CEALAB
COASTAL & ESTUARINE ADAPTATION

NCCC
National Centre for Coasts and Climate

LIVING SHORELINES AUSTRALIA

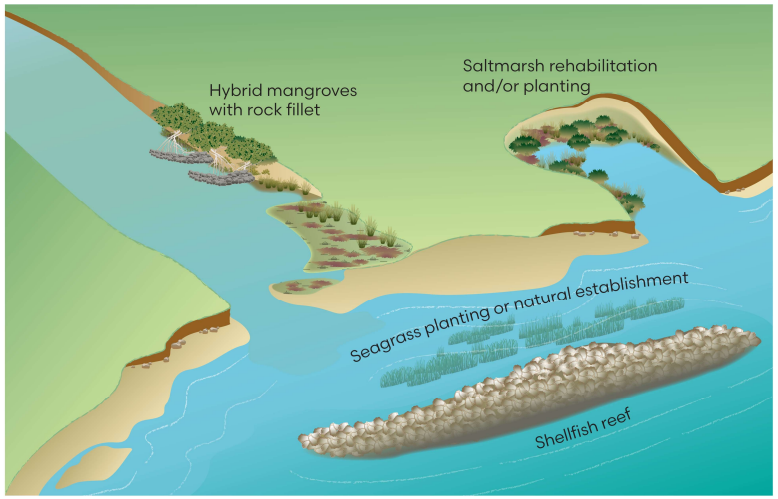
THE UNIVERSITY OF MELBOURNE

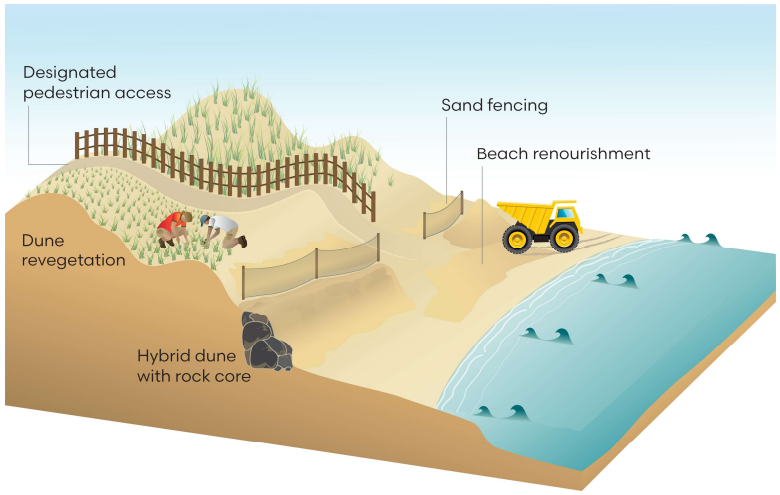
Living Shorelines Australia

Dr Andrew Pomeroy, The University of Melbourne

Living shorelines

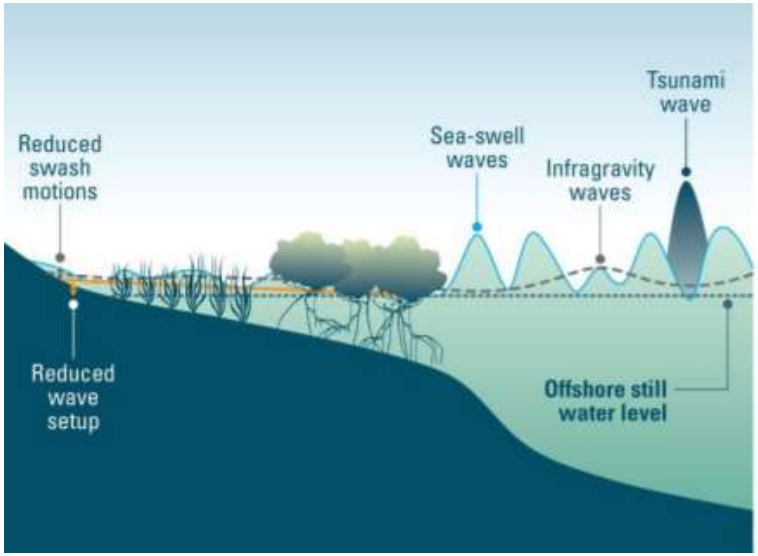
- Creation or restoration of coastal habitats for hazard risk reduction.
- Can restore coastal habitats alone ("soft" approach), or in combination with hard structures that support habitat establishment ("hybrid" approaches)
- Restore the ecological processes and functions that underpin the delivery of the natural coastal defence service.



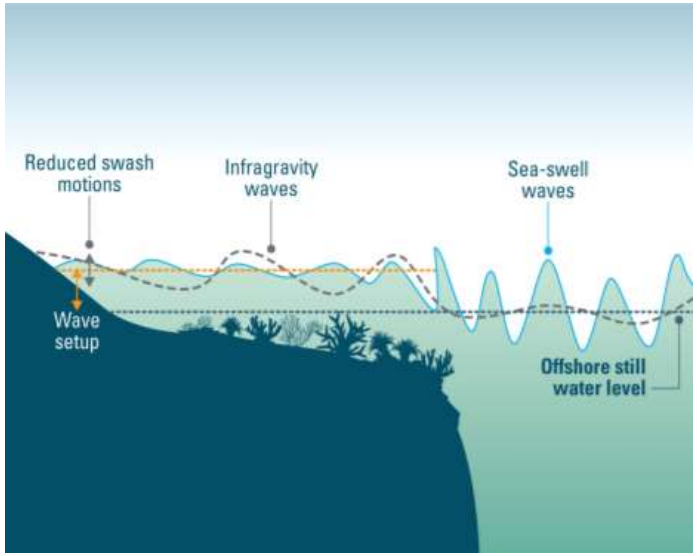


Morris et al. 2022. *Marine and Coastal Hub Report*

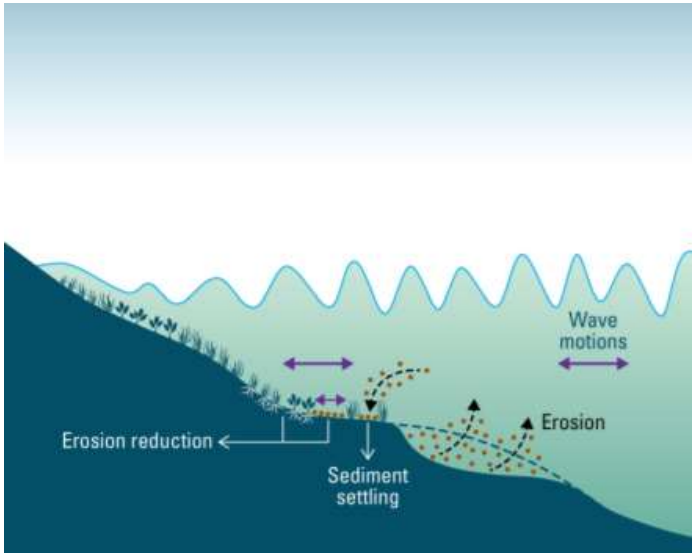
Living shorelines



Wave attenuation due to roughness



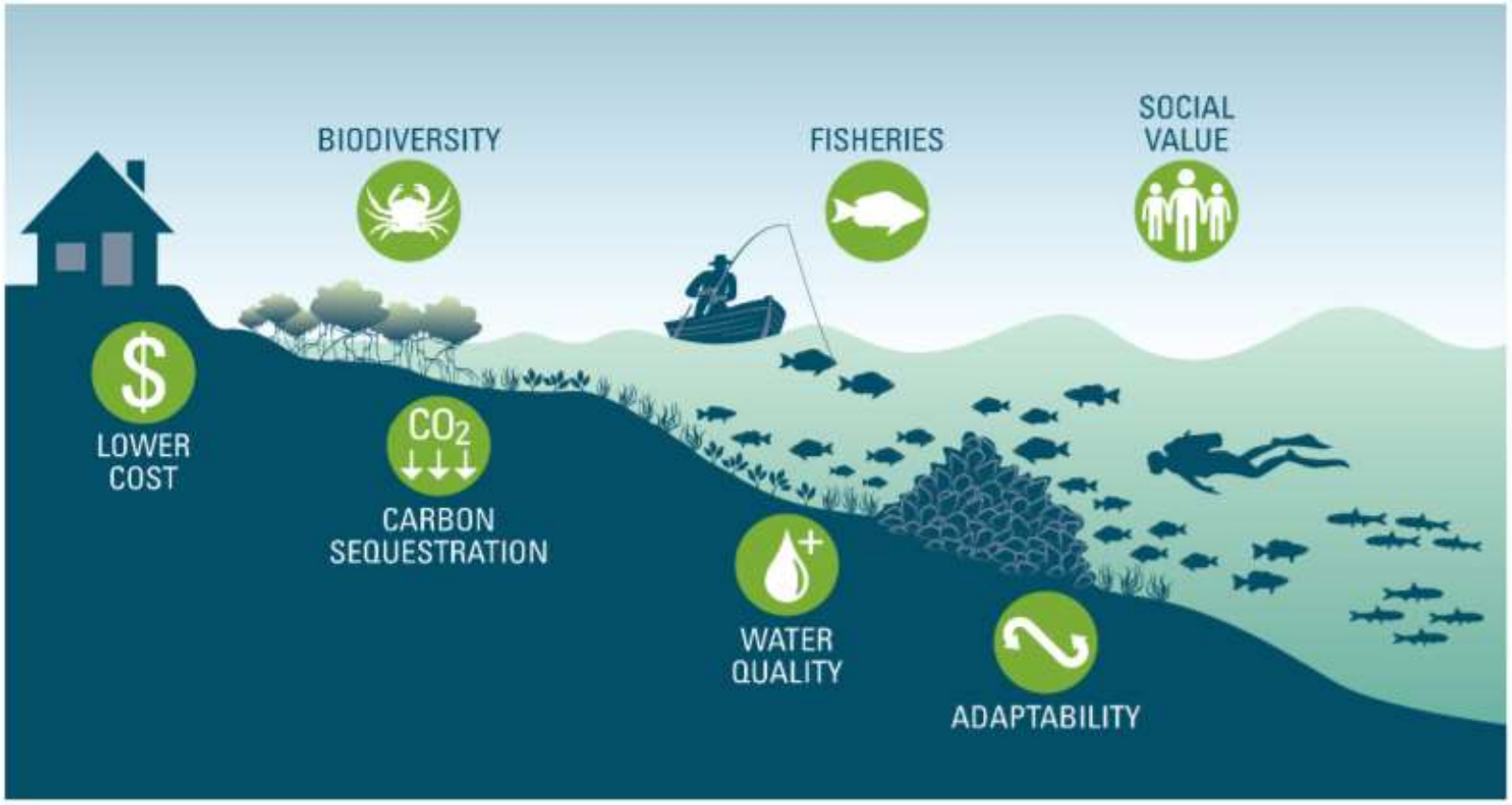
Wave attenuation by depth-induced breaking



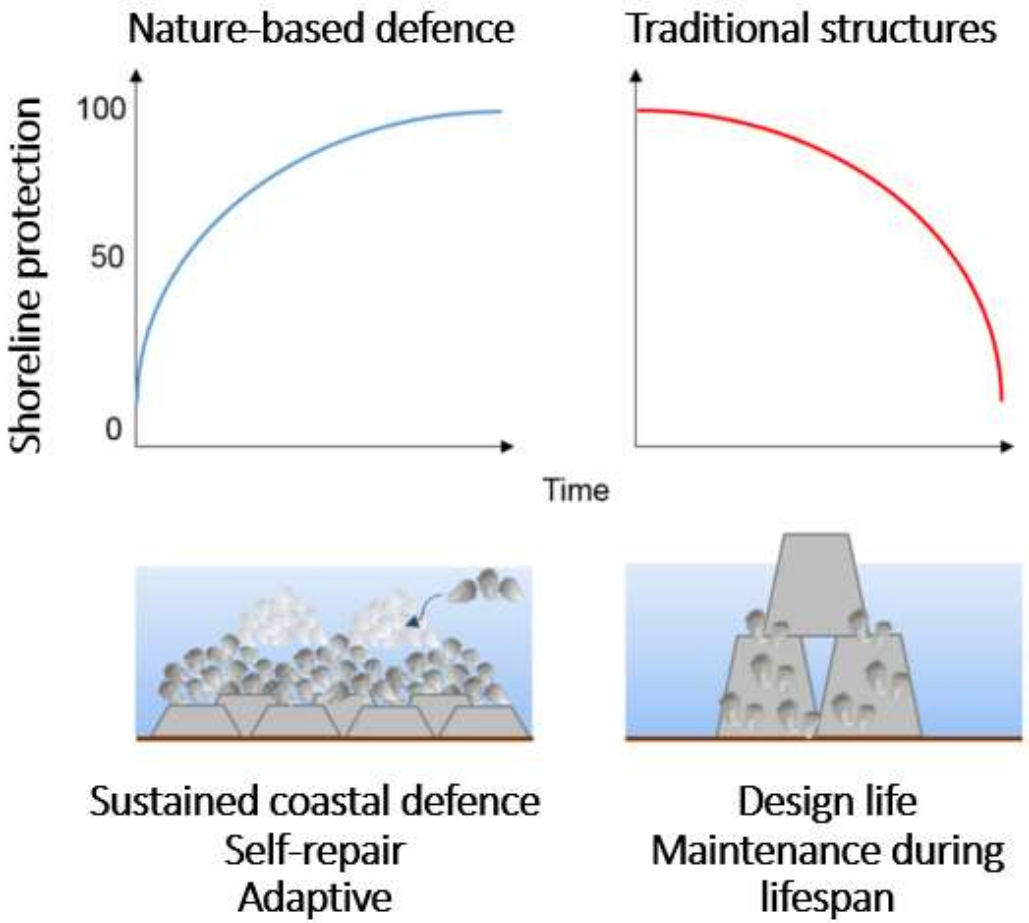
Erosion mitigation within ecosystem

Morris et al. 2021. *ESCC Hub Report*

Potential benefits of living shorelines

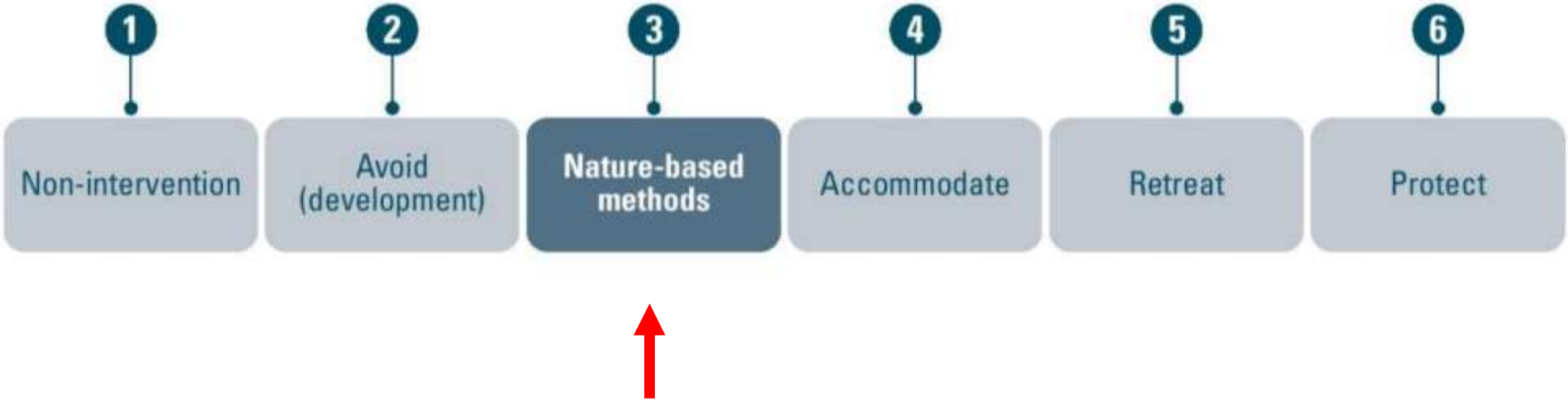


Morris et al. 2021. *ESCC Hub Report*



Morris et al. 2019. *Journal of Applied Ecology*

Adaptation Pathway Approach



Great. But how?

Marine and Coastal

National Environmental Science Program

RESEARCH REPORT

Project 3.7: Identifying and overcoming barriers to coastal and marine habitat restoration and nature-based solutions in Australia

1 March, 2024

A blueprint for overcoming barriers to the use of nature-based coastal protection in Australia

Rebecca L. Morris, Andrew W.M. Pomeroy, Anthony Boxshall, Gildas Colleter, David Dack, Andrew Dunlop, David Hanslow, Sam King, Ariana Magini, Katrina O'Malley-Jones, Sel Sultmann, Murray Townsend, Fiona Valesini, Jacquie White, Elisa Zavadil, and Stephen E. Swearer

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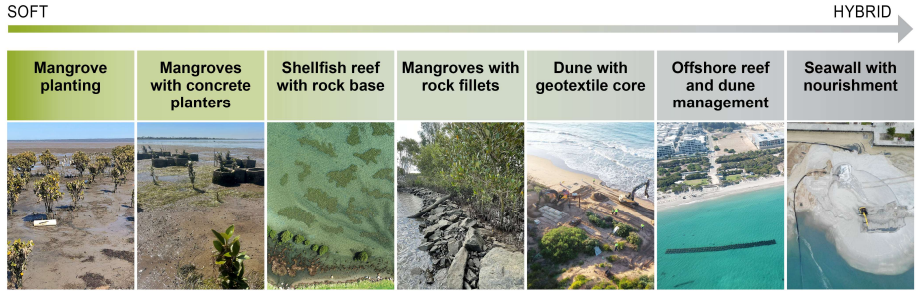


PRIMARY BARRIERS (in order of priority or prevalence)

HIGH — MID — LOW

GOVERNMENT SUPPORT Leadership to support implementation at all levels

FUNDING Availability and the confidence to spend money on nature-based coastal protection

★ **TECHNICAL GUIDANCE** Lack of (accessible) information on project scoping, concept to detailed design, life cycle costs, construction, maintenance and monitoring

NECESSARY EXPERTISE The availability of expertise to procure, design and construct nature-based coastal protection, and better integration of existing expertise into the process

★ **RISK – HAZARD AND REDUCTION** Coastal hazard risk present at a site that the solution needs to be designed for and the risk reduction that can be achieved by nature-based coastal protection supported by an evidence base

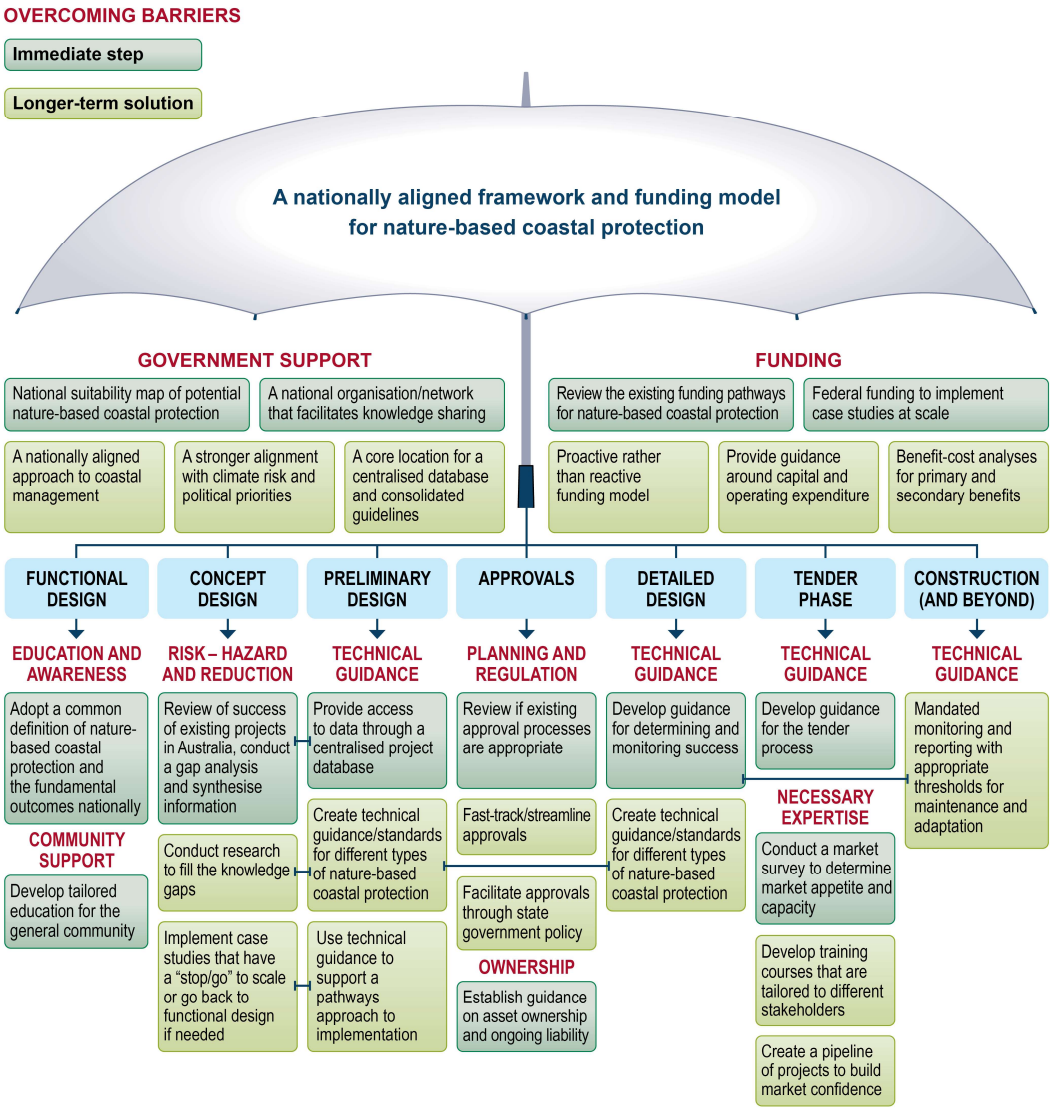
COMMUNITY SUPPORT Support for nature-based coastal protection from the local community that could be adjacent landowners, regular users of the area and may include Traditional Owners

PLANNING AND REGULATION Gaps for enabling nature-based coastal protection in strategic planning, approvals, permits and consents

OWNERSHIP The consideration of nature-based coastal protection as an asset and who has ongoing responsibility/liability for the structure

★ **EDUCATION AND AWARENESS** Lack of industry definition and recognition of what constitutes a nature-based coastal protection and the fundamental principles

Morris et al. 2024. *MaCC Hub Report*



Morris et al. 2024. *MaCC Hub Report*

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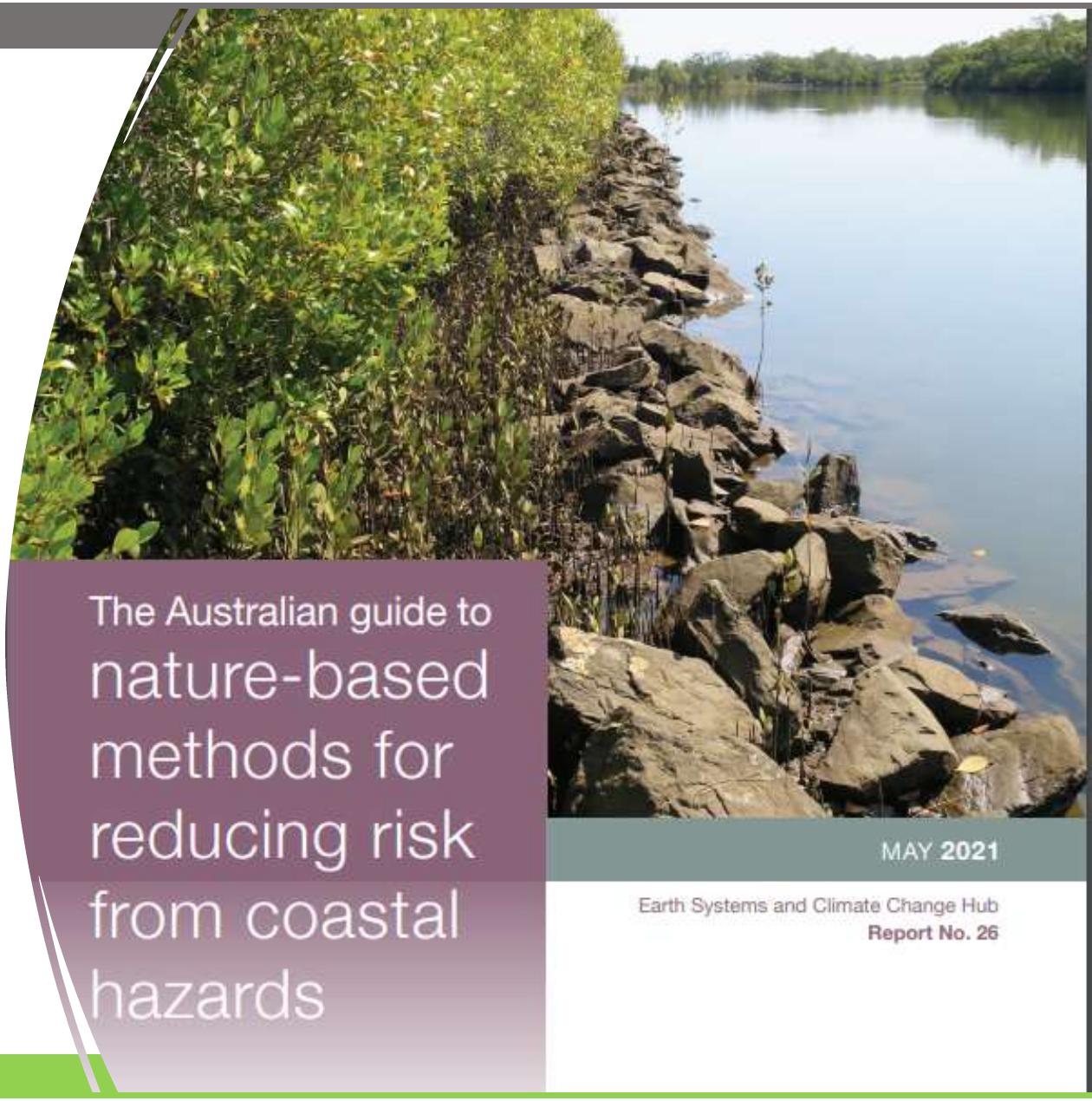
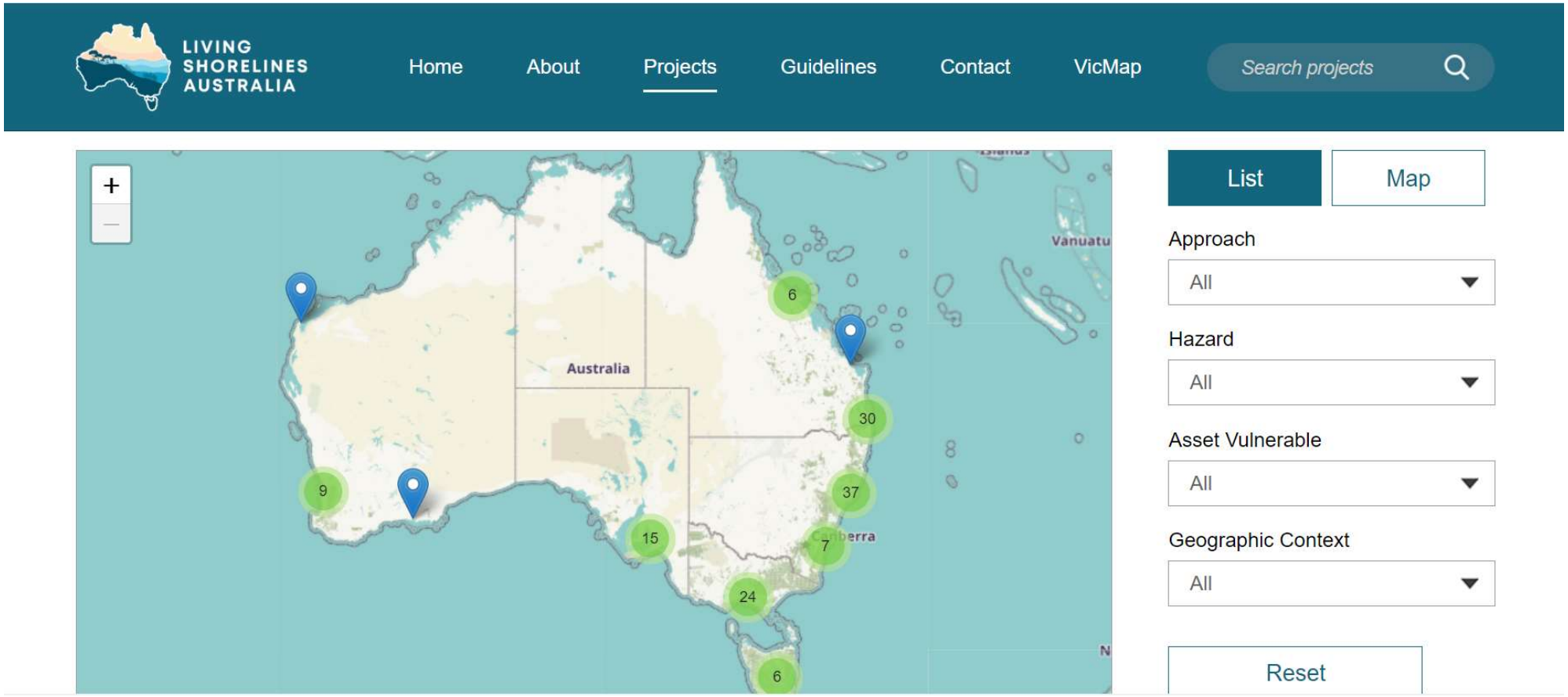
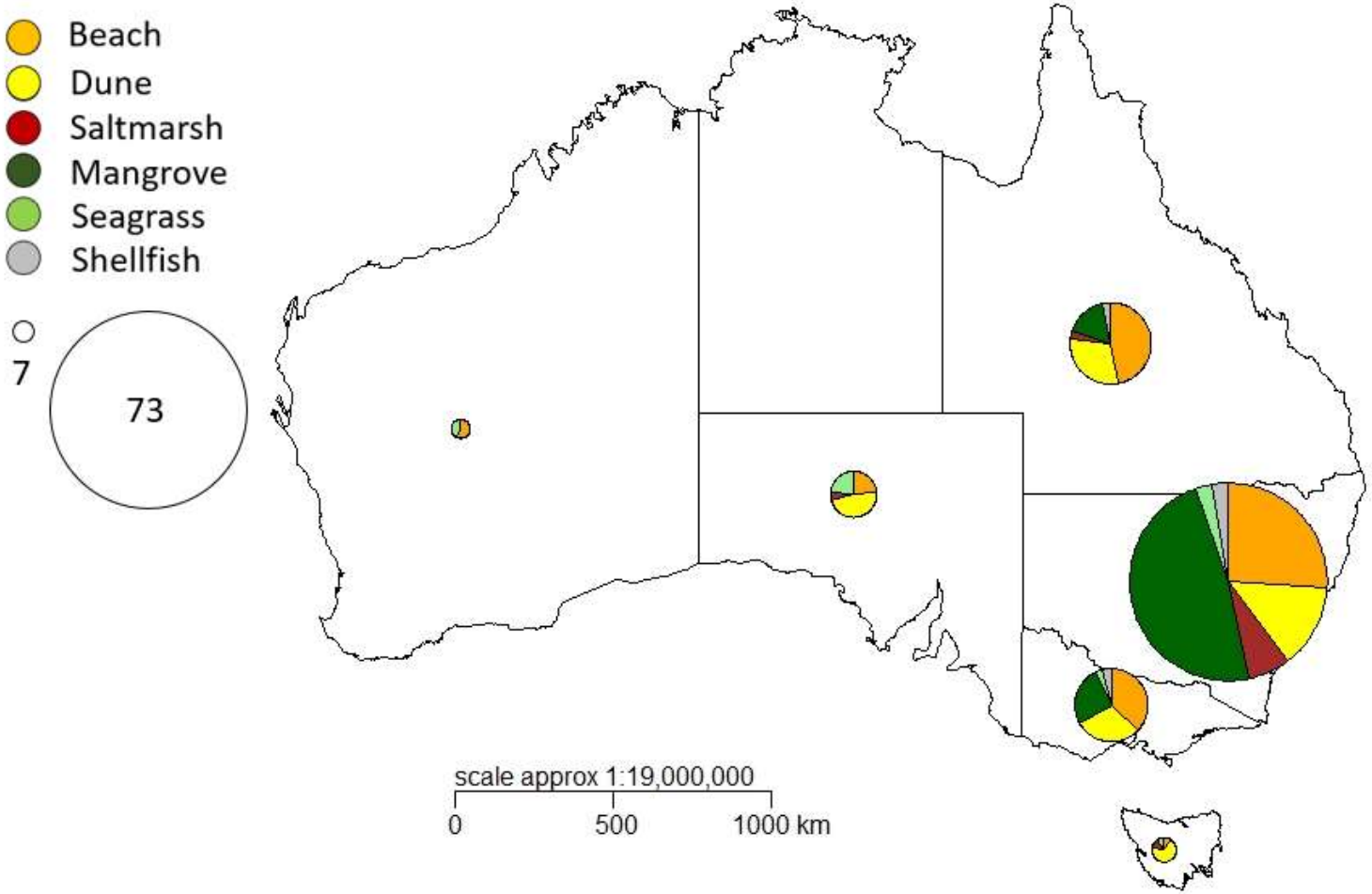
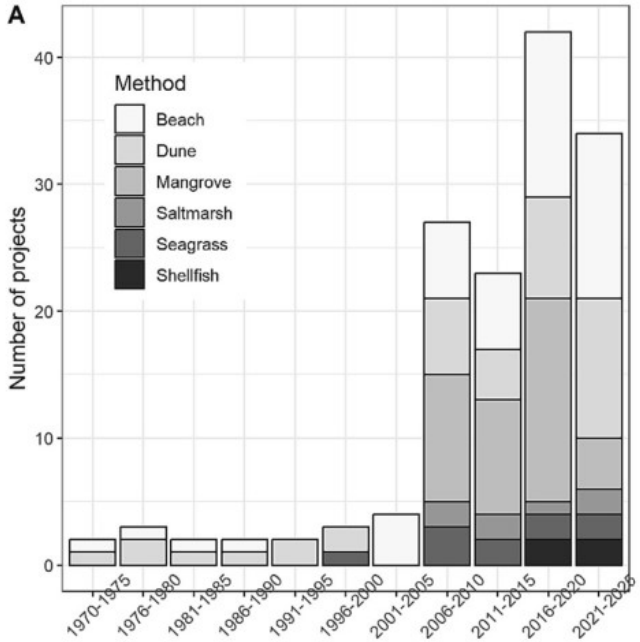


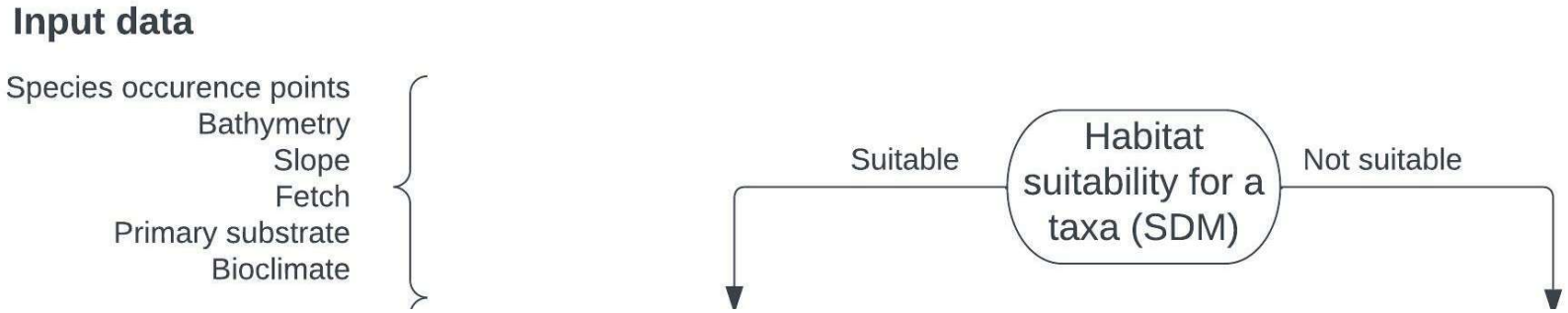


www.livingshorelines.com.au





Morris et al. 2024. *Science of the Total Environment*



Multi-criteria suitability analysis (Living Shorelines Tool)

SEAGRASS

Halophila australis

Amphibolis antarctica

Heterozostera nigricaulis

Zostera muelleri

MANGROVE

Avicennia marina

SALTMARSH

Gahnia filum

Austrostipa stipoides

Tecticornia arbuscula

Ostrea angasi

SHELLFISH

Mytilis galloprovincialis

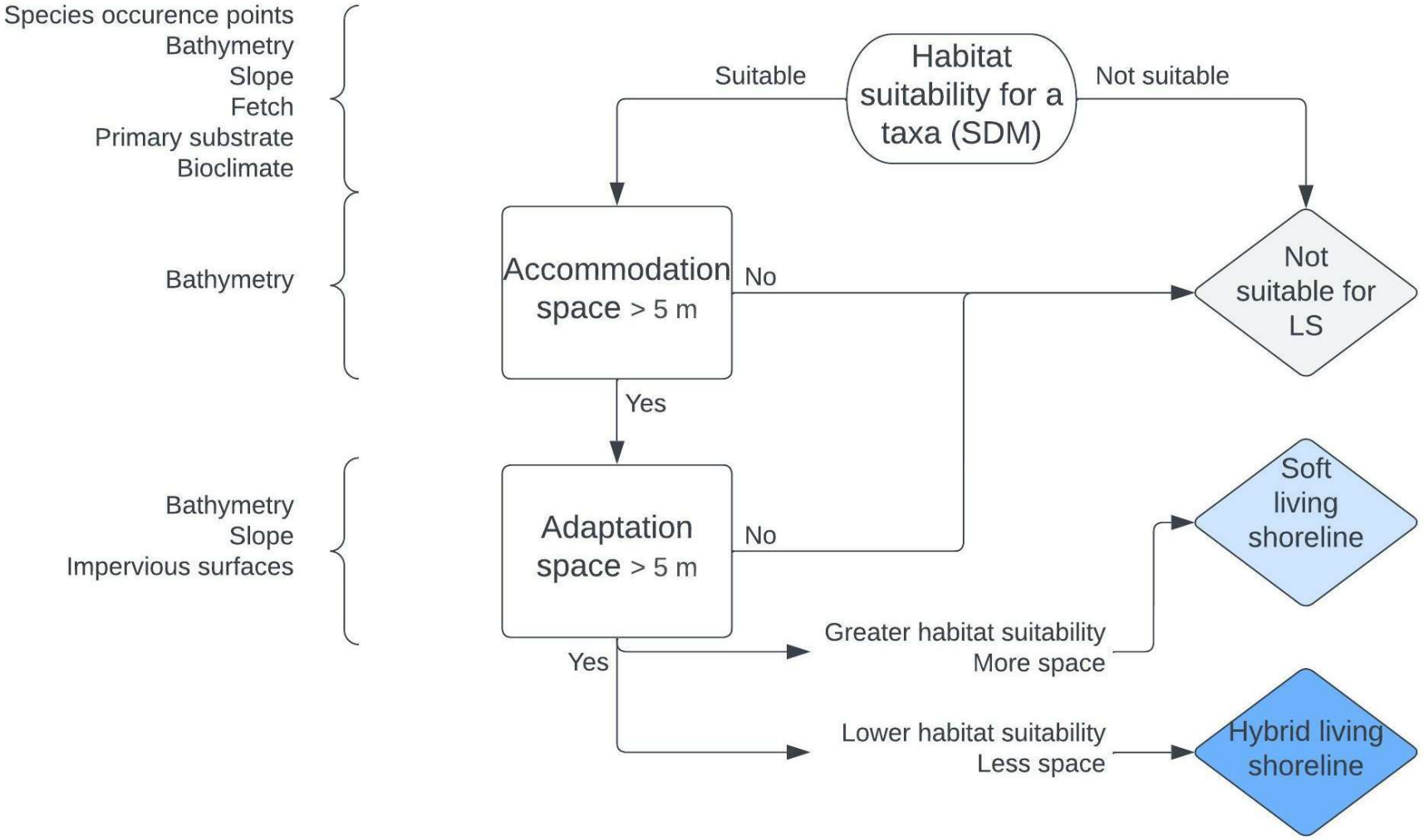
DUNES

Ammophila arenaria

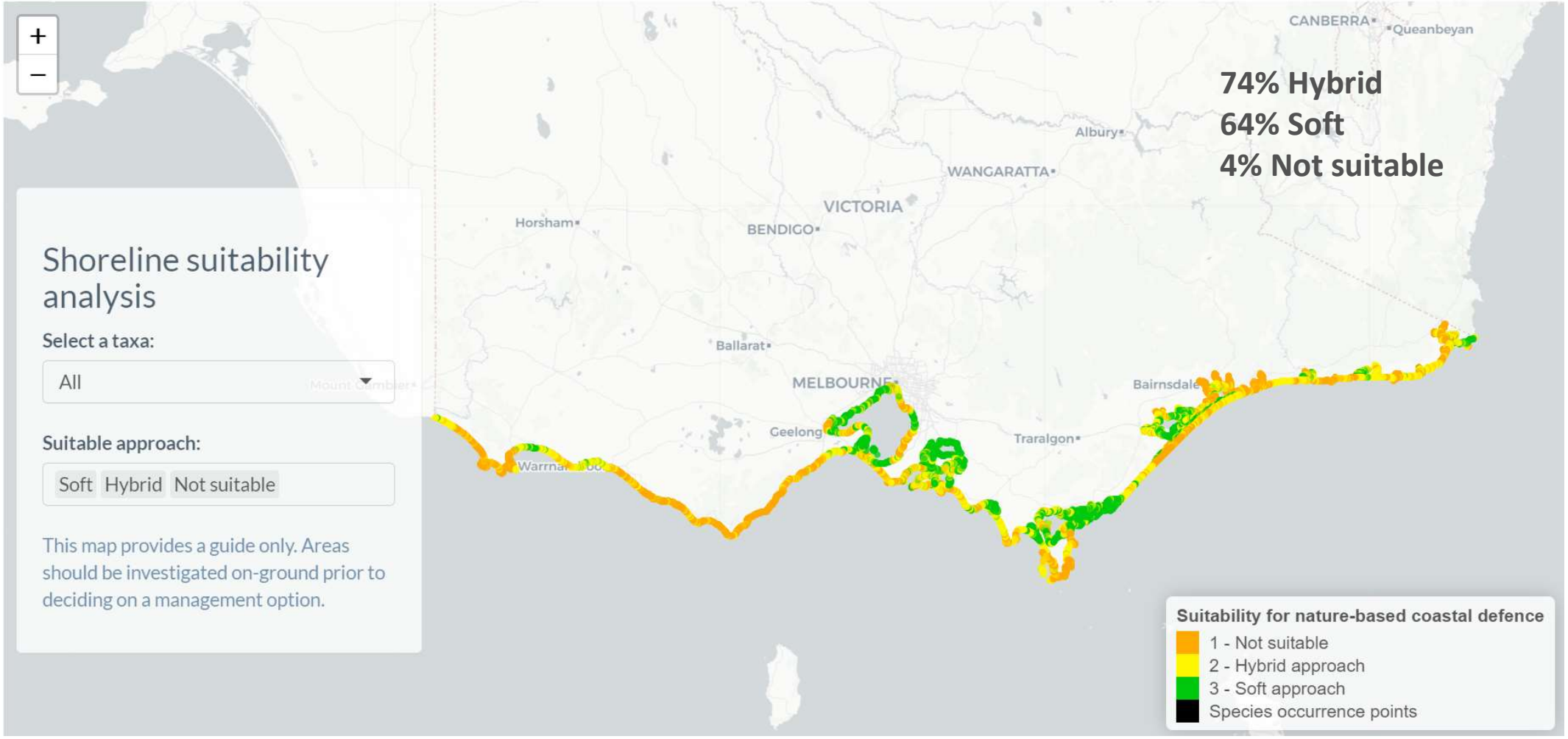
Spinifex sericeus

Thinopyrum junceiforme

Input data

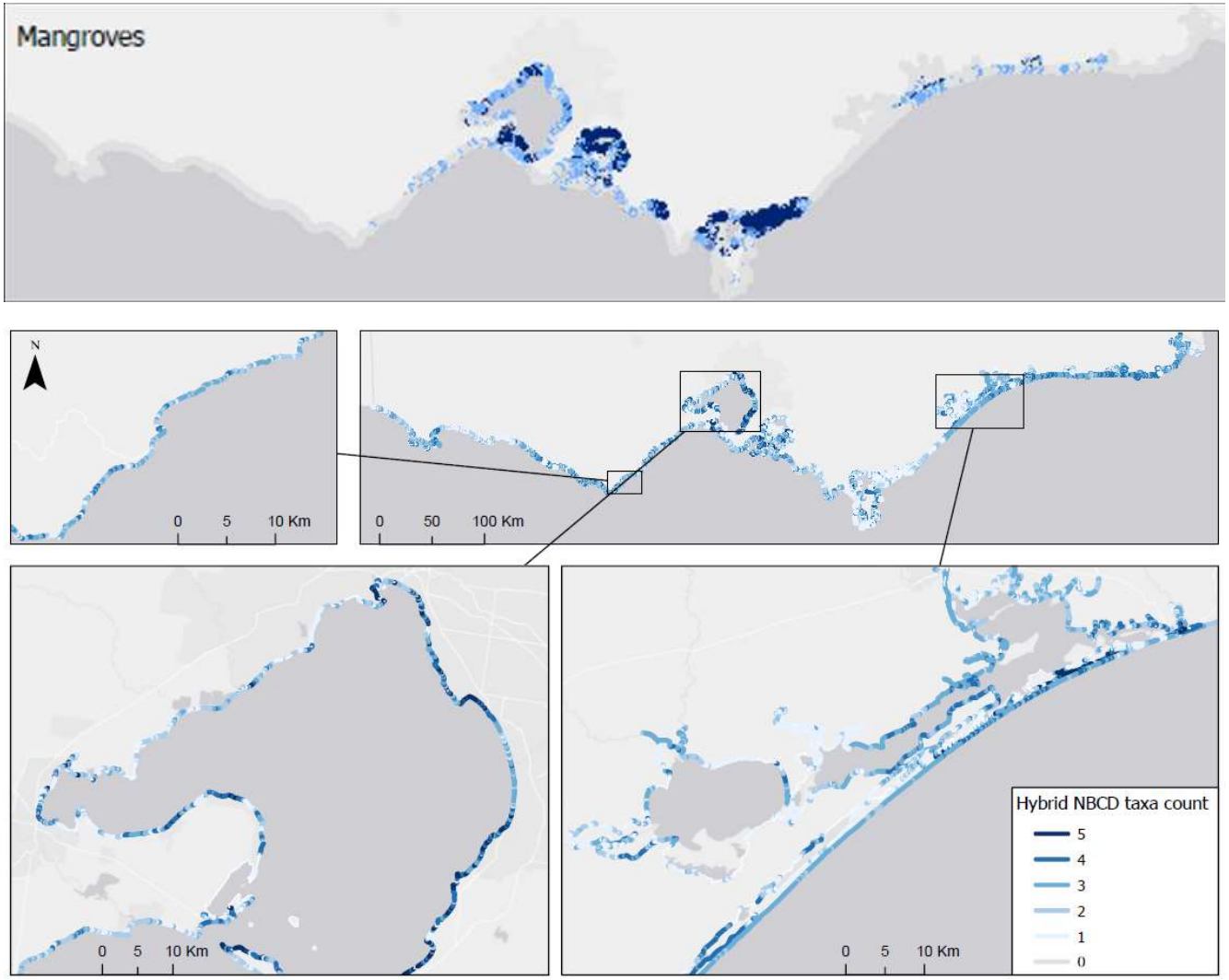

Species occurence points
Bathymetry
Slope
Fetch
Primary substrate
Bioclimate
Bathymetry
Bathymetry
Slope
Impervious surfaces
Habitat suitability for a taxa (SDM)
Suitable
Not suitable
Accommodation space > 5 m
No
Not suitable for LS
Yes
Adaptation space > 5 m
No
Soft living shoreline
Greater habitat suitability
More space
Yes
Lower habitat suitability
Less space
Hybrid living shoreline

https://nccc.shinyapps.io/livingshorelinetool/



Opportunities for Single Taxa

Opportunities for Multiple Taxa



Future Enhancements

- Expansion of system into Queensland.
- New layers: shoreline erosion; current habitat distribution; coastal hazard assessment
- Climate change predictions
- Other spatial layers – e.g., social acceptability
- Setting thresholds for soft and hybrid approaches
- Intersection with the smaller-scale – specific actions on-ground

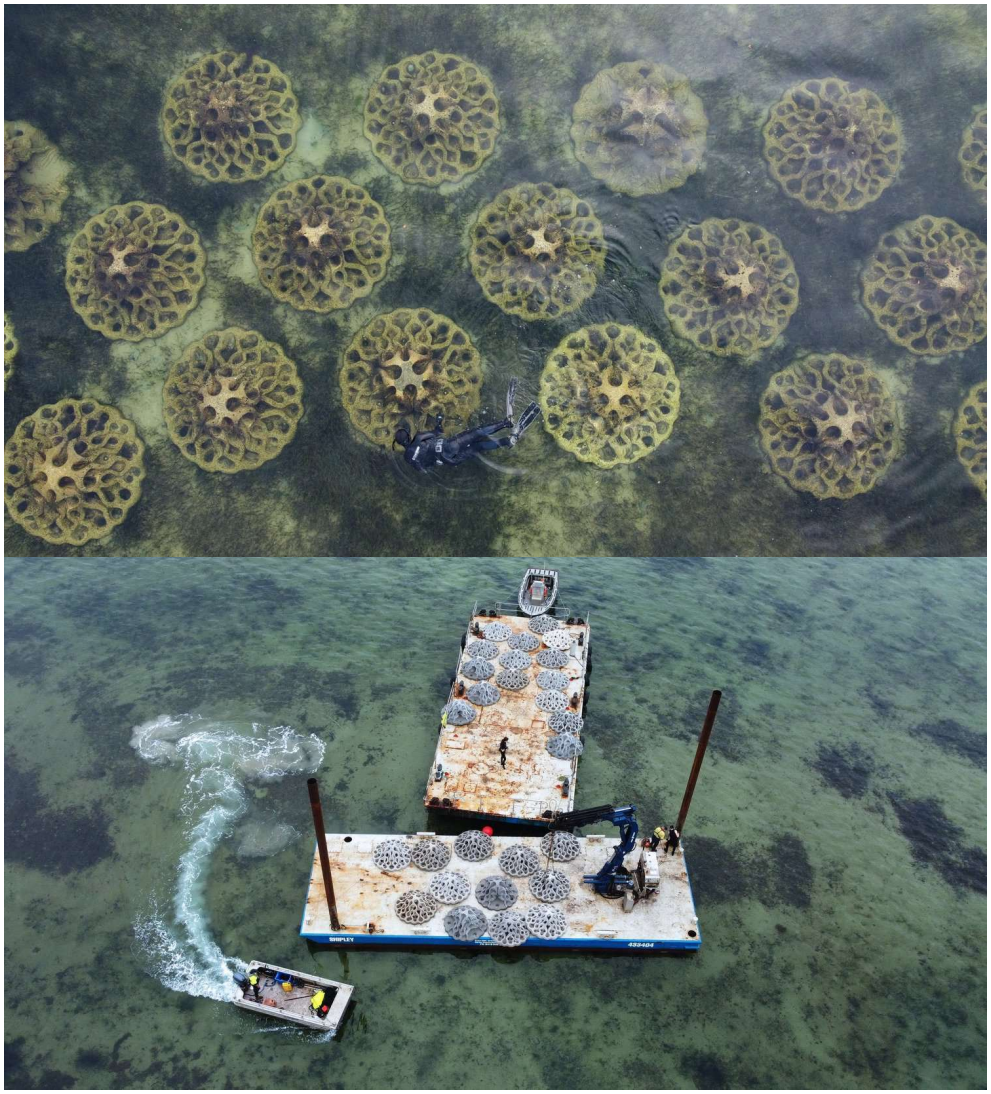
- Any feedback is welcome!

Examples – Ramblers Reef

- Combination of rock rubble cages (gabions) seeded with shellfish
- Was originally going to be higher but was changed based on community feedback.
- Successful modification to the shoreline (approx. 25m)

Examples – The Dell

- Ecologically inspired module design, custom fabricated in Melbourne at Reef Design Lab.
- Rely of self-weight to stay in place.
- Successful ecological response, particularly with respect to local seagrass.



Examples – Mangrove Planters

- Concrete planter that seek to help establish mangroves in environments that have become adverse over time.
- Once the plant has matured the planter can be reused for further plantings and the cycle can continue.
- Varying success.

Examples – Bermagui Shellfish Reef

- Built by The Nature Conservancy
- Promote shellfish establishment with the goal to move away from rectangles!
- Rubble in irregular shapes and seeded.

Examples – Reefence

- US Defence project
- Artificial oyster reef that seeks to mitigate incident waves and build shoreline resilience.
- Custom designed module (Melbourne) that promotes ecology, attenuates waves and is self-interlocking.

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- US Defence project

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Top Tips

- Work with diverse stakeholders
- Co-design living shoreline projects for multiple outcomes
- Be prepared to adjust expectations/acceptance of risk and success
- Ask how will it affect coastal processes

- Ask for help!

Top Tools

Australia

- Living Shorelines Database Australia (www.livingshorelines.com.au)
- Australian Guidelines for Nature Based Risk Reduction (Ask Google, or Me)
- Living Shorelines Tool (https://nccc.shinyapps.io/livingshorelinetool)

International

- Engineering with Nature (USA) (https://ewn.erdc.dren.mil/)
- Climate Action Tool (https://climateactiontool.org/)

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