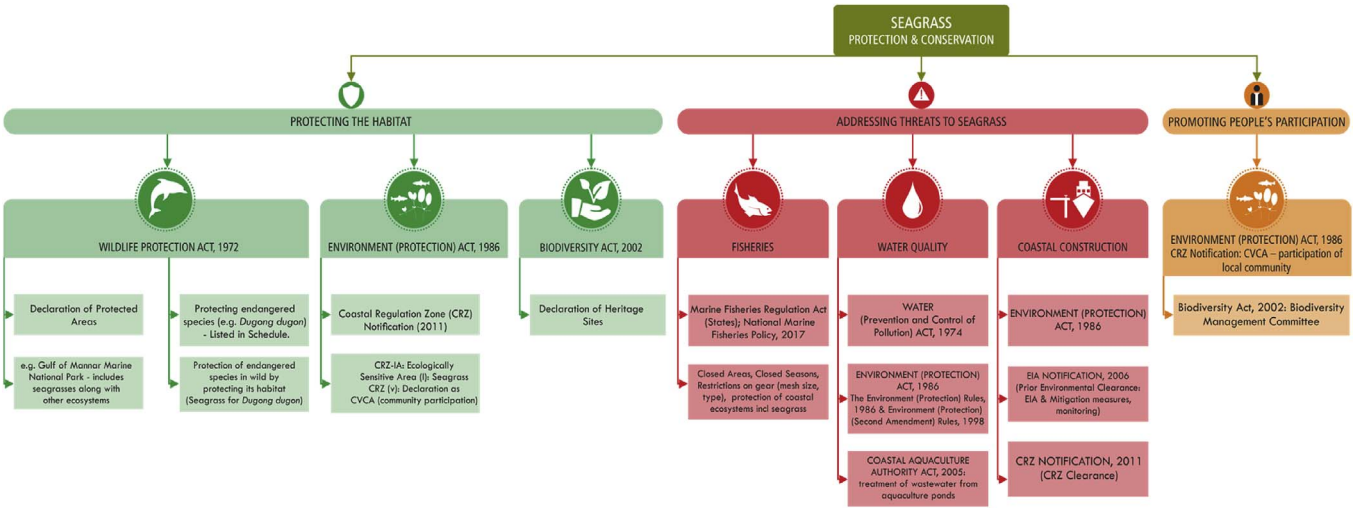


**Fig. 1.** List of legislation for protection and conservation of seagrass ecosystems.

### 2.1. The Wildlife protection Act, 1972

The Wildlife (Protection) Act (WLPA) ,[1] 1972 provides for both species and spatial conservation strategies. The endangered species are protected regardless of location in the former, while all species in designated areas, called sanctuaries or national parks are protected in the latter strategy (Divan and Rosencranz, 2001). In the first case, *Dugong dugon*, listed as a protected species under Schedule 1 of the WLPA (which affords it the highest degree of protection under the Act) is an example. Dugongs are found in the Gulf of Mannar, Palk Bay, Gulf of Kachchh, and Andaman and Nicobar Islands. India has a National Level Task Force for Dugong Conservation and a National Conservation Action Plan for Dugongs and their habitats (Sivakumar, 2013). Since *Dugong dugon* is a protected species, the best form of conservation is to protect its vital habitat, which is seagrass.

Chapter IV of the WLPA provides details of the declaration of sanctuaries, national parks and closed areas. Various levels of restrictions apply with reference to entry and activities within such areas. Protected areas with a marine/coastal component, are referred as Marine Protected Areas (MPA). In India, Protected Areas (PAs) that fall entirely or partially within the swathe of 500 m from the high tide line and the marine environment are considered to be in the MPA Network (Sivakumar, 2013). In mainland India there are 25 MPAs with a total area of 8231 $km^2$. The Andaman and Nicobar and Lakshadweep Islands consist of 106 MPAs with an extent of 1570 $km^2$. The Gulf of Kachchh Marine National Park, Gulf of Mannar National Park, Sundarban National Park and Wandoor Marine National Park are some of the important MPAs of India (Sivakumar, 2013). The MPAs, *inter alia*, the Gulf of Mannar Marine National Park, Chilika Wildlife Sanctuary, the Gulf of Kachchh Marine National Park and Marine Sanctuary off mainland India have extensive seagrass beds. Thus, protection of seagrasses is alongside protection of other ecosystems occurring in the designated Marine Protected Area. It is ironical however, that in the case of Lakshadweep Islands, the green turtle has been considered a threat to seagrass meadows because of intensive grazing pressure. However, turtle populations cannot be controlled in India, as they are listed as protected species under the WLPA, 1972 (Kaladharan et al., 2013; Kelkar et al., 2014).

### 2.2. The environment (protection) Act, 1986

The Environment (Protection) Act[2] is an enabling umbrella Act, under which there are specific notifications, which enable demarcation of specific areas as ecologically sensitive. The Coastal Regulation Zone (CRZ) Notification (2011) issued under the above Act, regulates development activities in the defined 'Coastal Regulation Zone' which encompasses a seaward stretch up to the territorial waters (12 NM) from the low tide line, the inter-tidal zone and 500 m landward from the high tide line. CRZ Notification (2011) classifies the coast into four zones and the CRZ-I area includes 'areas that are ecologically sensitive and the geomorphological features, which play a role in maintaining the integrity of the coast'. Seagrass beds are included in the list given under CRZ-IA.

No new construction is permitted apart from some essential activities such as weather tracking radars, pipelines and transmission systems and defense related activities in CRZ-I areas. In addition, activities requiring 'CRZ Clearance' as part of obtaining prior Environmental Clearance (if they are located in the coastal areas) require submission of information as per 'Form 1' which requires the project proponent to indicate if the project is located within the CRZ-I area and the distance from it. The notification mandates the respective states to prepare Coastal Zone Management Plans demarcating all four coastal regulation zones in all coastal areas so that the ecologically sensitive areas are identified and recognized. Mapping of seagrass meadows has been completed on a national scale (Geevarghese et al., 2016). This base information would ensure that seagrass beds are not threatened by coastal development activities by providing guidance for conservation and protection of seagrass meadows of the country.

### 2.3. Biodiversity Act, 2002

The Biological Diversity Act,[3] 2002, was enacted primarily to fulfil India's obligations to the Convention on Biological Diversity. The Act contains provisions that aim at preserving biodiversity as well as establishing a system for equitable sharing of benefits arising from the use of traditional biological resources and knowledge. Biodiversity Heritage Sites (BHS) may be declared under this Act (Section 37). Thus, the Act may be used if there are locations with seagrass meadows that can qualify for protection under this Act. The Act can also be used to notify

[1] http://envfor.nic.in/division/wildlife.

[2] http://envfor.nic.in/division/environment-protection.

[3] http://envfor.nic.in/division/biodiversity.