IOSEA 25 YEARS 2001/2025

MEMORANDUM OF UNDERSTANDING ON THE CONSERVATION AND MANAGEMENT OF MARINE TURTLES AND THEIR HABITATS OF THE INDIAN OCEAN AND SOUTH-EAST ASIA

CMS/IOSEA/AC11/Doc.5.2a
6 November 2026

11TH MEETING OF THE ADVISORY COMMITTEE
Bonn, Germany, 8-11 December 2026
Agenda Item 5.2

DIRT CHEAP? IMPACT OF POOR BEACH MANAGEMENT PRACTICES ON MIGRATORY SPECIES

(*Prepared by the Advisory Committee*)

Mandate:

- CMP Programme 1.6: *Develop nesting beach management programmes to maximize hatchling recruitment*
  a) Evaluate the effectiveness of nest and beach management programmes
  b) Reduce the mortality of eggs and hatchlings to maximise hatchling recruitment and survival, preferably using conservation techniques that emphasize natural processes wherever possible
  […]
- CMS Decision 15.99: *The Scientific Council is requested to, subject to the availability of resources:*
  a) support the work of the joint CMS/IOSEA Nesting Beach Management Steering Group, in collaboration with the Inter-American Convention for the Protection and Conservation of Sea Turtles as appropriate, aimed at expanding the existing guidelines on the management of beaches as an ecosystem and as important habitat for marine turtles and other migratory species that depend on coastal soft sediment habitats, and make recommendations on their implementation to COP16;
  […]

Summary:

- Rationale for addressing the impacts of sand extraction, beach nourishment, coastal modification and climate change on migratory species and their habitats.
- Proposal to establish a CMS/IOSEA Steering Group to assess impacts on sea turtles and other migratory species, develop management guidance, and identify solutions for climate adaptation.
- Outline of intended outputs, including a scientific assessment, draft policy recommendations for CMS COP16 and IOSEA MOS10, and a global manual of beach management practices.
- Proposed work programme, expert participation and timeline for intersessional work during 2026–2027.

Action requested:

- Review the concept note and provide comments on the proposed scope, objectives and work programme.
- Advise on the relevance of the proposed initiative to IOSEA priorities and activities.
- Suggest additional expertise, partners or funding opportunities to support the proposed Steering Group.
- Provide guidance on potential next steps for advancing the initiative within CMS and IOSEA.

Proposal: CMS/IOSEA Steering Group on Beach Management for Migratory Species in the Face of Climate Change and Poor Management Practices

Ronel Nel, SHAMS

2026

"Dirt Cheap? The Impact of Sand Mining and Poor Coastal Management on Coastal Migratory Species"

The problem

After fresh water, sand is the most extracted natural resource on Earth. It is used everywhere in daily life, often without our noticing: in the houses we live in, the roads we drive on, the glass we drink from and the mobile devices we stare at for much of the day. Global sand extraction across all environments is estimated to be four times faster than river replenishment. Much of this sediment comes from coastal ecosystems because of its particular properties, being rough and high in silica. The consequence is that the world is running out of usable sand.

Most coastal soft-sediment ecosystems between the supratidal and shallow subtidal zones, such as dunes, beaches and surf zones, salt marshes, mangroves, estuaries and seagrass beds, are connected through a shared sediment budget and work in tandem. Through weathering, runoff, wind and wave action, sand is continuously redistributed on a large conveyor belt, moving on, off and alongshore at different rates. This dynamic nature is what makes the coast both resilient and vulnerable.

Marine or river sand is harvested to "repair" eroding coasts. *Beach nourishment*, the practice of pumping dredged nearshore and offshore sand onto the coast, is a "band-aid" for poor coastal management practices that have disrupted sediment budgets and transport, so that sand is now disappearing from these places. Climate change effects (including sea-level rise, more frequent storms and acidification) exacerbate these problems. Beach nourishment is a short-lived "solution" that must be repeated every few years.

The economic cost of beach nourishment is high; a single nourishment event costs millions of dollars, and sand is brought back to the shore without understanding why it eroded in the first place. Developers nevertheless justify it easily, because it supports a tourism industry that is even more valuable. That support is both direct, by maintaining attractive and comfortable beaches, and indirect, through the associated infrastructure and amenities.

The social impact, largely unrecognized, is mostly negative. The sheer volume and economic importance of coastal sediments, combined with insatiable demand and greed, drive "sand mafias" globally towards illegal sand harvesting and trade involving millions of people and billions of dollars, despite attempts to regulate extraction and trade. The scale is estimated to exceed that of illegal, unreported and unregulated (IUU) fishing. Local communities live with the resulting "tragedy of the commons": individuals sell off buckets, baskets or truckloads of sand while the village loses a whole ecosystem, or several ecosystems.

There are also significant geopolitical repercussions. Artificially constructed islands, such as those in the Spratly archipelago in the South China Sea, have enhanced China's strategic, economic and military presence in the region, directly challenging the territorial interests of neighbouring nations,

including Viet Nam. Similarly, Singapore has expanded its land area by approximately 25% since independence in 1965 through extensive reclamation, creating tensions with Malaysia over maritime boundaries, navigation and transboundary environmental impacts. These differences culminated in a formal dispute before an international tribunal in 2003, which was resolved through a negotiated settlement in 2005. Dubai, in the United Arab Emirates, offers a different example; multiple artificial islands, including the iconic Palm developments, were constructed largely from locally sourced marine sand to create a globally competitive, ultra-luxury coastal tourism and investment industry. In this case, a cheap and abundant natural resource became the foundation for extraordinary economic wealth and international influence.

Beyond the strategic and economic value generated through coastal development, soft-sediment ecosystems provide essential ecosystem services, including coastal buffering and protection, water purification, nutrient recycling and habitat provision. They support a remarkable diversity of specialized species that depend on these environments for feeding, shelter, breeding and staging during migration, all of which rely on intact ecosystems.

However, the consequences of sand extraction, beach nourishment and coastal modification extend well beyond the immediate development footprint. Migratory species moving through and within regions such as the Red Sea, including sea turtles, dugongs and migratory shorebirds, are particularly vulnerable, with impacts potentially extending across national boundaries and along entire migratory routes. Beach nourishment can suppress intertidal prey diversity, productivity and movement for years, reducing shorebird foraging rates by as much as half. For sea turtles, poorly managed nourishment and beach modification can alter nest incubation conditions, affect hatchling sex ratios and reduce hatching success. At the same time, the burial of nearshore reefs and seagrass beds beneath artificially widened beach profiles, together with the sedimentation and turbidity associated with dredging, threatens critical nursery, feeding and refuge habitats for sea turtles and dugongs. Offshore sand extraction can also intensify coastal erosion in neighbouring areas, particularly along coastlines that are already sediment-starved, potentially compromising entire sea turtle nesting populations. These pressures are compounded for migratory shorebirds, including godwits, sandpipers and knots, and for colonial nesting terns and skimmers, for which shoreline modification and dredging have contributed to severe local population declines, exceeding 90% in some locations.

These impacts are therefore particularly concerning for migratory species conservation in the face of rapid climate change. Three in four species listed under the Convention on Migratory Species (CMS) are already affected by habitat loss and degradation, yet the cumulative impacts of marine sand extraction, beach nourishment and coastal erosion remain substantially under-addressed within existing CMS policy instruments. Government entities (Contracting Parties and Signatory States) responsible for the conservation and management of migratory species are uniquely positioned to help address this gap and to provide leadership where existing conservation frameworks fall short. This opportunity is especially significant in the Middle East, a critical geographical nexus for migratory species moving between Africa and northern Europe, and between Africa and Southeast Asia. Decisions about sand extraction, coastal nourishment and artificial island construction in this region therefore have implications not only for national coastal environments but also for biodiversity and migratory species conservation across entire international flyways and marine migration corridors.

The task

CMS COP14 (2024) mandated the Scientific Council to assess the impacts of beach management practices on migratory species, including climate change-related impacts. Beach management (nourishment and erosion control) has no dedicated regulatory instrument and therefore needs to be addressed through CMS and its species-specific instruments, such as the IOSEA Marine Turtle MOU. Furthermore, the combined impacts of sand mining on multiple species across soft-sediment habitats globally are recognized in principle, but few quantitative data are available, and these have not been combined to assess the spatial scale and extent of the impacts across species and life histories. It is therefore necessary to:

(1) convene a working group to assess the extent of the impacts on sea turtles and other migratory species across soft-sediment habitats;

(2) devise management regulations that will protect habitats and species; and

(3) map potential solutions in the face of climate change.

Intended outputs

1. **High-impact scientific publication** to provide the evidence base for regulations.
2. **Draft resolution on beach management** for CMS COP16 (Bonn, 2029) and IOSEA SS10 (~2028).
3. **Global manual of beach management practices** (practical and applicable).
4. **Press release and social media** on the impact of poor beach management practices on migratory species.

A dedicated working group with a broad range of expertise should be established to assess these impacts and potential solutions. The working group would work intersessionally from November 2026 to November 2027, with three hybrid (in-person and online) workshops and occasional virtual meetings.

Work programme

Three workshops are proposed:

1. **9–10 April 2027, South Africa**, making use of the many experts already gathered for the International Sea Turtle Symposium (ISTS). Focus: review spatial data and impacts for sea turtles.
2. **29–30 June 2027, St Francis, South Africa**, making use of the many beach experts attending the International Sandy Beach Symposium (ISBS). Focus: review data on impacts on beach habitats and other CMS species.
3. **Date and venue to be determined**, potentially in the Middle East or Europe, depending on funding. Focus: combine impacts and draft policy and management regulations targeting priority issues, including climate change impacts and novel beach habitats.

This work could be strengthened by an expert consultancy and/or postgraduate or postdoctoral analytical support.

Suggested working group participants and expertise

- **Omar Defeo** – General beach ecology, management and other species (Uruguay)
- **Anton McLachlan** – General beach ecology, management and other species (South Africa)
- **David Schoeman** – Climate change (Australia)
- **Linda Harris** – Ecosystem services and spatial planning (South Africa)
- **Lorenz Hauser** – Genetics and connectivity (USA)
- **José Antolínez** – Coastal hydrodynamics and engineering (Netherlands)
- **Ronel Nel** – Sandy beaches and turtles (Saudi Arabia)
- **Rob Baldwin** – Turtles and nesting beaches of the Arabian Peninsula (Oman)
- **Andrea Phillott** – Turtles and incubation environments (India)
- **IOSEA Secretariat** – Heidi Frisch-Nwakanma (CMS Secretariat)

The list may be expanded to include additional expertise if funding allows.

Annex 1: Potential CMS species affected by coastal sand management practices, and data layers to use

Only the 32 **Appendix I** species are listed here. Appendix I comprises migratory species that have been assessed as being in danger of extinction throughout all or a significant portion of their range.

Appendix II (an estimated 100+ relevant species) covers migratory species that have an unfavourable conservation status and that require international agreements for their conservation and management, as well as those whose conservation status would significantly benefit from the international cooperation that an international agreement could achieve.

An asterisk (*) placed against the name of a species indicates that the species, a separate population of that species, or a higher taxon that includes that species is also included in Appendix II. IUCN Red List categories are shown in square brackets: CR, Critically Endangered; EN, Endangered; VU, Vulnerable; NT, Near Threatened; LC, Least Concern; EW, Extinct in the Wild.

Table 1. CMS Appendix I species affected by coastal sand management practices

Taxonomy	Species and populations	Common name	Threat (relative to coastlines or sandy beaches)
Mammalia			
SIRENIA		Sea cows	
Trichechidae	*Trichechus manatus* * (populations between Honduras and Panama) *Trichechus senegalensis**	West Indian (also known as North American) manatee African manatee	Foraging habitat (shallow seagrass beds)
SPHENISCIFORMES			
Spheniscidae	*Spheniscus humboldti*	Humboldt penguin	NA
SULIFORMES			
Fregatidae	*Fregata andrewsi*	Christmas Island frigatebird	NA
CHARADRIIFORMES			
Charadriidae	*Vanellus gregarius* [21] *	Sociable lapwing	Winter migrant to the Middle East (Saudi Arabia and Sudan)
Scolopacidae Curlews Knots and sandpipers	*Numenius tahitiensis* * *Numenius borealis* * *Numenius tenuirostris* * *Numenius madagascariensis* * *Calidris tenuirostris* * *Calidris canutus rufa* * *Calidris pygmaea* [22] * *Calidris subruficollis* [23] * *Calidris pusilla* * *Tringa guttifer* *	Bristle-thighed curlew Eskimo curlew[CR|EW] Slender-billed curlew† Far Eastern curlew[EN] Great knot Red knot Spoon-billed sandpiper[CR] Buff-breasted sandpiper[VU] Semipalmated sandpiper[NT] Nordmann's greenshank[EN]	Non-breeding roosts on soft-sediment habitats Forages on beaches and mudflats Mudflats
Pluvianellidae	*Pluvianellus socialis* *	Magellanic plover[VU]	Estuarine forager
Laridae *(Larus and Leucophaeus)*	*Saundersilarus saundersi* [24] *Larus relictus* *Larus leucophthalmus* * *Larus audouinii* *	Saunders's gull[VU] (Chinese black-headed gull) Relict gull[VU] White-eyed gull[LC] {RS Endemic} Audouin's gull[NT]	Breeds in salt marshes; winters in estuaries Islands of saltwater lakes Breeds on inshore rock and sand islands

	Larus atlanticus *Sternula lorata* [25] *Thalasseus bernsteini* [26]	Olrog's gull[NT] Peruvian tern[EN] Chinese crested tern[CR]	Non-breeding in bays with sand Coastal ecosystems (rock or sand) Deserts and beaches Coastal ecosystems (rock or sand)
Alcidae	*Synthliboramphus wumizusume*	Japanese murrelet[VU]	Rocky coasts
TESTUDINATA			
Cheloniidae	*Chelonia mydas* * *Caretta caretta* * *Eretmochelys imbricata* * *Lepidochelys kempii* * *Lepidochelys olivacea* *	Green turtle[EN] Loggerhead turtle[VU] Hawksbill turtle[CR] Kemp's ridley turtle[CR] Olive ridley turtle[VU]	Nesting beaches and seagrass Nesting beaches and benthos Nesting beaches and mangroves Nesting beaches and benthos Nesting beaches and benthos
Dermochelyidae	*Dermochelys coriacea* *	Leatherback turtle[VU]	Nesting beaches
Podocnemididae	*Podocnemis expansa* *(only Upper Amazon populations)	Giant South American river turtle (or Amazon or Arrau turtle)[LC]	Nests on river beaches (threatened by damming)
CROCODYLIA			
Gavialidae	*Gavialis gangeticus*	Gharial (fish-eating crocodile)[CR]	Breeds on river sandbanks (habitat loss and sand mining)

Annex 2: Example spatial data layers to assess habitat vulnerability

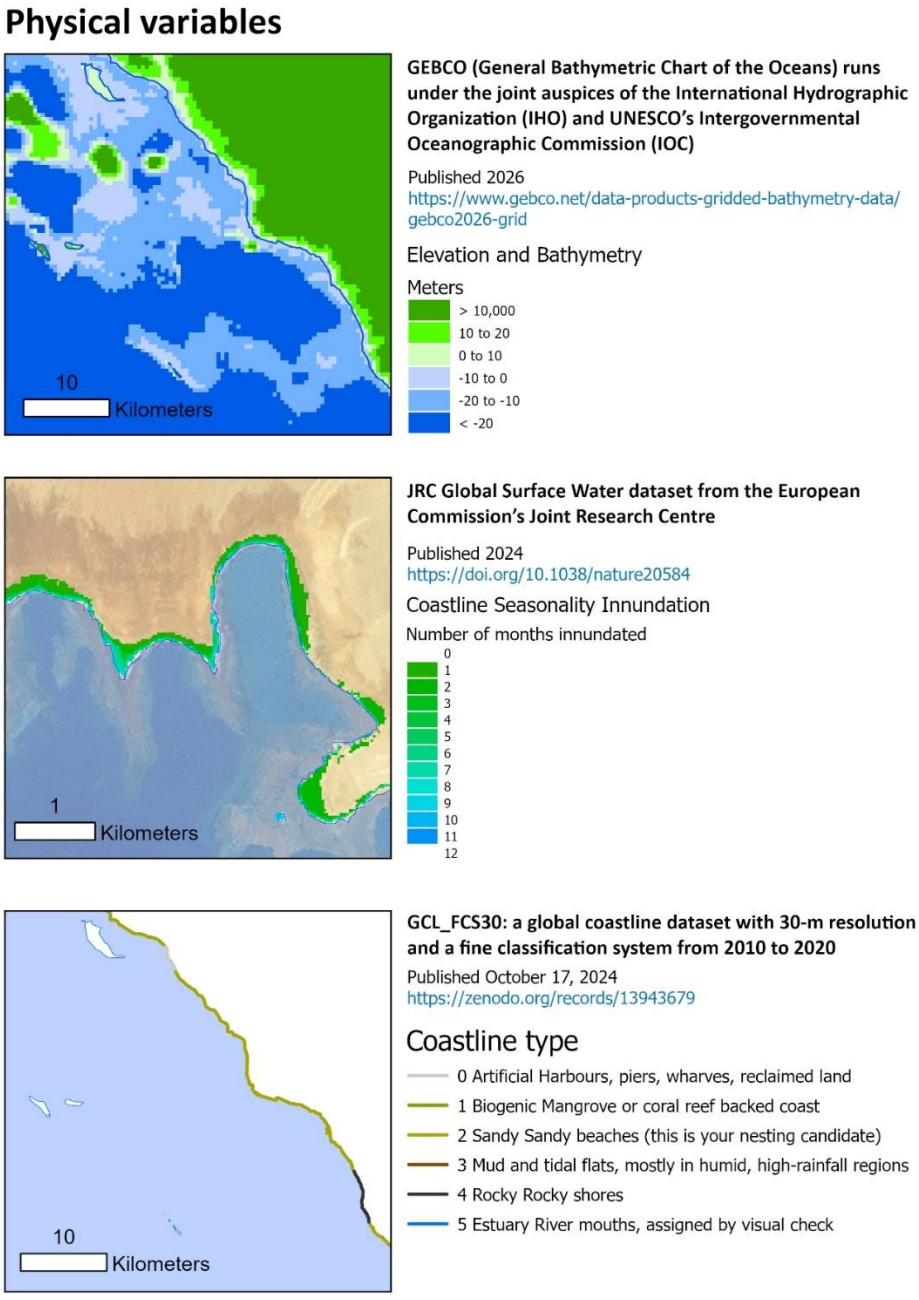

Figure A1. Physical variables.

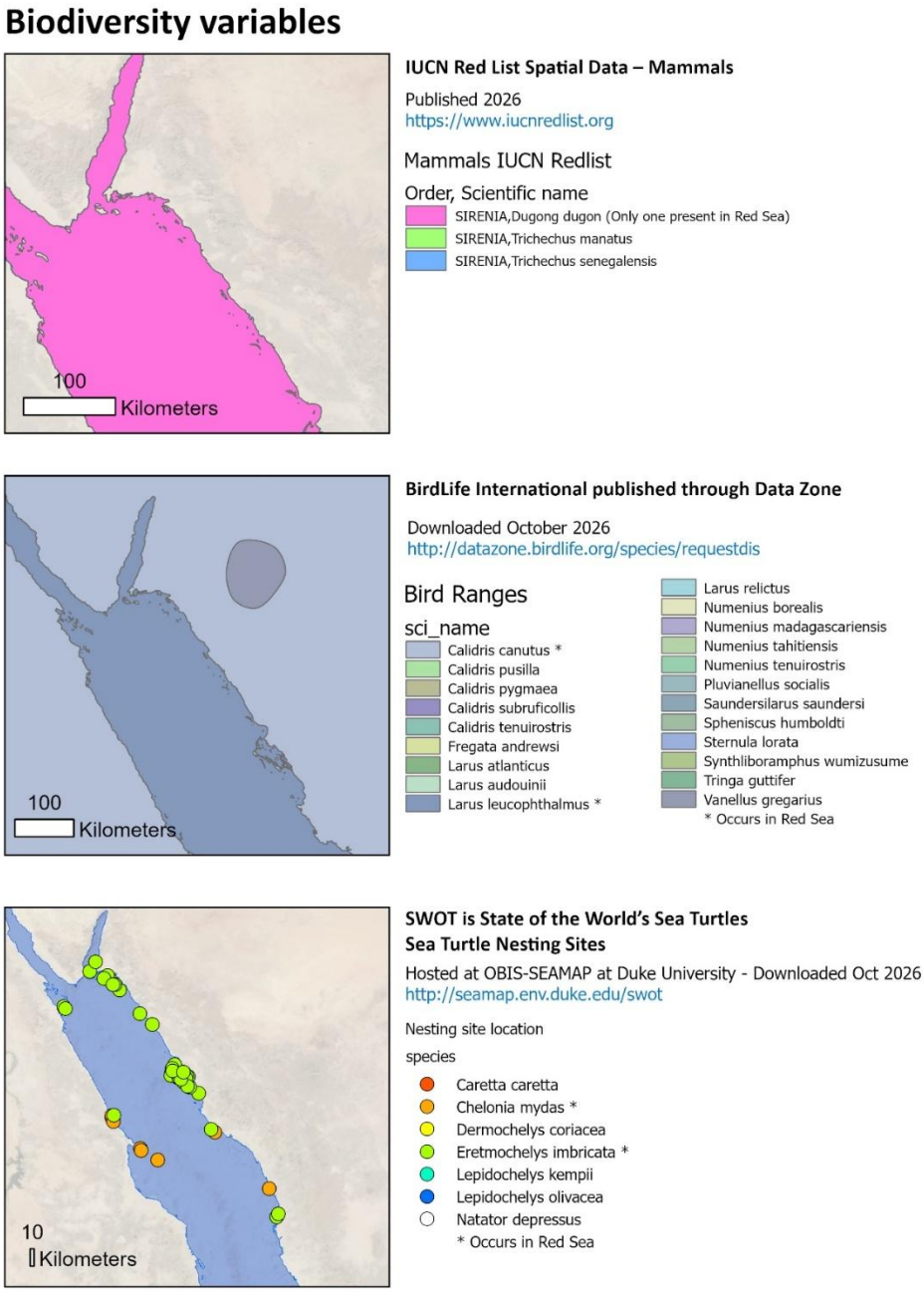

Figure A2. Biodiversity variables.

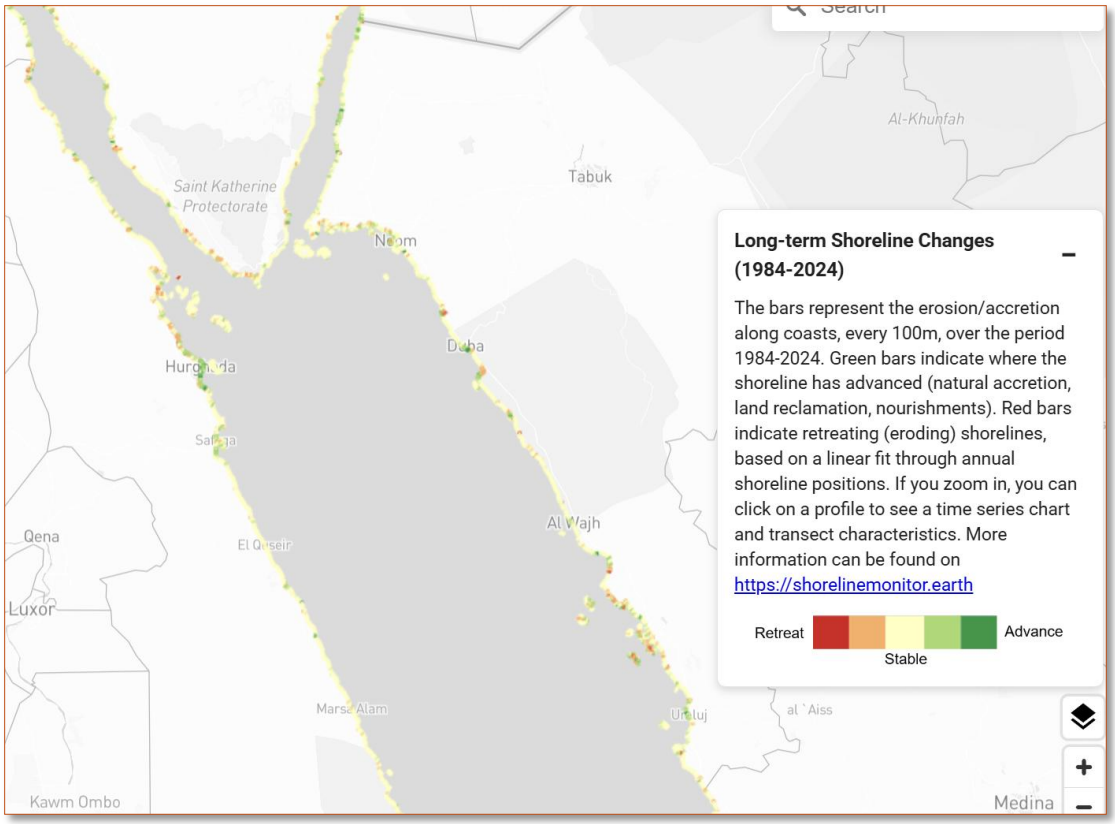

Figure A3. Long-term shoreline change, 1984–2024: accretion (green) and erosion (red).

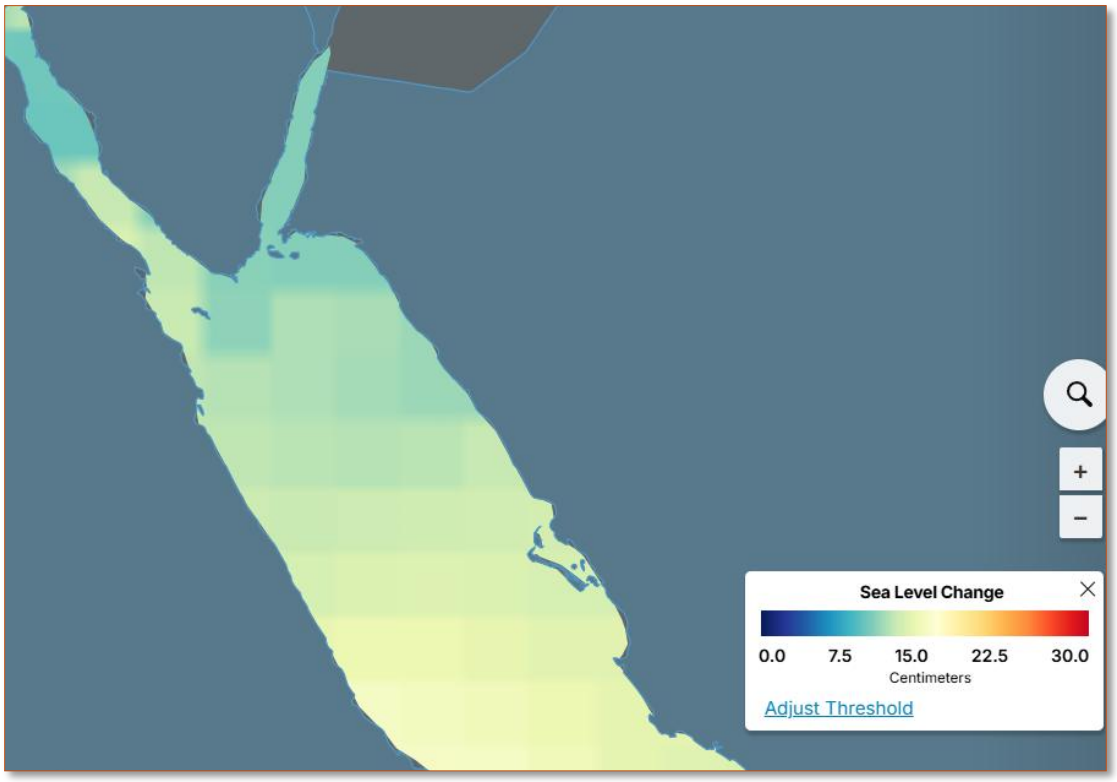

Figure A4. Projected sea-level change (cm) in the northern Red Sea.

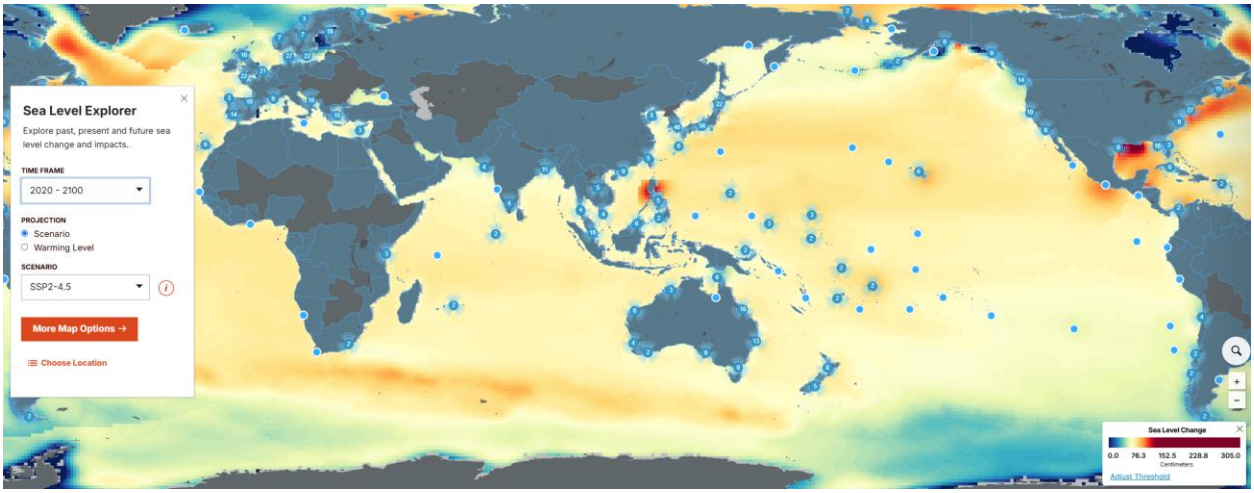

Figure A5. Projected global sea-level change, 2020–2100, under scenario SSP2-4.5.

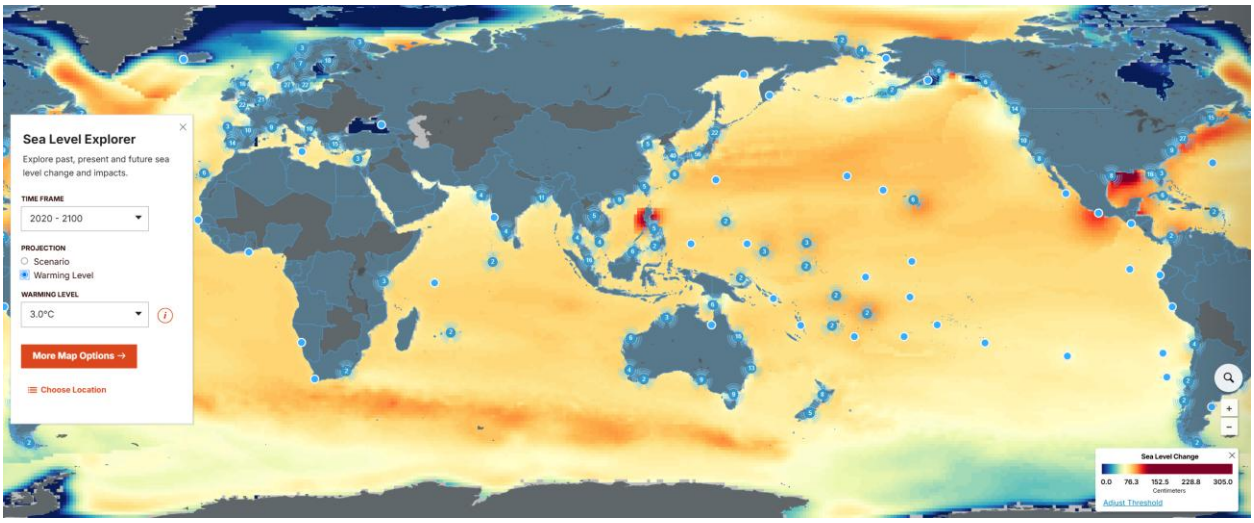

Figure A6. Projected global sea-level change, 2020–2100, at 3 °C of warming.

Source for Figures A4–A6: NASA Sea Level Explorer, https://earth.gov/sealevel/sea-level-explorer/?view=map