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DUGONG GRAZING AIDS SEAGRASS CARBON CAPTURE AND RESILIENCE

(Based on a document prepared by the UK Government)

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Dugong grazing aids seagrass carbon capture and resilience

Ecosystem: Seagrass beds

Seagrasses are flowering plants found globally along coastlines and estuaries across the world's oceans (Al-Asif *et al*. 2022). Seagrass beds are mainly threatened by direct anthropogenic impacts such as eutrophication, due to run-off from near coastal land, causing changes in the water nutrients and often increasing water turbidity. Other threats include the natural threat of overgrazing and the indirect anthropogenic impacts of climate change, for example, an imbalance in ocean salinity (flooding or drought), sea-level rise, plastics, and ocean acidification (Al-Asif *et al*. 2022). The total area covered by seagrass is estimated to have declined by 30-60% (Valdez *et* al. 2020). Seagrass beds are primary producers which support a large number of animals, including CMS listed species such as dugongs and turtles (Short *et al*. 2007; Al-Asif *et al*. 2022; e.g. terns, gulls, Berr *et al*. 2023).

Species group: Dugongs

Dugongs (*Dugong dugon*) are one of the many groups of species that rely on seagrass for food (Al-Asif *et al*. 2022). They are found around seagrass beds on the coastlines of countries bordering the Indian Ocean and western side of the Pacific Ocean. They are listed on CMS Appendix II and as Vulnerable on the IUCN Red List (CMS 2024, Marsh and Sobtzick, 2019). Various threats impact dugong populations, including ship strikes, hunting and bycatch. Climate change induced flooding and storm events also impact their habitat, with likely population-level impacts.

Climate change nature-based solution(s)

Seagrass beds provide ecosystem services which can help mitigate against the impacts of climate, including improving water quality and providing coastal protection (Valdez *et al*. 2020). They also act as important carbon sinks, responsible for 10-18% of the oceans total carbon storage despite occupying only 0.1% of the ocean floor (Bedulli *et al*. 2020). As they degrade, their roots and rhizomes deposit large amounts of underground, partially mineralised, carbon (Kennedy and Björk 2009). Around Indonesia alone seagrass beds have been estimated to hold up to 368 Megatonnes of carbon (Alongi *et al*. 2015; Al-Asif *et al*. 2022), yet recent studies of the Coral Triangle (including Indonesia) suggest this may be much lower (5.85-6.80 Megatonnes of Carbon per year; Stankovic *et al.* 2021). This may be attributed to loss of seagrass habitats (Stankovic *et al.* 2021; Al-Asif *et al*. 2022). Dugongs are a key, large-bodied herbivore that help maintain seagrass bed genetic diversity and consequently resilience through moderate levels of grazing (Al-Asif *et al*. 2022). Whilst grazing, they dig up seagrass rhizomes and consume seagrass leaves, creating a meandering furrow in the seabed (Preen 1995),

providing open areas of ground available for seagrass recruitment (McMahon *et al*. 2017). This recruitment creates genetically varied patches of seagrass, so when cyclones do pass through, a higher genetic diversity of seagrass is likely to be retained. The projected increase in climate change induced cyclones, combined with declining dugong populations means that there is less opportunity for genetically diverse seagrass plant recruitment and reduced genetic diversity after cyclones. This could reduce seagrass bed resilience to further environmental perturbations and reduces their carbon sequestration potential (McMahon *et al*. 2017).

Conservation benefits

There are various conservation management tools for dugongs and their habitats, which include Marine Protected Areas or restricted access zones, capped boat speed limits (Schoema, Patterson-Abrolat & Plön 2020) and ensuring appropriate management of the surrounding land and river systems within the adjacent watersheds to the coast (Quiros *et al*. 2017). The combination of these things (and other management tools) means that the habitat and maintained water quality within MPAs will not only aid the seagrass beds and consequently climate change mitigation through carbon capture, but they will also benefit other species that rely on seagrass beds for food and shelter (e.g. terns, gulls, Berr *et al*. 2023; turtles, Aragones & Marsh 2000). Under CMS the Dugong MoU promotes internationally coordinated actions to ensure the long-term survival of dugongs and their seagrass habitats throughout their extensive range. Within this MoU is the '2030 Seagrass Breakthrough' initiative, a collaborative effort between the CMS Abu Dhabi office and UNFCCC, for the conservation, restoration, and protection of global seagrass ecosystems.

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