Employing Environmental Data to Inform Planning of Infrastructure Projects

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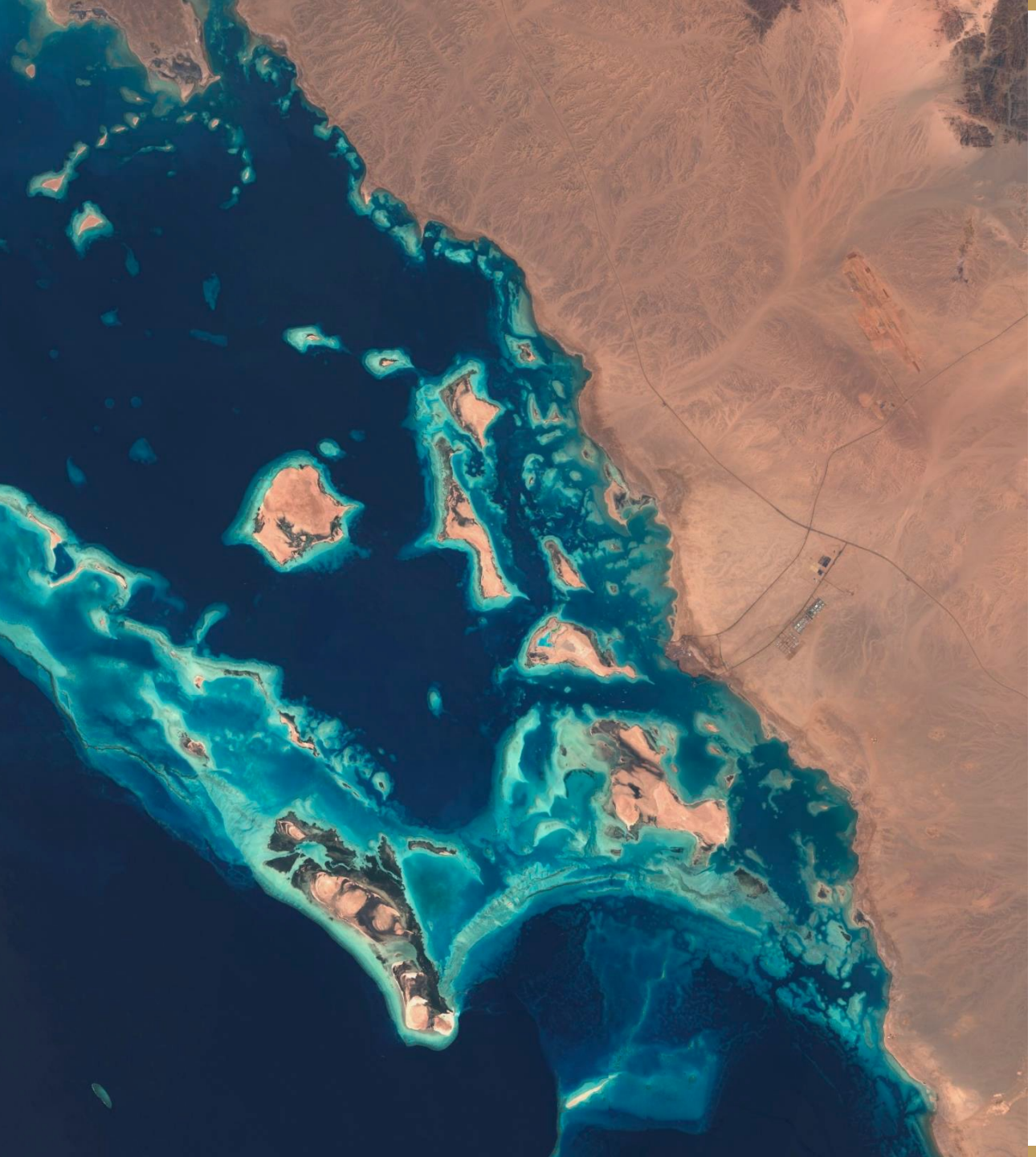
Introduction

- **Red Sea Global (RSG) -** State Developer of Saudi with the aim to realize Vision 2030 while implementing Regenerative Tourism model

- **Development Model -** Enhancing habitats, optimizing operational efficiencies that actively enhance the wellbeing of customers, communities, and environments.

- **Critical Habitat -** Red Sea Project, one of the many projects in the RSG portfolio, is based within an archipelago of islands, in a natural lagoon called the Al Wajh Bank situated in the northern-west coast of Saudi Arabia.

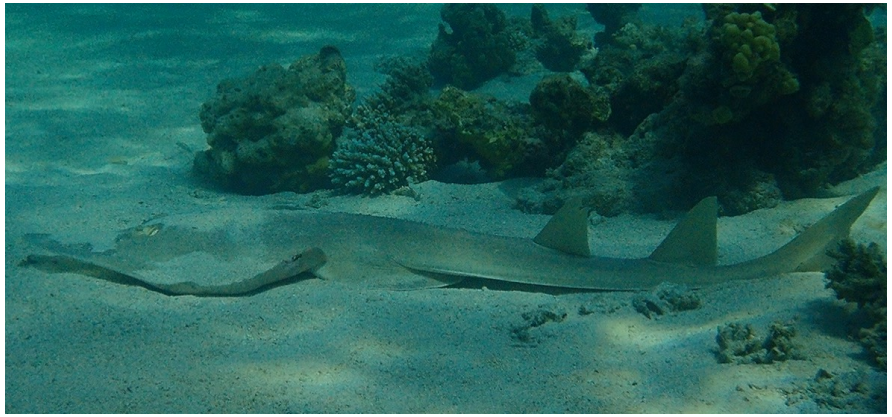


Environmental Overview

- The Al Wajh Bank and the surrounding lagoon's ecosystem, comprising 92 islands, is a particularly sensitive natural location with high-quality marine and coastal ecosystems.
- The area within The Red Sea does not include any nationally designated areas for biodiversity purposes. However, the site is within an Important Bird and Biodiversity Area (IBBA) as set out by Birdlife International.
- The Red Sea is recognized to host multiple habitats for avifauna, megafauna, terrestrial and marine fauna and vegetation species
- The lagoon serves as a nesting and breeding grounds for endemic and migratory species in the area

Environmental Overview

Some of the species recorded in The Red Sea lagoon



Halavi guitarfish

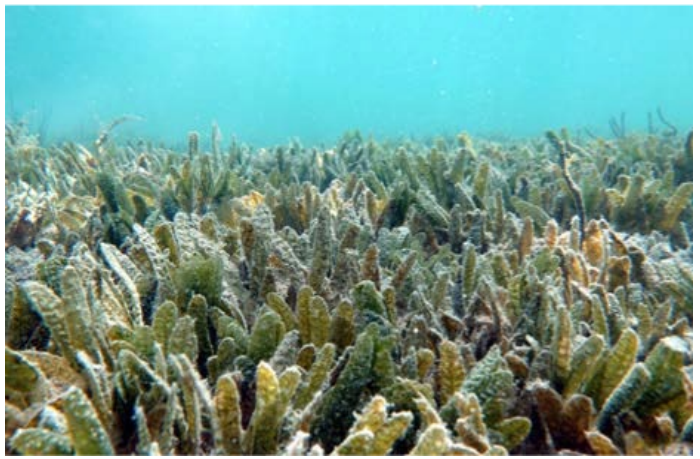
Hawksbill Turtle

Red Billed tropicbird with chick in nest

Sooty falcon

Crab plover

Red Mangrove *R. mangle*



H. Stipulacea Seagrass

Methodological Approach

RSG aims to achieve a 30% net conservation value increase by 2040 across its portfolio, through:

- Complying with national regulatory framework, international standards and guidelines (IFC/WB) and Industry best practices
- Adopting impact avoidance through front-end environmental planning approach
- Embedding the environmental planning framework within the project concept design
- Environmental data collection, modelling and knowledge-based decision making

Environmental Baseline Surveys

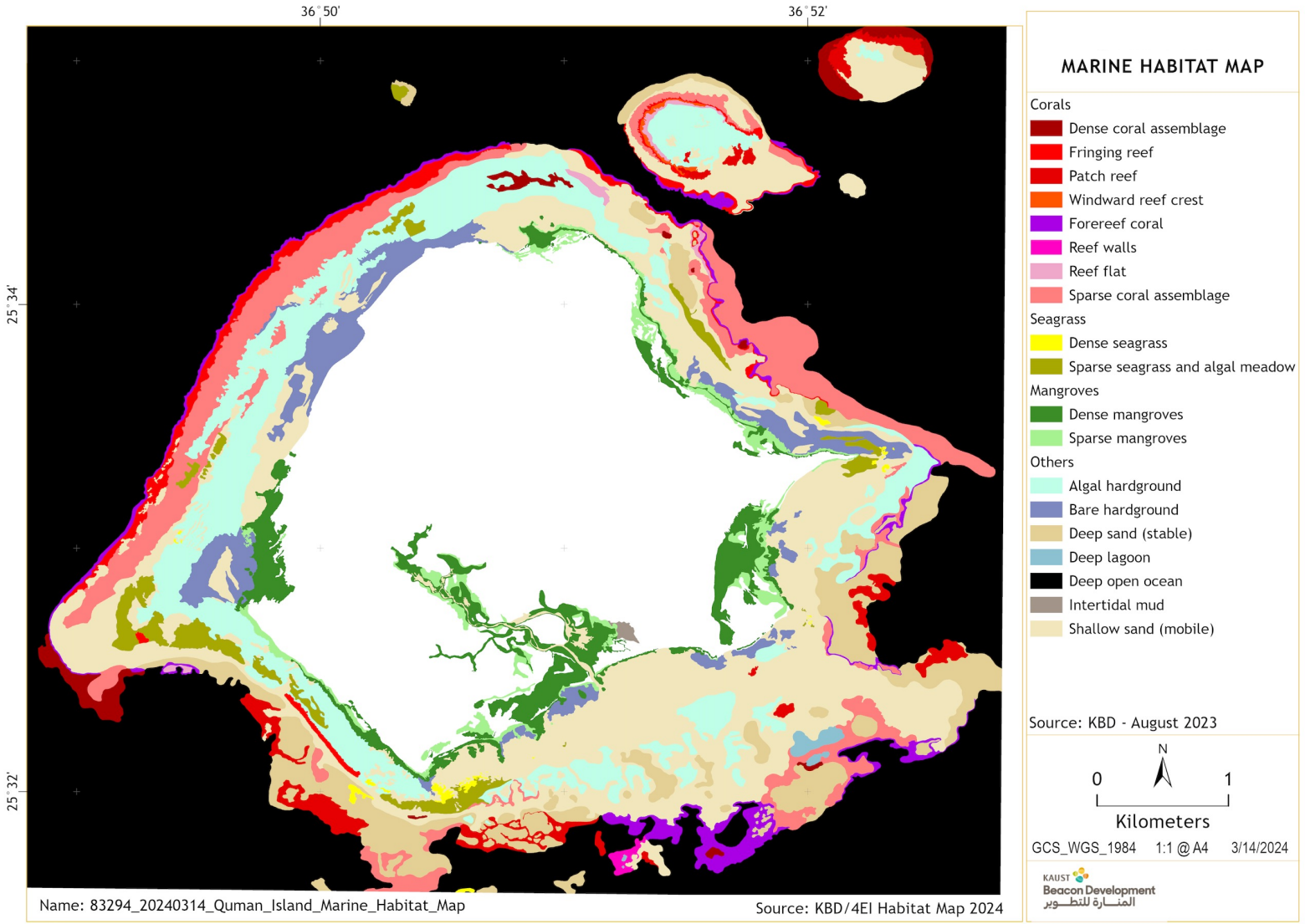
Environmental surveys are undertaken at project inception and typically include:

- Marine water and sediment quality;
- Marine and terrestrial ecology surveys from rapid screening to detailed community composition and health;
- Deployment of marine instrumentation to collect physical oceanographic data;
- Multispectral aerial imagery (satellite or drone); and
- Archaeology and cultural heritage characterisation

Habitat Mapping

Habitat maps are a key tool informing the spatial planning process

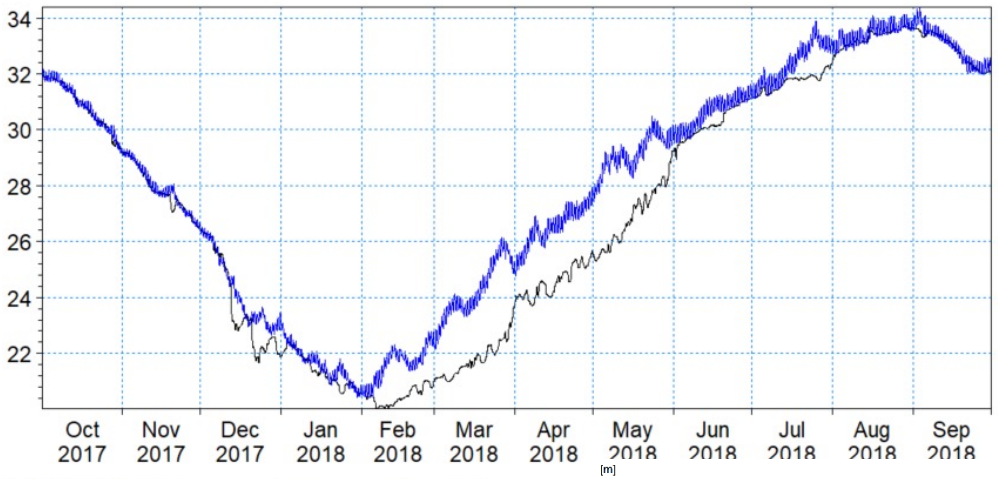
- Preliminary habitat map is developed using high resolution satellite imagery;
- Habitat classification is guided by ground-truthing data collected during the baseline surveys; and
- By using both primary and secondary data sources, areas of high conservation significance/critical habitats are identified
- Ground verified habitat maps with clear delineation of sensitivities are used for planning purposes

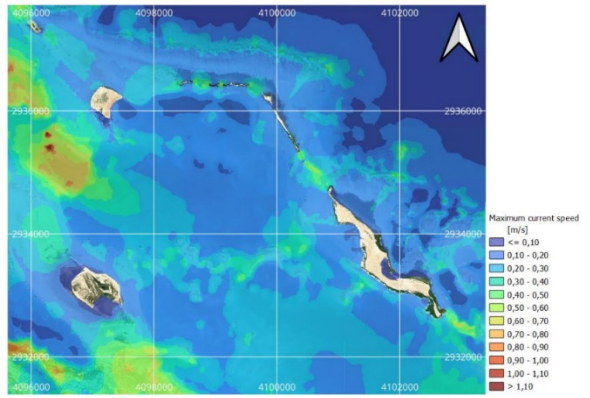


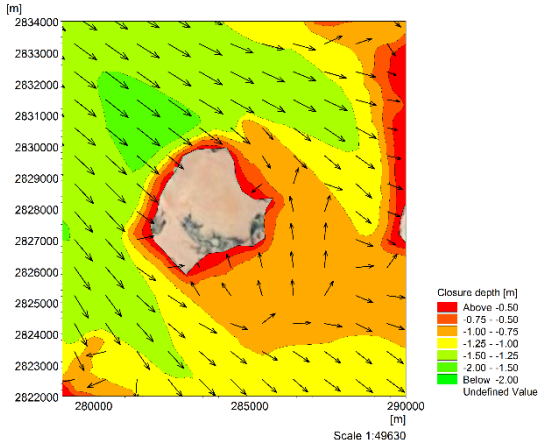
Met-ocean and Hydrodynamic Screening Studies

Preliminary met-ocean and hydrodynamic screening studies provide modelled conditions at the project site:

- Met-ocean conditions using KAUST's Red Sea hindcast data are characterized.
- A long-term time series (~40 years) of wave and water level conditions is established to provide seasonal water level changes.
- Extreme value analysis for each asset to derive the 1:1-year, 1:10-year and 1:100-year return period wave and water level conditions and the associated wind conditions.
- Hydrodynamic and spectral waves models are run to establish simulated pre-development hydrodynamic conditions.



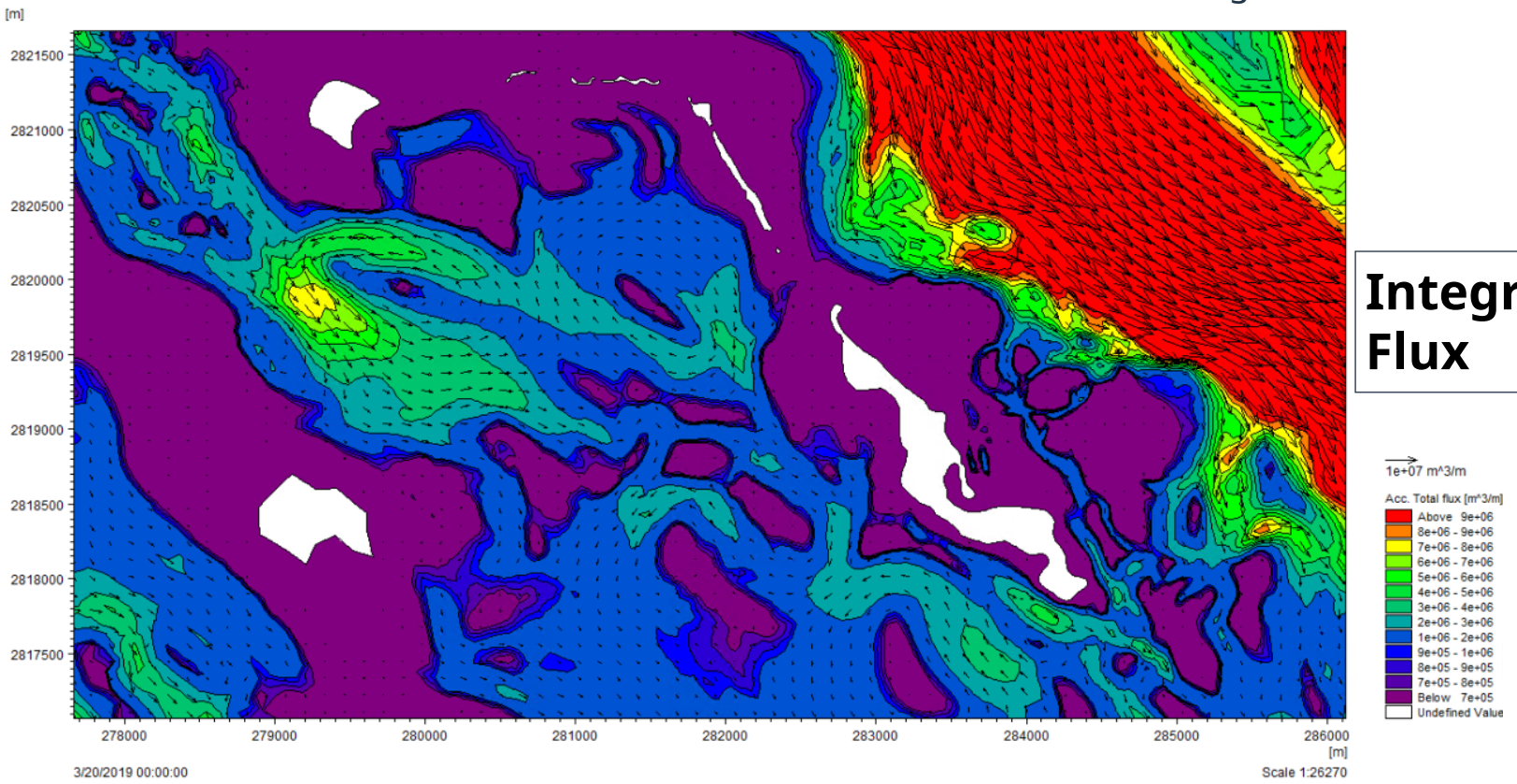




Hydrodynamic Modelling Studies

Modelling studies include:

- Impact of development components on hydrodynamics, flushing, temperature, and salinity;
- Assessment of shoreline dynamics and quality of beaches;
- Sediment plume dispersion modelling;
- Impacts to coastal processes; and
- Nutrient release modelling.



Integrated Water Flux

Offsets and Buffers

Utilizing environmental and hydrodynamic survey data, offsets and buffers are provided to:

- Avoid/minimize impact to priority species
- Set core and transition zones and their associated activities
- Provide mitigation measures
- Define areas suitable for enhancement

Design Reviews

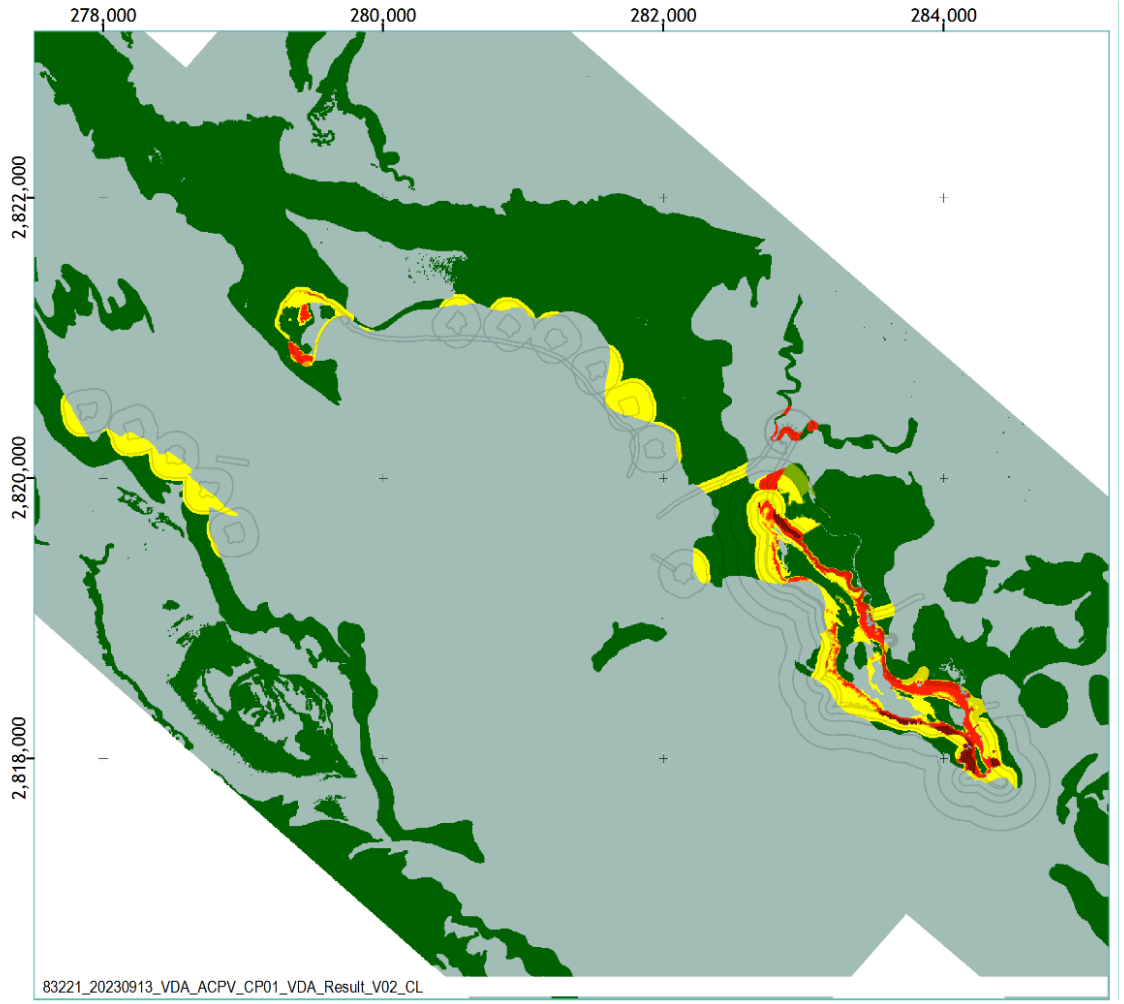
Regular guidance and assessment is undertaken during the design competitions:

- Feedback is provided to design teams at various stage gates
- Design teams are provided spatial planning guidance and appropriate environmental mitigation measures that help identify viable alternatives.
- Siting optioneering includes focus on specific infrastructure components

Habitat Risk Assessments

A qualitative risk assessment, based on the baseline information and expert judgement is undertaken:

- InVEST Habitat Risk Assessment (HRA) Model developed by the Natural Capital Project, Stanford University.
- Utilizes an ecological risk assessment approach
- Using the habitat map, the risk assessment is aimed at evaluating direct interactions between habitats (coastal natural capital) and activities (stressors) and mapping the resulting risks.
- Maps identify where cumulative risks from multiple stressors is greatest, and which specific human activities contribute to this risk.



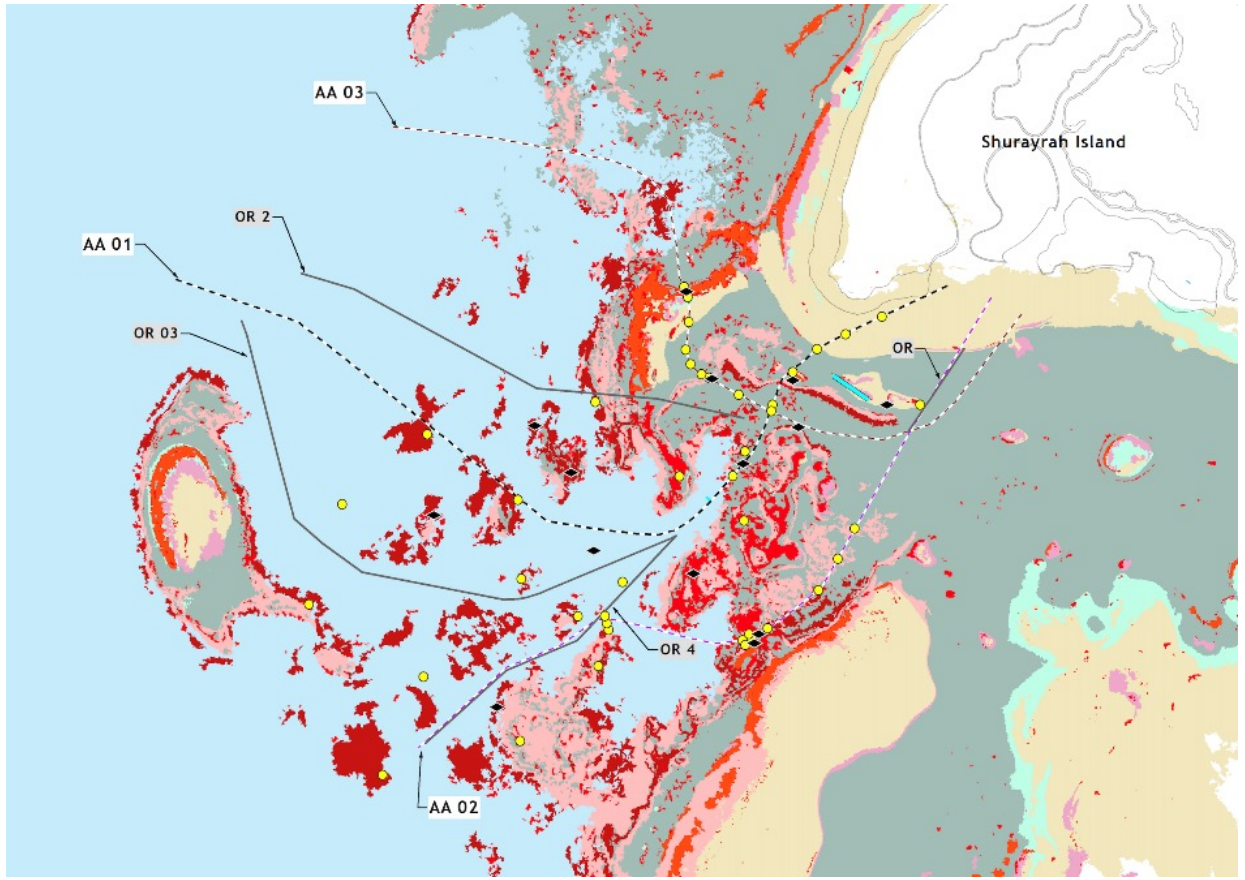
Siting Optioneering

Outputs from the surveys and studies are utilized to inform:

- Siting and orientation of marinas and marine transport infrastructure;
- Routing of proposed channels or utility corridors;
- Desalination plant intake / outfall components; and
- Other infrastructure components.

Modelling studies are utilized to determine suitability of locations for placement of wastewater / desalination infrastructure, considering:

- Dilution potential / flushing;
- Temperature and salinity of the ambient water; and
- Bathymetry / tendency for pooling of disposed effluents.



Summary

- Utilization of scientific knowledge and ground verified data
- Effective baseline and Habitat maps of natural systems and the associated biodiversity
- Proactive implementation of environmental planning approach
- Design decision making to avoid majority of significant impacts

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Questions and Discussions

Thank you

Let’s continue the conversation!

Post questions and comments in the IAIA24 app.

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