Strategy to Reality: Implementing Decarbonisation & ESG Strategies

Coasts & Ports 2025 PIANC AU-NZ Pre-Conference Workshop

Monday 18 August 2025
11:30am – 5:30pm
Adelaide Convention Centre, SA

Proudly sponsored by

ARUP

Presentations at PIANC AU-NZ Sustainability Workshop 18 August 2025- Adelaide.

P4 Agenda

P7 Luke Campbell, PIANC AU-NZ Chair **Welcome and introduction to PIANC**

p51 Adam van der Beeke, PIANC AU-NZ Environmental Commission **About EnviCom's Work**

p67 Tessa Wade, Managing Consultant- Sustainability Advisory, Worley -**Ports Australia Guidelines for Emissions Counting**

p81 Sarah Harvey, Senior Sustainability Consultant, Arup -**Decarbonisation Planning and Implementation (with insights from GeelongPort's journey)**

p99 Marnie Hope, Group Sustainability Manager, Flinders Ports - **Flinders Ports Case Study ,**

p116 Fauzan Zulkhepli, Senior Project Manager, Port Authority of NSW PIANC WG248 Chair -**PIANC WG248 ShorePower Update**

p127 Sam Mazaheri, Principal Engineer, Dalrymple Bay Coal Terminal **Fuel Transition: Impact for Port and Maritime Infrastructure**

p140 Dr Ashley Kingsborough, Senior Manager Water Futures and Security, SA Water - **Sustainability in Infrastructure - Lessons from the Water Industry**

p 168 Dr Ron Cox, Honorary Associate Professor Civil and Environmental Engineering UNSW & PIANC AU-NZ Board Member - **Climate Change: Impacts, Adaptation, and Sustainability for Ports and Maritime Infrastructure**

Acknowledgement of Country

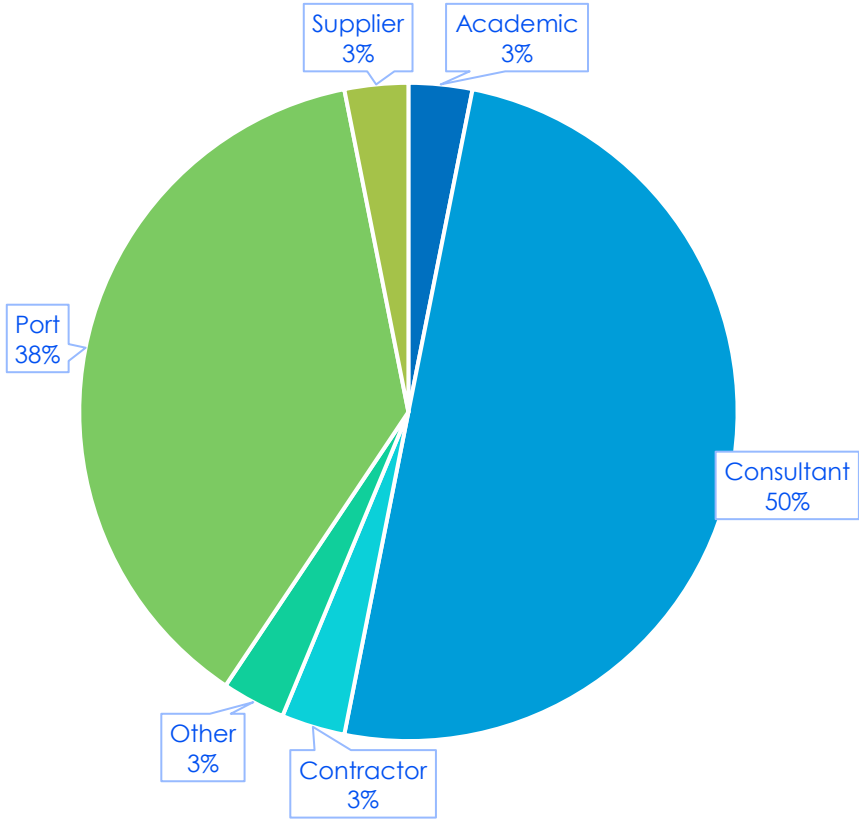
PIANC acknowledges the Traditional Custodians of Country throughout Australia. We recognise and celebrate their continuing connection to land, sea, space and community, and the importance and richness of their cultures and traditional knowledge. We pay our respects to Elders past and present, and to all Aboriginal and Torres Strait Islander peoples.

Agenda

11:30-11:45	**Arrival / Registration**	
11:45-12:30	**Welcome and Introduction**	Luke Campbell, PIANC AU-NZ Chair Adam van der Beeke, PIANC AU-NZ EnvCom Lead
12:30-13:15	**Lunch**	
13:15-13:45	**Ports Australia GHG Emissions Inventory Guidance for Ports**	Tessa Wade Managing Consultant- Sustainability Advisory, Worley
13:45-14:15	**Decarbonisation Planning and Implementation (with insights from GeelongPort's journey)**	Sarah Harvey Senior Sustainability Consultant, Arup
14:15-14:45	**Flinders Ports Case Study**	Marnie Hope Group Sustainability Manager, Flinders Ports
14:45-15:15	**Afternoon Tea**	
15:15-15:45	**PIANC WG248 Shore Power Update**	Fauzan Zulkhepli Senior Project Manager, Port Authority of NSW PIANC MarCom WG248 Chair
15:45-16:15	**Fuel Transition: Impact for Port and Maritime Infrastructure**	Sam Mazaheri Principal Engineer, Dalrymple Bay Coal Terminal
16:15-16:45	**Sustainability in Infrastructure - Lessons from the Water Industry**	Dr Ashley Kingsborough Senior Manager Water Futures and Security, SA Water
16:45-17:15	**Climate Change: Impacts, Adaptation, and Sustainability for Ports and Maritime Infrastructure**	Dr Ron Cox Honorary Associate Professor Civil and Environmental Engineering UNSW PIANC AU-NZ Board Member
17:15-17:30	**Facilitated Session: Learnings and Next Steps**	Luke Campbell, PIANC AU-NZ Chair Adam van der Beeke, PIANC AU-NZ EnvCom Lead

Attendees

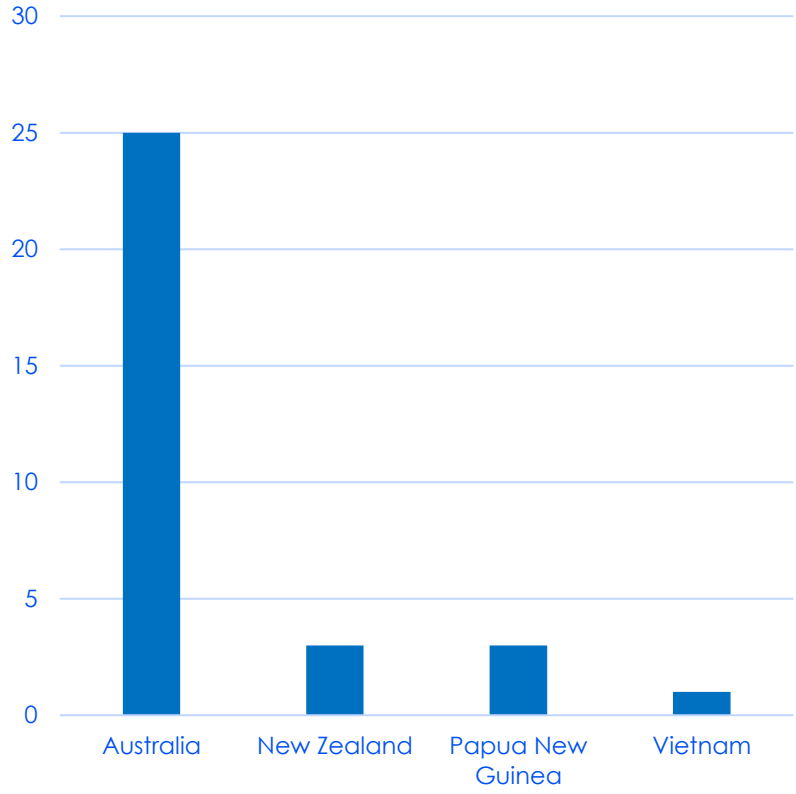
Attendee Employer Type



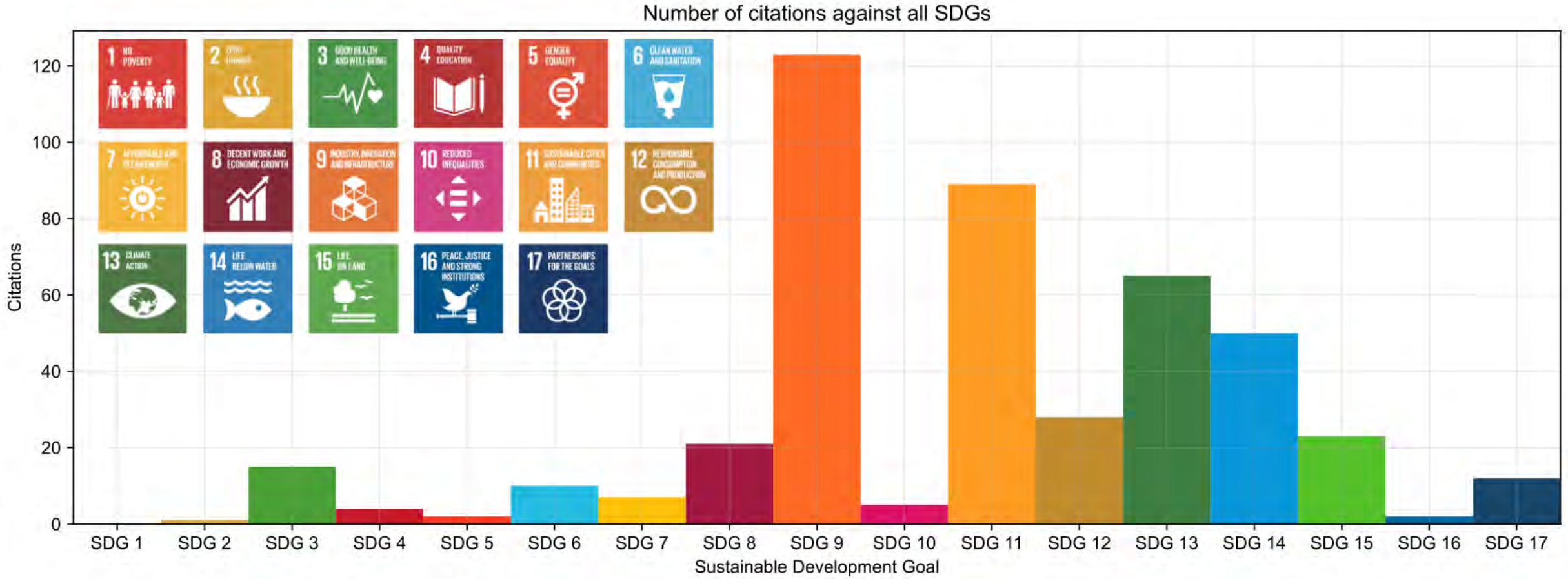
Attending Organisations

ABB Marine & Ports
Arup
AW Maritime Pty Ltd
BMT Commercial Australia Pty Ltd
Cavotec
Darwin Port
DBCT
Engeny Australia Pty Ltd
Flinders Ports Holdings
Fremantle Ports
Haskoning
HEB Construction
KBR / Frazer-Nash
PANSW
PNG Ports Corporation Limited
Port Otago Ltd
Port-Safety
SA Water
Tasports
UNSW
WGA
Worley
WT Partnership

Geographic Spread of Attendees



ESG in our industry through SDG lens



Luke Campbell - PIANC AU-NZ Chair

Ports and Marine Lead – WGA

Welcome & Introduction

Proudly sponsored by

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PIANC IS

The worldwide network of professionals, providing expert advice on cost-effective and sustainable waterborne transport & recreation infrastructure,

And the leading partner for governments and the private sector in the design, development and maintenance of ports, waterways and coastal areas …

SINCE 1885!

PIANC'S 140th birthday: last 25th May

EXCOM MEMBERS

- **President of PIANC**
- **Secretary (General) of PIANC**
- **The 4 VPs of PIANC**
- **And Commission chairpersons (Maritime Navigation, Environment, Inland waterways, Recreational navigation, Finance Commission, Young Professionals, Promotions Commission and International Co-operation Commission)**

WHAT PIANC DOES

- Deliver high-quality technical reports within our International Commissions and Working Groups
- Create a worldwide network of the best international experts, both public and private, on technical, economic and environmental issues pertaining to waterborne transport infrastructure
- Support Young Professionals and Developing Countries
- Keep the network connected through PIANC's international/regional/local events

The leading international source of waterborne transport-related information in the 21st century

PIANC IS ABOUT COLLABORATION AND MAKING A DIFFERENCE
(OPENING CEREMONY 35TH WORLD CONGRESS, CAPE TOWN 2024)

OUR MEMBERS

THE PIANC MEMBERSHIP CONSISTS OF:

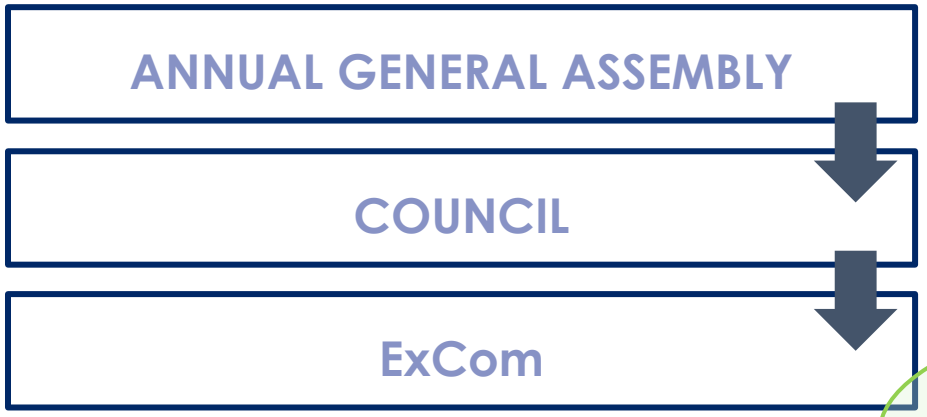
- 44 Qualifying Members (QM) of which 31 have a National Section (NS)
- About 1,800 Individual Members
- More than 500 Corporate Members
  - port authorities
  - professional associations
  - universities
  - public- and private-sector organisations
  - …
- 17 Platinum Partners

OUR MEMBERSHIP

OUR MEMBERSHIP: 17 Platinum Partners

PIANC STRUCTURE

Management:



4 Vice Presidents (continents)

4 commissions for technical and scientific activities:

- Inland Navigation Commission (**InCom**)
- Maritime Navigation Commission (**MarCom**)
- Environmental Commission (**EnviCom**)
- Recreational Navigation Commission (**RecCom**)

4 non-technical commissions:

- International co-operation and relations with Developing Countries (**CoCom**).
- Focusing on PIANC's Young Professionals (**YP-Com**).
- Dealing with the financial aspects of the Association (**FinCom**).
- Dealing with the marketing and promotion of the Association (**ProCom**).

PIANC

'Setting the Course'

Report n° 150 - 2014

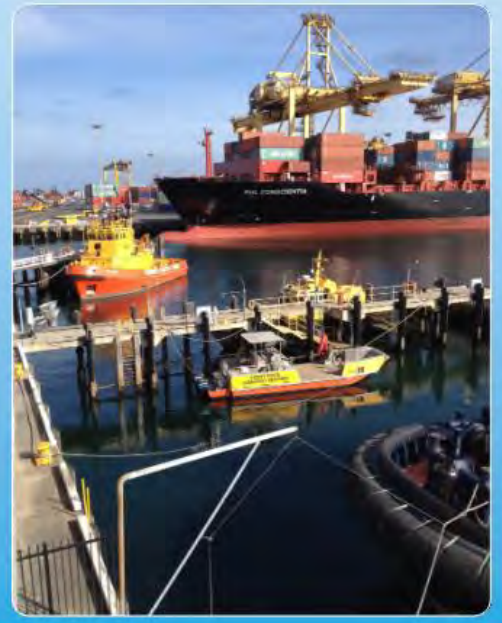
'SUSTAINABLE PORTS'

A GUIDE FOR PORT AUTHORITIES

The World Association for Waterborne Transport Infrastructure

PIANC

EnviCom WG Report
n° 178 - 2020



CLIMATE CHANGE ADAPTATION PLANNING
FOR PORTS AND INLAND WATERWAYS

The World Association for Waterborne Transport Infrastructure

PIANC

'Setting the Course'

EnviCom
Task Group 2

TOWARDS A SUSTAINABLE WATERBORNE TRANSPORTATION INDUSTRY

The World Association for Waterborne Transport Infrastructure

PIANC

The World Association for Waterborne
Transport Infrastructure

WATERBORNE TRANSPORT, PORTS AND WATERWAYS: A 2023 UPDATE OF CLIMATE CHANGE DRIVERS AND IMPACTS

EnviCom Task Group Report N° 3 – 2023

PIANC
The World Association for Waterborne Transport Infrastructure

Managing Climate Change Uncertainties in Selecting, Designing and Evaluating Options for Resilient Navigation Infrastructure

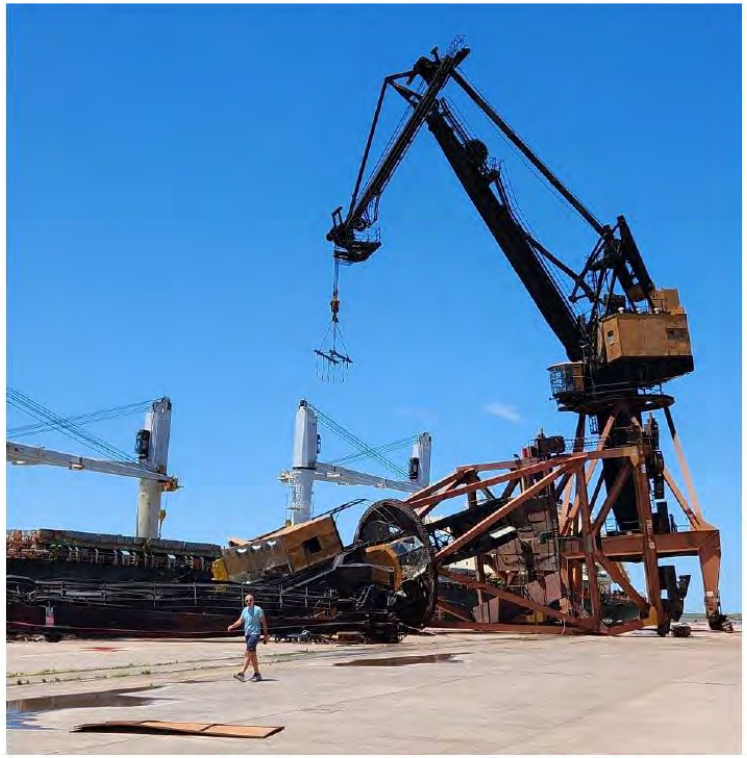
Permanent Task Group for Climate Change

Technical Note No. 1 - 2022

PIANC
The World Association for Waterborne Transport Infrastructure

Climate Change Costs to Ports and Waterways:

Scoping the Business Case Assessment for Investment in Adaptation



Permanent Task Group for Climate Change

Technical Note No. 2 – 2024

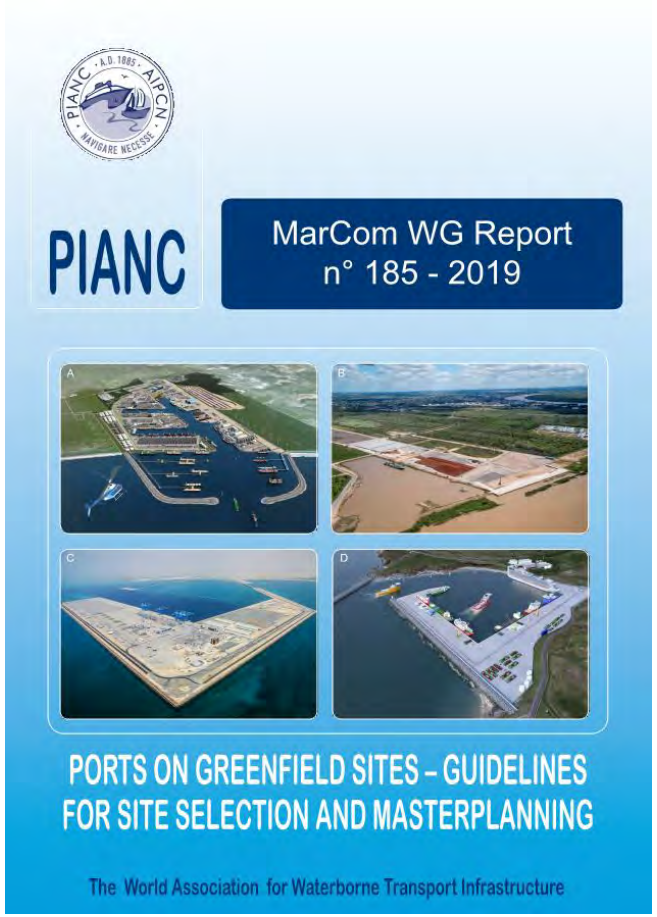
PIANC REFERENCE DOCUMENTS

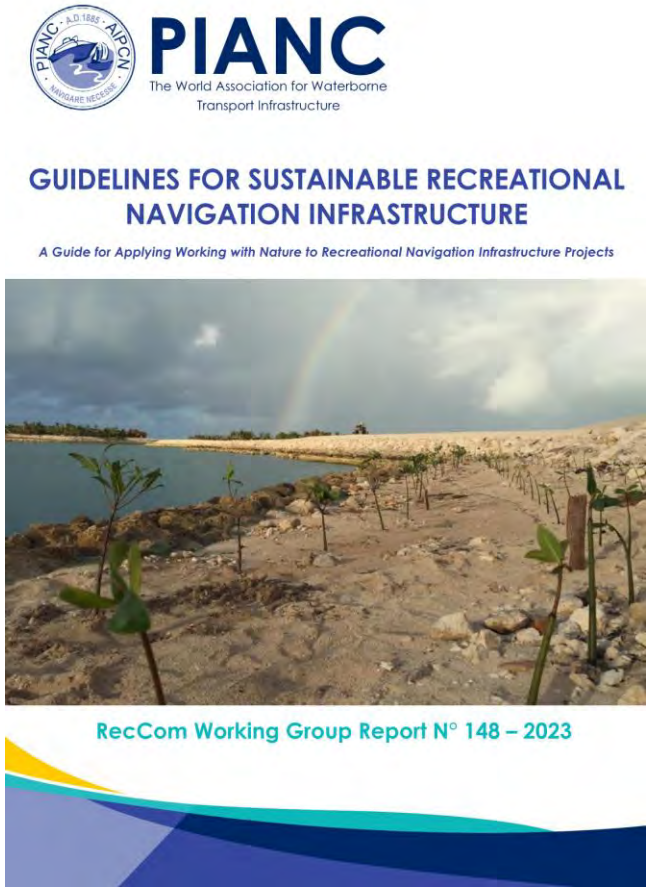
Documents can be found on the PIANC Website

EnviCom Archives

- Click on Read More for an Overview
- Click on Buy Now
- Enter your details
- Place Order

- Maritime Commission
- Recreational Navigation Commission





SUEZ CANAL – OPENED IN 1869

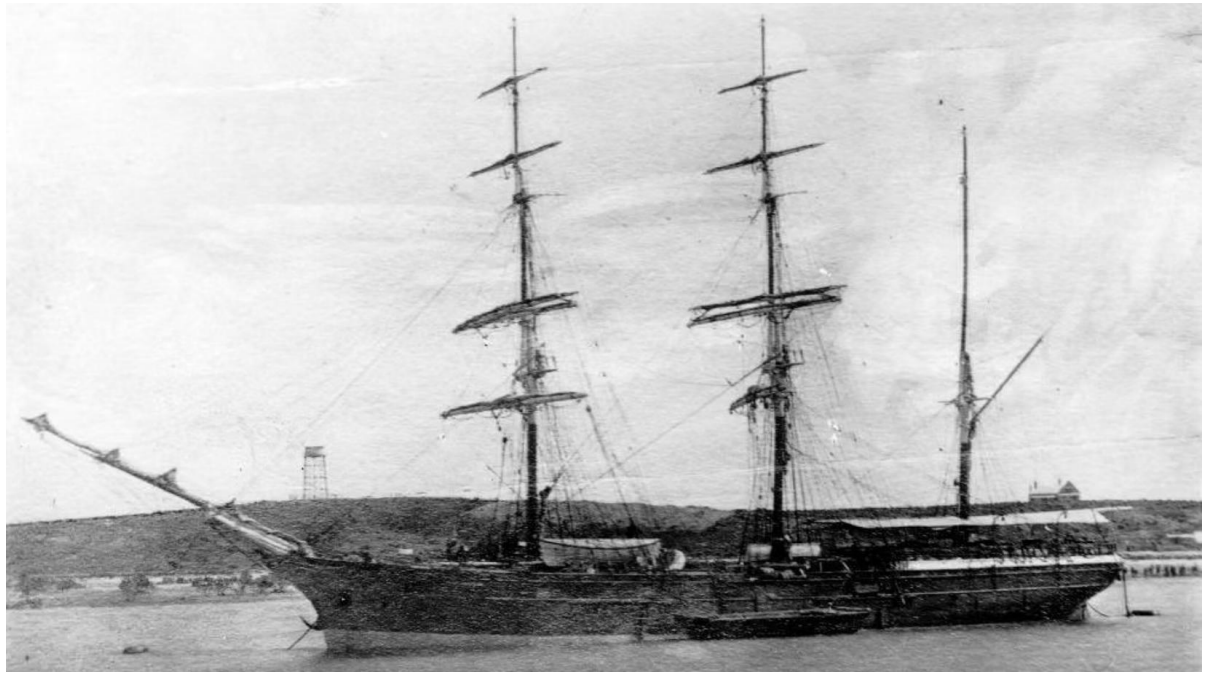
- **International Congress** for the *"Study of the Interocean Canal"*, convened in Paris in 1871
- Resolution decided on the location of the interoceanic canal - the Isthmus of **Panama**

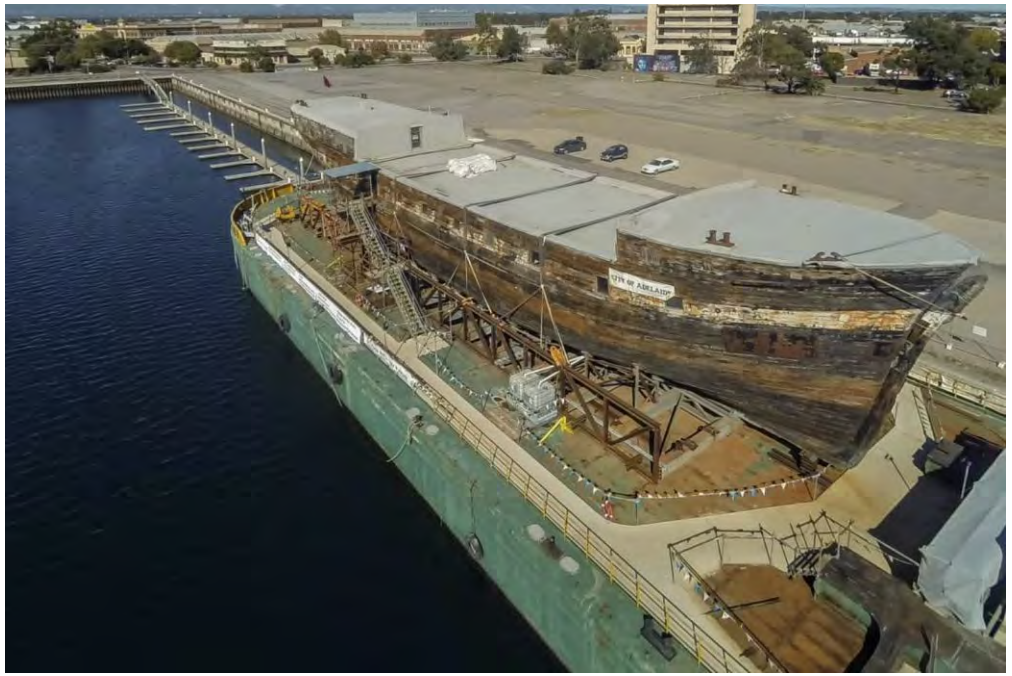
CUTTY SARK – BUILT IN 1869

- One of the last tea clippers to be built and one of the fastest
- The end of a long period of design development for this type of vessel
- End of an era as steamships took over their routes. (**Energy Transition!**)

CITY OF ADELAIDE – BUILT IN 1864

- 5 years older than Cutty Sark!
- Between 1864 and 1887 she made 23 annual return voyages from London and Plymouth to Adelaide
- Played an important part in the immigration of Australia





PANAMA CANAL – OPENED IN 1914

- France began work on the canal in **1881**, but stopped because of engineering problems and high worker mortality rate.
- The United States took over the project in 1904, and opened the canal in **1914**.
- What about vessels? What had occurred over a couple of decades?

THE CREATION OF **PIANC**: PERMANENT INTERNATIONAL **COMMISSION** OF NAVIGATION CONGRESSES

- A decision was taken in 1898 for a **permanent** Association => 1902.
- The *'**Inland** Navigation Congress'* had merged with the *'**Ocean** Navigation Congress'*.
- Before the Great War, twelve Congresses were organised, attendance increased to over 1,000 delegates!
- PIANC fulfilled the need for exchange of technical information in the emerging fields.

THE CREATION OF **PIANC**:
PERMANENT INTERNATIONAL **ASSOCIATION** OF NAVIGATION CONGRESSES

1885, founding

AIPCN: ***A**ssociation **I**nternationale **P**ermanente des **C**ongres de **N**avigation*

PIANC: English equivalent, some early translations mistakenly used *'Commission'* instead of *'Association'*

PIC: 'Permanent International Commission' was a defined term!

1885-1980's, dual usage

AIPCN: French version dominant in Europe and official publications

PIANC: The ***P**ermanent **I**nternational **A**ssociation of Navigation **C**ongresses*

1980's, shift to English

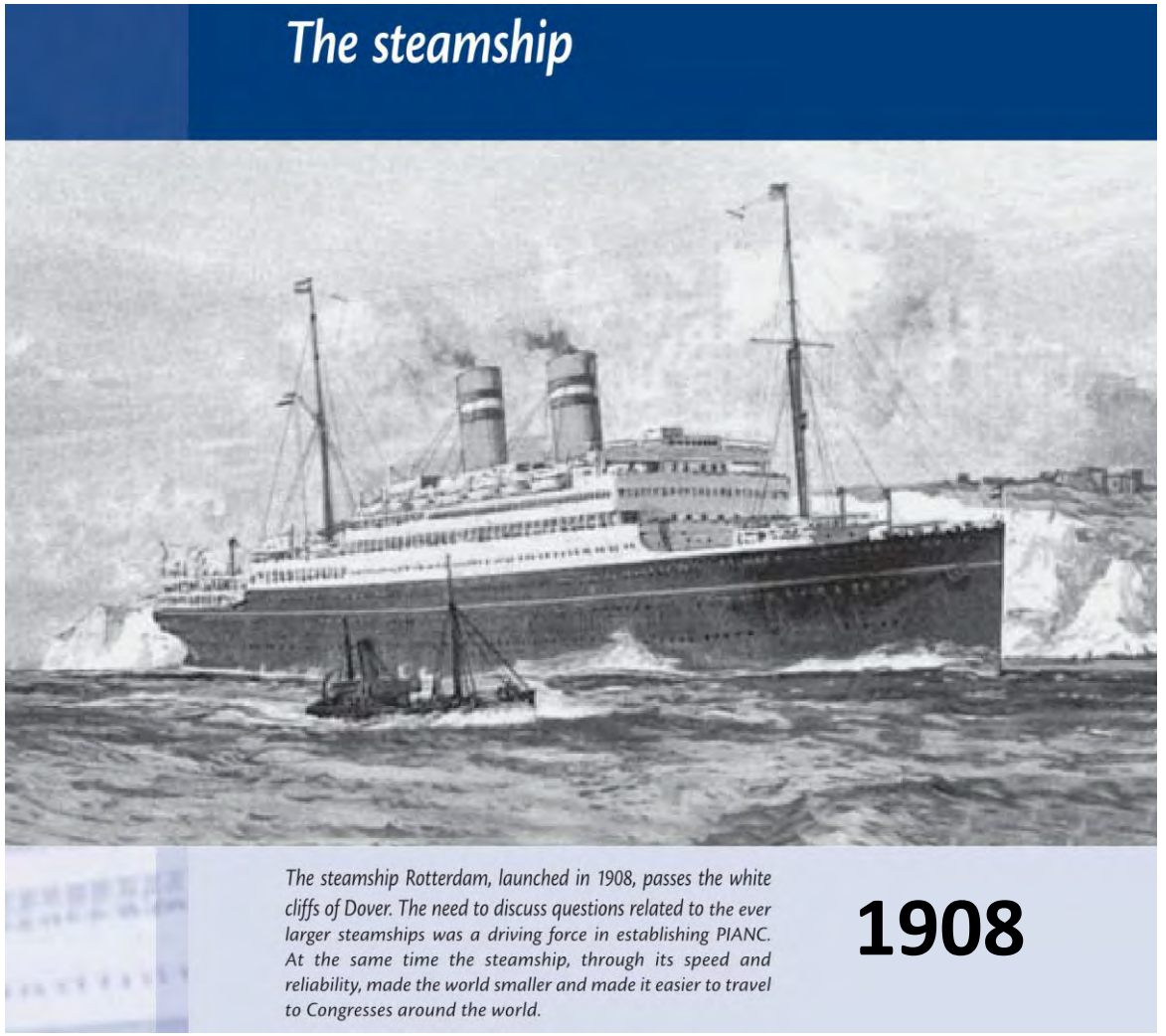
PIANC: The Permanent International Association of Navigation Congresses

2007, rebrand with new Strategic Plan

PIANC: *The World Association for Waterborne Transport Infrastructure*

PIANC:
PERMANENT INTERNATIONAL ASSOCIATION OF NAVIGATION CONGRESSES

1869



1908

PIANC: THE NEXT ENERGY TRANSITION

1955

2023

Battery-powered ASKO barge. Courtesy of Kongsberg.

PIANC - A Legacy of Leadership in Waterborne Transport

Where It All Began - A Historical Perspective

1885: First Navigation Congress in Brussels

Highlighting the growing need for international collaboration to address the challenges of expanding maritime trade

1914: Opening of the Panama Canal

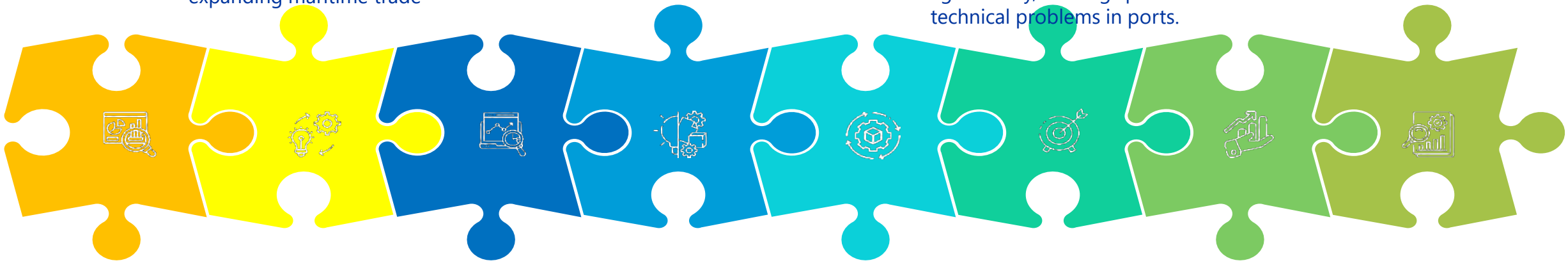
Further demonstrating the impact of infrastructure development on global trade.

2000-2010

During the first decade of the 21st century, the size and number of cruise and container vessels increased significantly, causing specific technical problems in ports.

2024

Technological advancement, Climate change and its impact on coastal and maritime infrastructure



1869: Opening the Suez Canal and building the Cutty Sark

Illustrating the rapid evolution of maritime technology..

1902: Formal establishment of PIANC

Showcasing its enduring legacy as a global leader in waterborne transport infrastructure..

1950s Container Ships: Revolution in Sea Transportation

In 1956 the first shipload of fifty-eight containers sailed from Newark to Houston.

2002

First Navigational Congress was held in Australia (Sydney)

What do we do?

What we do to fulfil our core purpose:

Share industry knowledge and best practices

- Deliver major events in our region, including the PIANC APAC and Coasts and Ports conferences.
- Deliver local events to share knowledge relevant to our members.
- Promote PIANC Technical Reports and other publications.

Bring people in our industry together

- Run events which provide opportunities for our people to meet and network.
- Promote engagement between PIANC Australia and New Zealand members and the broader international PIANC community.

Provide industry leadership

- Work with the public sector and other industry bodies to provide technical leadership relating to waterborne transport infrastructure in our region.

Contribute to the international body of knowledge

- Nominate and support PIANC Australia & New Zealand members to join relevant PIANC Working Groups.
- Actively contribute knowledge and experience for the development of PIANC publications.

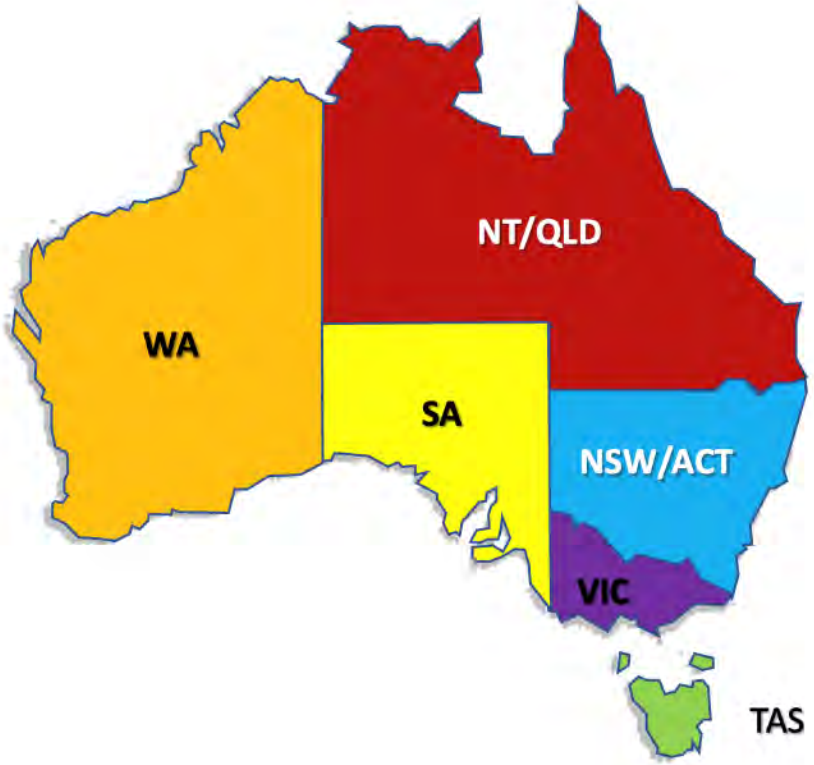
Support the next generation of professionals in our industry

- Provide technical guidance which fills the gap beyond academic studies.
- Create opportunities for young professionals to meet and network with the broader industry.

Represent the interests of our members

- Provide representation on relevant PIANC Commissions.
- Engage with the PIANC International to influence positive outcomes for PIANC Australia & New Zealand, and PIANC as a whole.

REGIONAL CHAPTERS: AU-NZ



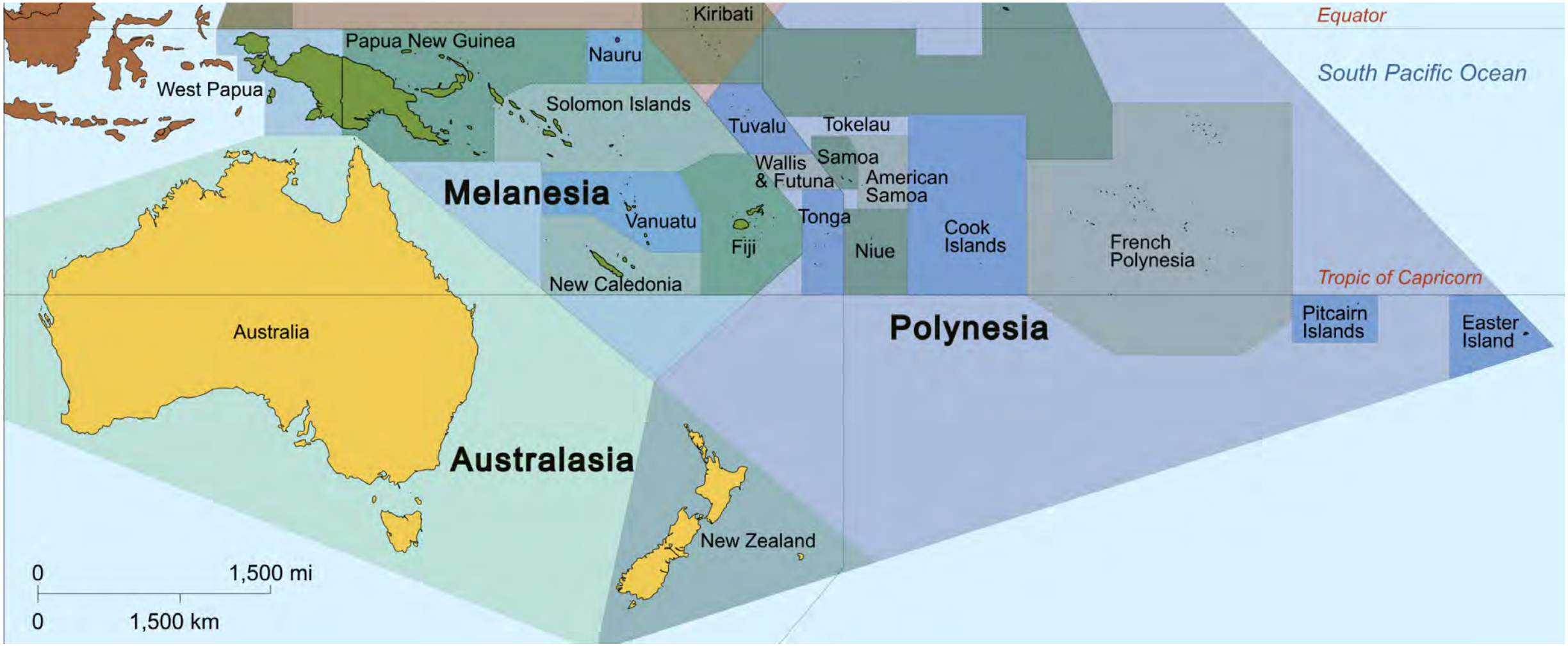
PIANC AU-NZ
Regional Chapters

REGIONAL CHAPTERS

...INCLUDING OCEANIA

REGIONAL CHAPTERS

...INCLUDING OCEANIA



PIANC Australia & New Zealand

2025-26 Strategic Plan

What is most important for PIANC Australia & New Zealand, right now?

Priority objectives

Our priority objectives for 2025-26

Shape the future of PIANC AU&NZ conferences	Understand and expand PIANC AU&NZ membership	Strengthen international outreach and collaboration	Improve tools to empower PIANC AU&NZ members and contributors

Supporting activities

- Define the purpose and vision for our conferences.
- Develop roadmap for the next 5-10 years
- Identify iand implement nitiatives for attracting a diverse group attendees and high-calibre speakers

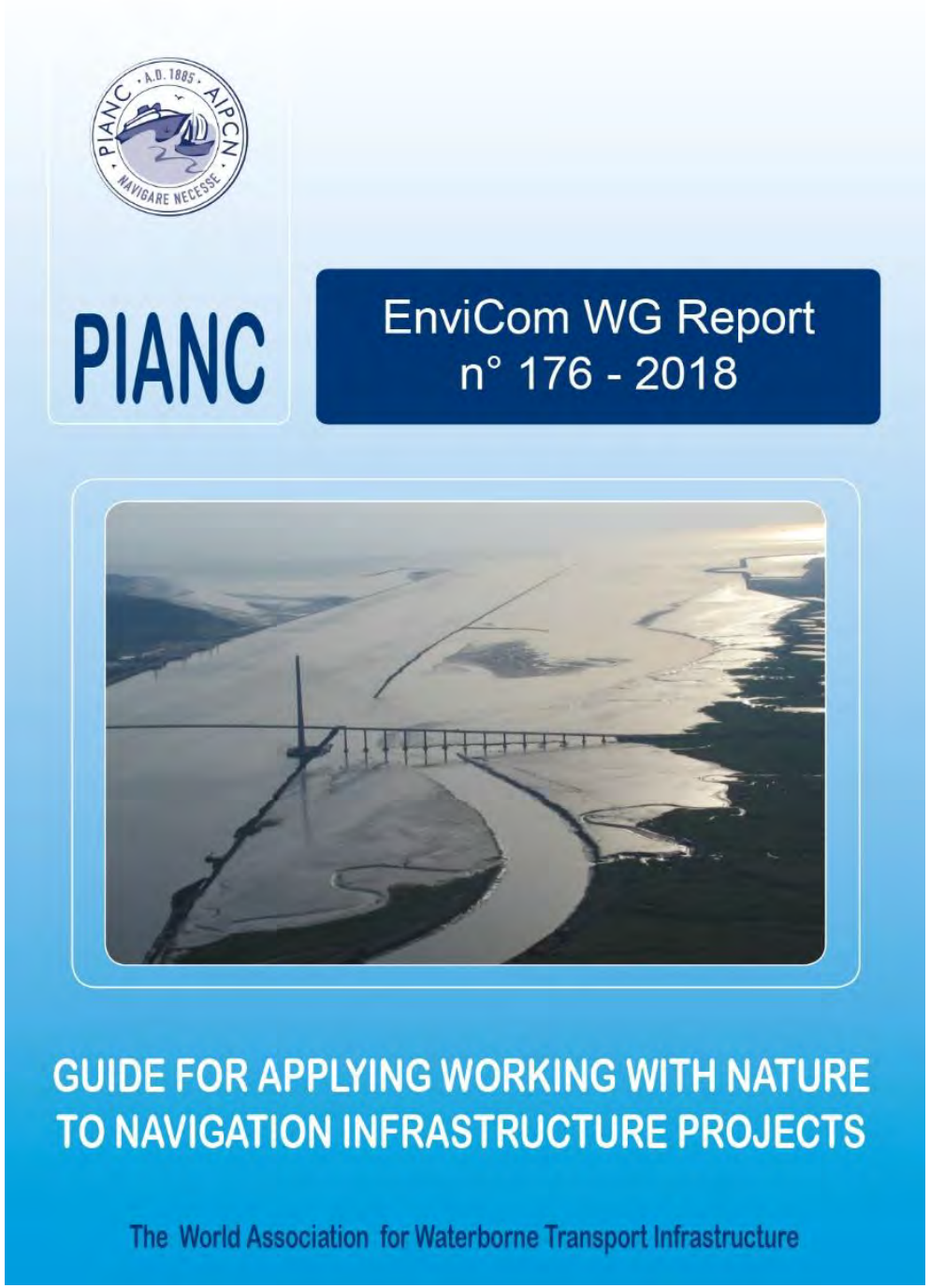
- Map current and potential members
- Implement outreach strategies for the next generation
- Increase membership diversity

- Deepen relationships with emerging National Sections
- Provide support for Pacific Nations
- Enhance bilateral relationships with established sections
- Strengthen our support of PIANC International

- Accessible marketing and communication tools
- Make wesbite improvements Integration of PIANC HQ membership software with PIANC AU&NZ systems.
- Streamline board operations
- Refresh regional chapter guidelines

PIANC Workshop

- **Economic and Regulatory Aspects:** Navigate the challenges and opportunities presented by environmental regulations, reporting requirements, and market pressures.
- **Environmental and Economic Synergy:** Explore the relationship between environmental performance and economic viability.
- **Real-Life Implementation Examples:** Learn from case studies in our region showcasing best practices and lessons learned in decarbonisation and ESG implementation.



Key Operational Steps:

1. Establish project need and objectives
2. Understand the environment (at **system** level)
3. Make meaningful use of stakeholder engagement
   => identify **win-win options**
4. Prepare project designs to benefit navigation infrastructure and nature
5. Build and implement
6. Monitor, evaluate and adapt

EWN Engineering With Nature ®

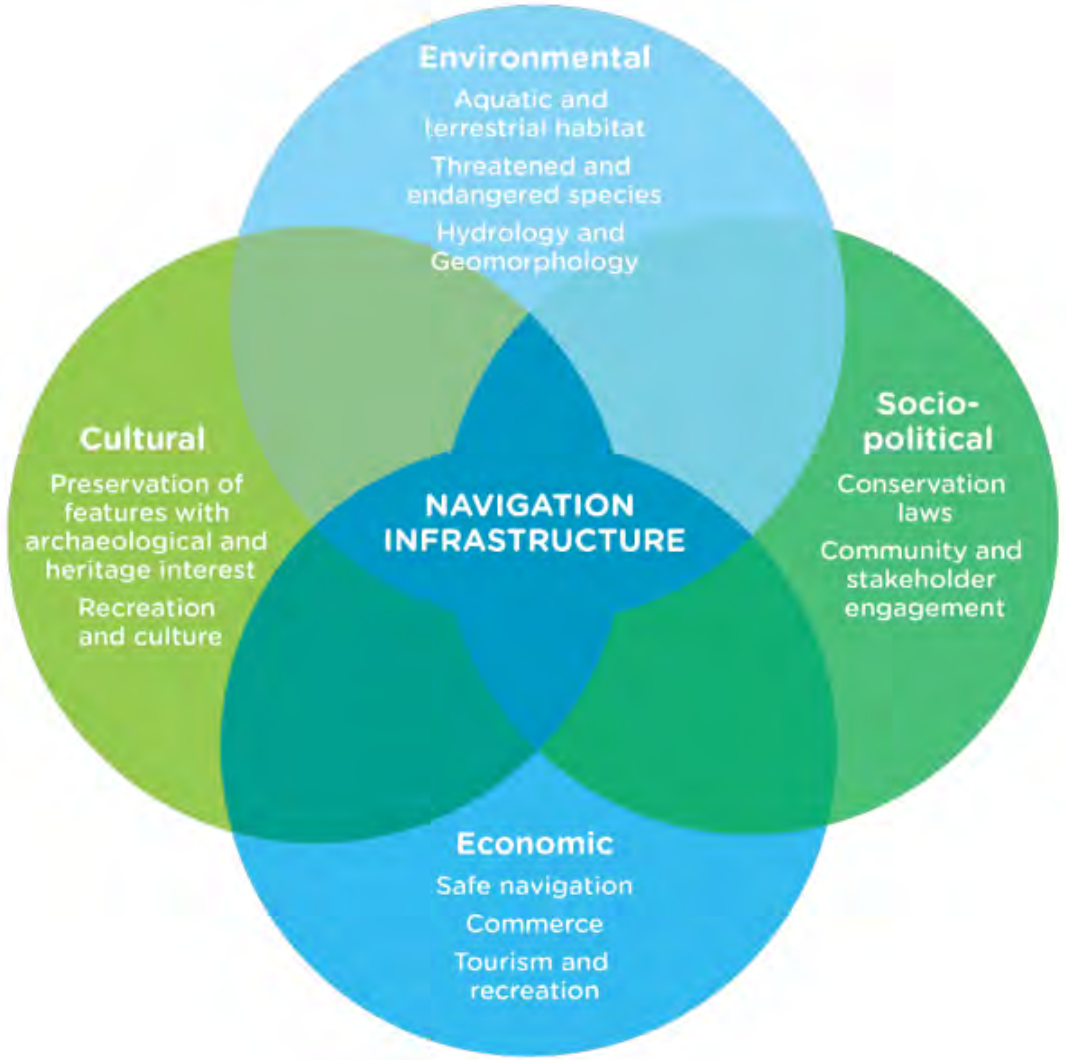
US Army Corps of Engineers

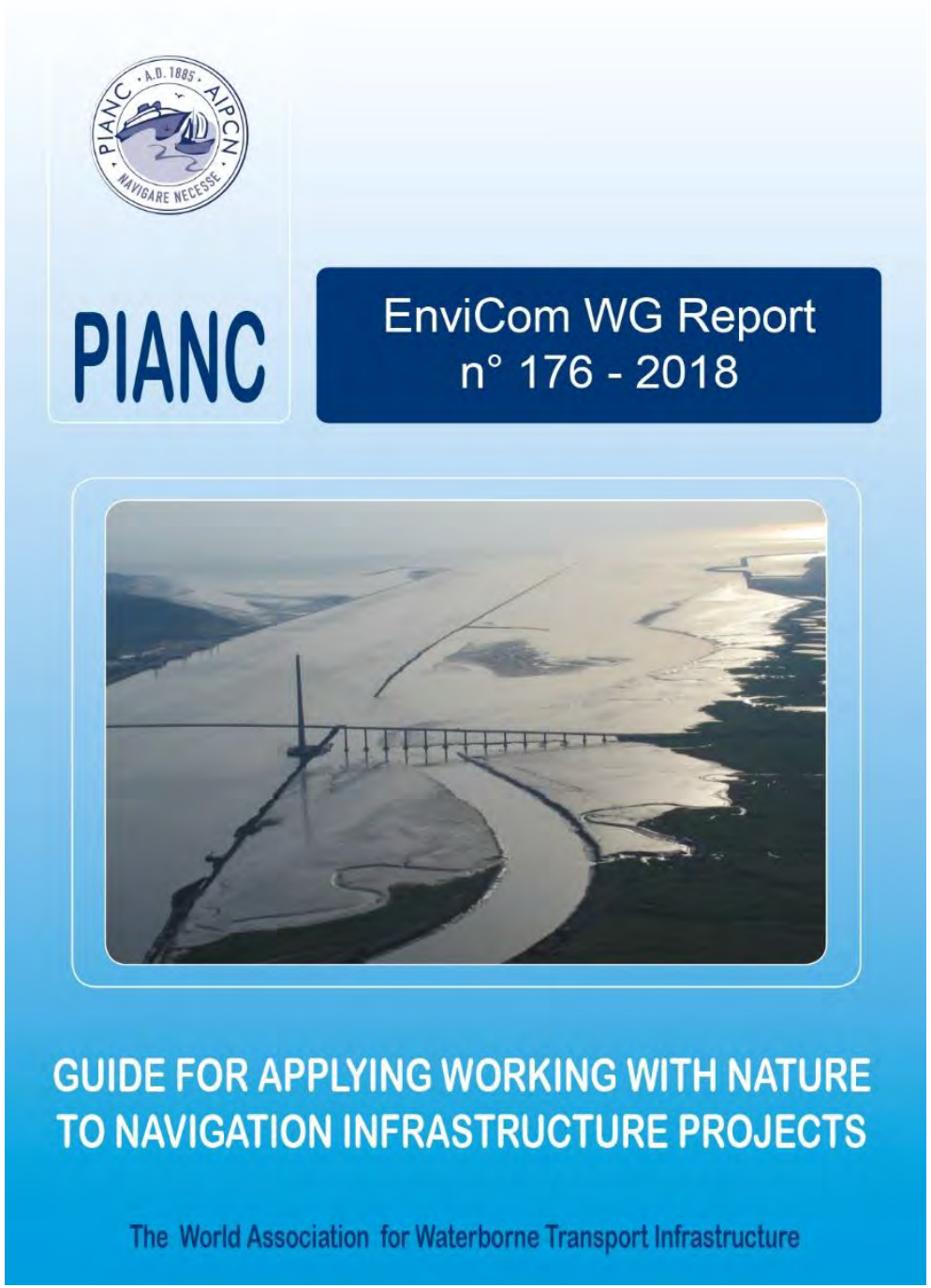
PIANC

EnviCom WG Report
n° 176 - 2018

GUIDE FOR APPLYING WORKING WITH NATURE TO NAVIGATION INFRASTRUCTURE PROJECTS

The World Association for Waterborne Transport Infrastructure





Working With Nature Case Studies

1. Port 2000 Le Havre and Seine Estuary, France
2. Kreetsand/Spadenlander Busch, Germany
3. **Middle Harbour, Oakland California, United States**
4. Atchafalaya River Island Creation, Louisiana, United States
5. Jätkäsaari Port Redevelopment, Helsinki, Finland
6. Vuosaari Port Redevelopment, Helsinki, Finland
7. Brightlingsea Harbour USAR, United Kingdom
8. Salhouse Broad USAR, United Kingdom
9. Updated Sigmaplan and Sustainable Management Plan, Upper Sea Scheldt, Belgium
10. Fehmarnbelt, Denmark & Germany
11. Green Gateway (‘Groene Poort’), Port of Rotterdam, the Netherlands
12. Securing Delta Coastlines and Socio-Economic Prosperity in Northern Java, Indonesia

Port of Oakland looking west towards San Francisco

Middle Harbour, Oakland California, United States

- Developed as part of the Port of Oakland's Year 2000 Vision Plan.
- $ 1.2 billion capital expansion plan to build a **new modern port** for the 21st century.
- Modernisation of terminals and **deepening of the Inner Harbour**.
- Community and environmental steward-ship goals achieved by creating a public park space and shallow water habitat area.
- Included the **dredging of the federal channel** from -12 to -15 metres deep, jointly cost-shared 50/50 between the port and the USACE.
- Two **new marine terminals**, a joint inter-modal rail terminal, and the realignment of roadways.
- 15 hectare Shoreline Park + 73 hectare shallow water habitat area created by **beneficially reusing the sediment** from the channel deepening project.

Working With Nature Case Studies: **Australian Examples**

Project Name	Location	WwN Application	Recognition Status
• **Rous Head Fairy Tern Sanctuary**	Fremantle, WA	Habitat creation using dredged shelly sand to support seabird breeding	PIANC WwN Certificate (2018)
• **Shorebirds Biodiversity Offset**	Newcastle, NSW	Creation of offset habitat for shorebirds post port development	PIANC WwN Certificate
• **Port of Brisbane Seagrass Reclamation**	Brisbane, QLD	Reclamation project promoting seagrass growth using beneficial sediment reuse	Aligned with WwN (PIANC case study)
• **Dalrymple Bay Coal Terminal**	Mackay region, QLD	Risk-based dredging strategy aligning with ecosystem priorities	Aligned with WwN (PIANC/USACE report)
• **Newcastle – Everlasting Swamp Wetland Restoration**	Clarence River Catchment, NSW	3,500 ha wetland rehabilitation to offset port-related environmental impact	Aligned with WwN (PIANC/SMART Rivers report)
• **Port of Geraldton Sediment Management**	Geraldton, WA	Beach nourishment using maintenance dredge material	Aligned with WwN principles

Infrastructure Sustainability Council

Certified Port/Harbour

Rous Head Industrial Park

WA / As Built

The project relates to the development of the reclamation area in Rous Head and comprises partitioning into lots, construction of the access roads, and the various services to the boundaries of the...

Certified Port/Harbour

Victoria International Container Terminal

VIC / As Built

VICT is the new fully-automated international container terminal operator at Webb Dock East in Melbourne, Australia. When fully developed, and as required by volume growth, the 35.4 hectare

Certified Port/Harbour

Webb Dock West Automotive Terminal

VIC / Design

Webb Dock Automotive Terminal is located in the Port of Melbourne and facilitates the Import, Export and storage of Automotive vehicles, heavy machinery & other miscellaneous items.

Port/Harbour

Westport Program

WA / Planning

This project has registered for an IS Ratings Scheme Certification. More details will be updated soon.

Undergoing a Rating Port/Harbour

Brotherson Dock Life Extension Project

NSW / As Built

The Brotherson Dock was built 40 years ago and is degrading through environmental conditions – i.e. salt water ingression and operational wear and tear.

Certified Port/Harbour

Moorebank Logistics Park As-Built

NSW / As Built

The Moorebank Logistics Park is a vital piece of infrastructure for Australia and NSW that will transform the way containerised freight moves through Port Botany and deliver a faster, simpler, and more cost-effective service. When

Undergoing a Rating Port/Harbour

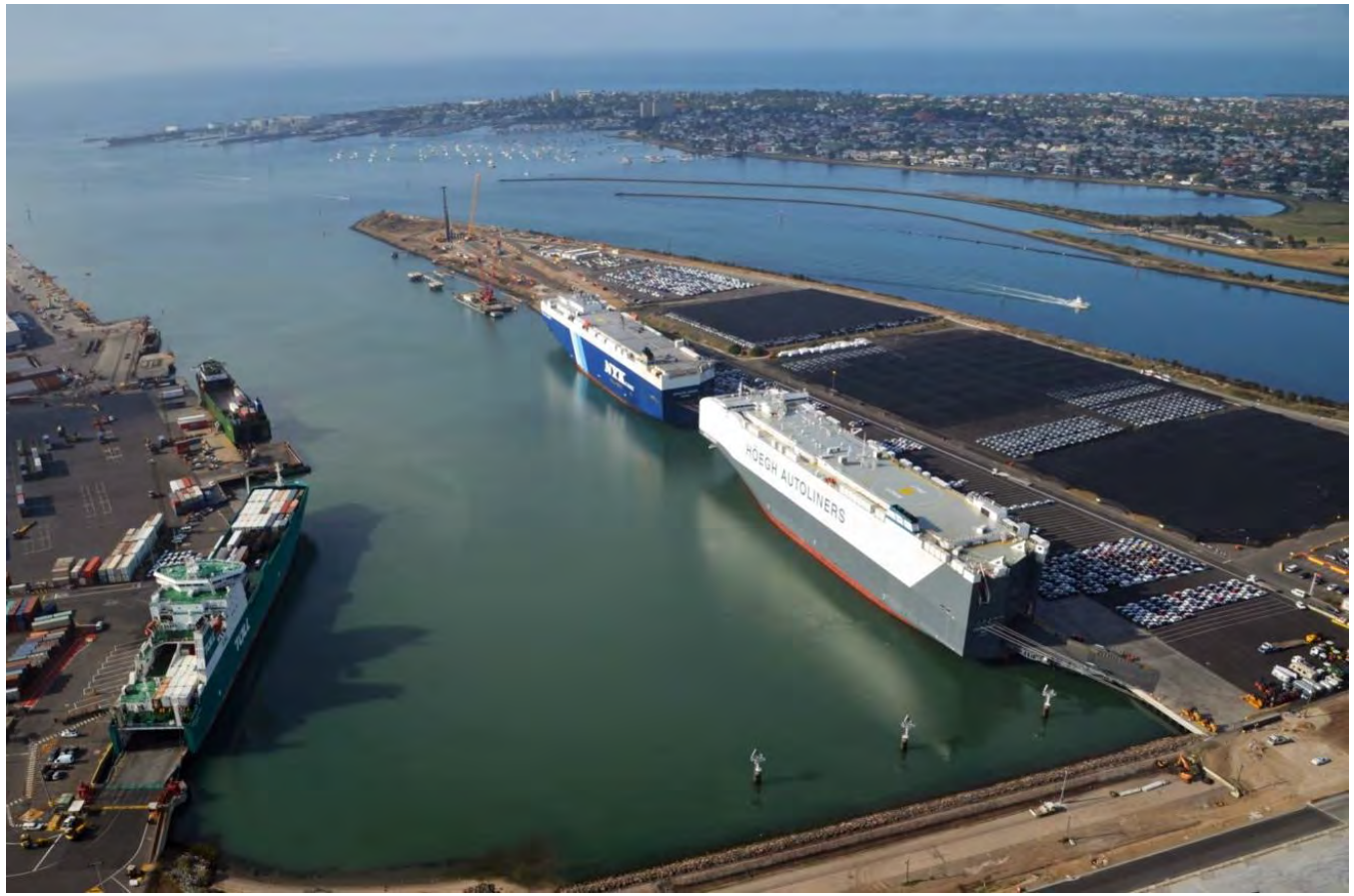
Moorebank Logistics Park Operations

NSW / Operation

Moorebank Logistics Park is a nationally significant infrastructure development that will transform the way containerised freight moves through Port Botany and deliver a faster, simpler and more

Infrastructure Sustainability Council

Ensuring all infrastructure delivers social, cultural, environmental and economic benefit.



> "Sustainability is doing things better. It's being more efficient, it's being intelligent, it's being smart, it's being integrated, it's being connected, it's being challenging, it's being able to do what we do as a society, but in a much more efficient way."

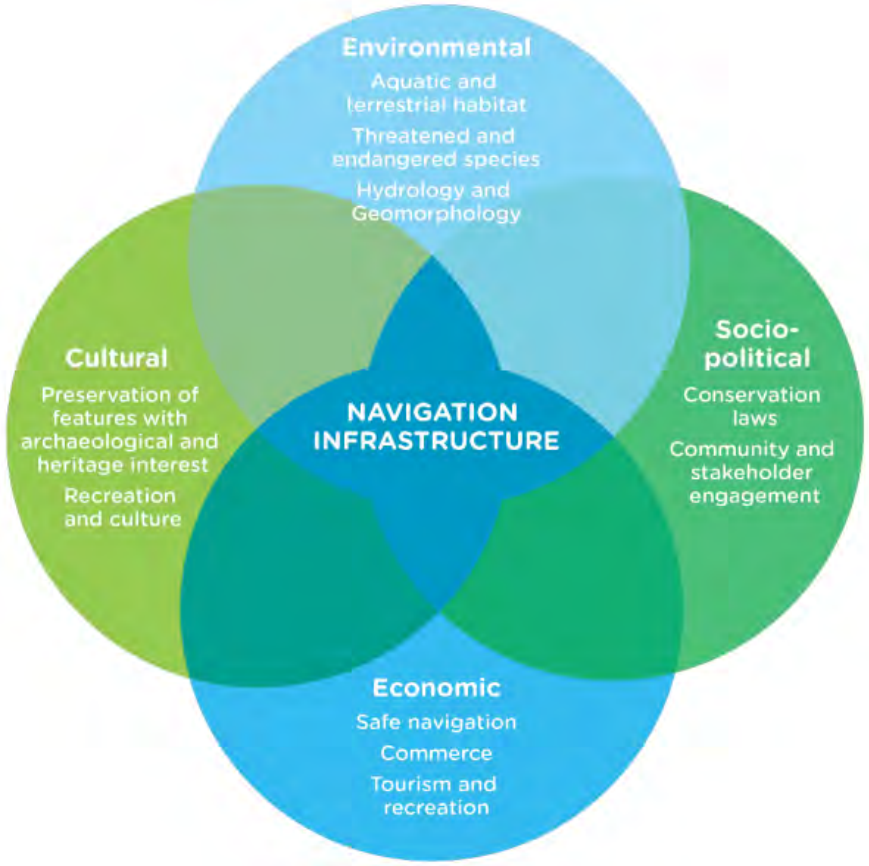
Nicole Neal -McConnell Dowell

ISC - Key Themes

- Governance
- Economical
- Environment
- Social

Infrastructure Sustainability Council

Ensuring all infrastructure delivers social, cultural, environmental and economic benefit.



> "Sustainability is doing things better. It's being more efficient, it's being intelligent, it's being smart, it's being integrated, it's being connected, it's being challenging, it's being able to do what we do as a society, but in a much more efficient way."

Nicole Neal -McConnell Dowell

ISC - Key Themes

- Governance
- Economical
- Environment
- Social

PIANC White Paper (March 2025 – DRAFT)
PIANC's Commitment to Sustainability

Mission: Advance sustainable waterborne transport infrastructure by integrating economic, environmental, and social objectives.

Historical Efforts: Established commissions and task groups like EnviCom and the Permanent Task Group on Climate Change.

Sustainability Definition: Balance economic, social, and environmental goals for current and future generations.

Working with Nature: Leverage natural processes for cost-effective, sustainable infrastructure. Cross-Commission Integration: Ensure consistent sustainability integration across all technical commissions.

Collaborations: Partner with organizations like IADC, CEDA, and the World Ports Sustainability Program.

Future Strategy: Engage stakeholders to align goals with UN SDGs and enhance sustainable outcomes.

BORG HAVN

7 REN ENERGI FOR ALLE

9 INNOVASJON OG INFRASTRUKTUR

11 BÆREKRAFTIGE BYER OG SAMFUNN

13 STOPPE KLIMAENDRINGENE

17 SAMARBEID FOR Å NÅ MÅLENE

LOW EMISSION PORTS

PIANC AGA OSLO 2023

Charlotte Iversen, Environmental Manager - Port of Borg

1. Decarbonising the maritime industry

Are you ready for 85?

Can climate emissions in the Oslofjord be reduced by 85% before 2030?

PUBLISERT: 06.01.2023

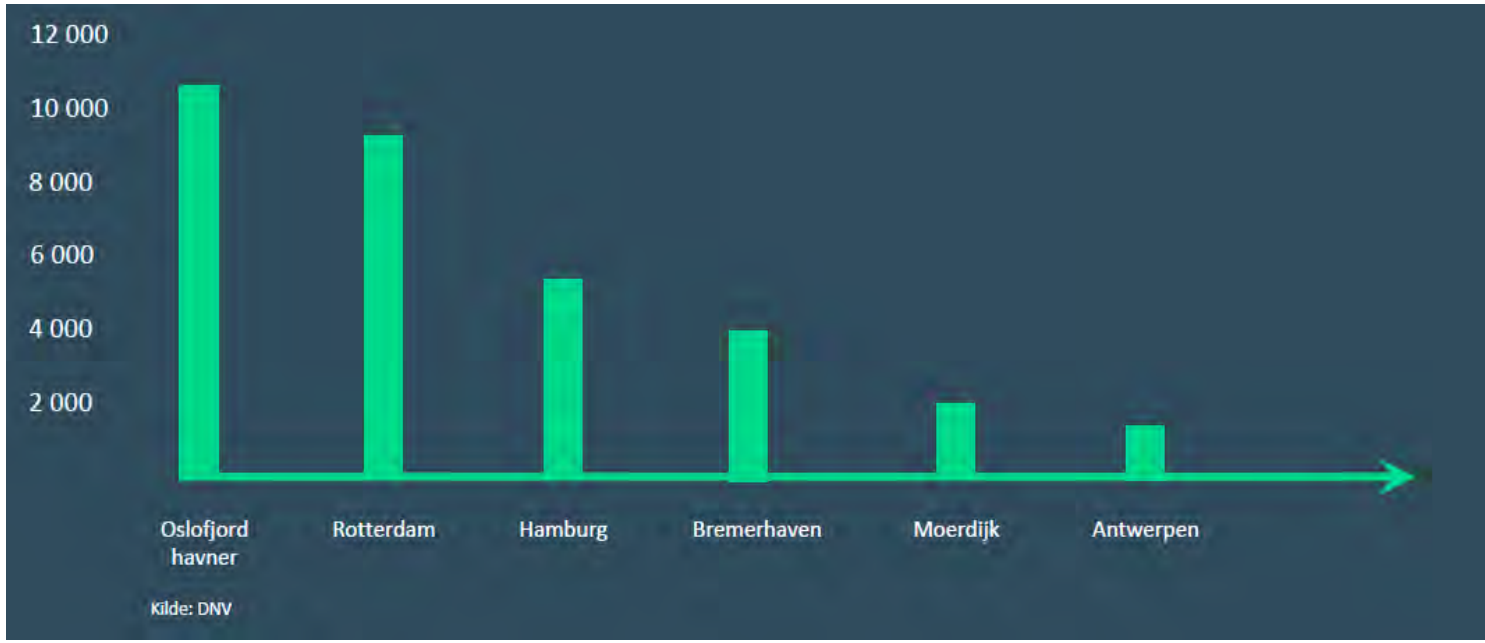
INTERNATIONAL FERRIES USE SHORE POWER: International ferries of DFDS use the shore power facility at Utstikker II, which opened in 2019. Color Line's cruise ferries - which run between Oslo and Kiel - gained access to the shore power facility in 2011. In Sydhavna, Heidelberg cement's boats can connect to shore power (established in 2022). The next, natural step is to establish shore power facilities for container ships. The Port of Oslo has recently decided to build a shore power facility for cruise ships at Revierkaia on Vippetangen. Photo: Motion Air/Port of Oslo.

Onshore Power Supply (OPS) in the Port of Borg

HeidelbergCement Norway and Felleskjøpet AGRI has awarded Egil Ulvan Rederi the prestigious contract to build and operate the world's first zero emission cargo ship. The ship shall enter operation in early 2024. Powered by hydrogen and wind.

15 ships on fixed routes (Norway – Europe) use OPS in ports reduces emissions by up to 90 % !

#	Fartøynavn	Reder/operatør	Alder	Antall anløp		Ligge-timer* [h]		Liggetid/ anløp [h]	Beregnet kWh forbruk 2020
1	JSP CARLA	Viasea Shipping	17	52		843		16	418 953
2	Meandi	Unifeeder	18	50		840		17	417 675
3	Jork Ruler	Viasea Shipping	15	39		798		20	396 693
4	VEGA VELA	Msc Norway	16	33		475		14	235 935
5	Energizer	Unifeeder	17	43		442		10	219 500
6	Katharina Schepers	Unifeeder	9	39		403		10	285 717
7	Ida Rambow	Unifeeder	14	38		394		10	279 489
8	Pachuca	Unifeeder	16	46		333		7	165 477
9	Benedikt	Msc Norway	15	18		281		16	139 619
10	JSP ROVER	Viasea Shipping	15	13		242		19	120 274
11	Spirit	Unifeeder	16	28		226		8	112 479
12	Greetje	Viasea Shipping	23	4		76		19	37 887
13	Helena Schepers	Gac Norway	9	12		73		6	51 997
14	Grete Sibum	Unifeeder	13	7		69		10	48 937
15	Astrorunner	Unifeeder	14	10		65		6	32 074
	Delsum 15 skip			***432***	***89 %***	***5 560***	***93 %***	***13***	***2 962 705***
	Øvrige 28 skip			*54*	*11 %*	*438*	*7 %*	*8*	*252 689*
	Sum			486	100 %	5 999	100 %	**12**	**3 215 394**



Source: DNV

2. Decarbonising logistics in port

Photo: Kalmar / Terberg / Seacom / Port of Oslo

Foto: Port of Moss / Port of Grenland

Autonomous drone ships in the Oslofjord

- ASKO: shuttle between Moss-Horten
- Yara Birkeland: shuttle between Herøya-Brevik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PIANC HULL 2026
AGA & NAVIGATION: TO NET ZERO
11 - 15 MAY 2026

Adam van der Beeke

PIANC AU-NZ EnvCom Lead – Fremantle Ports

Welcome & Introduction

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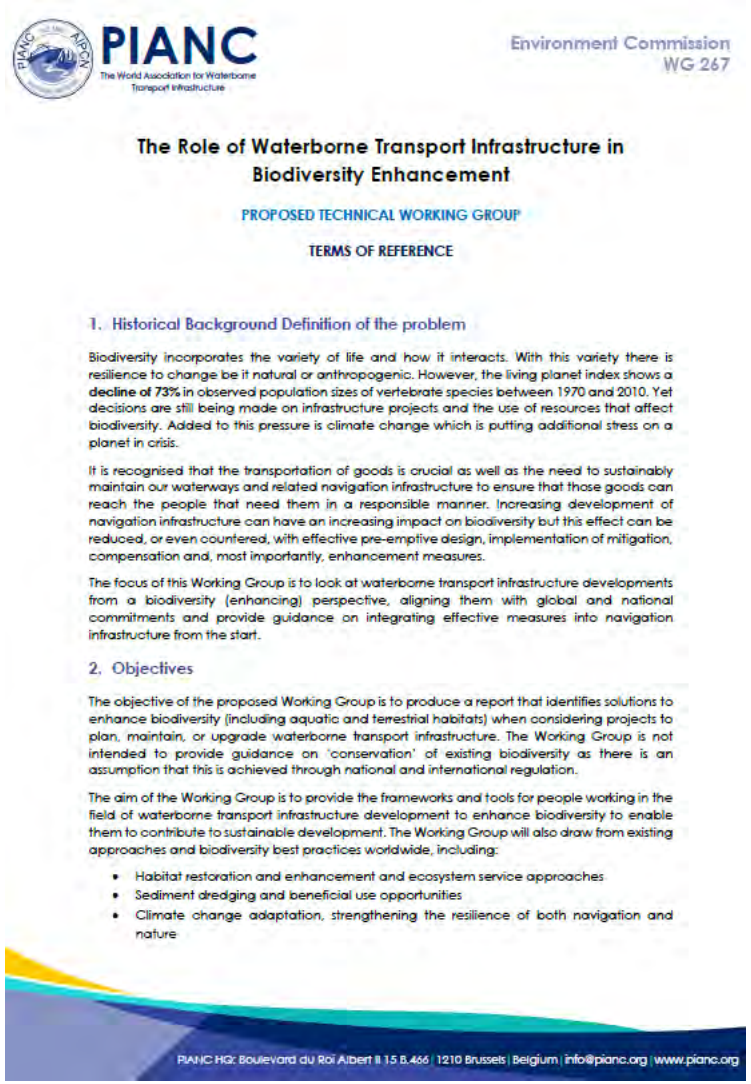
Overview

- New & Recent Working Group Reports
- Active Working Groups & Terms of Reference
- EnviCom Priorities
  - Advancing Sustainability
  - Evolving Working with Nature
    - What is WwN
    - WwN Progress & Challenges
    - Case Study – Cockburn Sound
- Wrap Up: Next steps



PIANC
The World Association for Waterborne Transport Infrastructure

Environment Commission
WG 267

The Role of Waterborne Transport Infrastructure in Biodiversity Enhancement

PROPOSED TECHNICAL WORKING GROUP

TERMS OF REFERENCE

1. Historical Background Definition of the problem

Biodiversity incorporates the variety of life and how it interacts. With this variety there is resilience to change be it natural or anthropogenic. However, the living planet index shows a **decline of 73%** in observed population sizes of vertebrate species between 1970 and 2010. Yet decisions are still being made on infrastructure projects and the use of resources that affect biodiversity. Added to this pressure is climate change which is putting additional stress on a planet in crisis.

It is recognised that the transportation of goods is crucial as well as the need to sustainably maintain our waterways and related navigation infrastructure to ensure that those goods can reach the people that need them in a responsible manner. Increasing development of navigation infrastructure can have an increasing impact on biodiversity but this effect can be reduced, or even countered, with effective pre-emptive design, implementation of mitigation, compensation and, most importantly, enhancement measures.

The focus of this Working Group is to look at waterborne transport infrastructure developments from a biodiversity (enhancing) perspective, aligning them with global and national commitments and provide guidance on integrating effective measures into navigation infrastructure from the start.

2. Objectives

The objective of the proposed Working Group is to produce a report that identifies solutions to enhance biodiversity (including aquatic and terrestrial habitats) when considering projects to plan, maintain, or upgrade waterborne transport infrastructure. The Working Group is not intended to provide guidance on 'conservation' of existing biodiversity as there is an assumption that this is achieved through national and international regulation.

The aim of the Working Group is to provide the frameworks and tools for people working in the field of waterborne transport infrastructure development to enhance biodiversity to enable them to contribute to sustainable development. The Working Group will also draw from existing approaches and biodiversity best practices worldwide, including:

- Habitat restoration and enhancement and ecosystem service approaches
- Sediment dredging and beneficial use opportunities
- Climate change adaptation, strengthening the resilience of both navigation and nature

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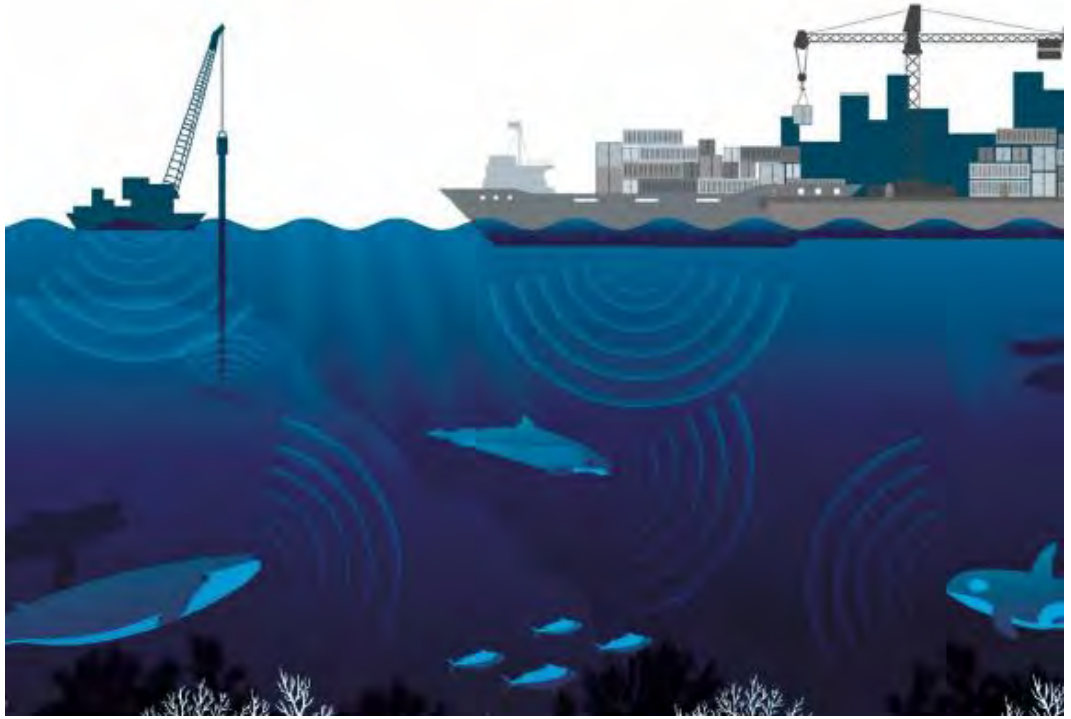
New Working Group Reports (2025)

GREEN FINANCING OF NATURE-BASED NAVIGATION INFRASTRUCTURE

A GUIDE FOR ASSESSING AND MANAGING EFFECTS OF UNDERWATER SOUNDS FROM NAVIGATION INFRASTRUCTURE ACTIVITIES



Recent Working Group Reports (2024)

Climate Change Costs to Ports and Waterways:
Scoping the Business Case Assessment for Investment in Adaptation

BENEFICIAL USE FOR SUSTAINABLE WATERBORNE TRANSPORT INFRASTRUCTURE PROJECTS

Recent Working Group Reports (2023)

WATERBORNE TRANSPORT, PORTS AND WATERWAYS: A 2023 UPDATE OF CLIMATE CHANGE DRIVERS AND IMPACTS

ENVIRONMENTAL ASPECTS OF DREDGING, PORT AND WATERWAY CONSTRUCTION AROUND COASTAL PLANT HABITATS

Recent Working Group Reports (2022)

Managing Climate Change Uncertainties in Selecting, Designing and Evaluating Options for Resilient Navigation Infrastructure

5x Active Working Groups

- Risk-Based Approach to Environmental Windows for Dredging and Navigation Infrastructure Works
- Best Practices of how to Deal with Sea Turtles and Mammals in Marine Waterway and Port Construction
- Implications of Invasive Alien Species for Waterborne Transport Infrastructure
- Role of Waterborne Transport Infrastructure in Biodiversity Enhancement
- Understanding Blue Carbon: A Practical Guide

3x New Terms of Reference

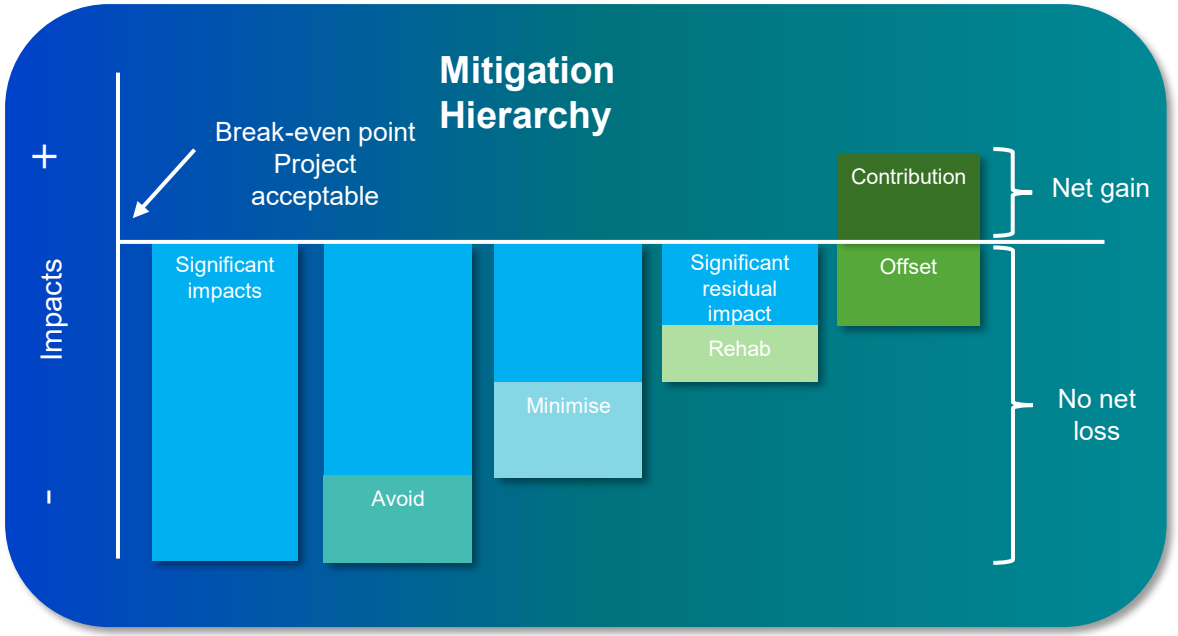
1. Comparative GHG Emissions Accounting

Description	Unit	Emission factor
Asphalt	Kg CO_2-eq/kg	0.051
Concrete	Kg CO_2-eq/kg	0.153
Cement	Kg CO_2-eq/kg	0.715
Carbon steel	Kg CO_2-eq/kg	2.03

Embodied Emissions Factors Options:

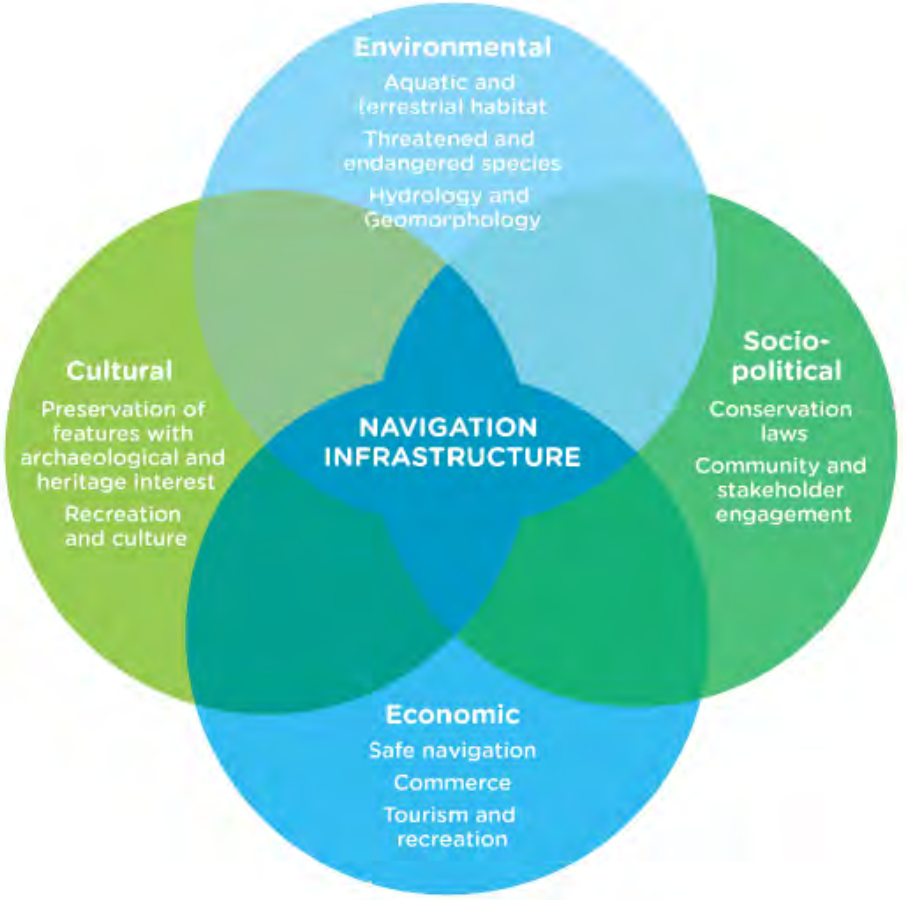
- Detailed LCA (high effort, v. accurate)
- Env. Prod. Dec (low effort, m. accurate)
- Generic (regional industry average)

2. Thin Layer Placement
3. Quantifying Benefits of Ecosystem Services



Sustainability White Paper

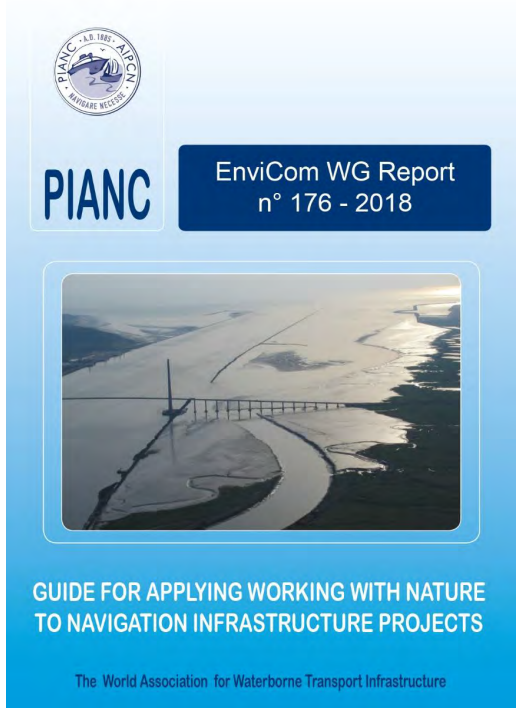
- Recognises complexity and opportunity for WTI to impact/advance sustainability
- Engage PIANC Commissions, members, aligned organisations to clarify gaps, ID priorities, coordinate action
- Proposes PIANC develop sustainability goals and actions to support PIANC / WTI priorities
- Develop Sustainability Position Paper



Working with Nature

PIANC WG Report 176 published in 2018 summarised the operational steps :

1. Establish project need and objectives
2. Understand the environment *(at <u>system</u>* level)
3. Make meaningful use of stakeholder engagement; identify win-win options
4. Prepare project proposals or designs to benefit navigation and nature
5. Build and implement
6. Monitor, evaluate and adapt



WwN Progress

- WwN is no longer a ‘new’ way of thinking
- Climate change awareness has increased massively, now a main driver for WwN
- Linkages between resilient natural systems, resilient trade and a resilient society are much better understood - practical solutions now need to be delivered
- How do we evolve the WwN philosophy to exceed BAU, to strengthen resilience across navigation, nature and society?

Climate change potential impacts on maritime transport

	Operations	Infrastructures
Heat waves	• Limits on periods of construction activity. • More energy for reefer transportation and storage.	• Thermal expansion of piers. • Pavement integrity and softening. • Deformation of rail tracks.
Rising sea levels	• Frequent interruptions of coastal low-lying road and rail due to storm surges. • Flooding of terminal areas.	• More frequent flooding of infrastructure (and potential damage) in low lying areas. • Erosion of infrastructure support. • Changes in harbor facilities to accommodate higher tides and surges.
Intensity of precipitation	• Increase in weather related delays and disruptions.	
Increasing hurricane intensity	• Topple of container stacks and port equipment. • Debris on port infrastructure.	• Greater probability of infrastructure failure. • Greater damage to port infrastructures. • More significant flooding on hinterland infrastructures.
Increase in arctic temperatures	• Longer shipping season. • More ice-free ports in northern regions. • Availability of trans-arctic shipping routes.	• Damage to infrastructure because of the thawing of the permafrost.

Source: Adapted from National Research Council (2008).

What is limiting WwN action?

- Lack of definitions and metrics for **ecosystem** resilience considerations in port investment projects
- Concepts and goals on ecosystem resilience need to be translated into **practical design and engineering standards** for port infrastructure
- **Failure to monitor** and track ecosystem resilience after WTI delivery – cost/benefit realisation, early warning trigger
- Environmental Economic Accounting in BC - stocks of natural capital and flows of ecosystem goods and services into economy **difficult to quantify**

Resilience-related variables and metrics

ROBUSTNESS	REDUNDANCY	VISIBILITY
Deviation from normal throughput	Reserve capacity (equip. and workforce)	IT to track operations
Continuation of operations	Energy and utilities backup	IT to track equipment and workforce
Stability of operations	Reserve capacity for demand surges	Business data intelligence
Effect of multiple disruptions		
FLEXIBILITY	**COLLABORATION**	**AGILITY**
Adjust delivery schedules to disruptions	Interact with key stakeholders	Respond to uncommon customer requests
Adjust workforce to disruptions	Develop objectives with key stakeholders	Respond to changes
Port users can adjust capacity	Develop synergies with key stakeholders	Workforce able to perform diverse tasks
INFORMATION SHARING	**RESPONSE**	**RECOVERY**
Relevant information with stakeholders	Quick response to disruptions	Financial ability to recover
Timely information with stakeholders	Effective response to disruptions	Lessen the cost of disruption
Accurate information with stakeholders	Available contingency plan	Lessen the cost of recovery

Source: Adapted from Kim, S., S. Choi and C. Kim (2021).

WwN Challenges Evolved

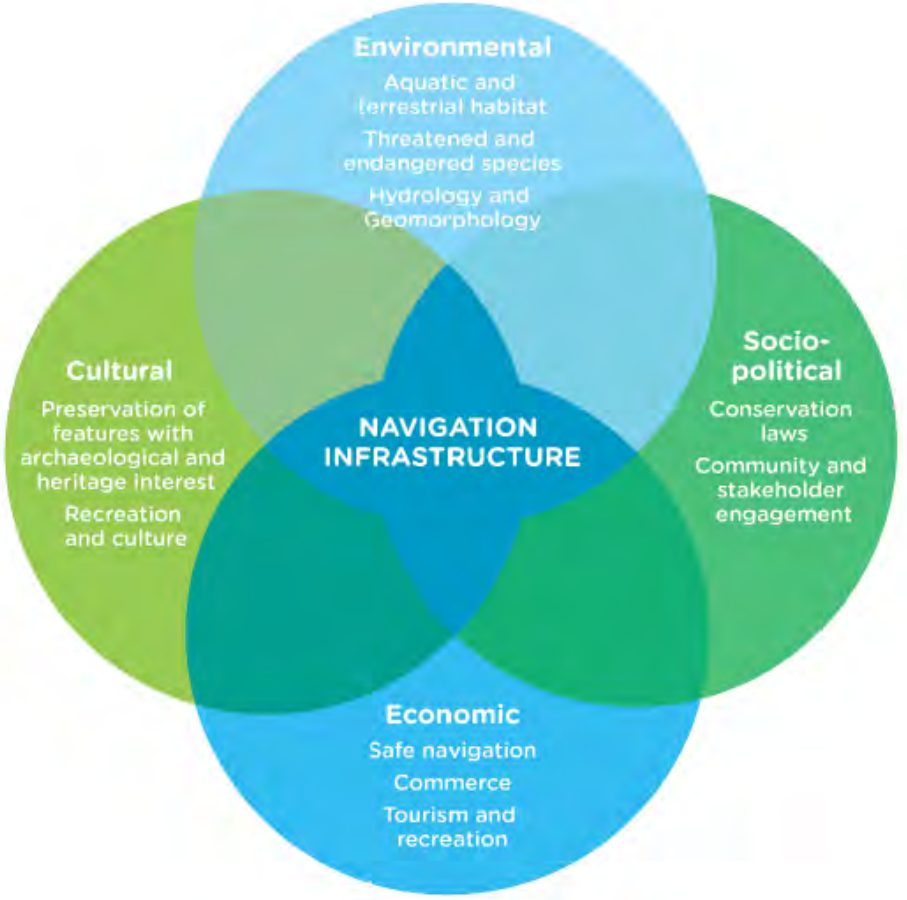
- Genuine collaborative work and partnerships - development of NbS at scale in WTI projects
- Ensuring ideas are developed and delivered in a whole system context rather than at a ‘site’ level
- Scaling up NbS pilot studies / obtaining WwN finance remains a problem
- Risk of greenwashing, mis-labelling WwN, NbS as ‘nature positive’ = de-incentivising investment

EWN Engineering With Nature®

EcoShape
building with nature

EnviCom's Priorities

- Complete **review of WwN** and publish an addendum – redefine challenges for todays priorities
- Develop Position Paper on **Sustainability** – Identify priorities and actions for PIANC community
- Support decision makers with guidance – account for nature's condition and value to society (case studies, tools, references)
- Pursue collaborative opportunities with PIANC commissions and aligned organisations
- Align PIANC member capabilities and WGs to our priority areas…



PIANC

The World Association for Waterborne Transport Infrastructure

Thank you for your attention.

For more information visit us at

www.pianc.org

Lunch

12:30-13:15

Tessa Wade

Managing Consultant/Sustainability Advisory – Worley

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Ports Australia Guidelines for Emissions Counting

GHG Emissions Inventory Guidance for Ports

Worley Consulting

Tessa Wade

August 2025

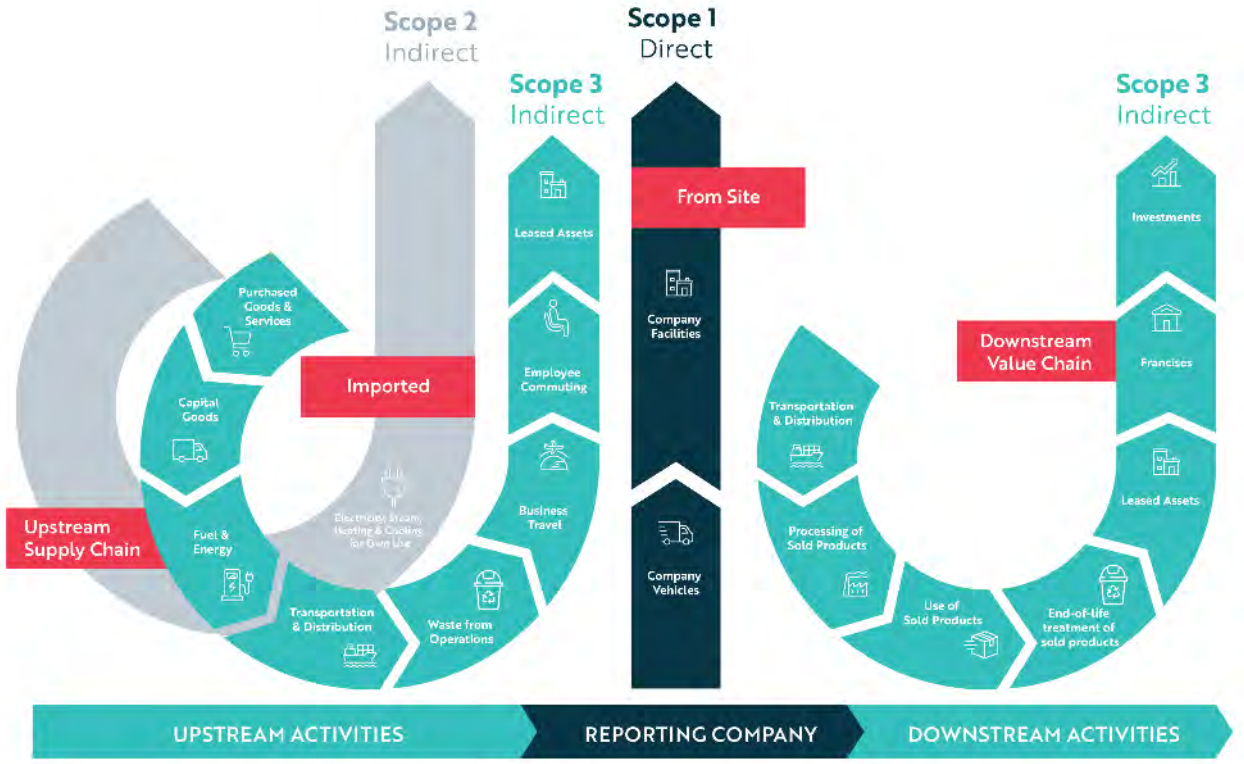
Terminology recap: scopes of emissions

Greenhouse gas (GHG) emissions are grouped under different Scopes, which indicate differing levels of control or influence.

- **Scope 1:** Emissions from operations that are owned or controlled by the reporting company (GHG Protocol, 2011). For example: emissions from a forklift owned and operated by the port.

- **Scope 2:** Emissions from the generation of purchased or acquired electricity, steam, heating, or cooling consumed by the reporting company (GHG Protocol, 2011). For example: emissions from producing the electricity used to power the port offices by a third party.

- **Scope 3:** All indirect emissions (not included in Scope 1 or Scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions (GHG Protocol, 2011).
  For example: emissions of equipment operated by a third party stevedore on port land.



What is the Guidance?

Purpose: **Providing clarity in GHG emissions estimation for ports, including boundary setting.**

Boundary setting determines which emissions get counted in the port's Scope 1, 2 and 3 emissions.

When it comes to Scope 3, the Guidance sets recommended boundaries. Ports can go beyond these boundaries when quantifying Scope 3 emissions if they wish to.

Why do we need it?

Lack of industry-specific GHG emissions clarity

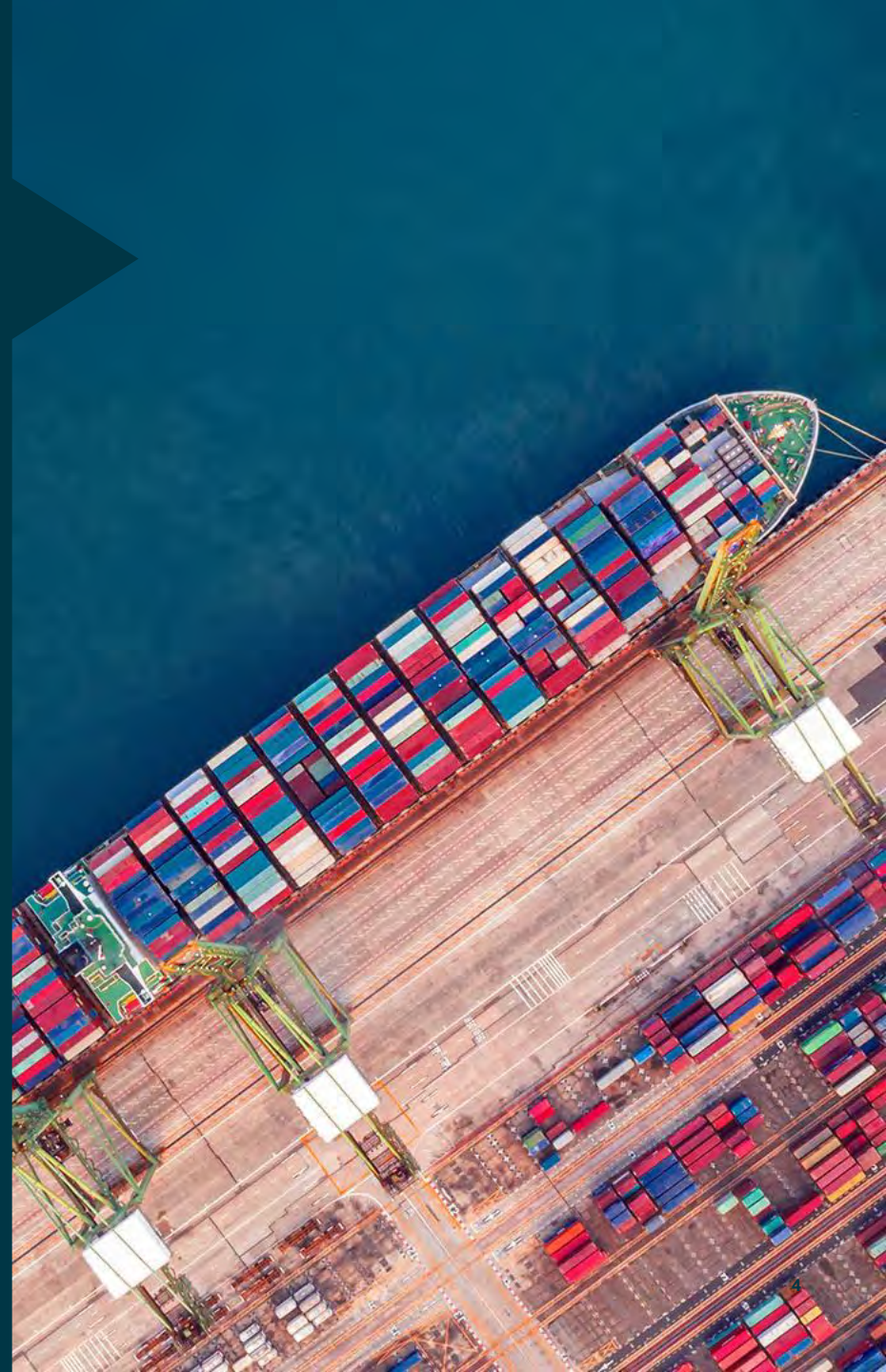
Existing GHG emissions accounting guidance and standards are difficult to interpret for port purposes, due to:

- Ports being a node in the value chain, rather than a part of the product manufacture, processing and use,
- The complexities of port jurisdictions. Multiple stakeholders interact on the same activities, which can make it difficult to ascertain whose emissions are whose, and
- Uncertainty on the outer boundaries of scope 3, as ports don't sell a good which can be followed down the value chain

Increasing expectation for GHG reporting

While some ports already measured or reported their Scope 1 and 2 emissions, Scope 3 emissions inventories were relatively new in the industry.

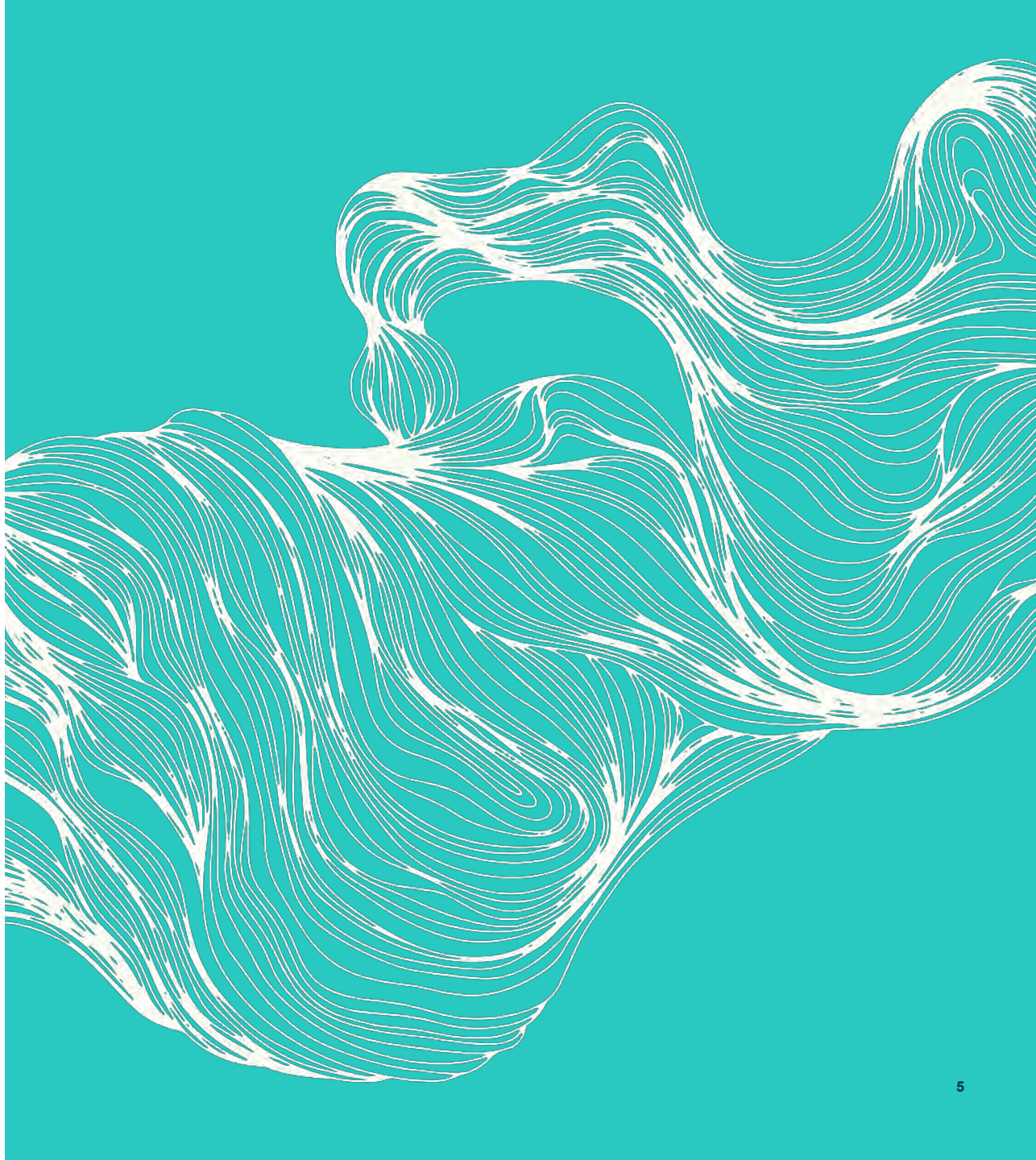
During the development of the Guidance, the **Australian Sustainability Reporting Standards** were passed, which will apply to many ports over the coming years. These include mandatory reporting of Scope 3.



How did we get here?

To make the Guidance as practical as possible, it was developed in a phased approach with significant stakeholder engagement. The process included:

- **Stakeholder engagement, including:**
  - Framing workshop with the Climate Change and Decarbonisation Subcommittee
  - Stakeholder workshops include ports, marine and landside stakeholders
  - Individual interviews with 9 key stakeholders, including
    - Marine and landside operators
    - Industry bodies (e.g. GHG Protocol)
    - Government Departments
    - International ports
- **Policy, standards and guidance review**
- **Position Paper for feedback**



Key positions

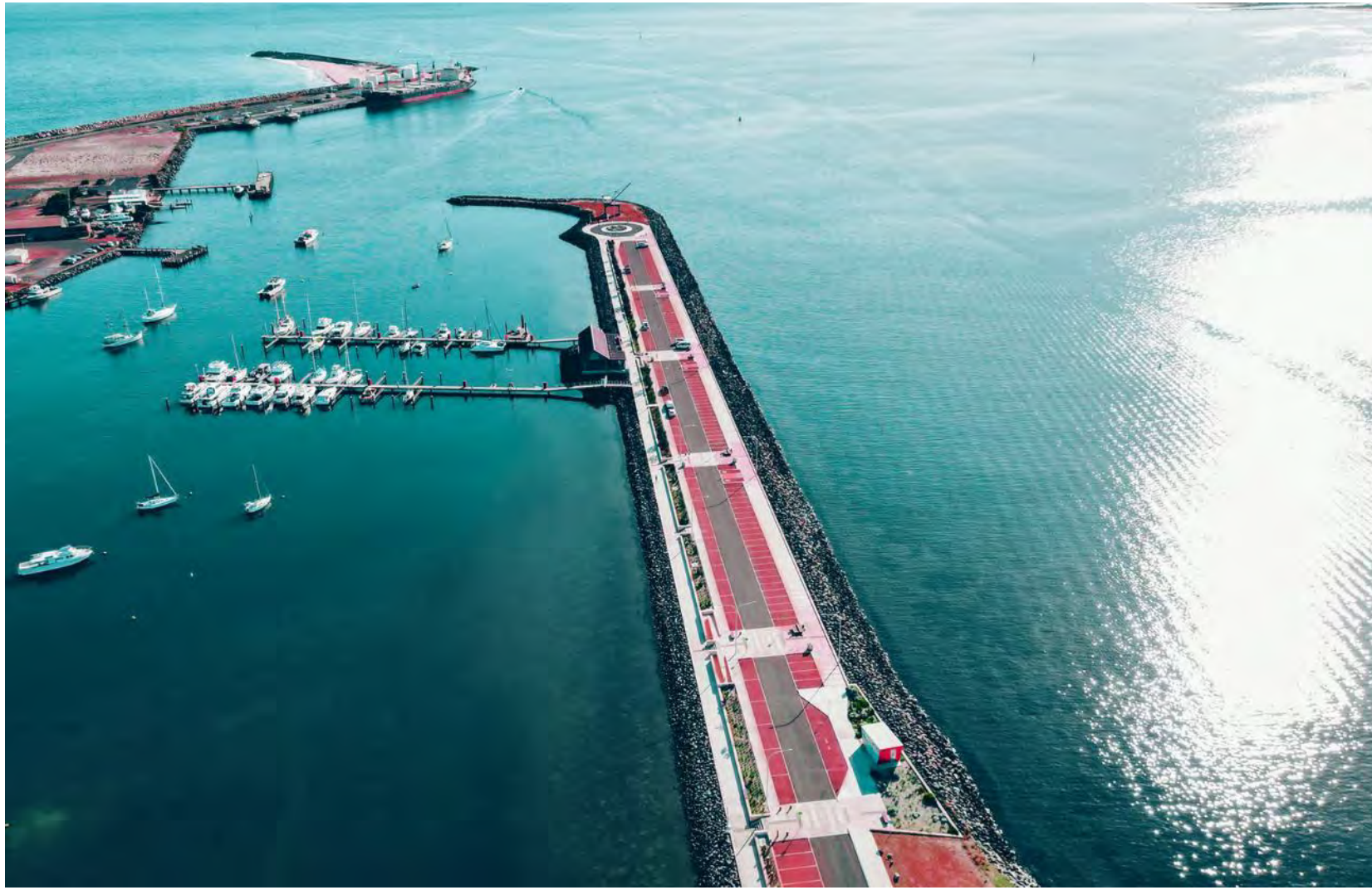
Due to the lack of consistency in reporting throughout the industry, a key outcome of the Guidance was to have positions on certain topics of confusion, or “grey areas”

The reference Scope 3 boundaries in this Guidance were chosen to balance the following considerations:

- **Alignment** with national and international standards

- Maximising **participation** of Australian ports, acknowledging that data gathering can be an onerous task for Scope 3

- Giving enough **flexibility** to ports to not only capture their Scope 3 emissions, but also their associated abatement actions1

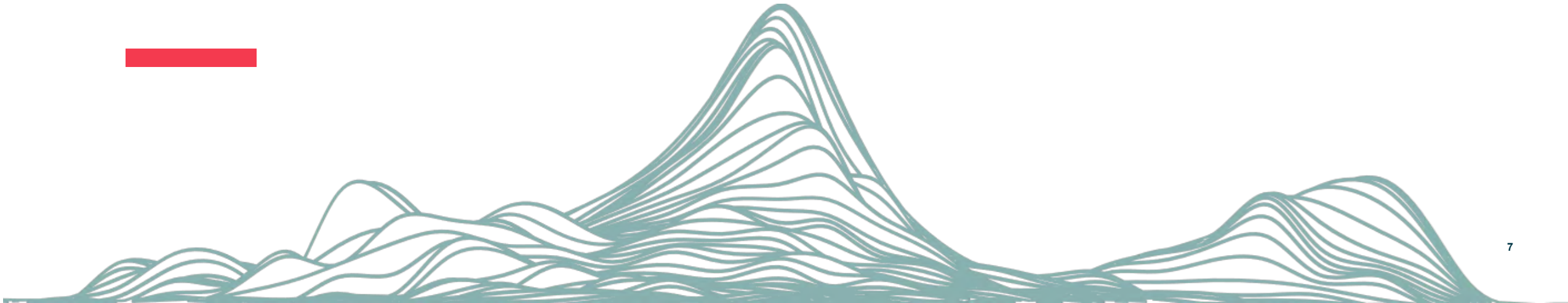


Key position: vessels

Include vessel emissions for ships using the port as **Scope 3** emissions for ports.

The suggested boundary for vessel emissions is **while the vessel is within port limits**.

Vessels passing through port limits but unrelated to port activities do not need to be included.



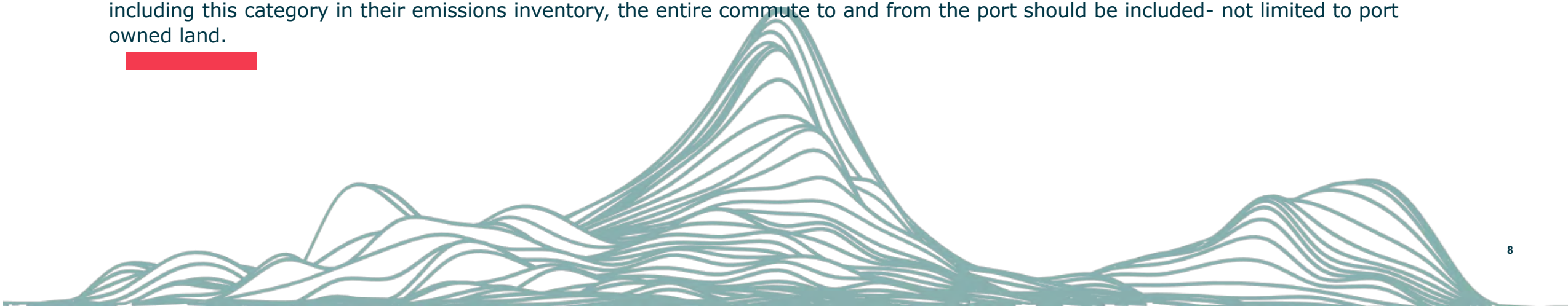
Key position: trucks and rail

Include trucks and rail emissions that operate within the port for port purposes as **Scope 3** emissions for ports.

The suggested boundary for truck and rail emissions is **while the truck/train is within port owned land**.

Vehicles passing through port owned land but unrelated to port activities do not need to be included.

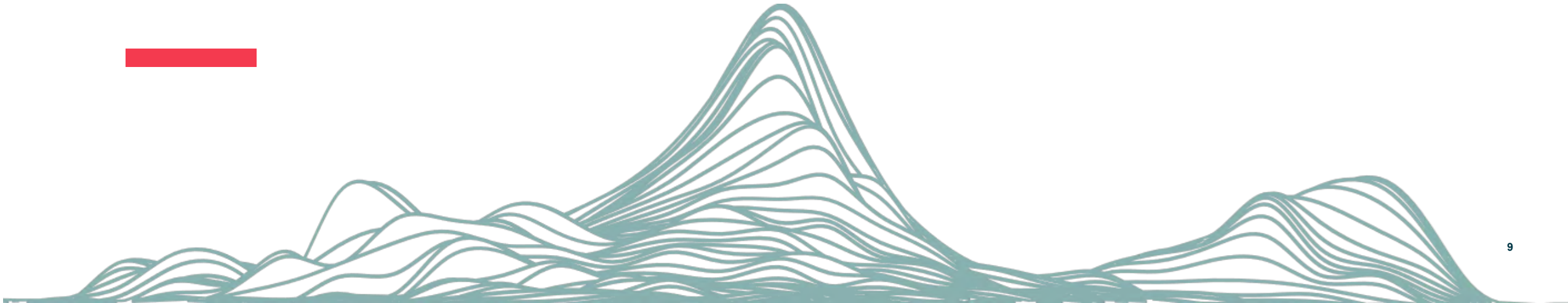
Employee vehicles should be treated differently, as they fall under Scope 3 Category 7: Employee Commuting. In this case, if a port is including this category in their emissions inventory, the entire commute to and from the port should be included- not limited to port owned land.



Key position: port services

For emissions occurring **directly from a port service (e.g., towage, stevedoring):** where the port service is undertaken by the port (i.e., the port has operational control of the service/activity), they are classified as **Scope 1 and/or Scope 2** for the port.

Where the **port service is undertaken by another party** (i.e., the port does not have operational control of the service/activity), it is classified as **Scope 3** for the port, regardless of stakeholder arrangement (e.g., license, contract, tenancy, direct operation).

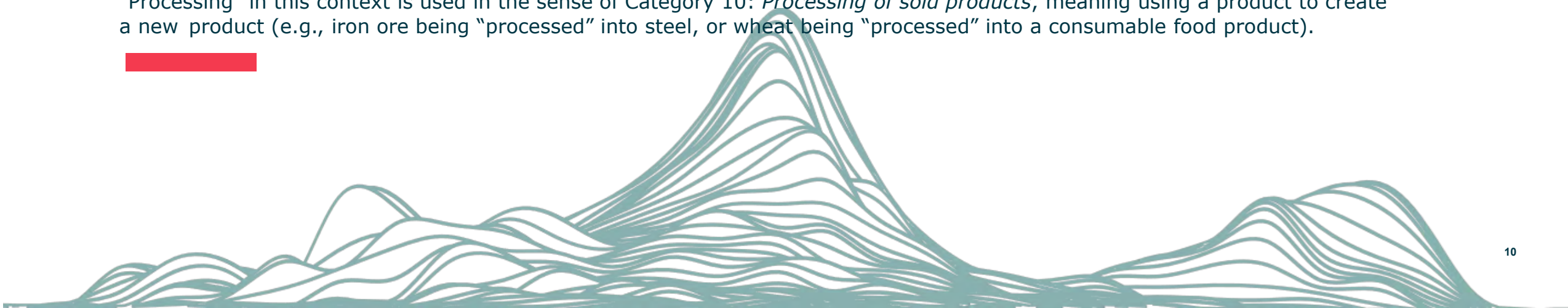


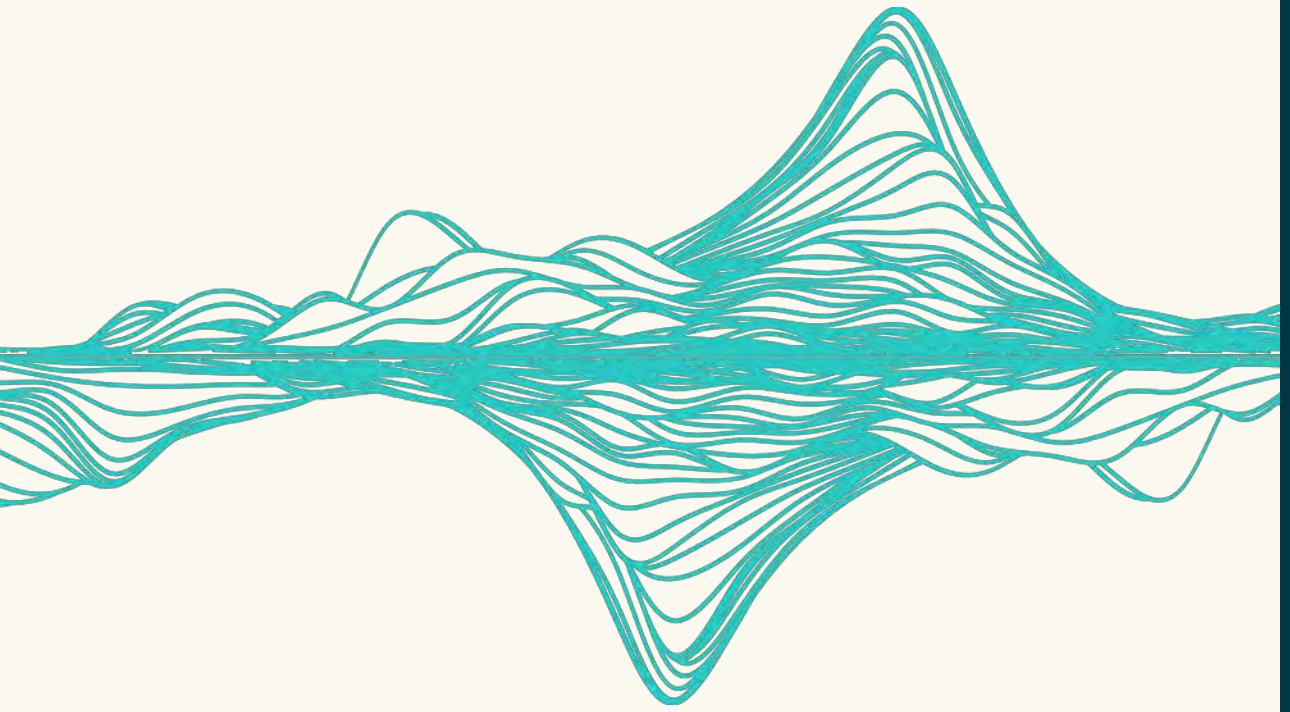
Key position: cargo

If the port **does not contribute to the value** of a product (i.e., is a part of its production, processing or use) or does not own and sell a product, then the upstream and downstream emissions associated with the production, processing and use of that product do not need to be quantified by the port in their Scope 3 emissions.

If the port **does produce, process, use, own or sell a product**, the upstream and downstream emissions of that product should be included in the port's emissions inventory as a **Scope 3** emission.

"Processing" in this context is used in the sense of Category 10: *Processing of sold products*, meaning using a product to create a new product (e.g., iron ore being "processed" into steel, or wheat being "processed" into a consumable food product).





Other key positions: quickfire

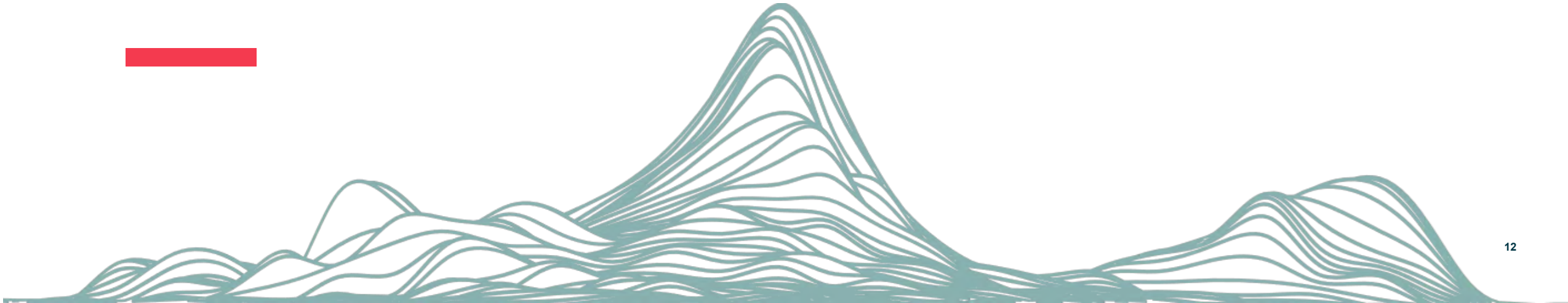
- Double counting
- Scope 2 emissions accounting
- Consolidation approach: operational control
- Tenants

What does this mean for ports?

- **Emissions inventories** are increasingly expected: this Guidance will provide a useful basis for ports who have not yet established these inventories, including for Scope 3

- **Decarbonisation pathways**: setting emissions boundaries, and gaining confidence in emissions inventories will empower ports to decarbonise their operations and value chains

- **Stakeholder engagement**: a key takeaway from this Guidance is that these inventories cannot be done in isolation. We encourage ports to engage with their tenants and other operators onsite.



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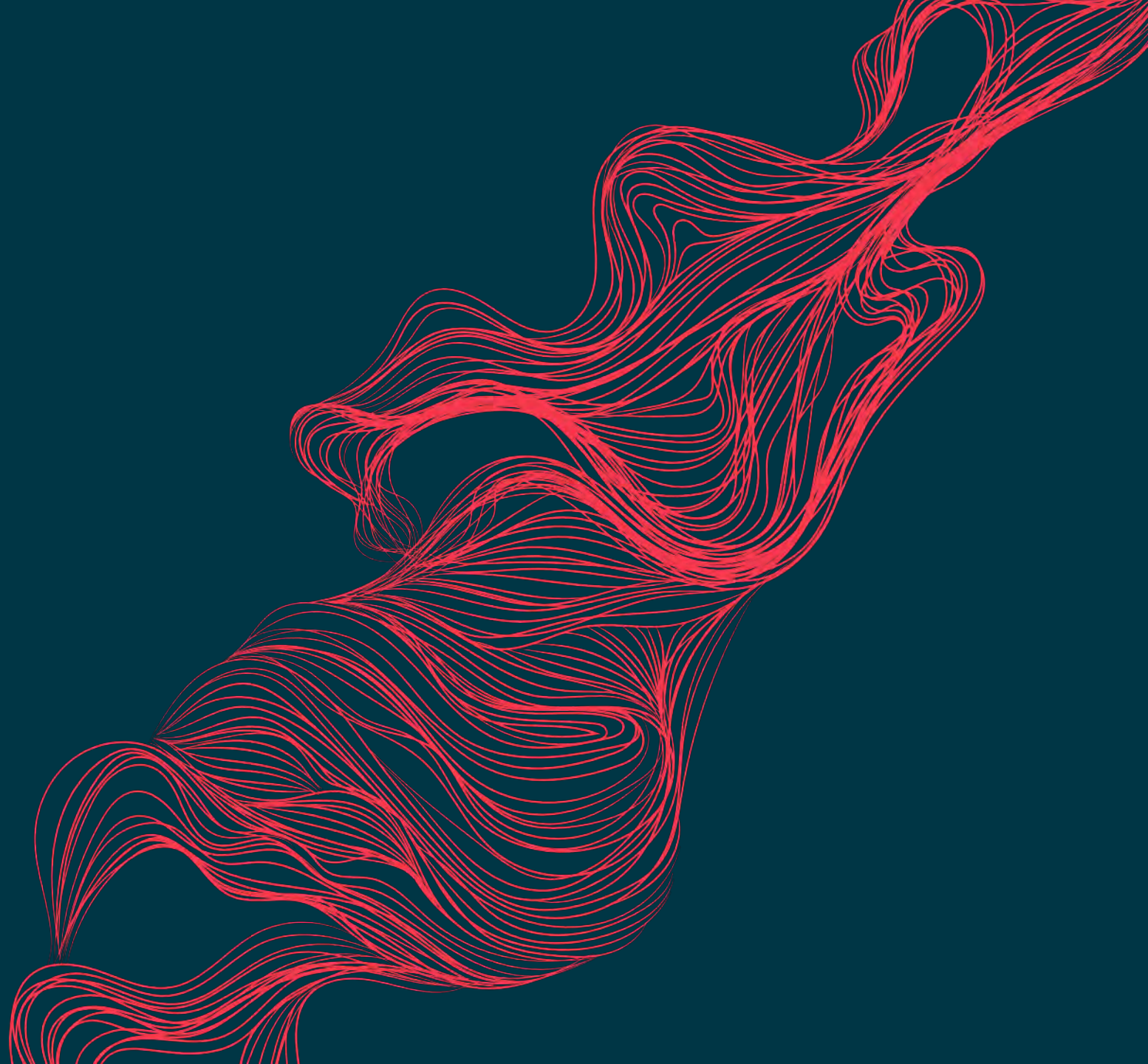

Sarah Harvey

Senior Sustainability Consultant – Arup

Decarbonisation Planning & Implementation (with insights from Geelong Port's journey)

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Decarbonisation Planning and Implementation

With Insights from GeelongPort's Journey

August 18 2025

ARUP

Agenda

1. GeelongPort Snapshot
2. Strategic Planning Process
3. Challenges and Approaches
4. Implementation Insights
5. Closing and Q&A

GeelongPort Snapshot - Operations

GeelongPort manages wharf and land-side infrastructure and works closely with Ports Victoria, which is responsible for channel management and navigation of commercial waters in and around Geelong.

GeelongPort owns and manages approximately 95 hectares of landholdings surrounding the Port of Geelong and includes five precincts below.

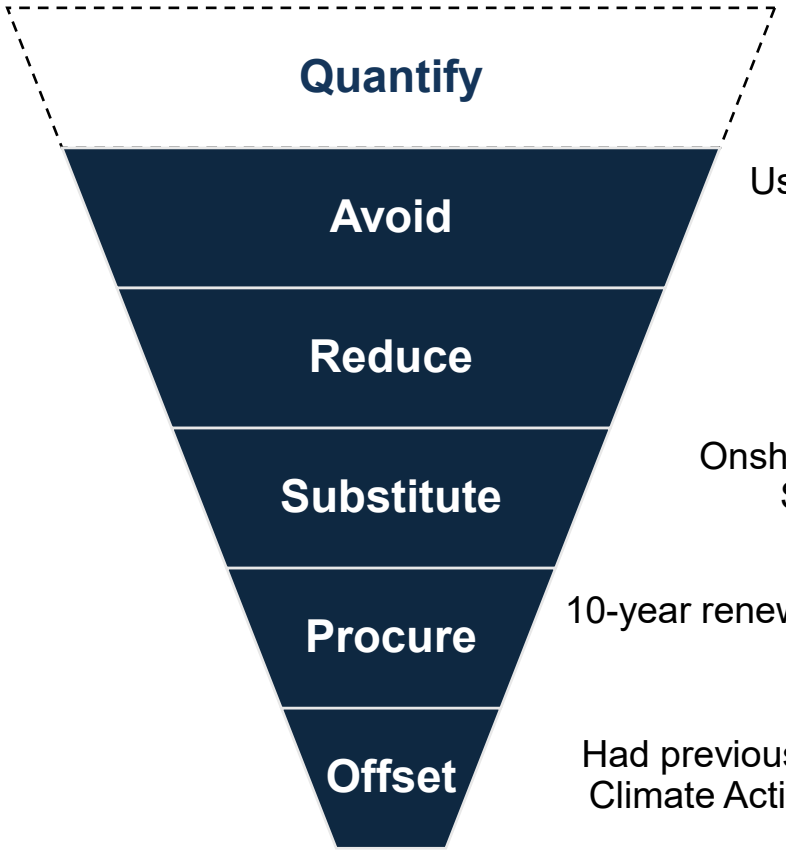
GeelongPort Snapshot - Decarbonisation Journey

Journey to date

Emissions reduction target previously validated with the Science-based Targets Initiative:

- Reduce scope 1 and 2 emissions by 50% by 2030 from a 2018 baseline and to measure and reduce scope 3 emissions

Scope 1 and 2 target met ahead of time



Emissions reduction hierarchy

Big wins already on the board

Reporting scope 1 and 2 emissions

Reporting against 7/15 scope 3 categories

Using Rightship to quantify scope 3 emissions from vessels

Onshore power supply (OPS) connections for the new Spirit of Tasmania passenger and freight terminal

10-year renewable Power Purchase Agreement (PPA) with the Barwon Renewable Energy Partnership, 2022

Had previously been offsetting quantified emissions achieved Climate Active carbon neutral certification (2020-21, 2021-22 periods)

GeelongPort Snapshot - Decarbonisation Journey

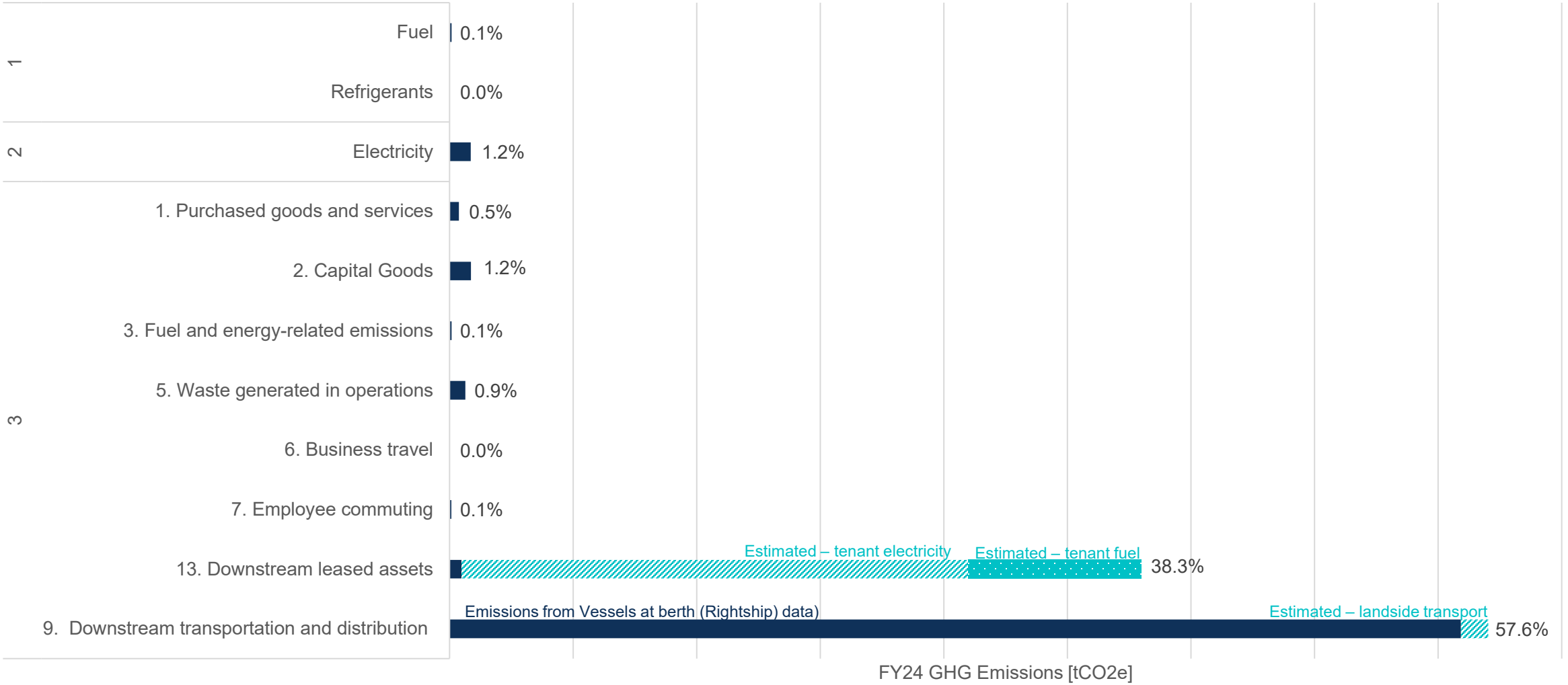
When did we get in involved?

- Commitments up for review (SBTi)
- Data gaps
- Strategic decision to withdraw from the Climate Active carbon neutral certification

Scope

- Review existing footprint
- Peer benchmarking and review of best practice target setting approaches
- Business as usual emissions trajectory to 2050
- Identify decarbonisation interventions
    - Scale of carbon reduction, ability to influence, and current maturity of the technology
- Develop an interactive dashboard
- Refresh of emissions reduction targets
- Action Plan

GeelongPort Snapshot - Emissions Footprint



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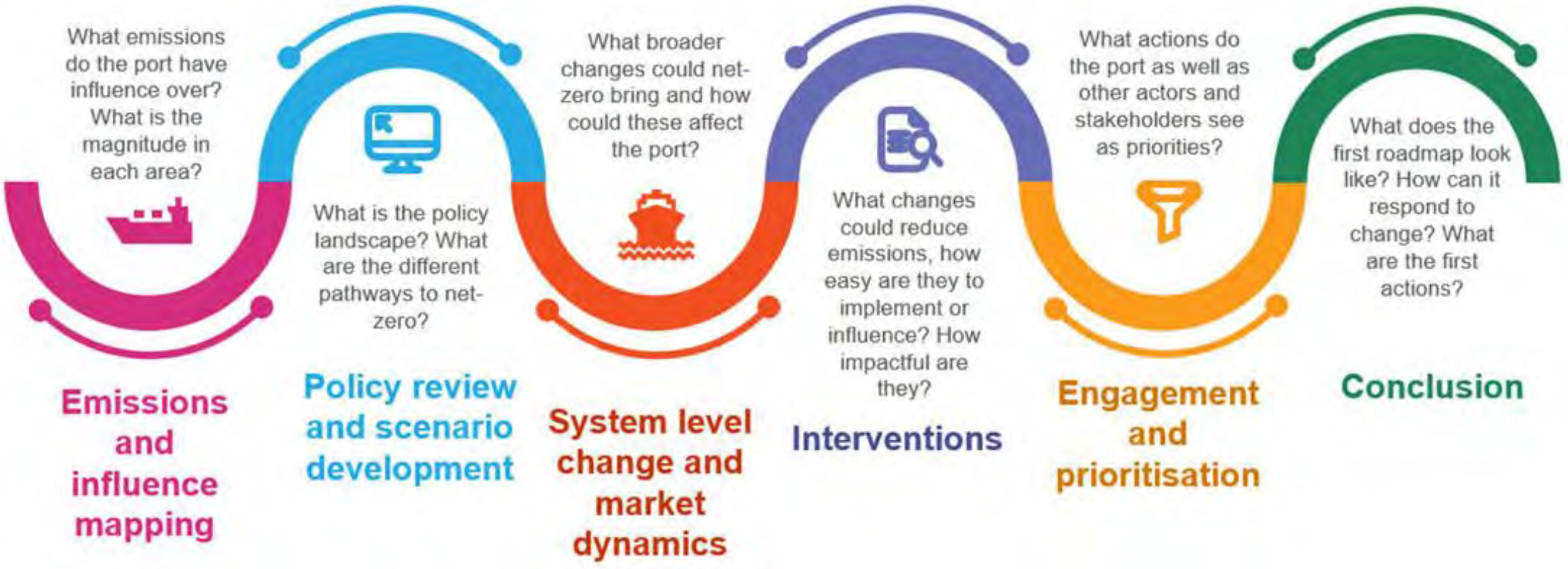
Strategic Planning Process

Stages in developing a decarbonisation roadmap



Strategic Planning Process

What can ports do?

Wider system change

Support decarbonisation beyond their boundaries by transforming their functions and services provided

Port users

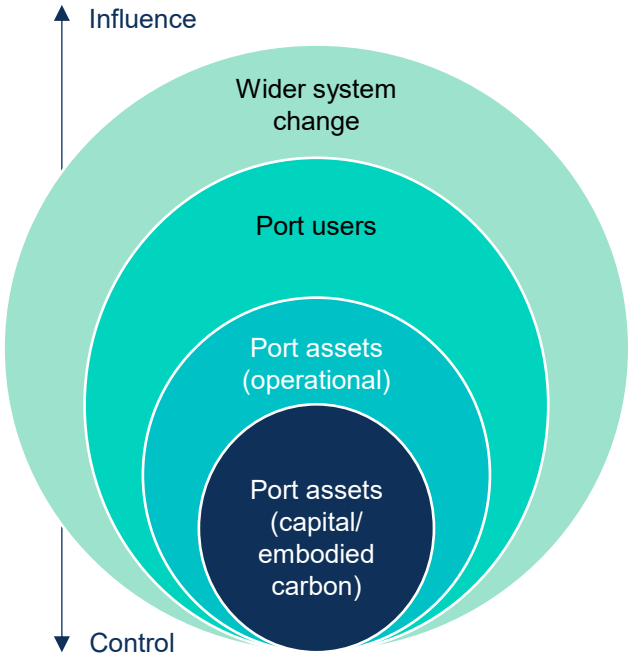
Influence decarbonisation of customers or visitors on the land and water side of the port and their associated transport emissions.

Port assets (operational)

Decarbonise GHG emissions associated with the operation of a port asset required to deliver its service.

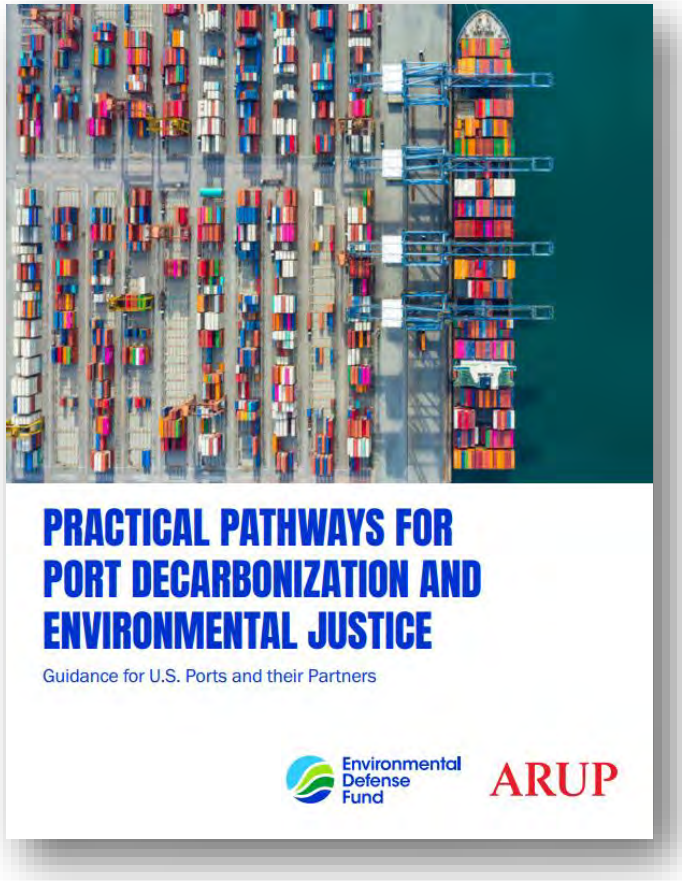
Port assets (capital/embodied carbon)

Decarbonise emissions associated with the creation, maintenance and end-of-life treatment of port assets.



Areas of impact

Source: Figure 1 from Practical pathways for port decarbonization and environmental justice



Implementation - Common Challenges and Opportunities

Data gaps

Varying interpretations of guidance + rapidly evolving guidance

High number of variables

Majority of emissions are **outside of direct control**

Time and Money

Industry Guidance, Frameworks and Standards

Australian Sustainability Reporting Standard and Commonwealth Climate Disclosure Policy

GHG Protocol

Ports Australia Guidance

Science Based Target Initiative
- Evolving requirements

2023 IMO Strategy on Reduction of GHG Emissions from Ships
2025 IMO Net Zero Framework
How will play out on routes that include Australia?

Implementation - Unique Challenges and Opportunities

Cargo types

High number of distinct vessel types

Passenger Ferries
→ Frequent port calls, OPS viable (and integrated)

Bulk Good / Carriers
→ Minimal OPS adoption (supply, demand, utilisation)
→ Throughput limited by loading / unloading speeds

Refinery (crude + chemical tankers)
→ High emissions intensity at berth
→ Additional safety concerns/hazards related to any potential OPS

Tenants
→ Wide variety of tenants with varied contract types, durations and ambitions

GeelongPort **no longer meets the SBTi SME eligibility criteria** (new criteria effective 2024)

KEY CRITERIA FOR NEAR AND LONG-TERM SCIENCE-BASED TARGETS

SCIENCE BASED TARGETS
DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

This table is a non-exhaustive summary of the key target boundary, timeframe, method eligibility and minimum ambition requirements for near and long-term science-based targets. For more detail on methods, pathways, criteria and recommendations, see the [Corporate Net-Zero Standard].

			Scope 1 and 2			Scope 3			
Near-term science-based targets	**Target boundary**		95% coverage of scopes 1 & 2			If scope 3 represents more than 40% of total emissions: target boundary must cover minimum 67% of scope 3 emissions			
	Target year		5-10 years from date of submission			5 - 10 years from date of submission			
	Method eligibility and minimum ambition	*Method*	Cross-sector absolute reduction (i.e., ACA)	Sector-specific intensity convergence (i.e., SDA)	Renewable electricity (scope 2 only)	Cross-sector absolute reduction (i.e. ACA)	Sector-specific intensity convergence (i.e. SDA)	Supplier or customer engagement	Scope 3 physical and economic intensity reduction
		Eligibility and minimum ambition	• Minimum of 4.2% linear annual reduction (LAR) dependant on base year • Exception: FLAG pathway is 3.03% LAR	• Depends on sector and company inputs	• 80% RE by 2025 • 100% RE by 2030 and thereafter a maintenance target	• 2.5% LAR	• Depends on sector and company inputs (SDA)	• Suppliers/customers have science-based targets in line with the latest Corporate Near-Term Criteria	• 7% year-on-year physical/economic intensity reduction in annual compounded terms
Long-term and net-zero science-based targets	**Target boundary**		95% coverage of scopes 1 & 2			90% coverage of scope 3			
	Target year		2050 or sooner (2040 for companies using the power and maritime SDAs)			2050 or sooner			
	Method eligibility and minimum ambition	*Method*	Cross-sector absolute reduction (i.e., ACA)	Sector-specific intensity convergence (i.e., SDA)	Renewable electricity (scope 2 only)	Cross-sector absolute reduction (i.e., ACA)	Sector-specific intensity convergence (i.e., SDA)	Supplier or customer engagement	Scope 3 physical and economic intensity reduction
		Eligibility and minimum ambition	• 90% reduction (cross-sector pathway) • 72% reduction for FLAG • Other sector pathways vary	• Sector/commodity pathways vary	• 100% RE by 2030 and thereafter a maintenance target	• 90% reduction (cross-sector pathway) • 72% reduction for FLAG • Other sector pathways vary	• Sector/commodity pathways vary	• Not eligible for long-term science-based targets	• 97% overall reduction for both physical and economic intensity

Not eligible | 1.5°C ambition | Well-below 2°C ambition

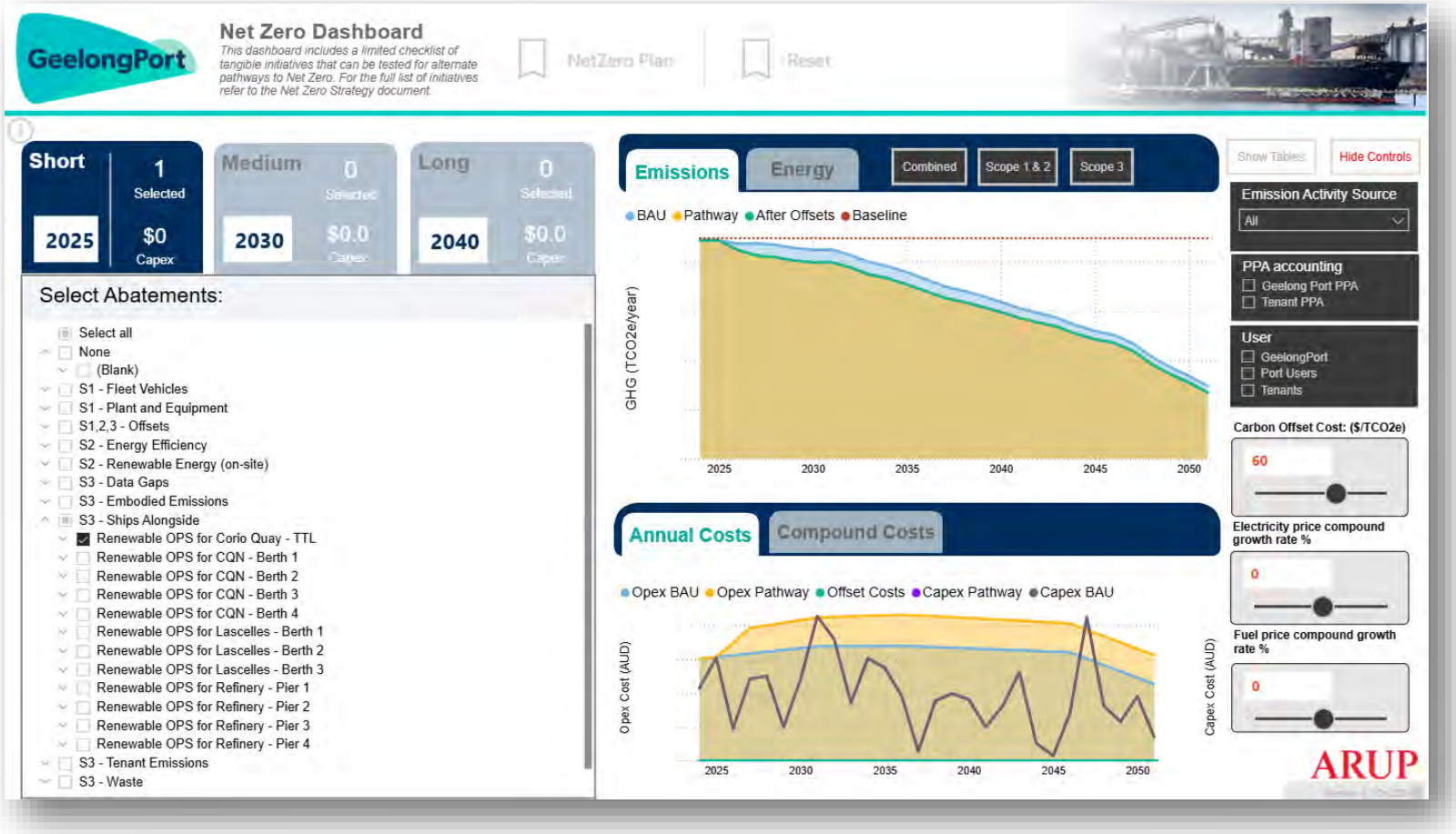
Implementation - Approach

Flexibility in variables

- Internal buy in and approval is critical for success
- Different stakeholders will have different concerns
- Understand and build in flexibility for key variables to avoid roadblocks and unnecessary rework

'Which and When' Dashboard

- Different decarbonisation initiatives can be selected at different timescales (short, medium, long) to understand the estimated impact
- Can view emissions trajectory for location-based or market-based reporting (i.e. taking into account the impact of the procurement of renewable electricity)
- Flexible variables (e.g. Offset prices, Energy prices)



Implementation - Insights

Integrate into Planning

- Embedding emissions reduction into the infrastructure investment pipeline ensures alignment with broader asset renewal strategies.
- Side by side review of capital works plans and fuel consumption by equipment
  - For GeelongPort, 2 pieces of equipment were responsible for 35% of scope 1 emissions and were scheduled for replacement 2027-2030

Key takeaways to avoid missed opportunities

- Understanding the capex/opex pipeline and how it relates to your emissions footprint
- Maximise the impact of your planned works and reduce the ‘green premium’ by uplifting planned capex to cover the difference from like-for-like replacement to net zero ready (rather than out of cycle upgrades)
- Leave adequate time to work through supporting infrastructure and procurement challenges
- Grouping of initiatives to get a collectively acceptable payback where necessary

Implementation - Insights

Tenant Engagement

- Understand their ambitions
  - ~ 67% of tenants (by number: 14/21) had an aligned or partially aligned target.
  - 8/9 tenants deemed to be medium-large tenants have an aligned or partially aligned target.
- Use data collection as an opportunity for engagement
- Look for mutually beneficial opportunities
- Prioritise engagements

Tenant Size	Number of Tenants		
	Aligned with SBTi near-term *Based on the available information the company appears to already have a commitment that is in line with the latest climate science (emission reduction in line with Paris Agreement/SBTi).*	**Partial Alignment** *The company does have a carbon reduction or carbon neutral commitment, but it does not currently align with the emission reductions required to be line with the latest climate science. Or the tenant itself does not have a publicly stated commitment, but its parent company does.*	**None** *No information available.*
Large	1	4	
Medium		3	1
Small	2	4	6
Total	**3**	**11**	**7**

Implementation - Insights

Engagement with Port Users

- Challenging!
- Look at the data and understand who to prioritise
  - *what access systems and data is already collected that could support with prioritisation?*
- Build influence through infrastructure
  - *Understand and prioritise the needs of frequent callers and predictable operations where utilisation is more certain*
- Understand the influence levers available and implement thoughtfully

Port	Port tenants		Port users		Wider system change
Code Progressively update Standards to ensure developments are designed to reduce upfront embodied emissions and for net zero operational emissions.	**Co-invest** Co-invest in infrastructure that enables emissions reduction from tenants and port users.	**Lease** Progressively update Sustainability Standards in leases to drive tenants to implement GHG emission reduction measures and facilitate data collection.	**Incentivise / Penalise** Design and implement incentives and/or penalties that reward / penalise GHG emitters (access & financial). (Thoughtfully and were possible)	**Pilot / Trial** Work with industry and government stakeholders to implement scalable pilots and trials of new technology.	**Inform & Educate** Identify topics that suppliers and customers need help with and produce/share resources and/or information sessions.

Final Reflections

- Build in flexibility to support internal buy-in
- Proactive planning
- Effective stakeholder engagement
- Transparency builds trust
- Progress over perfection

ARUP

Marnie Hope

Group Sustainability Manager – Flinders Ports

Flinders Ports Case Study

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Strategy to Reality: Implementing Decarbonisation and ESG Strategies in Port and Maritime Facilities

Flinders Ports Case Study | 18 August 2025

Flinders Port Holdings

About us…

Flinders Port Holdings Group Operations

Flinders Port Holdings own and operate Flinders Adelaide Container Terminal, the port of Port Adelaide as well as the six key regional ports of Port Giles, Port Lincoln, Wallaroo, Port Pirie, Klein Point and Thevenard.

We also provide integrated supply chain solutions through Flinders Warehousing and Distribution. Beyond ports, we deliver hydrographic survey services through HydroSurvey Australia.

Flinders Port Holdings is ranked as one of South Australia's top 10 companies, with an annual turnover of more than $300 million. We employ over 750 people and indirectly support 6000 jobs in South Australia.

Through our operations we facilitate over $25 billion in international trade annually and are the key platform for South Australian two-way trade in goods.

Our trade book:

Vessel visits	1,803 vessels
Grain	4.603m ton
Petrol/Gas	2.677m ton
Gypsum	1.975m ton
Limestone	3.562m ton
Cement	1.214m ton
Mineral Sands	505,000 ton
Concentrates	542,000 ton
Fertilizer	673,000 ton
Other	963,000ton
Cars/Machinery	127,000 ton
Containers	399,000 teu

Flinders Port Holdings

Decarbonisation Snapshot

Carbon emission profile

Emissions profile	Tonnes $CO_{2\text{-}e}$
Scope 1	5,614
Scope 2	1,942
Scope 3	70,103
TOTAL	**77,659**

- Emissions are sensitive to trade volumes (we track S1&2 emissions/$M revenue and forecasting emissions for the container terminal based on TEU)
- Data is assured to limited level
- Category 1,2 and 13 are our largest scope 3 emissions due to vessel emissions, tug-boats and construction materials – focus for the business
- Set emission reductions targets for S1&2.
- Annual carbon budget tied to $350M sustainable finance KPI and targets and $70M CEFC debt funding to implement decarbonisation plan.

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Challenges

Policy and regulation (reporting, disclosures and greenwashing, fuel standards and bunkering).

Climate transition risk – Technology (Plant and Equipment, Battery Chemistry, Vessel Fuel).

Energy transition - Fuel switching, liquid fuel and electricity optimisation, RE and batteries, supporting infrastructure.

Energy and carbon emissions and economics – friend or foe?

Value chain emissions – stakeholder engagement and who pays?

Financial - valuing non-financial metrics, company investment frameworks and carbon pricing

Trump and is ESG dead – creating value for your company

Climate and nature risk – environment and economic synergies

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Konecrane Noell Diesel Battery Hybrid

Straddle Carriers

- FPH's new Konecranes Noell diesel battery hybrid straddle carriers consume 36% less fuel compared to older models, offering both operational and safety benefits.
- Part of our climate transition plan of how we move shipping containers around our container terminal.
- Fuel switching (electric and hybrid) and optimising (engine and operations) is how we are reducing our scope 1 emissions. We are also introducing telemetrics on our equipment. Operational requirements and technology advancements along with cost remain a challenge
- Over the last year we are reducing fuel use from electric forklifts, electric and hybrid light vehicles and more efficient empty container handlers, elevated work platforms.

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New Pilot Boat Fleet

PV Spencer & Spirit

Collaboration with Hart Marine

- We collaborated with Hart Marine to design new pilot boats aimed at improving safety, technology, and sustainability.
- We introduced PV Spirit, equipped with a pod drive propulsion system and fuel-efficient smart engines.
- This vessel is designed to accommodate future low and zero-emission technologies e.g. electric and HVO
- Reduction in fuel use is also dependent on weather conditions and speed of the boat.

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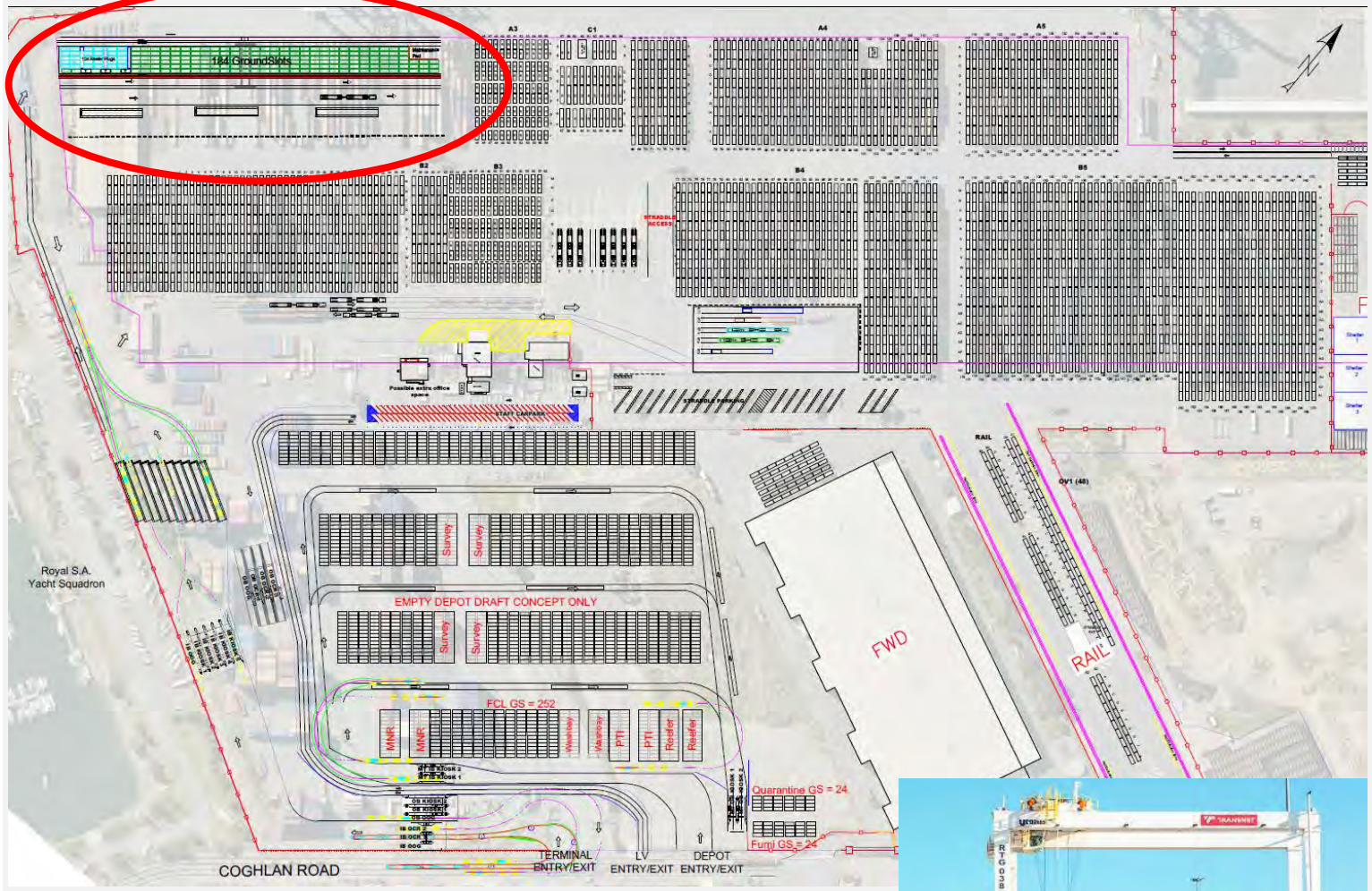
GATEWAY SA – STAGE 1 (INFRASTRUCTURE AND TECHNOLOGY UPGRADE - ~ 4 YEARS)



- Development of adjacent land with new, heavy-duty pavement and services
- Construction of improved access to the terminal including a new gate operating system
- Reconfiguring elements of the terminal layout to improve operational safety and efficiency.
- Procurement, installation and commissioning of new, super post-Panamax ship to shore cranes
- Establishing an Auto Rubber Tyre Gantry (ARTG) block and testing area
- Implementation of a new or redeveloped Terminal Operating System (TOS) to support new technology and ARTG cranes
- Purchase of ARTG cranes and horizontal transport vehicles (ITVs) to support Stage 1

GatewaySA

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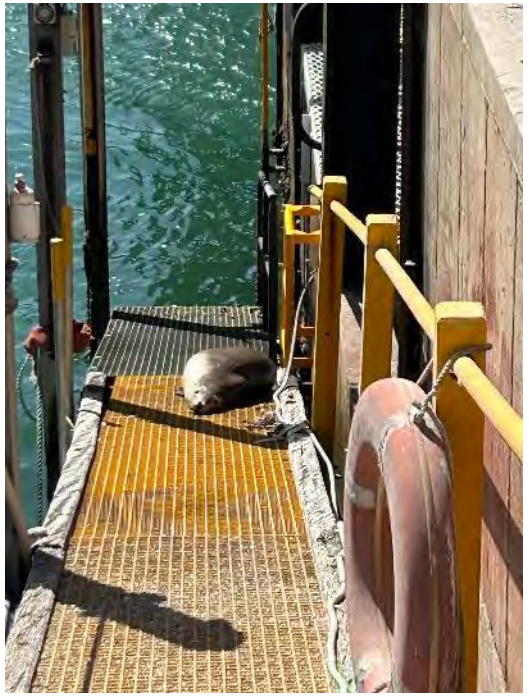
The role of nature in climate policy



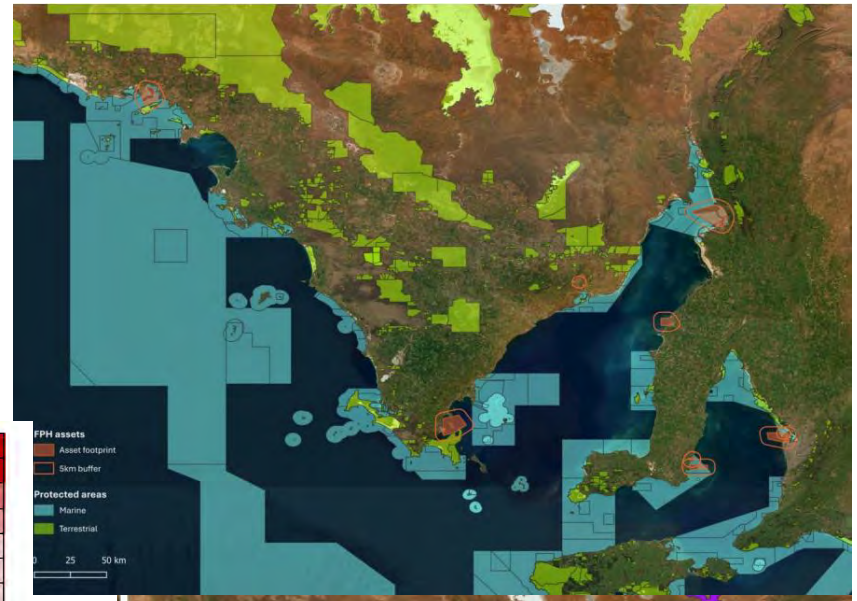
Nature

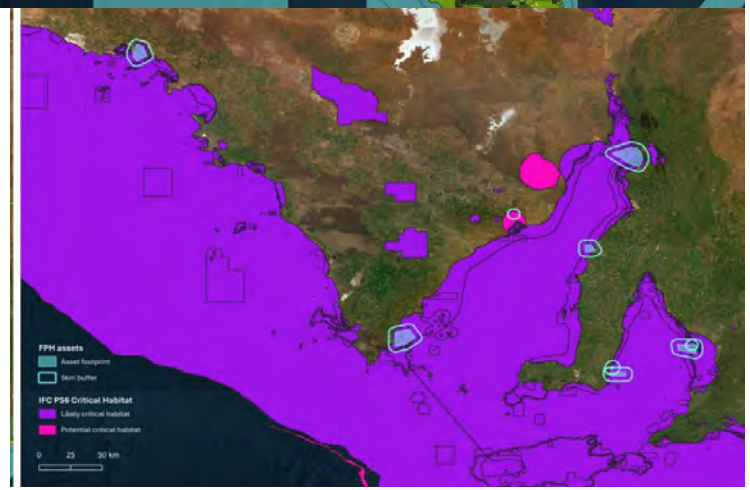
Nature-based innovation at the water's edge

- Developing Our Nature Strategy – baseline and action plan
- TNFD – LEAP Assessment

Impact / pressure	3. Medium	4. High	5. Very High
Disturbances (e.g noise, light)	12	5	5
Introduction of invasive species	4	3	3
Emissions of non-GHG air pollutants	6	3	2
Emissions of GHG	14	5	1
Emissions of toxic soil and water pollutants	9	5	1
Area of freshwater use	5	4	1
Other biotic resource extraction (e.g. fish, timber)	1	1	1
Volume of water use	11		1
Generation and release of solid waste	10	6	
Area of land use	21	3	
Area of seabed use	8	2	
Emissions of nutrient soil and water pollutants	7	2	

Dependency / ecosystem service	3. Medium	4. High	5. Very High
Visual amenity services			9
Rainfall pattern regulation	8		7
Education, scientific and research services			6
Recreation related services			5
Soil and sediment retention	11	5	4
Global climate regulation	12	1	3
Biomass provisioning		1	3
Water purification	12		3
Solid waste remediation	2		3
Spiritual, artistic and symbolic services			3
Water flow regulation	11	6	2
Water supply	9	5	2
Flood control	16	9	1
Local (micro and meso) climate regulation	4	1	1
Genetic material	2	1	1
Nursery population and habitat maintenance		1	1
Storm mitigation	15	6	





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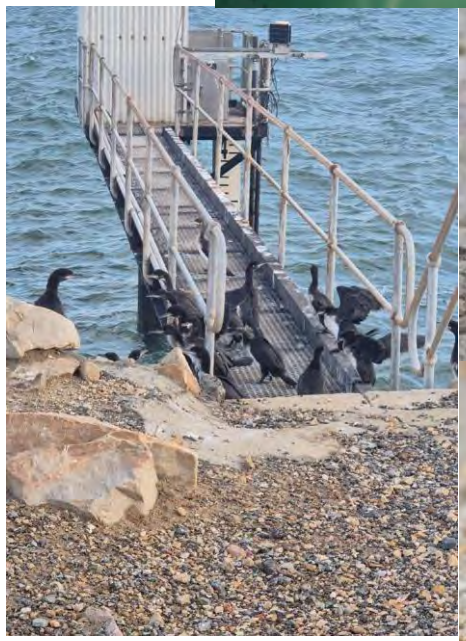
Nature

Bird Island

- What and where is the Island?
- Joint management under MoU
- One of the largest nesting sites for the Black-Faced Cormorant
- Endangered and migratory birds – Fairy Tern (two colonies of 88 adults), Crested Terns, Hooded Plovers, Eastern Curlews to name a few
- Sponsorship provided – colonial bird counts , pest management and revegetation
- Avian Influenza– response and preparation
- Integration of nature and climate into engineering projects and dredge management plans



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Nature

Understanding our benthic habitat and species of significance

- Benthic habitat assessment for all ports – three of six regional ports complete
- Build an understanding of benthic habitats such as seagrasses, impacts from dredging and shipping.
- The hidden biodiversity in Port environments (pylons and sheet piles), species of biosecurity and conservation significance
- R&D projects
- Relationship to development approvals

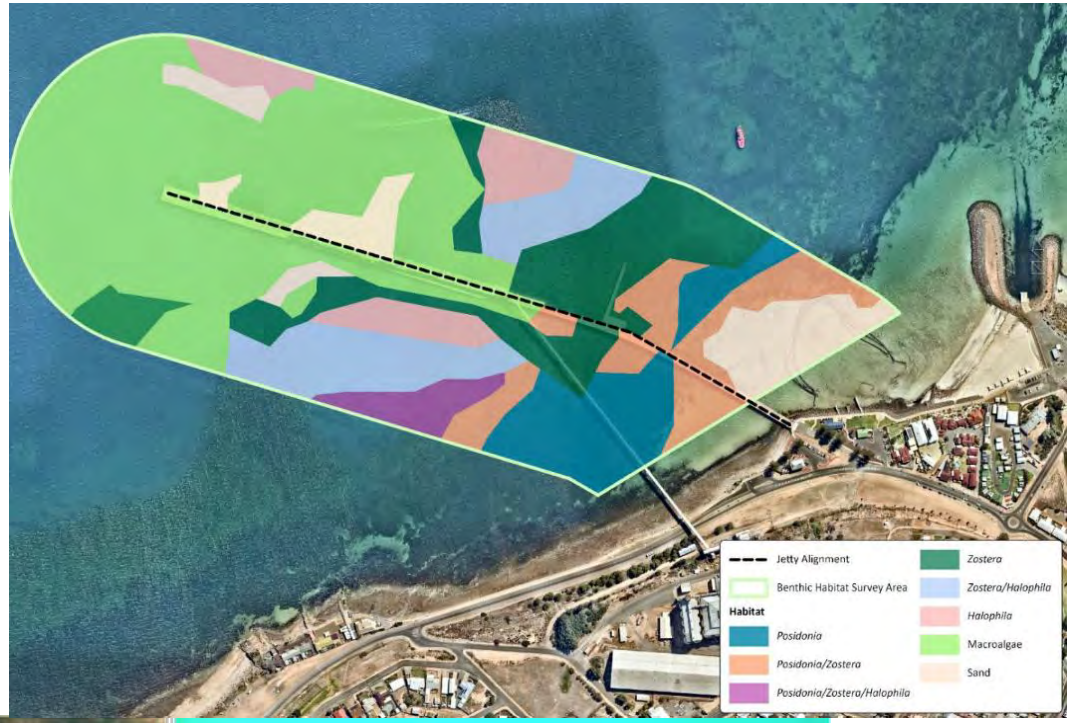


Plate 12. Representative example of a pile encrusting community


Plate 8. Dense *Zostera nigricaulis*

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Carbon Farm

Eyre Peninsula

- Purchased 712 ha of land in Minbrie for the purposes of undertaking an environmental planting project.
- Generate up to 50,000 ACCU's.
- Part of our transition plan around net zero for residual emissions
- Linked to our nature strategy.

Flinders Port Holdings

Thank you

Do you have any questions?

ACKNOWLEDGMENT OF COUNTRY | Flinders Port Holdings acknowledges the Traditional Owners of the land and waterways on which we operate, and pays respect to Elders past, present and emerging. We're working towards reconciliation and engaging with Traditional Owners is a critical part of business on an acute port and local community level, but also on a far greater scale, contributing to the growth of unity between Aboriginal and Torres Strait Islander peoples and non-Indigenous peoples across Australia.

We acknowledge that our business operations spread across six Aboriginal and Torrens Straight Islander lands. These are Kaurna, Banggarla, Narangga, Nawu, Wirangu and Nukunu.

Flinders Port Holdings

ONE FPH

Afternoon Tea

14:45-15:15

Fauzan Zulkhepli

Senior Project Manager – Port Authority of NSW

PIANC WG248 Shore Power Update

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PIANC MARCOM WG248

GUIDELINES FOR ONSHORE POWER SUPPLY (OPS) FOR SHIPS

Working Group Progress Update and Findings

Fauzan Zulkhepli
PIANC MarCom WG248 Chair
Senior Project Manager – Shore Power
Port Authority of New South Wales

18 August 2025

PIANC MARCOM WG248 – GUIDELINES FOR ONSHORE POWER SUPPLY FOR SHIPS

WORKING GROUP PROGRESS UPDATE AND FINDINGS

INTRODUCTION AND PROGRESS UPDATE

34 NATIONAL REPRESENTATIVES

19 INDUSTRY EXPERTS

7 TASK FORCE

1 MAIN GUIDELINES (ALL HIGH VOLTAGE VESSEL TYPES)

DELIVERABLES

- **3-5** MINI PUBLICATIONS
- **7-8** SUPPORTING MATERIALS (CHECKLISTS, FORMS, VIDEOS, FLOWCHARTS)

PURPOSE

"Creating practical, globally relevant guidelines for OPS design, implementation, and governance."

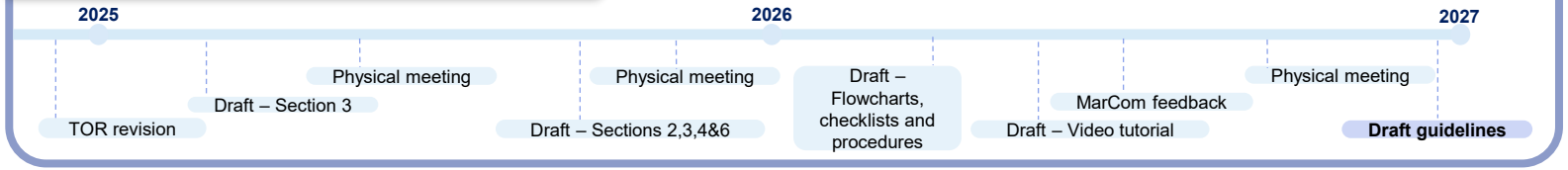
KEY FINDINGS

- KEY GLOBAL TRENDS & POLICY LANDSCAPE
- TECHNICAL DEVELOPMENTS & IMPLEMENTATION CHALLENGES
- SHORE POWER AS ESG ENABLER
- FUTURE OUTLOOK & CALL TO ACTION

OPS GUIDELINES

KEY TOPICS	SCOPE
Onshore Power Supply System Description and Functionality	▪ Background & history, understanding OPS system, environmental & economic benefits
Commercial, Financial and Regulatory Considerations	▪ Investment strategy, cost analysis, quantitative modelling, regulatory considerations
Technical and Design Considerations	▪ Demand assessment, technical standards, vessel interface, quay-side & vessel-side design considerations
Start-Up and Commissioning	▪ Pre-commissioning, commissioning, training & handover
Operation and Maintenance	▪ Organisational & process integration, operating procedures, resourcing strategy, asset management models, metering & billing, maintenance procedures, vulnerability & risk management, safety & security
Case Studies and Examples of OPS Installation	▪ Overview of OPS installations globally, lesson learnt, multi-port project approaches, recommended feasibility studies
Future Opportunities and Integration	▪ Smart grid, battery-powered vessels, integration into wider environmental strategies, emerging technologies,

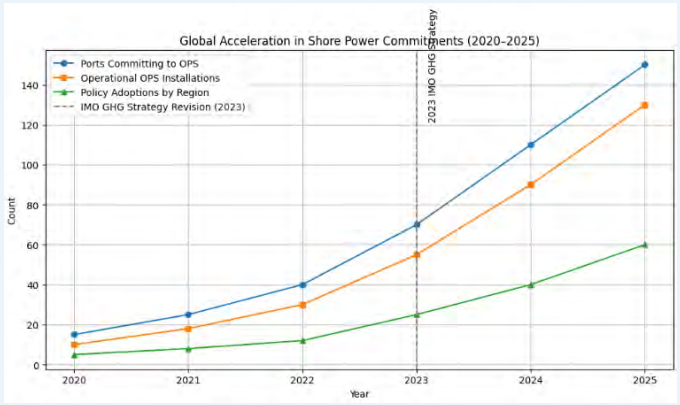
INDICATIVE PROJECT TIMELINE



PIANC MARCOM WG248 – GUIDELINES FOR ONSHORE POWER SUPPLY FOR SHIPS

WORKING GROUP PROGRESS UPDATE AND FINDINGS

KEY FINDINGS



KEY FINDINGS

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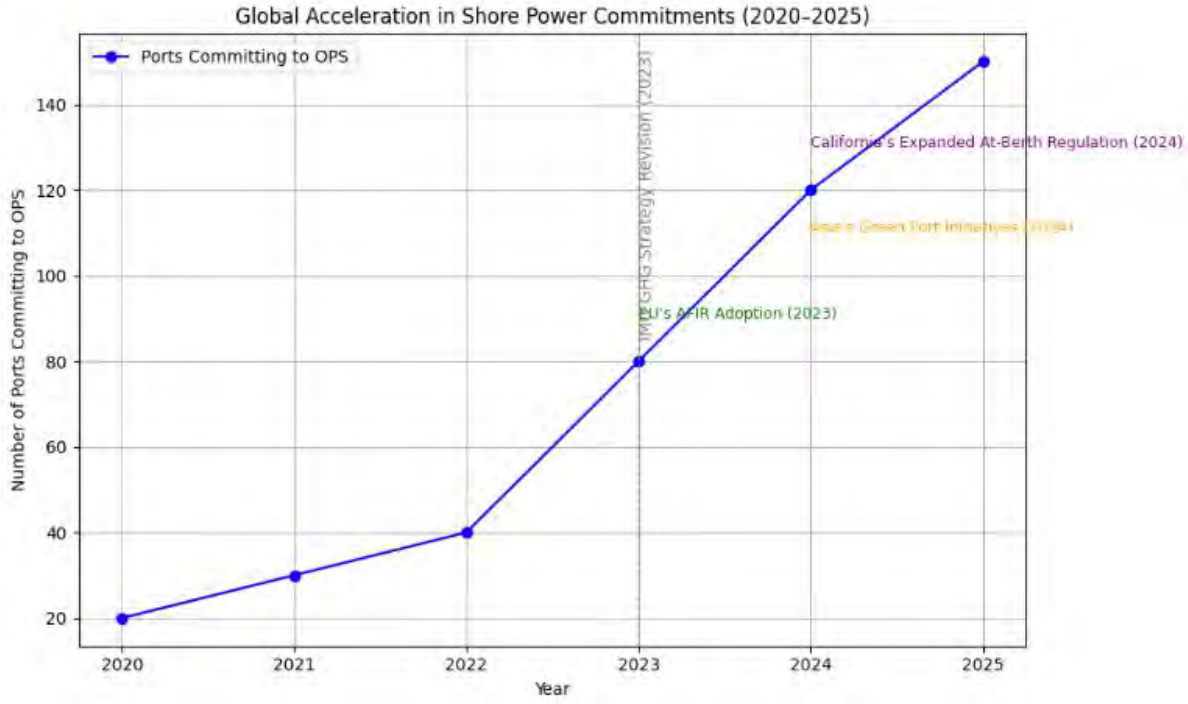
Rapid acceleration post-IMO GHG Strategy 2023 revision

Surge in OPS policy incentives – EU's Alternative Fuels Infrastructure Regulation (AFIR), California's expanded At-Berth Regulation, Asia's green port initiatives

Demonstration projects to full-scale operational integration – cruise, container sectors



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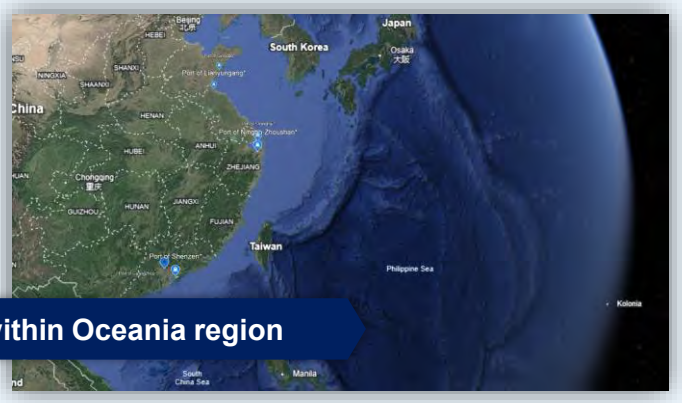
WORKING GROUP PROGRESS UPDATE AND FINDINGS

KEY FINDINGS



Gaps within Oceania region

KEY FINDINGS

- KEY GLOBAL TRENDS & POLICY LANDSCAPE
- TECHNICAL DEVELOPMENTS & IMPLEMENTATION CHALLENGES
- SHORE POWER AS ESG ENABLER
- FUTURE OUTLOOK & CALL TO ACTION

Funding mechanisms driving uptake – carbon credits, green bonds, port dues discounts

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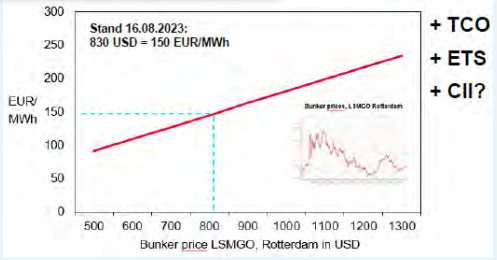
WORKING GROUP PROGRESS UPDATE AND FINDINGS

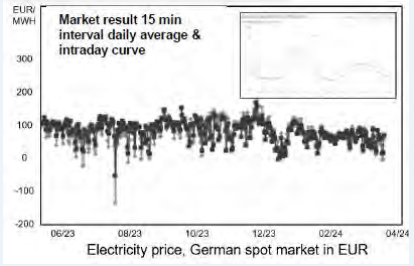
KEY FINDINGS

Onboard Generation



+ TCO
+ ETS
+ CII?

Shore Power



KEY FINDINGS

- KEY GLOBAL TRENDS & POLICY LANDSCAPE
- TECHNICAL DEVELOPMENTS & IMPLEMENTATION CHALLENGES
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Maturity and adoption of IEC/IEEE 80005 standards across regions – gaps within the standards to be addressed in WG248 guidelines

Advances in shore-to-ship technologies

Trends in voltage levels – increasing shift to 11kV and MV solutions

Grid capacity and resilience issues in older port precincts – creative solutions, operational strategy

Technical compatibility with diverse ship fleets

Cost recovery models – charging infrastructure VS electricity supply tariff

Metering requirements, restrictions in electricity supply regulations

PIANC MARCOM WG248 – GUIDELINES FOR ONSHORE POWER SUPPLY FOR SHIPS

WORKING GROUP PROGRESS UPDATE AND FINDINGS

KEY FINDINGS

Case Study – Port of Oslo

Gateway Impact:

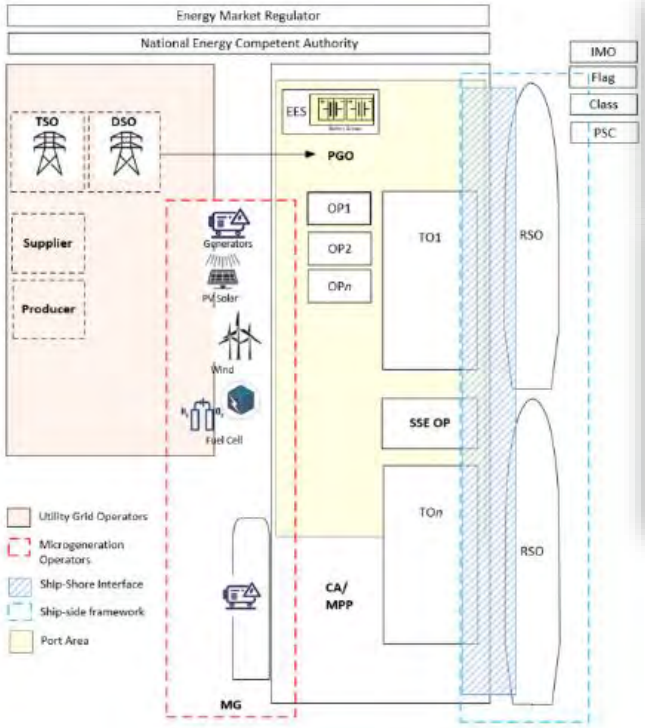
- Led to full electrification of inner harbor ferry services.
- Integrated with Norway's national grid upgrades and renewable energy targets.
- Supported Oslo's goal to become the world's first zero-emission port.

KEY FINDINGS

- KEY GLOBAL TRENDS & POLICY LANDSCAPE
- TECHNICAL DEVELOPMENTS & IMPLEMENTATION CHALLENGES
- SHORE POWER AS ESG ENABLER
- FUTURE OUTLOOK & CALL TO ACTION

Shore power as gateway technology enabling broader port electrification and decarbonisation

Positioning shore power as a viable, measurable ESG initiatives



Case Study – Port of Los Angeles

Gateway Impact:

- Triggered upgrades to grid infrastructure and substation capacity.
- Enabled integration of electric cargo handling equipment and battery storage.
- Supported the port's Clean Air Action Plan, aligning OPS with broader electrification goals

PIANC MARCOM WG248 – GUIDELINES FOR ONSHORE POWER SUPPLY FOR SHIPS

WORKING GROUP PROGRESS UPDATE AND FINDINGS

KEY FINDINGS

Pilot technologies:
Barge-to-ship OPS, portable system, floating OPS

KEY FINDINGS

- KEY GLOBAL TRENDS & POLICY LANDSCAPE
- TECHNICAL DEVELOPMENTS & IMPLEMENTATION CHALLENGES
- SHORE POWER AS ESG ENABLER
- FUTURE OUTLOOK & CALL TO ACTION

Shore power VS Alternative fuels / CCS / Zero emission technologies

Future technologies

Case examples highlighting successful governance models and cross-border OPS alignment

Automated Shore-to-Ship Connection Systems

- Robotic arms or automated plug-in systems that connect vessels to shore power without manual intervention.
- Reduces turnaround time, improves safety, and supports high-frequency OPS usage.
- Example: Ports in China, Scandinavia and Germany are piloting automated mooring and OPS connection systems for ferries and RoRo vessels.

Wireless Monitoring and Smart Load Balancing

- Real-time energy monitoring systems that optimize power delivery based on vessel demand and grid conditions.
- Enhances grid efficiency, prevents overloads, and supports dynamic pricing models.
- Example: Some Asian ports are integrating smart meters and IoT sensors into OPS infrastructure to track emissions reductions and energy use.

OPS-Linked Battery Storage and Renewable Integration

- Co-locating OPS systems with battery storage and solar/wind generation to reduce grid dependency.
- Enables clean energy delivery even during peak demand or grid outages.
- Example: Port of Oslo and other Scandinavian ports are testing hybrid OPS systems with renewable energy and storage.

Call for feedback:
How can WG248 guidelines best support ports in the region?

PIANC MARCOM WG248 – GUIDELINES FOR ONSHORE POWER SUPPLY FOR SHIPS

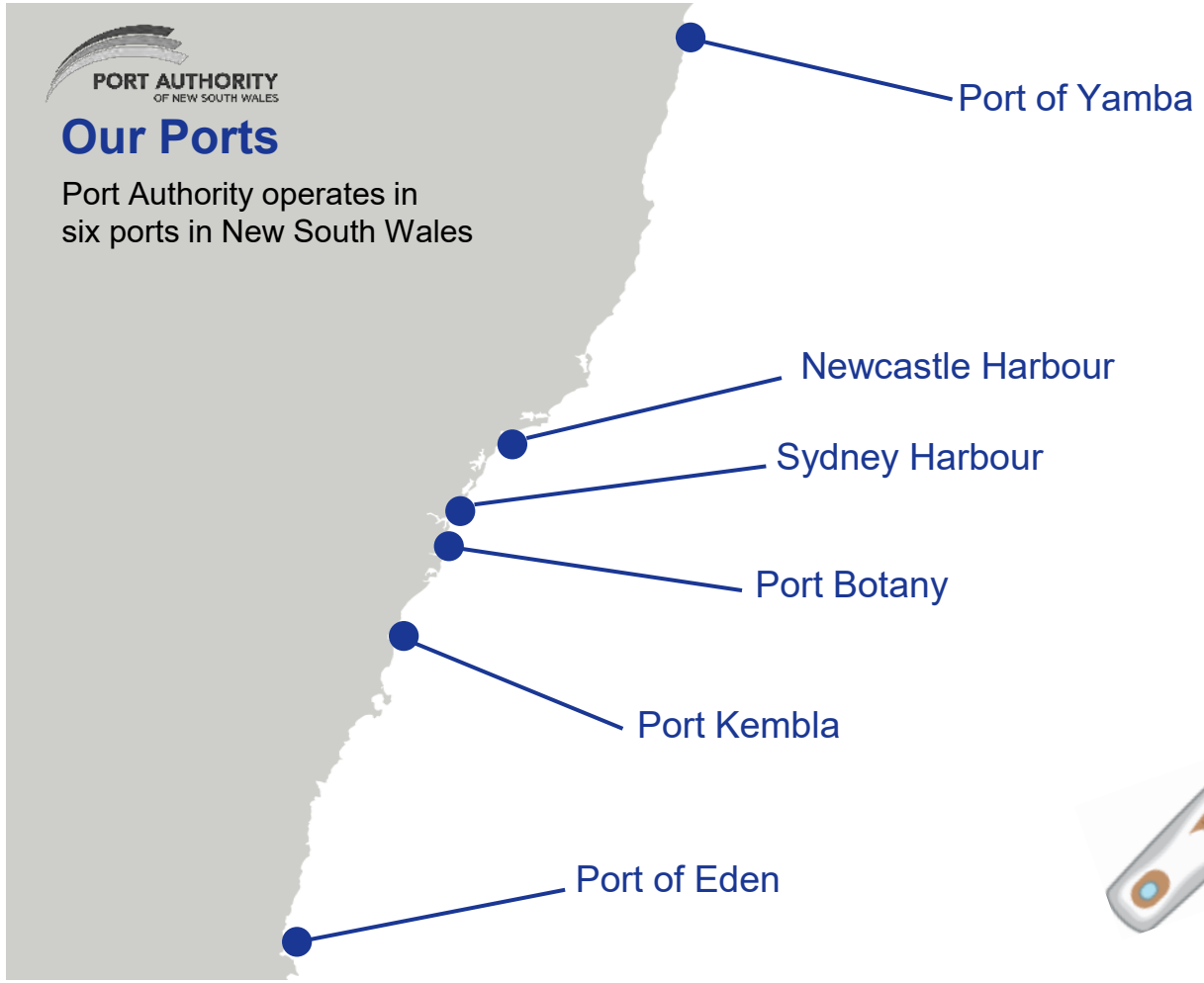
WORKING GROUP PROGRESS UPDATE AND FINDINGS

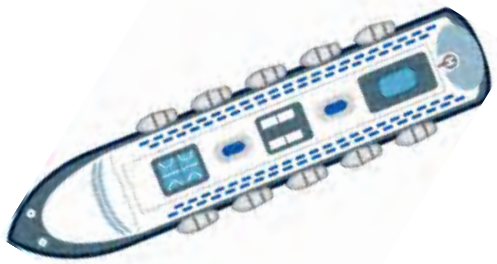
INTRODUCTION: PORT AUTHORITY OF NEW SOUTH WALES

PORT AUTHORITY OF NEW SOUTH WALES

Our Ports

Port Authority operates in six ports in New South Wales





- Cruise terminals
- Harbour master directions
- Marine pilotage
- Cruise development
- Safe navigation
- Port management
- Hydrographic survey
- Port security
- Vessel traffic services
- Dangerous goods
- Emergency response
- Marine assets

PIANC MARCOM WG248 – GUIDELINES FOR ONSHORE POWER SUPPLY FOR SHIPS

WORKING GROUP PROGRESS UPDATE AND FINDINGS

INTRODUCTION: PORT AUTHORITY OF NEW SOUTH WALES

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Chair of PIANC MarCom WG248 – Guidelines for Onshore Power Supply System (OPS) for Ships
Chair of Standards Australia EL-071 – Electrical Installations for ships and mobile and fixed offshore units
Australian Representative for IEC TC18, IEC/ISO/IEEE JWG28 – Utility Connections in Port

Sam Mazaheri

Principal Engineer - Dalrymple Bay Coal Terminal

Fuel Transition: Impact for Port & Maritime Infrastructure

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Fuel Transition: Impacts for Port and Maritime Infrastructure

Dr Sam Mazaheri
Principal Engineer, Beta International Associates Pty Ltd
PIANC Australia–New Zealand

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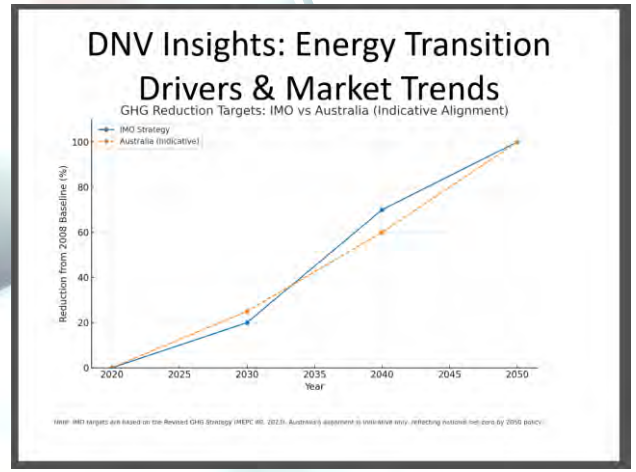
Engineering for Tomorrow



1. Fuel Transition Landscape and Strategic Drivers

- Anticipated timelines for transition to low- and zero-emission fuels:
  - Electrification and Green fuels (e.g. ammonia, methanol, hydrogen, e-LNG) are long-term megatrends.
  - DNV confirms that despite short-term volatility, these are essential to global decarbonisation.
- Overview of emerging marine fuels and bunkering options:
  - LNG (transitional), Methanol, Ammonia, Hydrogen, Biofuels, Electric/Hybrid systems
- Safety and regulatory considerations:
  - – IGF Code, class rules
- Ports must anticipate this trajectory by aligning infrastructure planning accordingly

"Hydrogen and CCS face uncertainty due to unclear or inadequate policies. Countries need to commit to practical roadmaps… Without such interventions, these crucial technologies risk remaining too costly and slow-moving."

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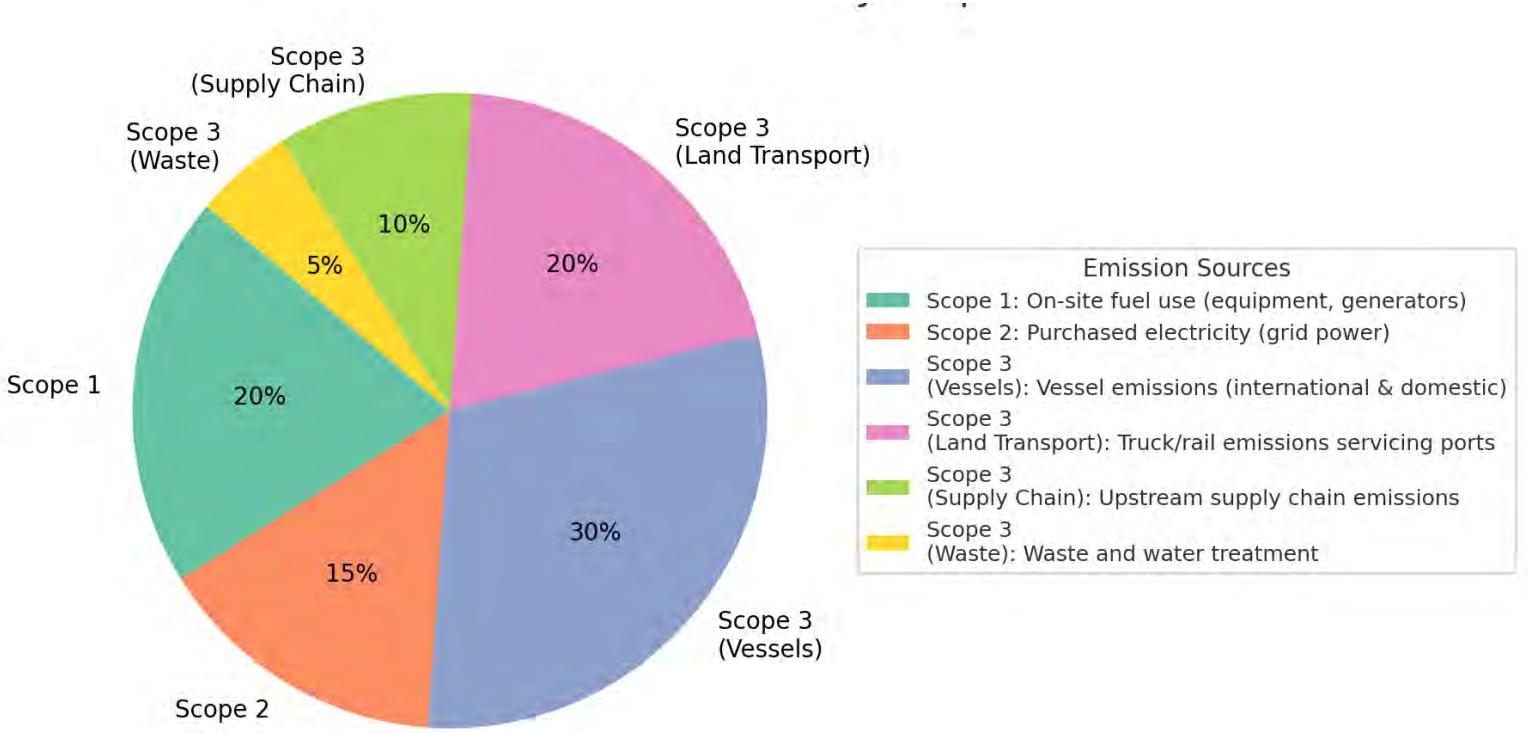
2. Illustrative Breakdown of Port-Related Emissions by Scope



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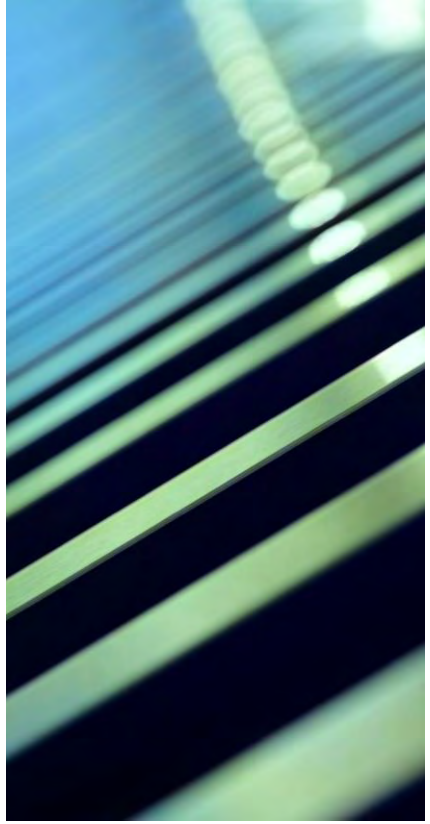
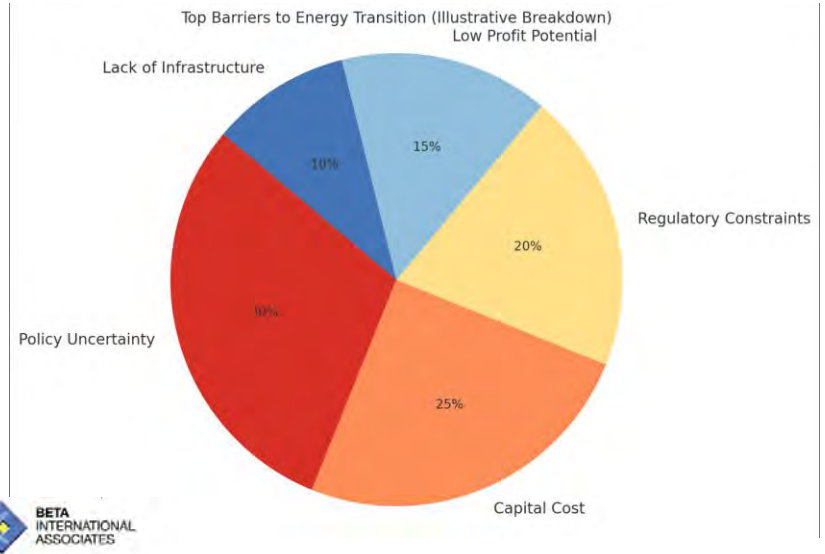
3. Infrastructure Implications

- Characteristics, handling, and storage requirements
- Retrofitting vs new build: Impacts on terminal design and operational footprints
- Fuel-specific infrastructure needs:
  - Storage tanks, pipelines, safety zones, hazard mitigation
  - Dedicated bunkering facilities (onshore/offshore)
- Compatibility with existing port operations and vessel types
- Interfaces with other assets (e.g., power supply, water for electrolysis, cooling systems)



4. Planning and Engineering Considerations



- Risk and hazard assessments (e.g., QRA, HAZID/HAZOP for new fuels)
- Layout planning and separation distances
- Digital tools for simulation, optimisation, and phasing of infrastructure upgrades

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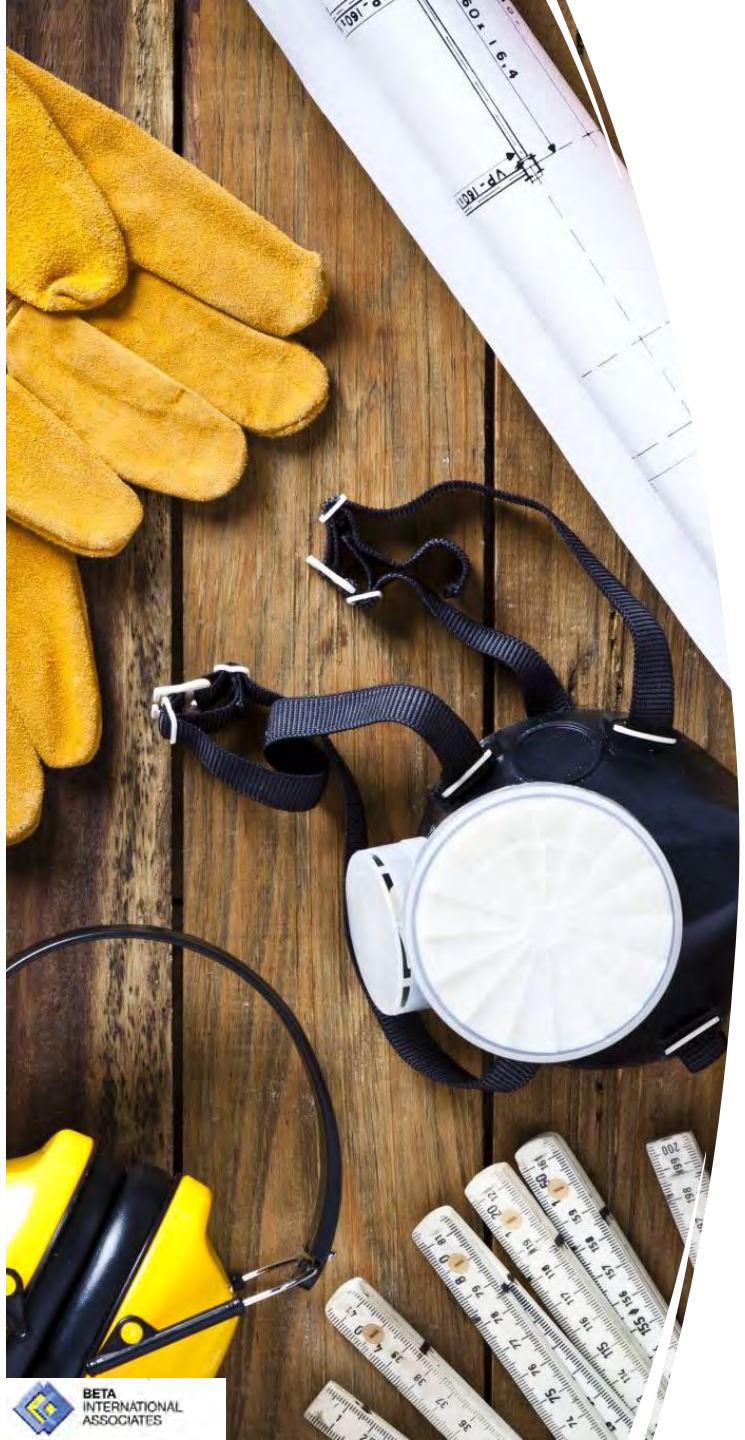
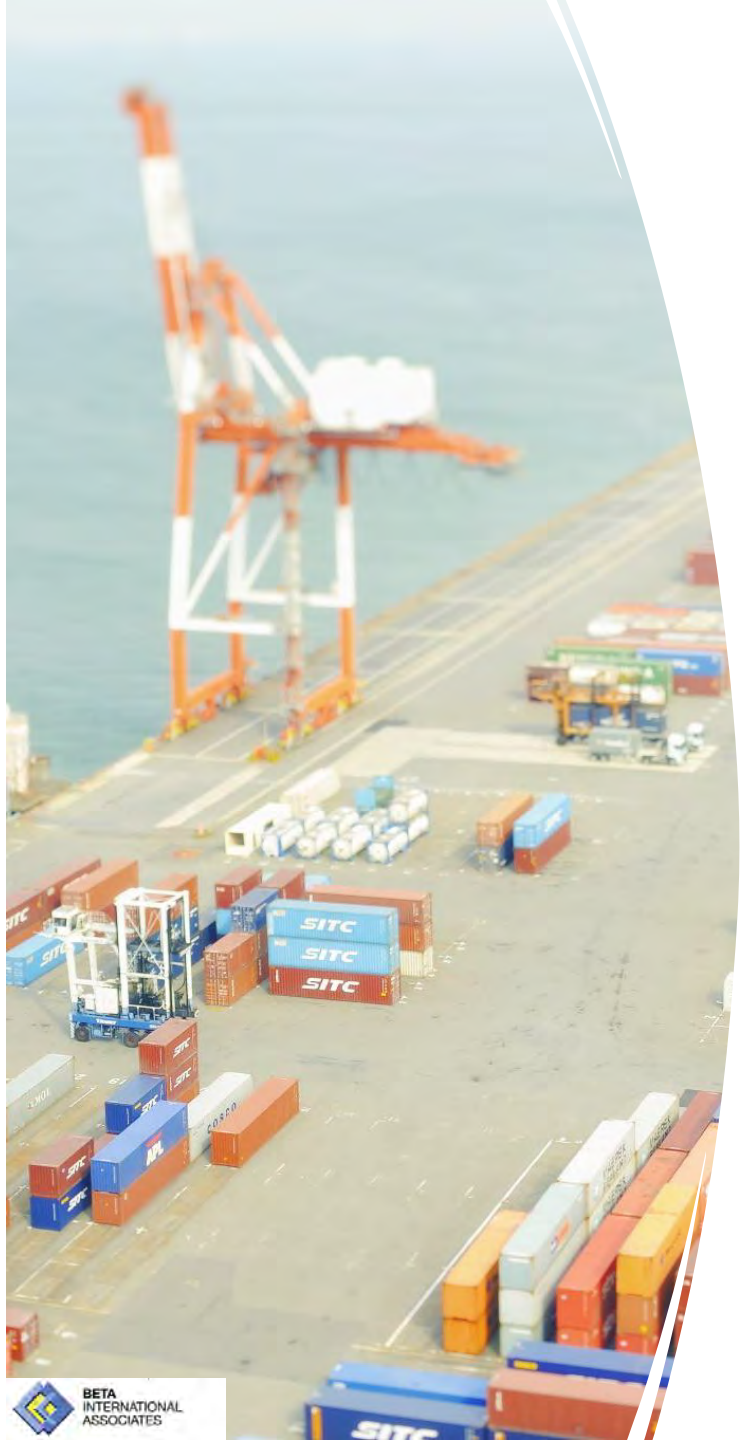


5. Operational and Maintenance Challenges

- Safety protocols and emergency response planning
- Workforce upskilling and competency development
- Asset lifecycle considerations and resilience
- Monitoring and maintenance practices tailored to new fuels and systems



6. Case Examples and Emerging Practice

- Early adopter examples (e.g., Port of Rotterdam, Port of Gothenburg, Australian pilot projects)
- Collaboration with fuel suppliers, shipowners, and regulators

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6. Case Examples and Emerging Practice – Cont'd

Port of Rotterdam (Netherlands)
•Developing large-scale **hydrogen import and bunkering terminals**
•Integrated with **pipelines, CCS**, and **industry partners** (Shell, Uniper, BP)
•Acts as a **fuel and logistics hub** for broader decarbonisation

Port of Gothenburg (Sweden)
•Operational **methanol bunkering** with Stena Line
•Developing **ammonia readiness**
•Participates in **Green Shipping Corridor** initiatives
•Early adopter of **shore power and electrified port operations**

Australian Pilot Projects
•**Pilbara**: multi-user green hydrogen export hub
•**Newcastle**: clean fuel feasibility studies
•**Brisbane**: ammonia and hydrogen readiness planning
•**Gladstone**: hydrogen trials and shore power exploration

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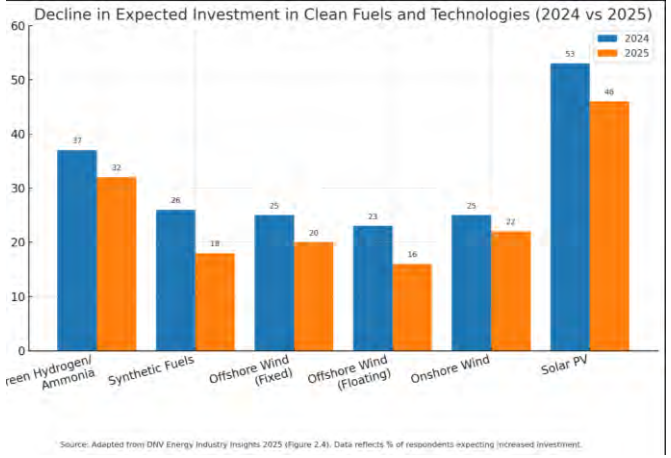
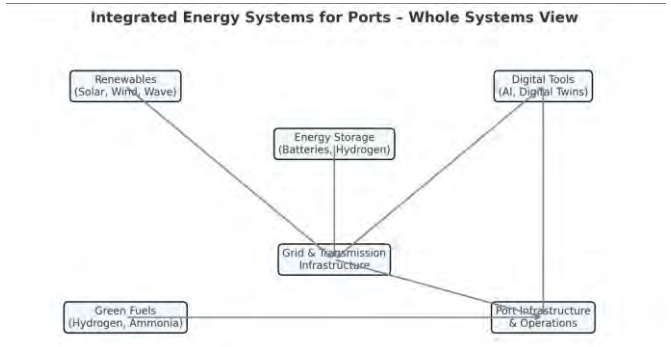
Case Examples (Cont'd): Port of Newcastle Green Hydrogen Hub

- Strategic location: access to grid, land, port facilities, and demand centres
- Pilot-scale viable: 44 MW electrolyser, ~20 ktpa green ammonia at KIWEF site
- Emissions impact: 52,000 tCO_2e/year abatement (pilot), >1.7 $MtCO_2e$/year (full scale)
- Costs:
  - CAPEX: AUD 287M (pilot), AUD 2.7B (full scale)
  - OPEX: AUD 15.8M/year (pilot)
  - LCOH: AUD 10.6/kg (pilot)
- Economic benefits: AUD 334M GRP uplift (pilot), AUD 4.2B GRP uplift (full scale)
- Jobs: ~195 construction jobs, 38 ongoing operational roles (pilot)
- Challenges: energy price volatility, lack of offtakes, need for concessional finance
- Current status: Stage 2 deferred pending improved project economics





7. Strategic and Systems-Level Impacts

- Systems thinking: Coordinating fuel transition with broader port decarbonisation strategies
- Stakeholder roles: Port authorities, terminal operators, regulators, and government bodies
- Regulatory uncertainties and commercial risks
- Opportunities for innovation, funding, and partnerships

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8. Recommendations and Next Steps

- To start with readiness assessments and phased implementation plans
- To engage early with fuel providers, vessel operators, and local regulators
- To incorporate transition planning into asset management and CAPEX/OPEX forecasting
- To monitor international developments and PIANC WG outputs for guidance
- To ensure equitable and inclusive fuel transition planning, aligned with ESG and just transition principles

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Thanks for your attention

Fuel Transition: Impacts for Port and Maritime Infrastructure

Ashley Kingsborough

Senior Manager Water Futures & Security – SA Water

Sustainability in Infrastructure - Lessons from the Water

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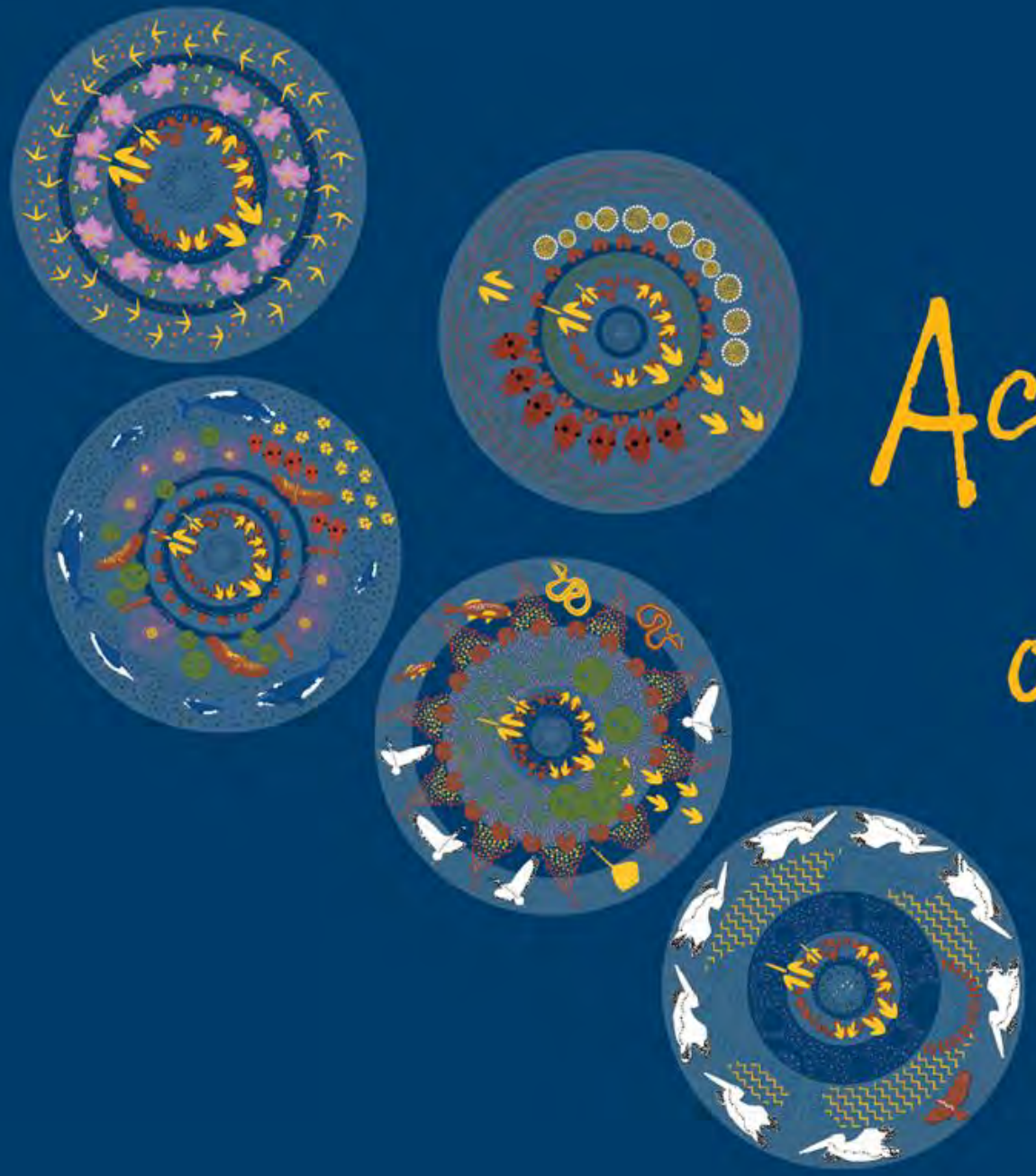
SA Water

Climate adaptation and resilience – Lessons from the water industry

PIANC Pre-conference Workshop - Strategy to Reality: Implementing Decarbonisation and ESG Strategies

18 August 2025

Government of South Australia



Acknowledgement of Country

What and why

Water industry climate hazards

Acute

Storms and storm surges

Intense rainfall and floods

Bushfires

Heat

Chronic

Sea level rise and coastal erosion

Declining rainfall and drought

Impact of hazards

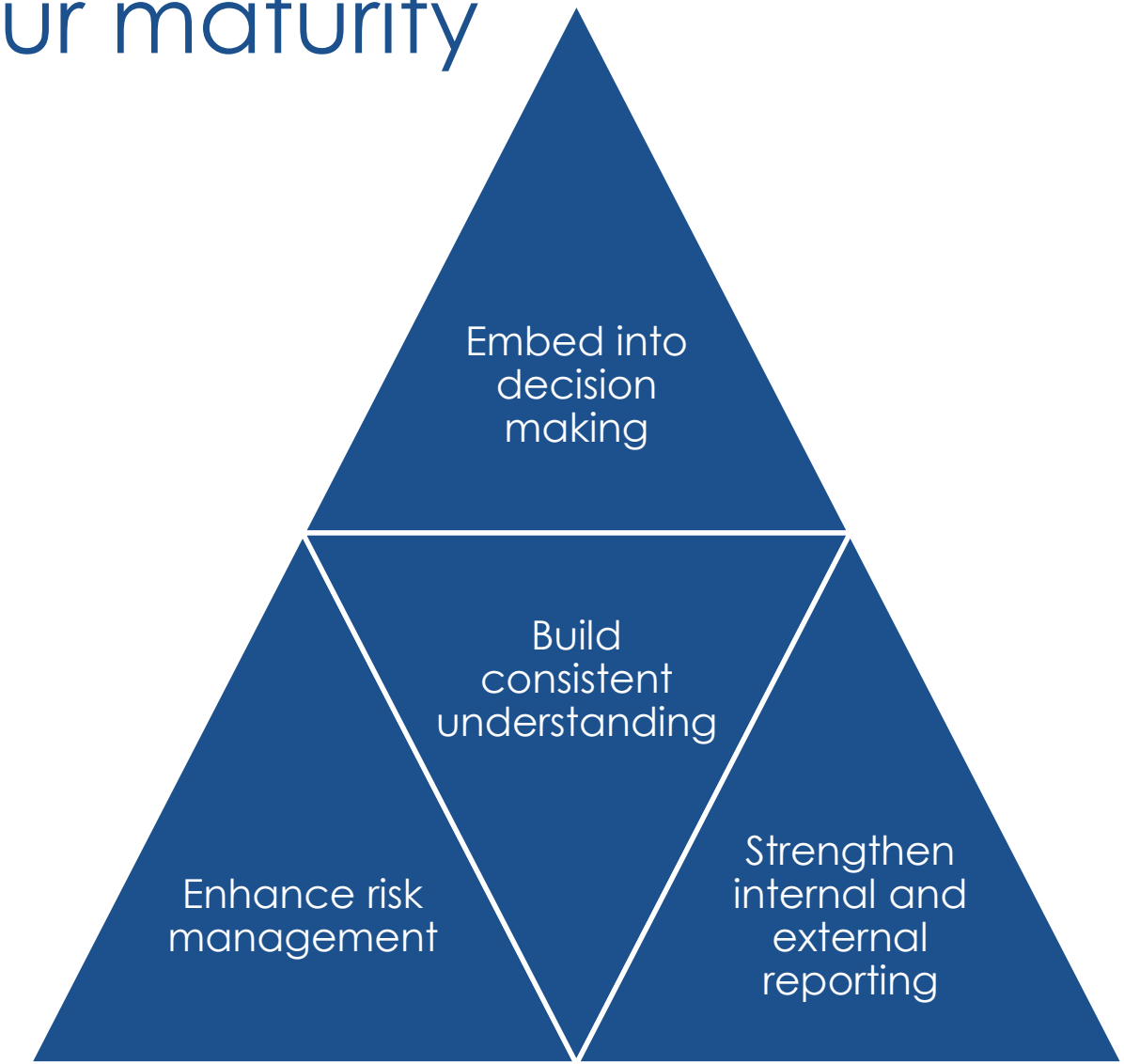
2022-23 River Murray flood

2020 Kangaroo Island bushfires

2024-25 Adelaide's persistent dry conditions

How we're responding

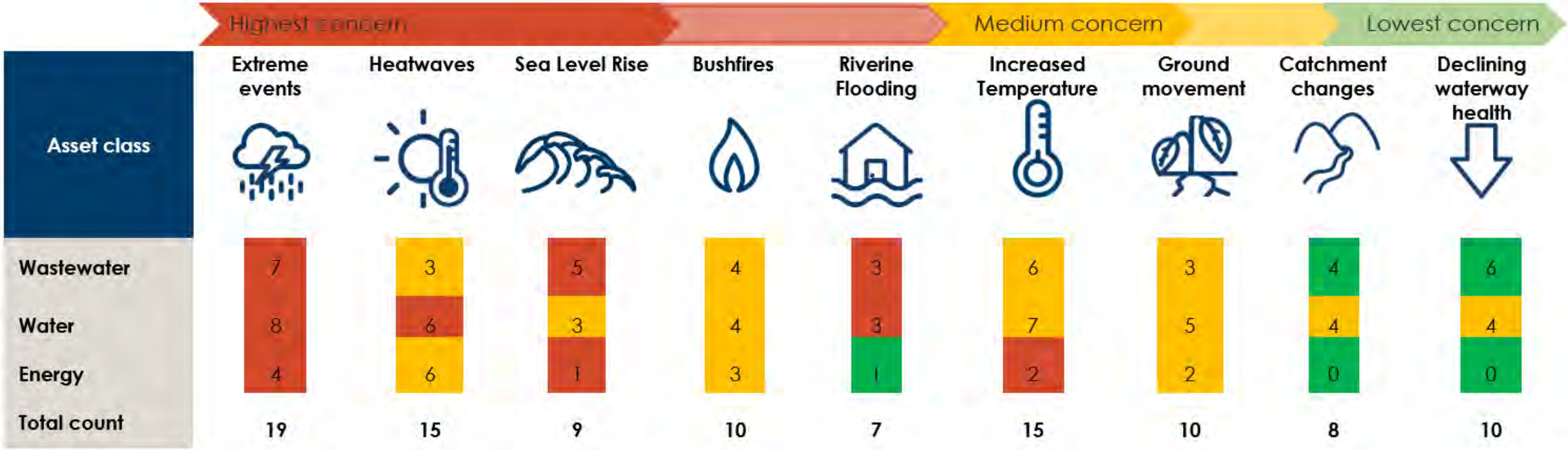
Improving our maturity



Outcome of Physical Risk Assessment

Assets only

Code	Concern to SAW
	Highest
	Medium
	Lowest



Adaptation in action

Construction of a desalination plant at Billy Lights Point on the Eyre Peninsula

Engaging with stakeholders to develop long-term water security strategies

Public messaging for a water saving campaign on the Eyre Peninsula

Developing 3D models of our sites to inform development of an **asset technical standard**

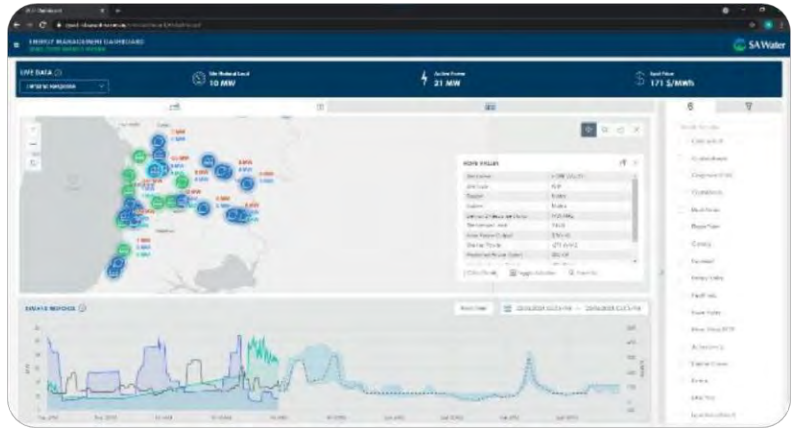
Mitigation in action

Renewable energy investment including biogas, solar generation and battery storage

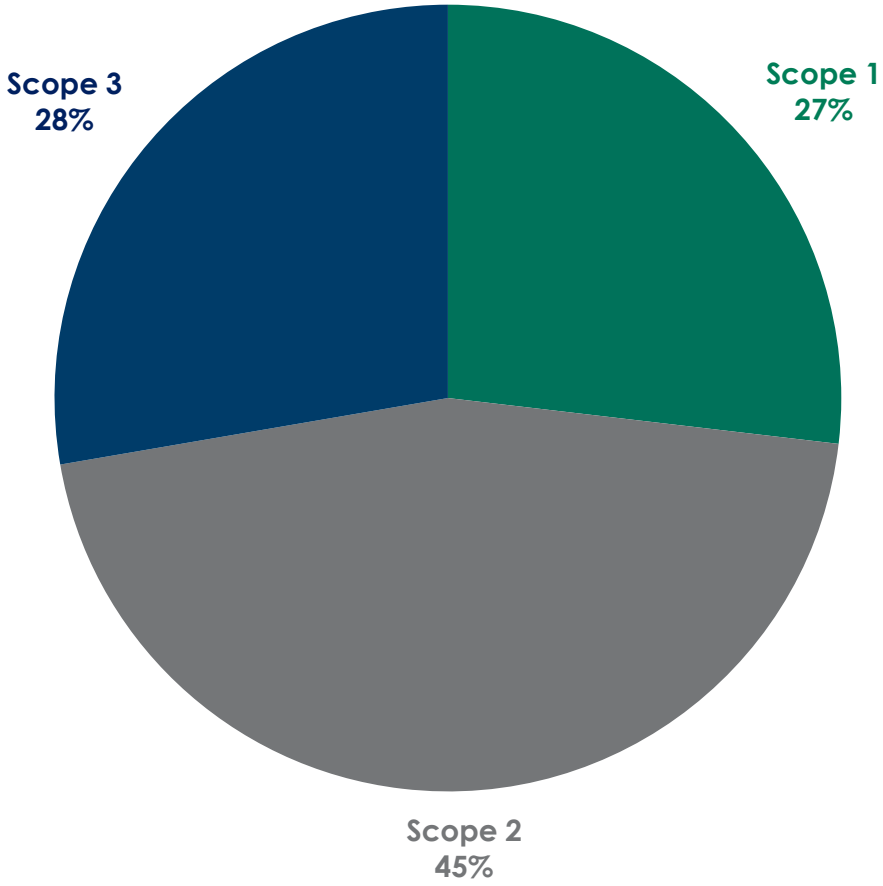
Biodiverse carbon-plantings on our land delivering environmental and community benefits

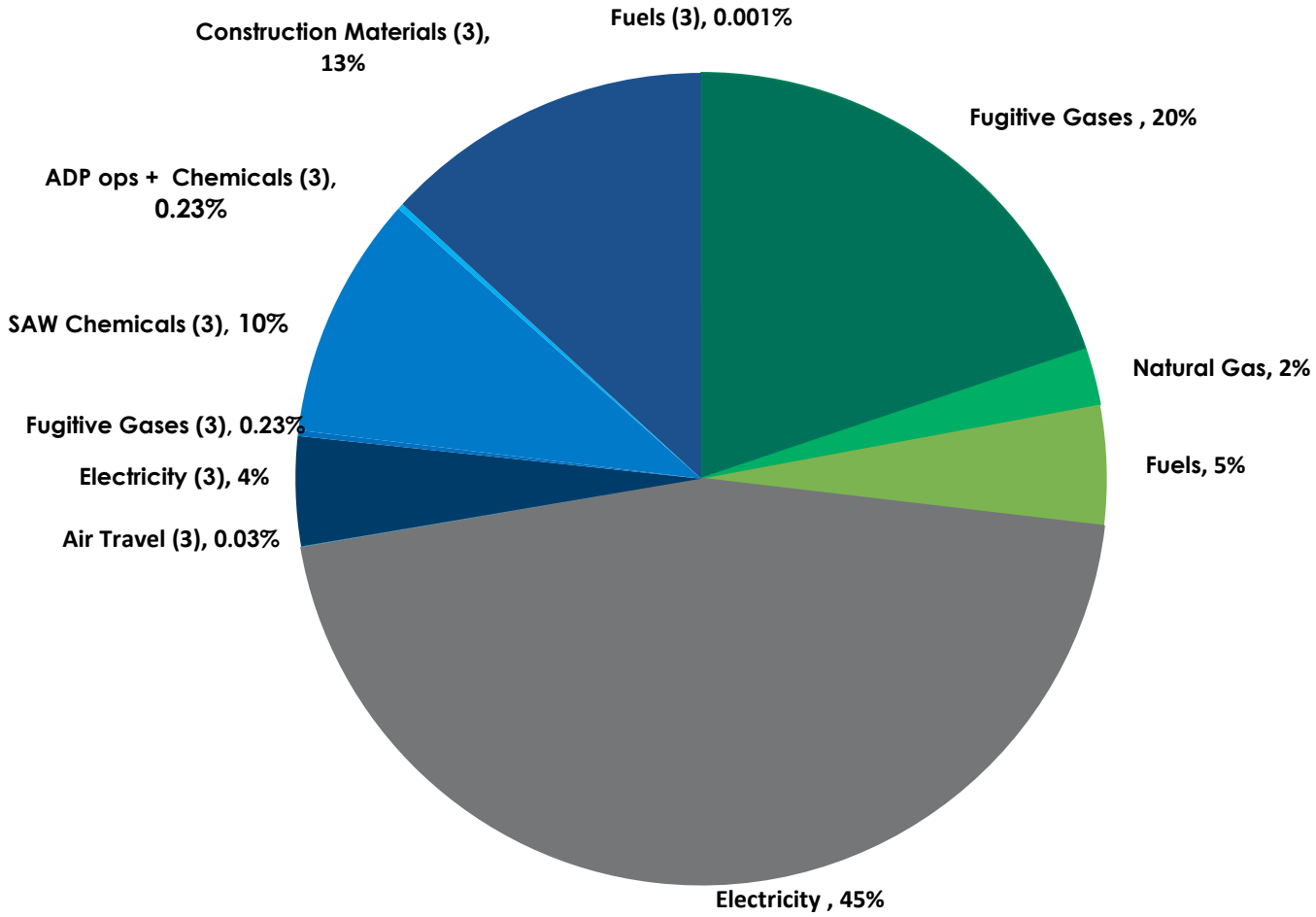
Research **measuring and monitoring fugitive emissions** from our networks and WWTPs

Actively **managing and optimising** our energy use

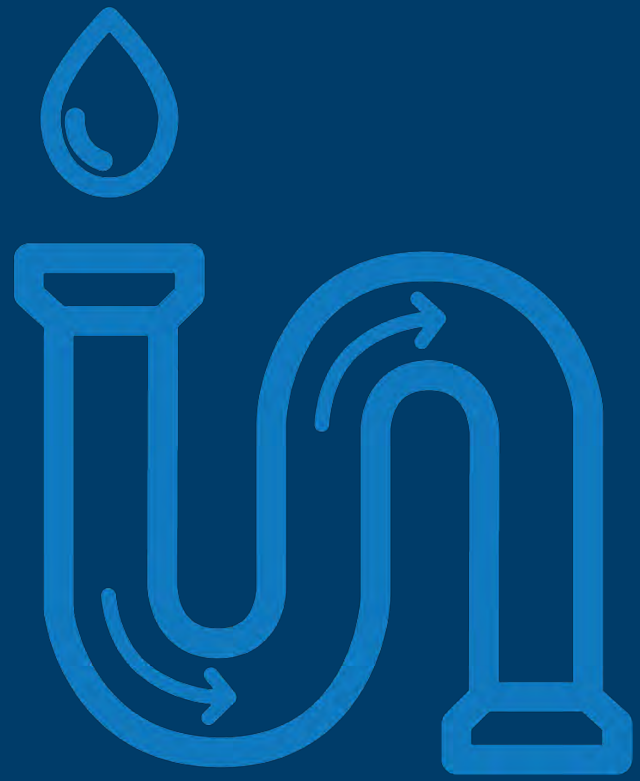


Emissions profile



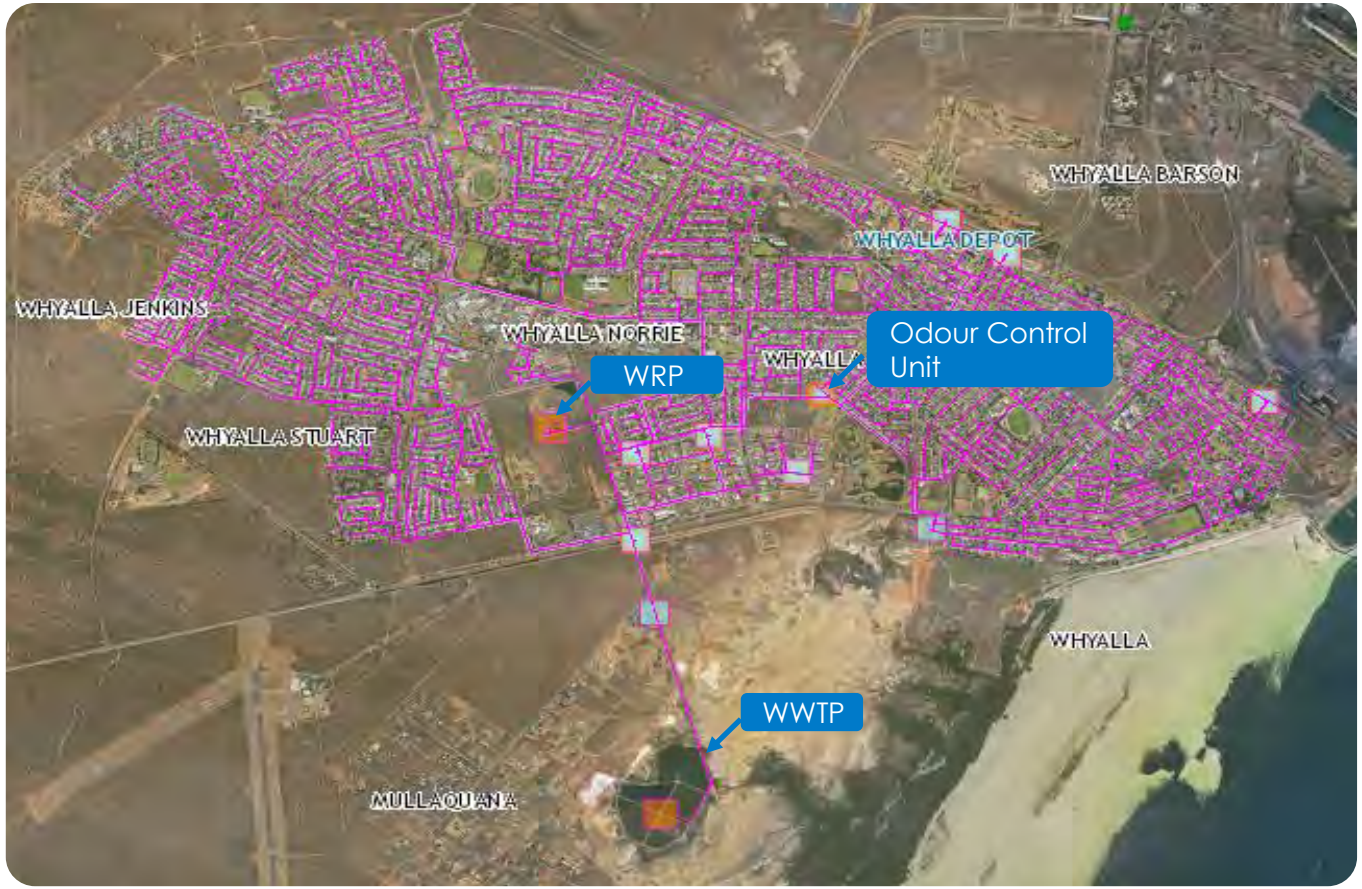


Whyalla Wastewater Treatment Plant



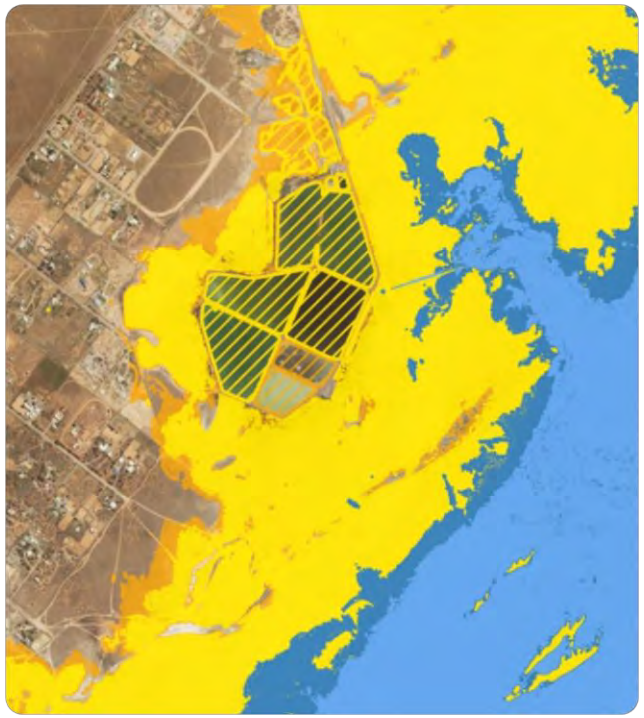
Climate impact on a coastal asset

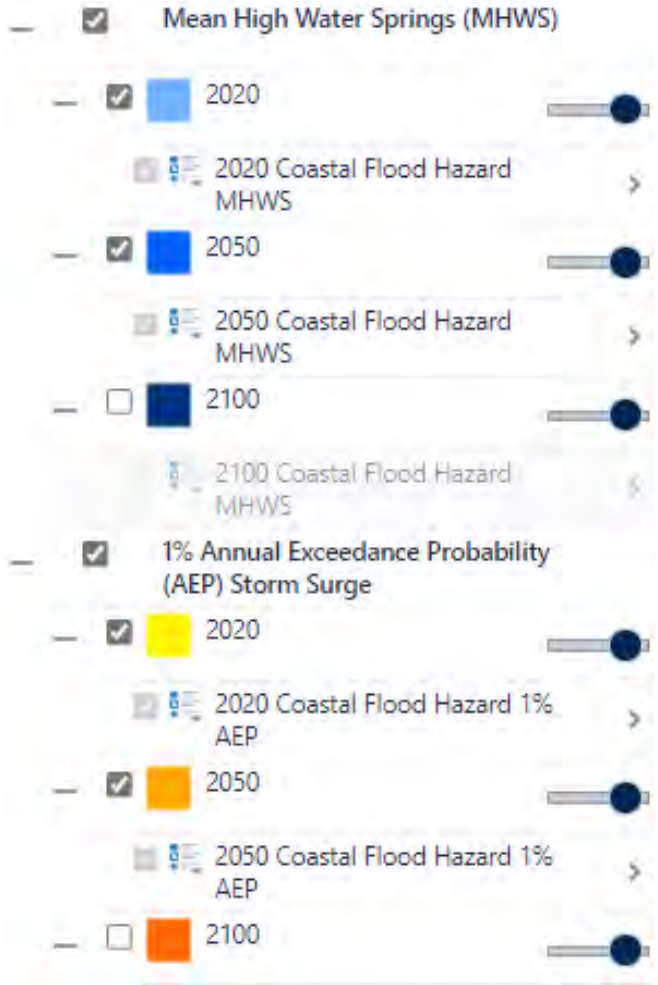
- Lagoon based treatment, constructed in 1966
- EPA requirement to consider climate change
- Risks: sea level rise, storms, extreme heat, increasing ground water level.
- Impacts: compromised wastewater/stormwater management, cooling system failure, power blackouts, increased odour incidents, compliance risks to discharge schedules, reduced air quality in surrounds.



1st Pass Risk Assessment – Storm surge –

Bathtub Modelling





Source: data.environment.sa.gov.au/Coast-and-Marine/Data-Systems/Coastal-Flood-Mapping-Viewer/Pages/default.aspx

Learnings from climate risk assessment

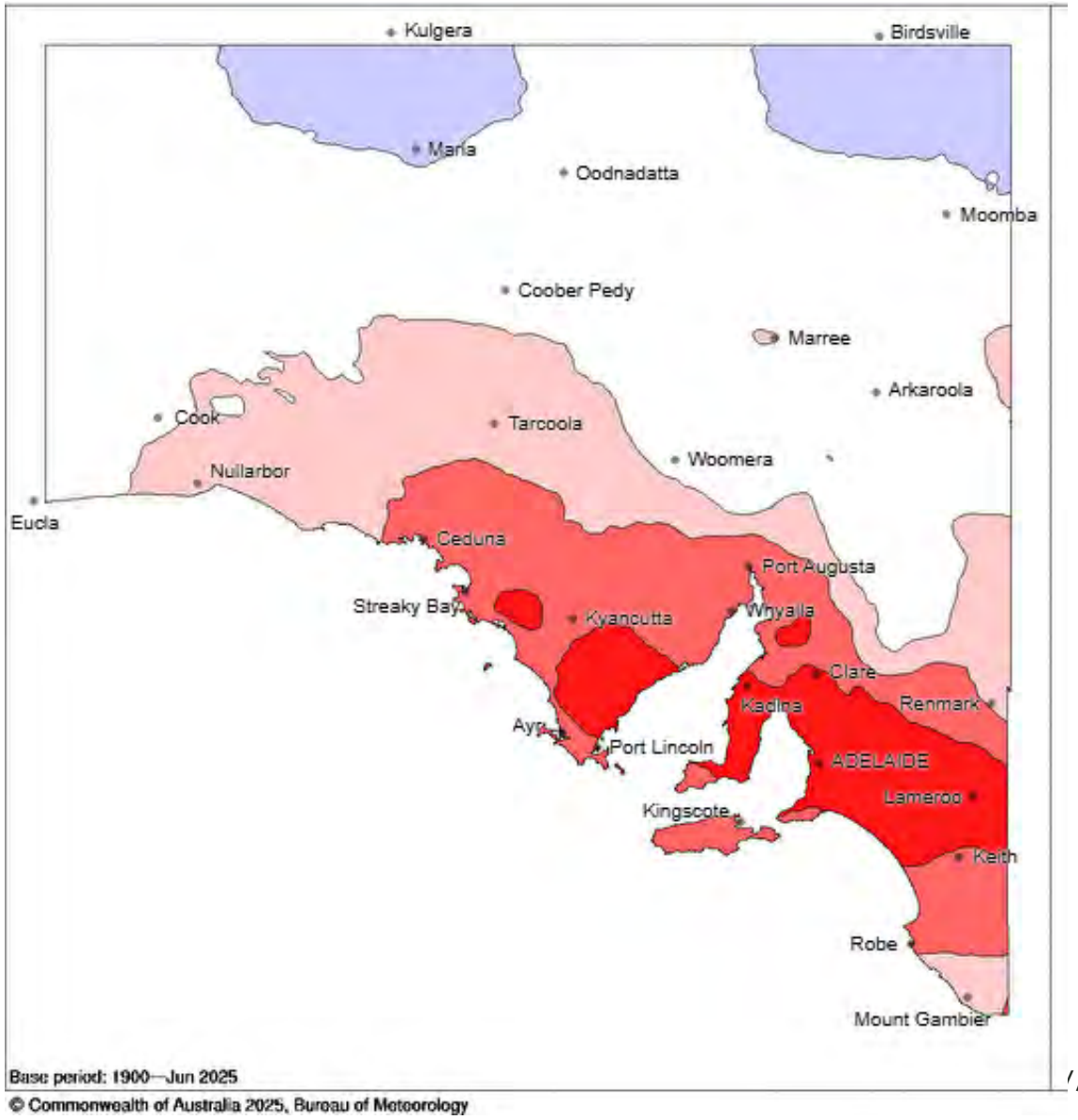
- **Data requires interpretation and interrogation**
  - risk of inundation from storm surge events led to hydrodynamic modelling.
- **Ground truth what the data says**
  - operators on-site experience was not consistent with level of present inundation risk.
- **Collaborate**
  - don't start from scratch, a model was already available.
- **Be adaptive - avoid fixed goals**

Long-term water security

South Australian rainfall deficiencies

Rainfall deficiencies 1 July 2024 – Jul 2025

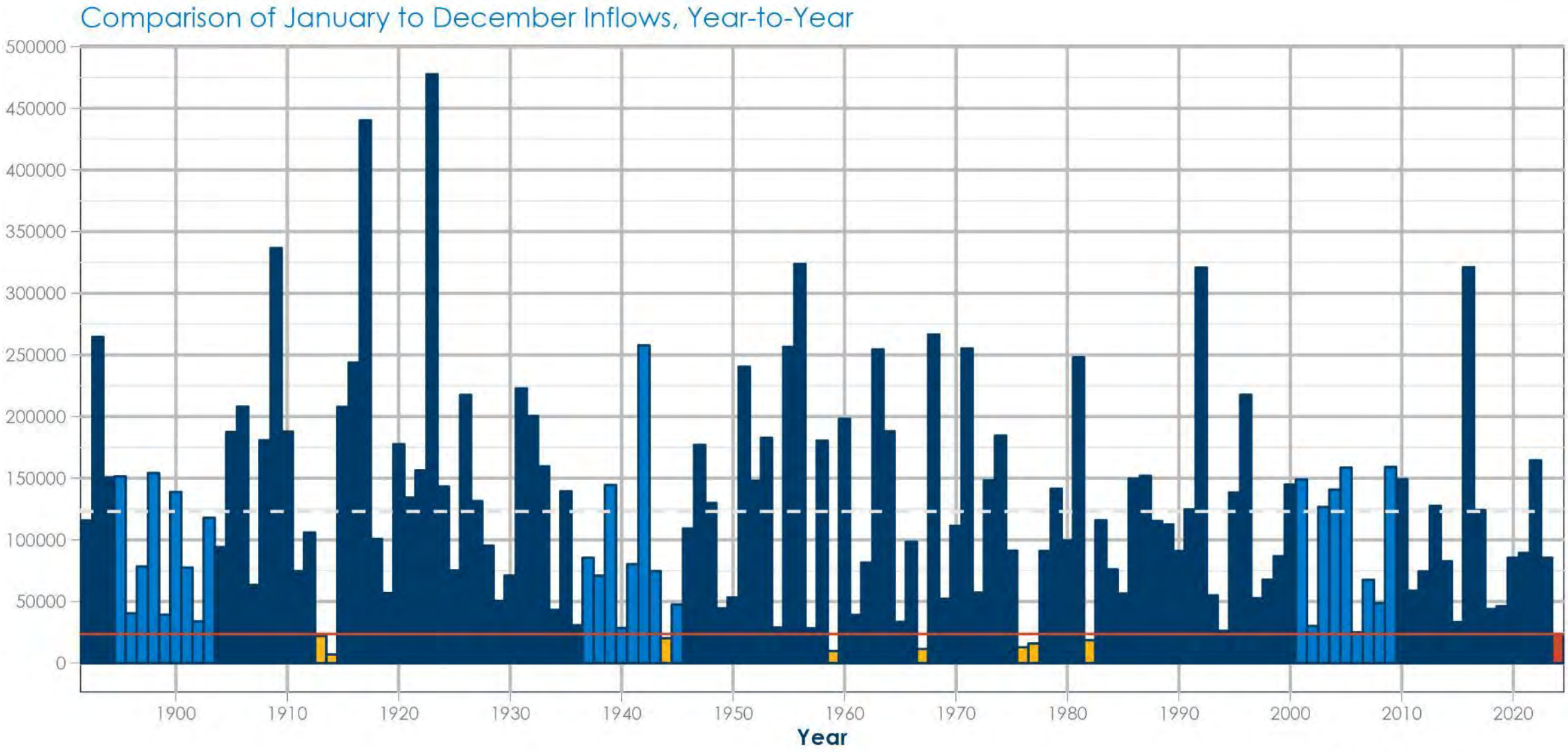
Australian gridded climate data



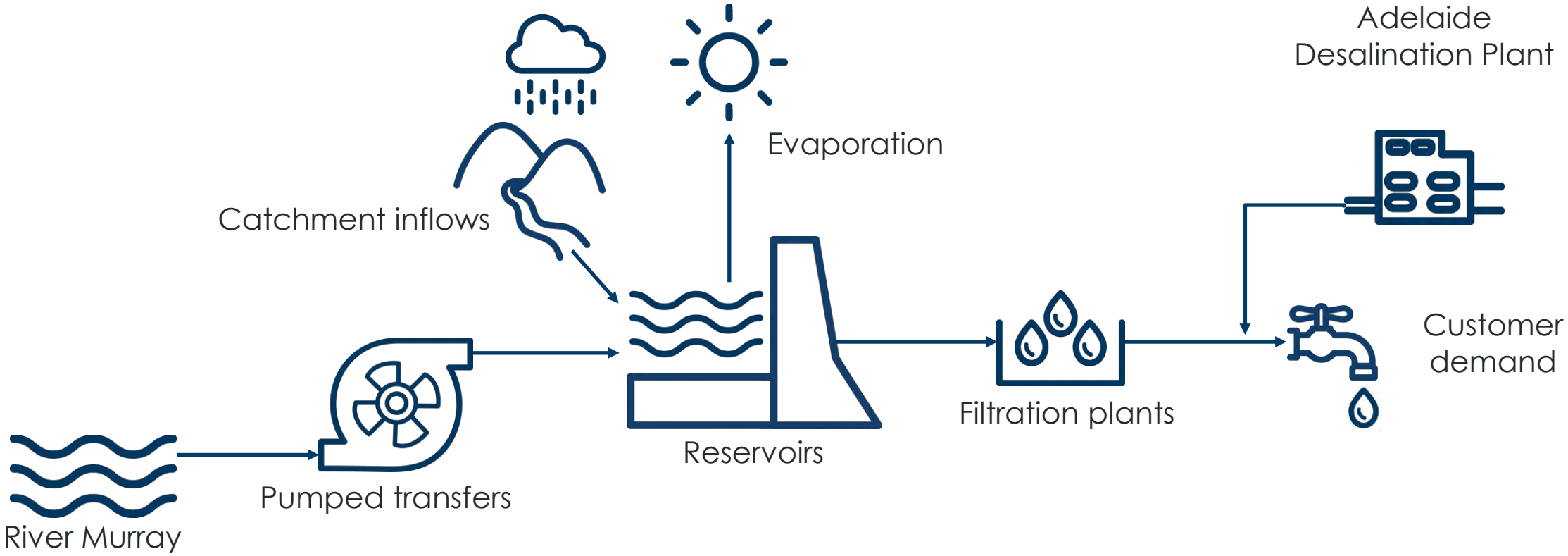
Rainfall percentile ranking

- Serious deficiency
- Severe deficiency
- Lowest on record

Western Mount Lofty Ranges Reservoir inflows



Adelaide's **current** system balance



Facing up to future challenges

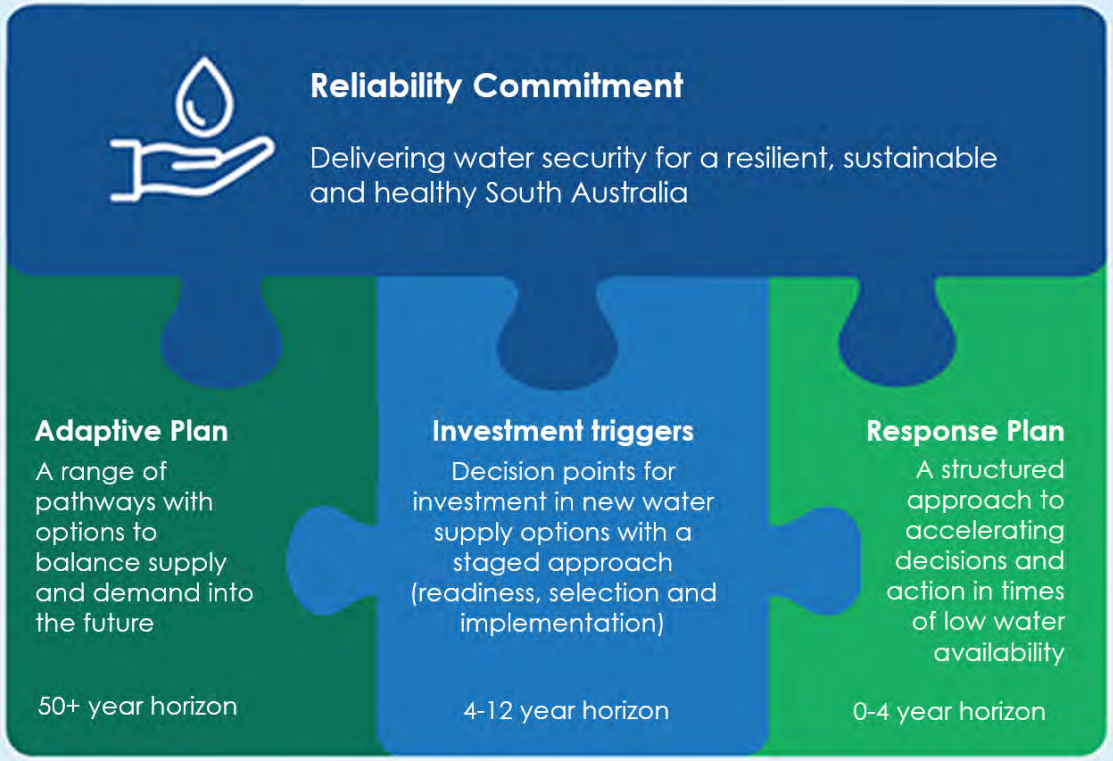
Our changing and uncertain climate

Our growing regions and changing needs

System resilience in the face of extreme events

Balancing affordability with ongoing water security needs

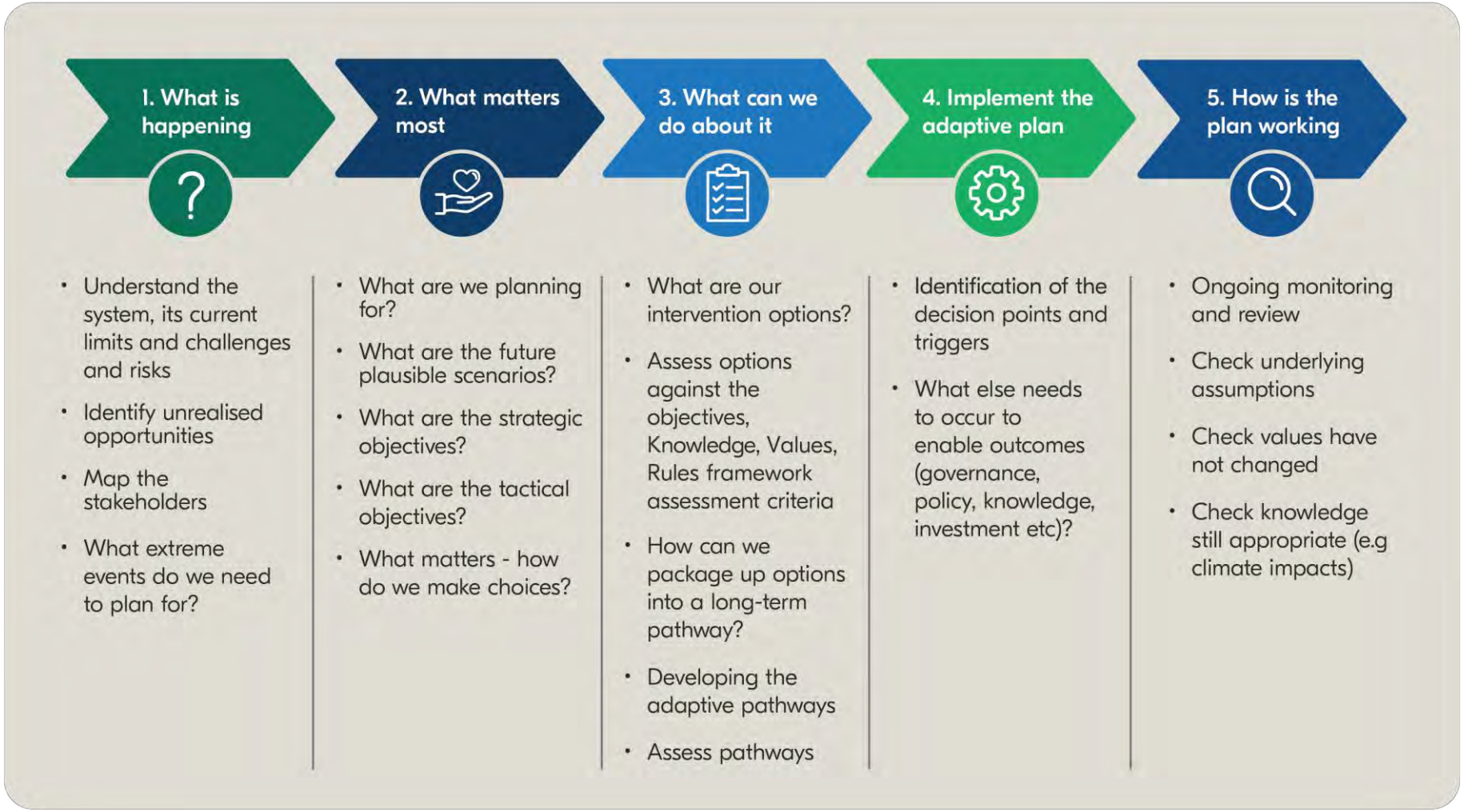
Water Resilience Framework



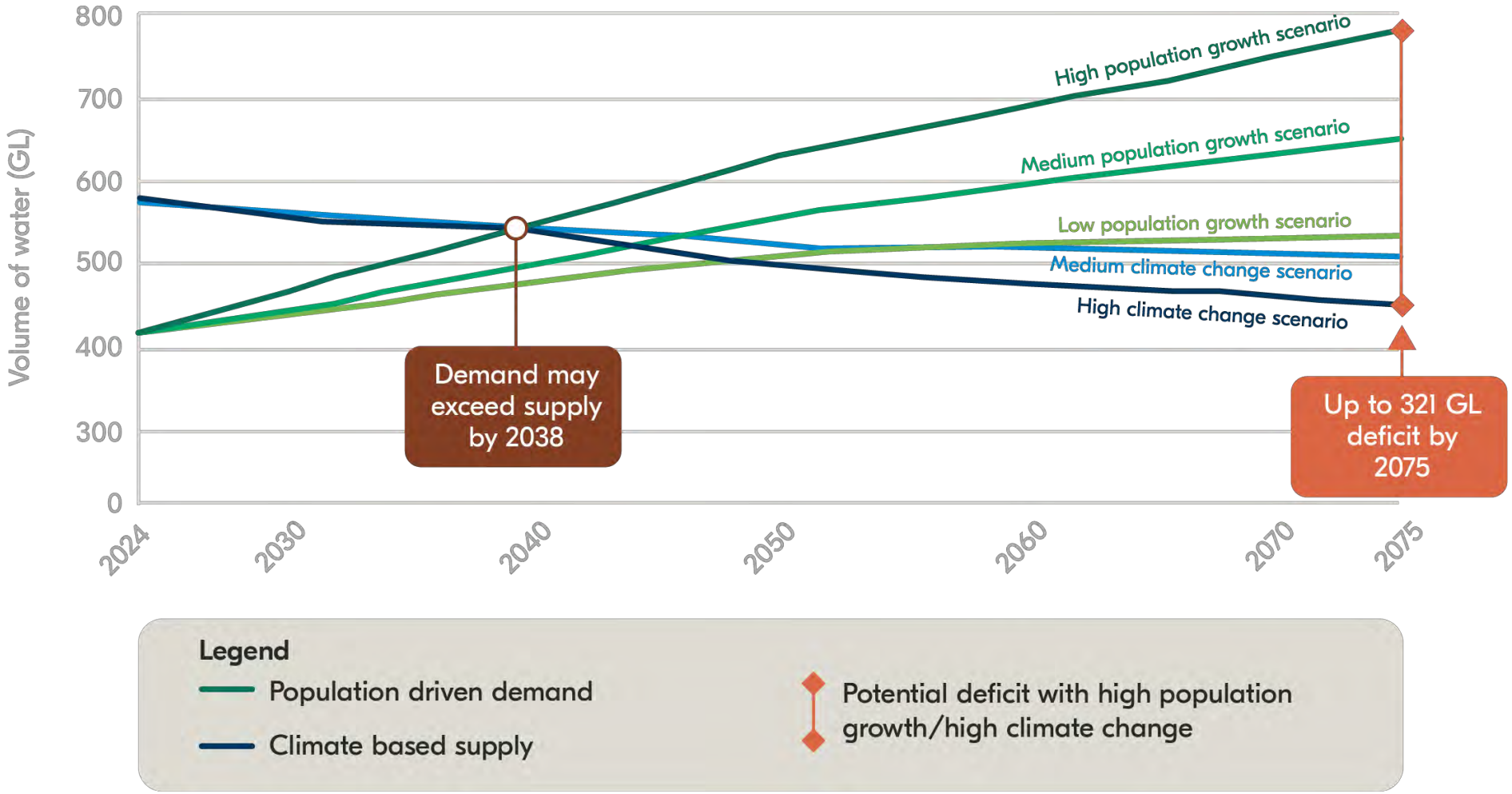
Enabling Governance Environment

Rules, policies and processes that enable and encourage integrated solutions with robust and timely decisions

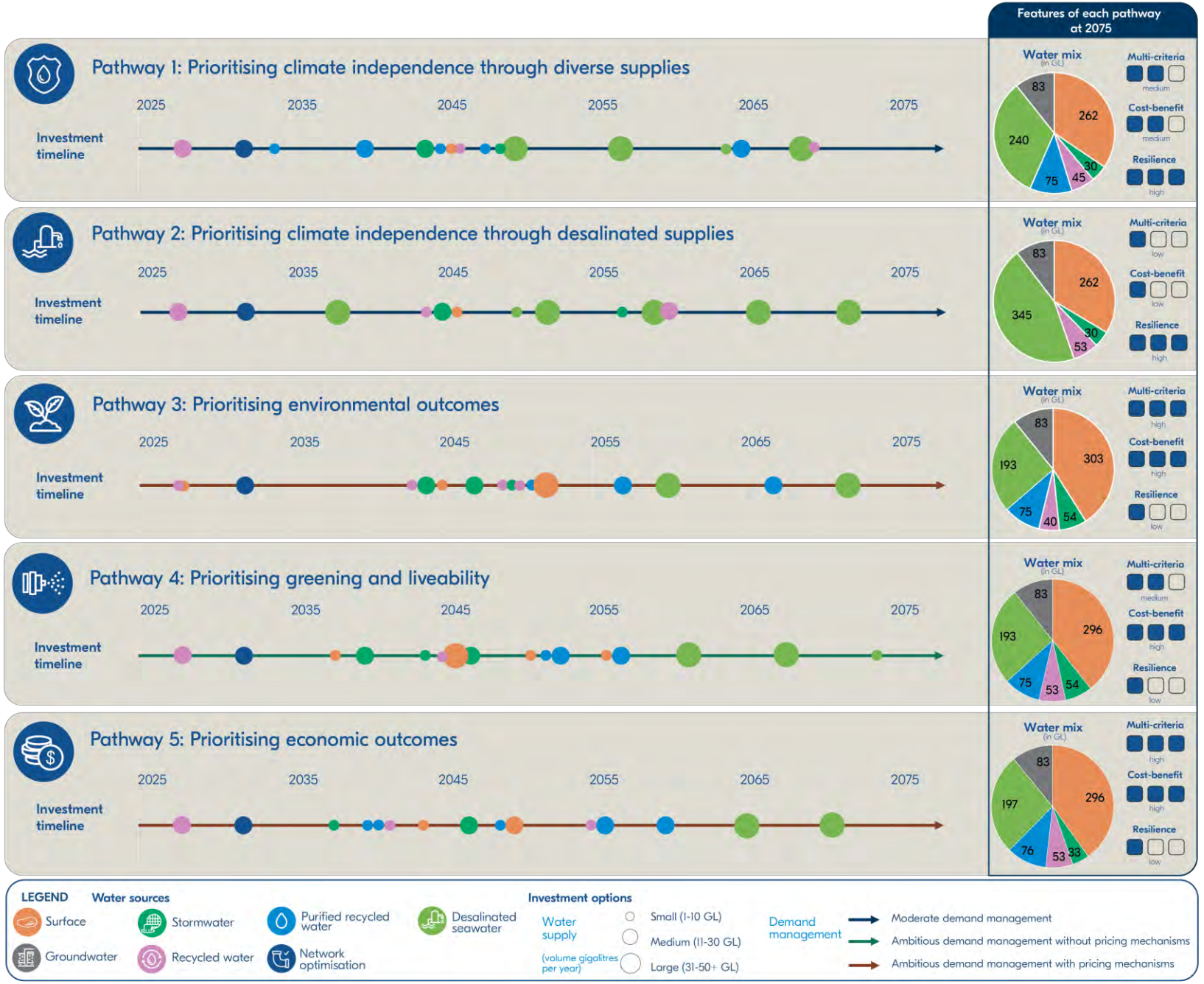
Adaptive planning



Projecting future needs



Adaptive Pathways



Water mix
By 2075 each pie chart is similar for our water supply mix, meaning that we need all options, and prioritisation of what we do first is important.

Multi-criteria Analysis
Some pathways offer greater social, environmental or cultural benefits, as highlighted by a positive multi-criteria analysis scoring.

Cost-benefit Analysis
Some pathways offer a better cost-benefit ratio, meaning that we get improved social and environmental outcomes from some pathways compared to others.

Resilience
Some options provide improved resilience to shocks and drought, whereas other options lack climate independence and are less resilient.

Key takeaways from the Adaptive Plan

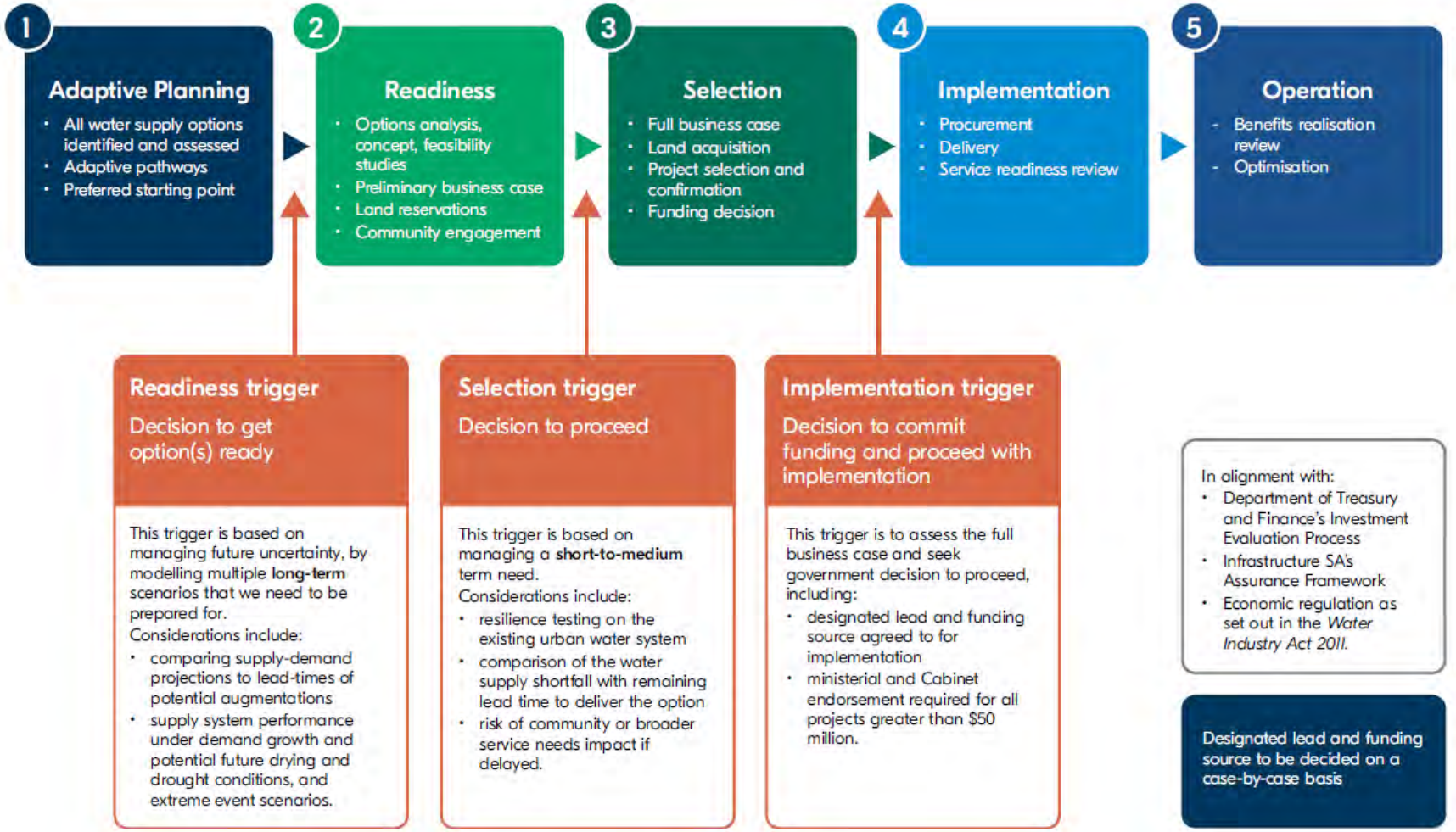
All options on the table
An integrated water management approach.

Climate independent supplies
Building system resilience is critical to managing climate variability.

Readiness is key
We will likely need a lot more water and must be ready.

Investment planning process

For large-scale water supply projects



Response Planning

Target level	Response actions			Target level
Level 1: Be responsible – continue using water efficiently. Normal water availability	**Optimise and prepare**			**Level 1:** Normal operations
	Behavioural: Examples • Water efficiency campaigns • Community education	Operational: • Lowest cost drinking water source prioritisation • Promote fit-for-purpose supplies and innovate technological solutions • Minimise water losses • Regular forecast monitoring • Ongoing water sector collaboration	Investment: • Maintain updated drought readiness plan • Readiness investments for system augmentations	
Level 2: Be proactive – reduce your water usage. Reducing water availability	**Proactive**			**Level 2:** Transitioning back to normal operations
	Behavioural: Examples • ↑ water efficiency campaigns • ↑ community education • ↑ fit-for-purpose supplies & innovate technological solutions	Operational: • ↑ desalinated supply • ↑ forecast monitoring • ↓ water losses further • Water sector working groups	Investment: • Bring forward system augmentations as appropriate	
Level 3: Act now – minimise your water usage. Limited water availability	**Responsive**			**Level 3:** Progressive easing of water shortage measures
	Behavioural: Examples • Mandated water use behaviours and fit-for-purpose water use	Operational: • Maximise desalinated supply • Maximise water loss reduction • Water sector working groups	Investment: • Bring forward system augmentations as appropriate	
Level 4: Critical water use only. Extreme water shortage	**Emergency**			**Level 4:** Extreme water shortage
	Behavioural: Examples • Implement critical water use plans	Operational: • Declare emergency/ drought • Emergency supplies	Investment: • Revise plans	

Transition into water shortage

Transition out of water shortage

making life flow

Government of South Australia

SA Water

Ron Cox

Honorary Associate Professor Civil & Enviro Engineering – UNSW

Climate Change: Impacts, Adaptation & Sustainability for Ports & Maritime Infrastructure

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PIANC workshop Strategy to Reality 18 August 2025 Implementing Decarbonisation and ESG Strategies in Port and Maritime Facilities

Climate Change: Impacts, Adaptation and Sustainability for Ports and Maritime Infrastructure

Presentation – Ron Cox

Honorary Associate Professor UNSW

PIANC Australia & New Zealand Board Member

Member PIANC international EnviCom, PTGCC, CoCom

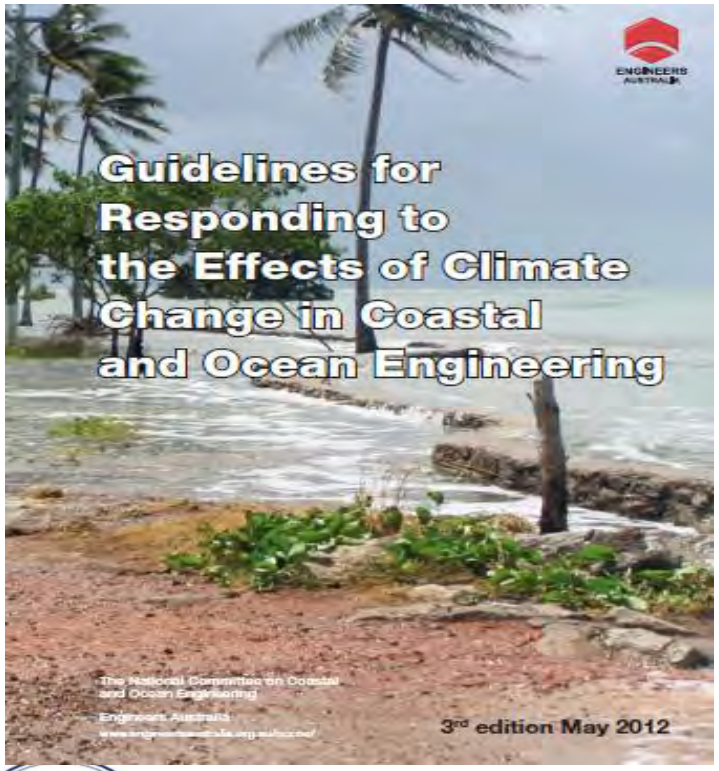
Chair Paper Selection Committee – COPEDEC conferences

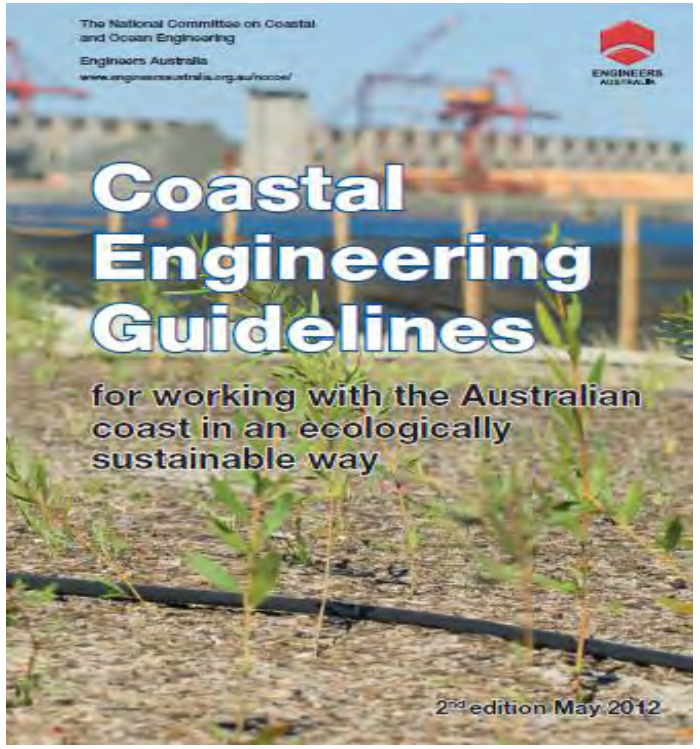
Engineers Australia Climate Change Adaptation Guidelines

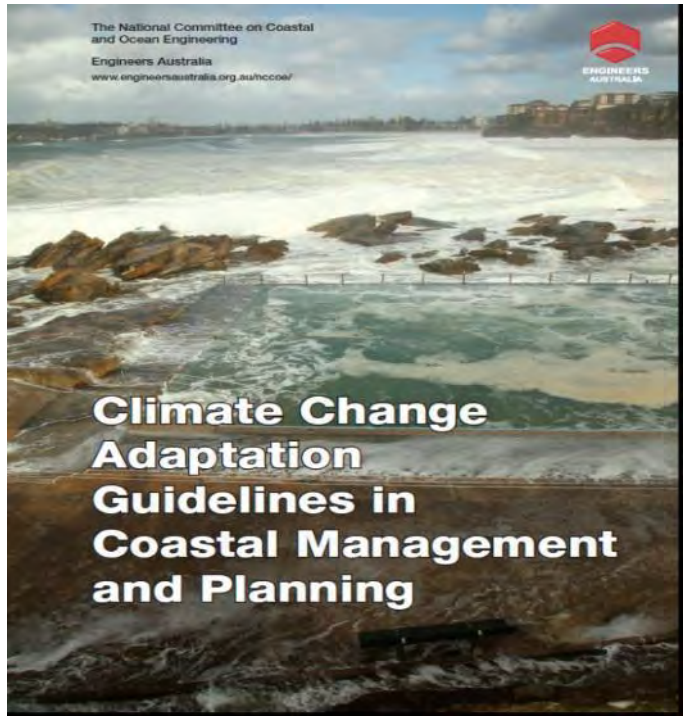
Vol 1 1991 2004 2012 2017

Vol 2 2004 2012 2017

Vol 3 2012







EA CODE OF ETHICS

The Guidelines on Professional Conduct

The Guidelines on Professional Conduct provide a framework for members of Engineers Australia to use when exercising their judgment in the practice of engineering.

EA SUSTAINABILITY POLICY Nov 2014

Engineers Australia, as an organisation, considers that sustainability is a key consideration, informed by societal expectations, technical knowledge and expertise, and is to be applied in all areas of its endeavour and strongly promoted to all of its members.

EA CLIMATE CHANGE POLICY Nov 2014

Engineers Australia policy position is that increasing atmospheric greenhouse gas concentrations, including from the combustion of fossil fuels, are contributing to anthropogenic global warming and adverse changes to Earth's climate systems.

……..

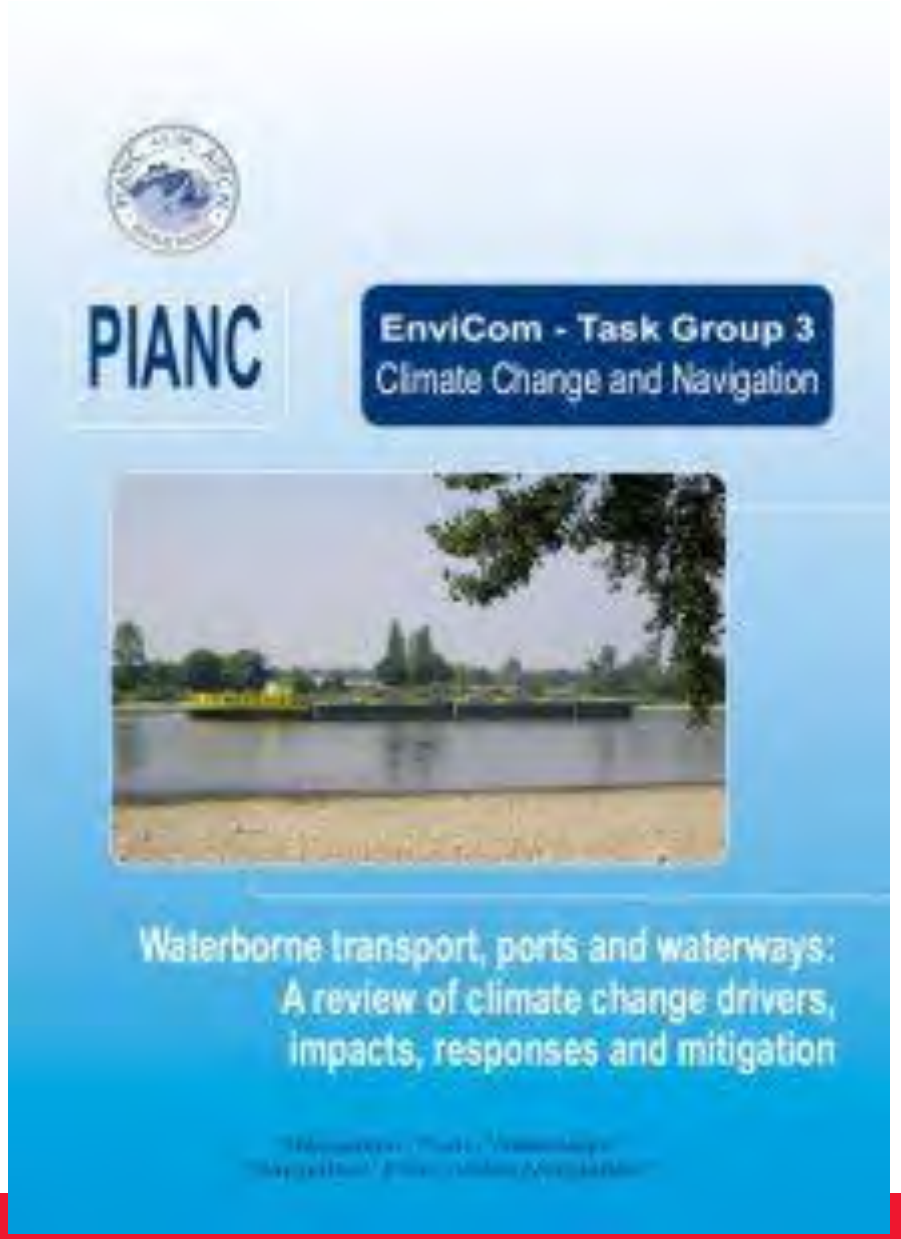
Engineers Australia reinforces that Engineers are critical to the implementation of long-term strategic policies addressing the inextricable link between energy generation and use, resource consumption, and climate impacts

……..

PIANC EnviCom TG 3:

Climate Change and Navigation - Waterborne Transport, Ports and Waterways: A Review of Climate Change Drivers, Impacts, Responses and Mitigation (2008)

Chair –Kathleen White, USACE



Based on IPCC AR4

All climate drivers included

Impacts, mitigation and adaptation

Maritime and inland navigation sectors

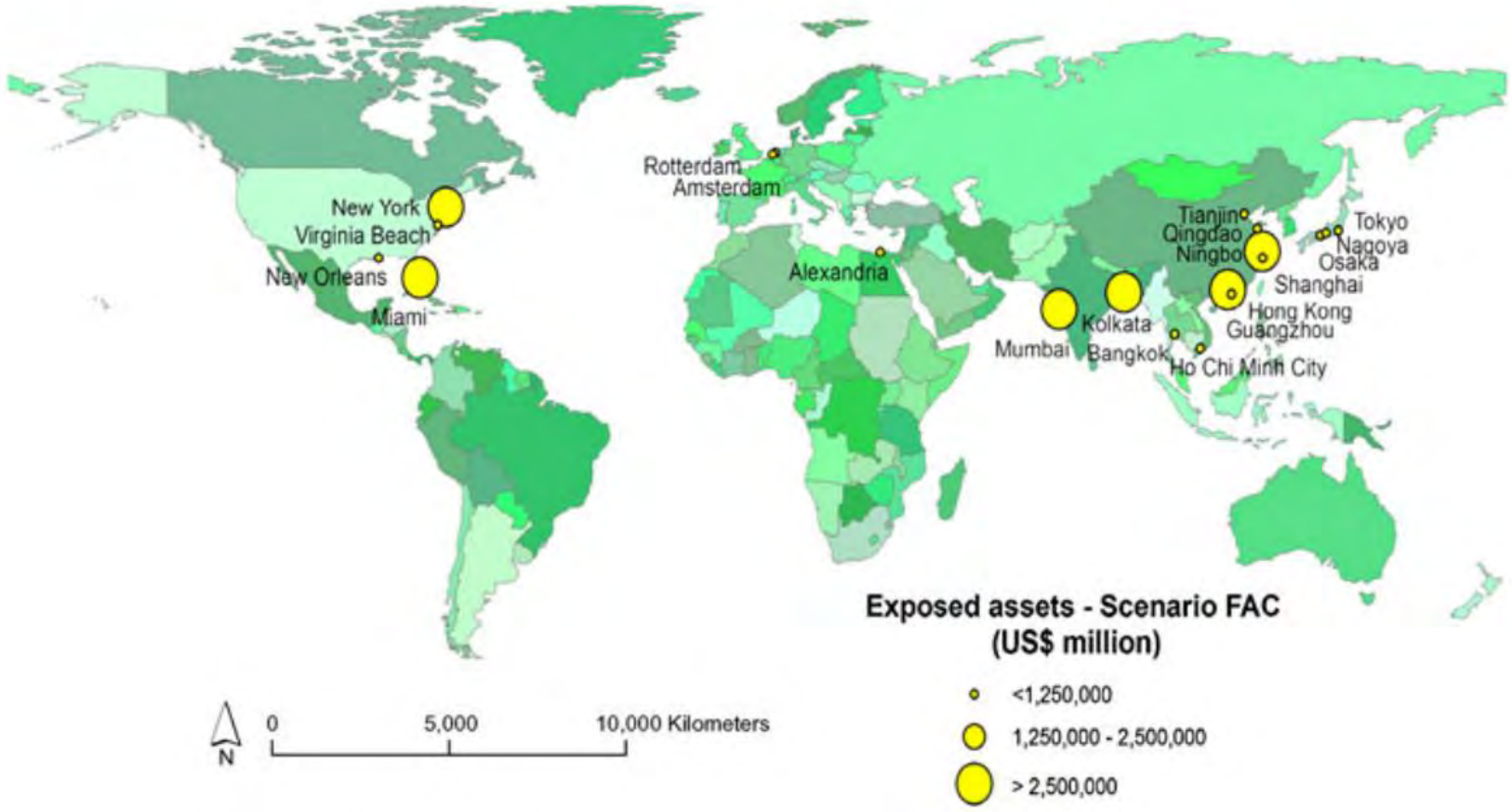
PIANC Declaration on Climate Change released prior to COP25, Madrid, Dec 2019

The climate is changing. The evidence is unequivocal. ……..It is time to reinforce the message and upscale prudent action.

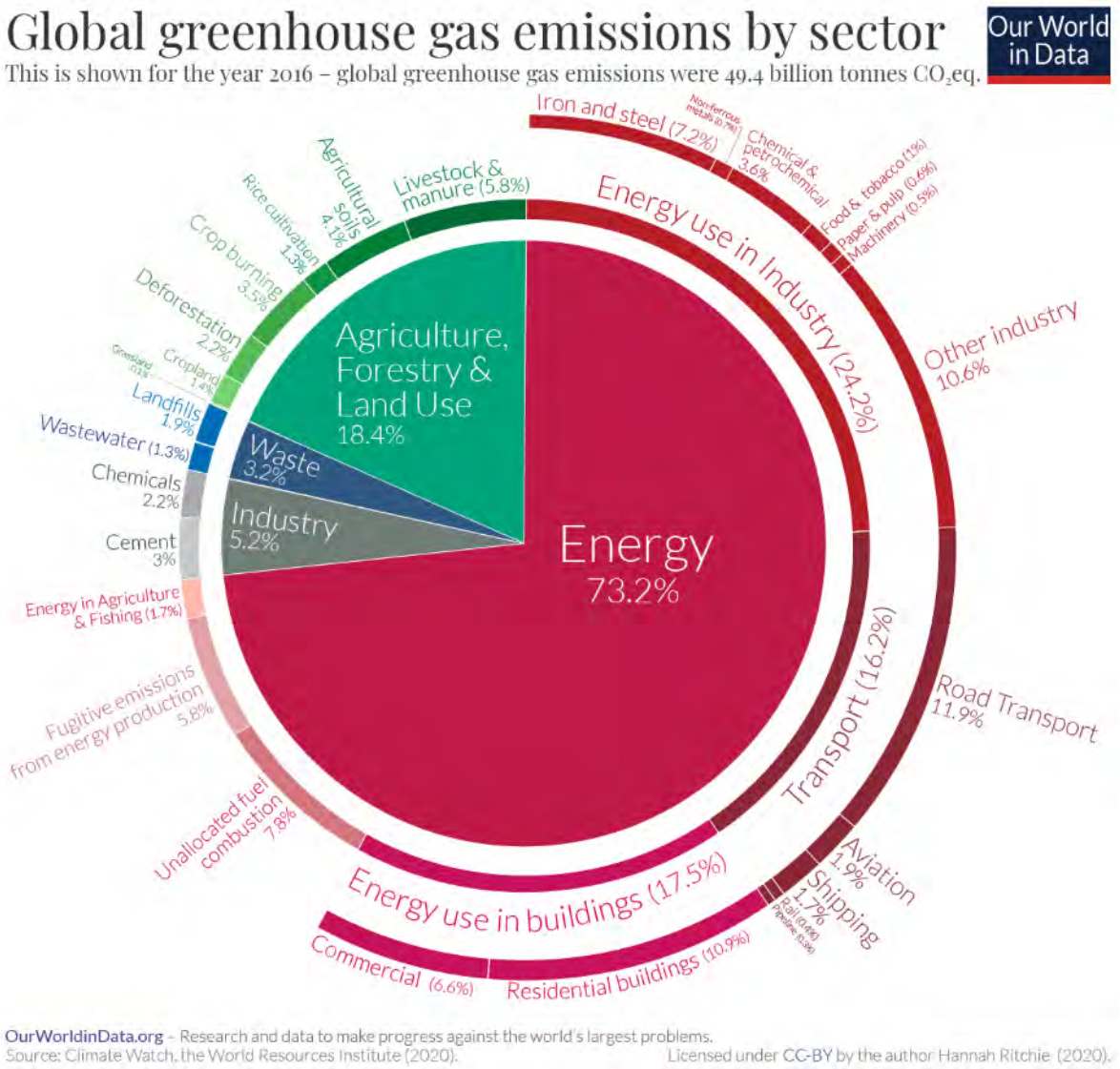
Waterborne transport infrastructure will be adversely affected by climate change. In addition to playing their role in decarbonisation (i.e. moving to 'net zero' greenhouse gas emissions), owners and operators need to take urgent action to strengthen resilience and adapt – both to gradual changes in parameters such as temperature and sea level, and to the expected increase in the frequency and severity of extreme meteorological, hydrological or oceanographic events.

PIANC recognises the importance of the climate change challenge and will actively pursue the sustainable future of the waterborne transport industry by supporting its members in addressing this challenge.

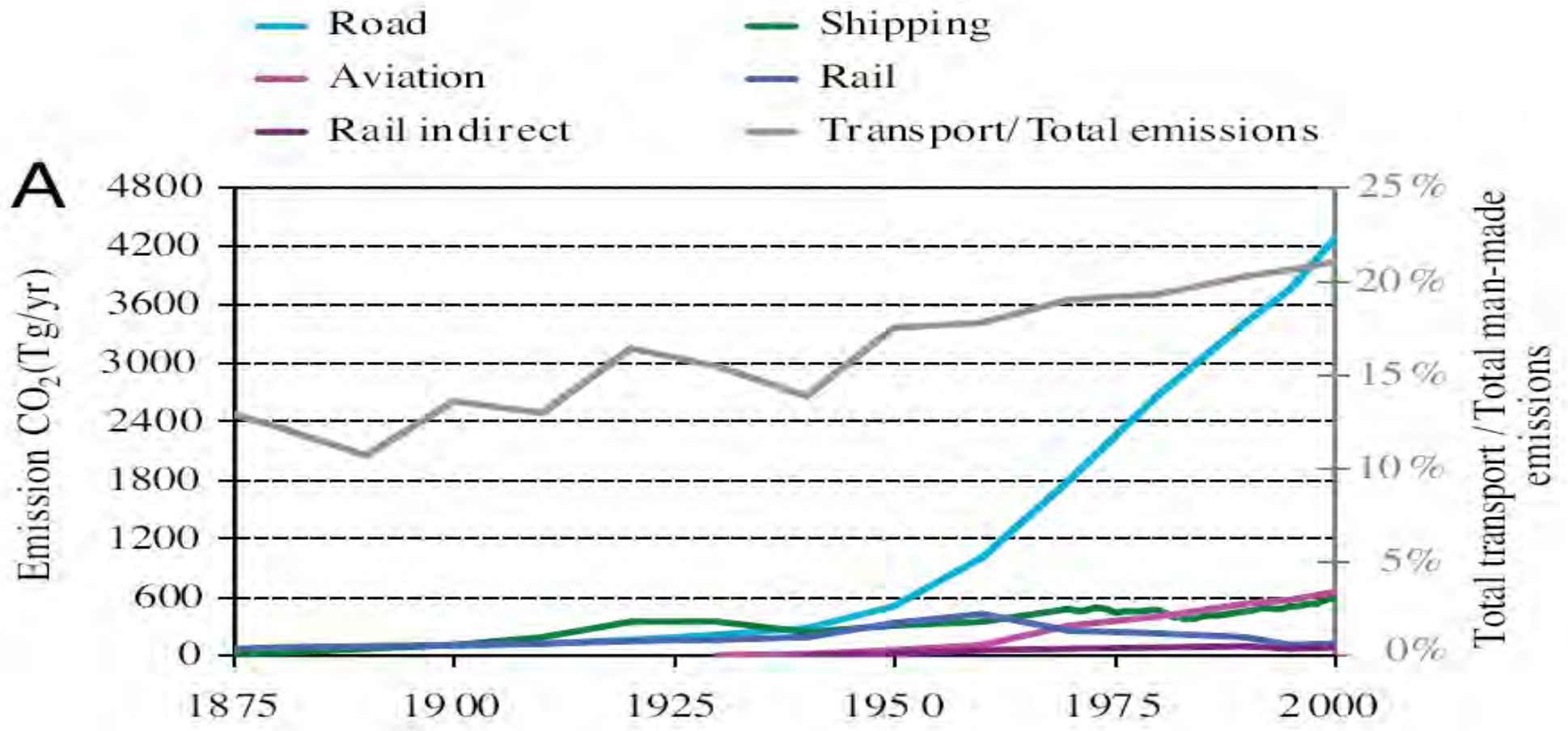
Hanson et al. (2011) identified the top 20 port cities with exposed assets under future climate (2070) and socioeconomic change scenarios

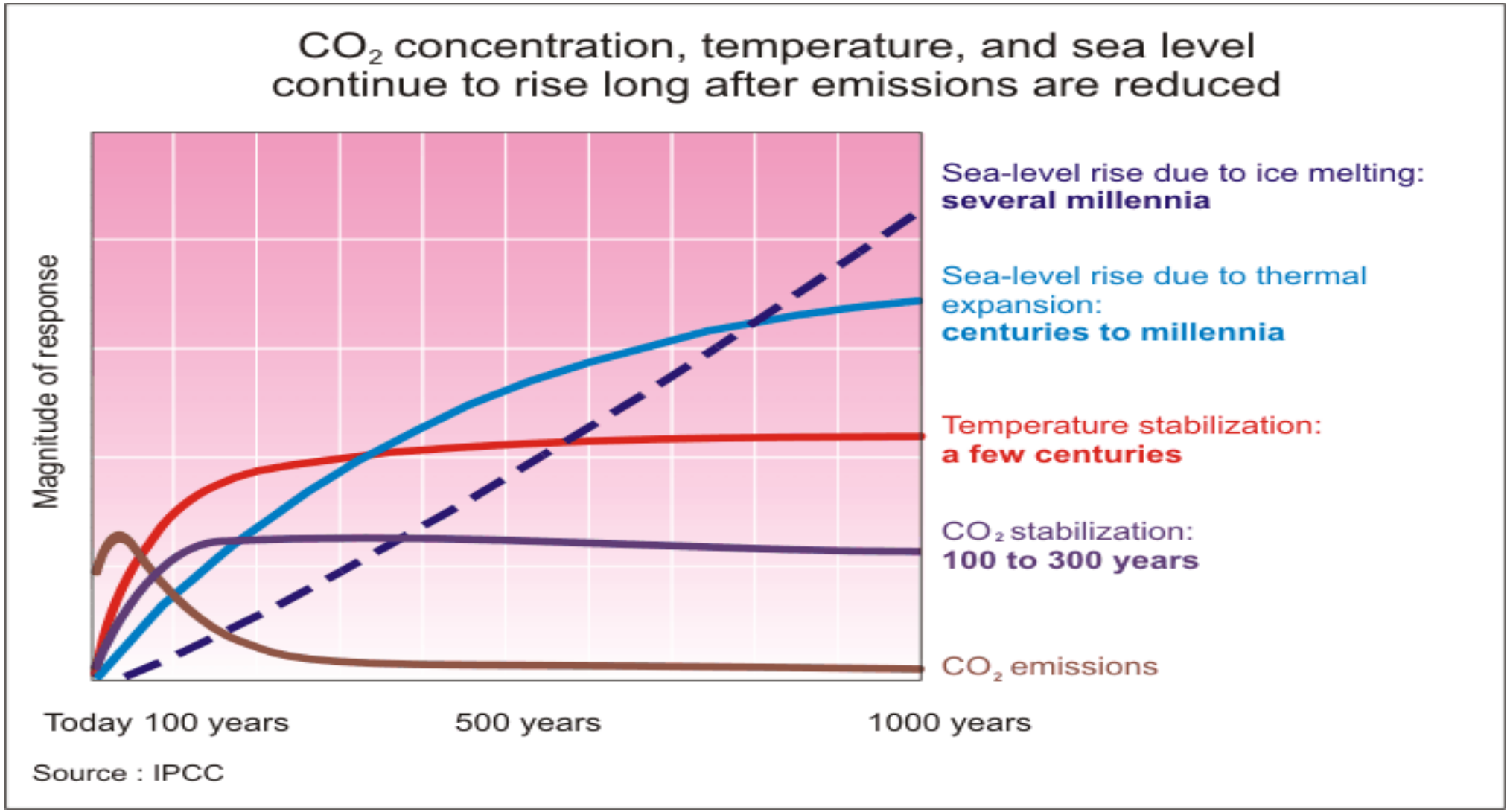


Transport	**16.2%**
Road	**11.9**
Air	**1.9**
Shipping	**1.7**
Rail	**0.4**
Pipeline	**0.3**



Mitigation – historical growth in CO2 across transport sector




CO_2 concentration, temperature, and sea level continue to rise long after emissions are reduced
Magnitude of response
Sea-level rise due to ice melting: several millennia
Sea-level rise due to thermal expansion: centuries to millennia
Temperature stabilization: a few centuries
CO_2 stabilization: 100 to 300 years
CO_2 emissions
Today
100 years
500 years
1000 years
Source : IPCC

IPCC major updates of Climate science & adaptation

Since TG3 in 2008, IPCC has completed several major new reports :-

5th assessment report (IPCC AR5, 2013),

Special Report on Global Warming of 1.5°C (IPCC SR15, 2018),

Special Report on the Ocean and Cryosphere in a Changing Climate (IPCC SROCC, 2019)

6th assessment report (IPCC AR6, 2021).

IPCC AR5 (2013)
Representative Concentration Pathways (RCPs)

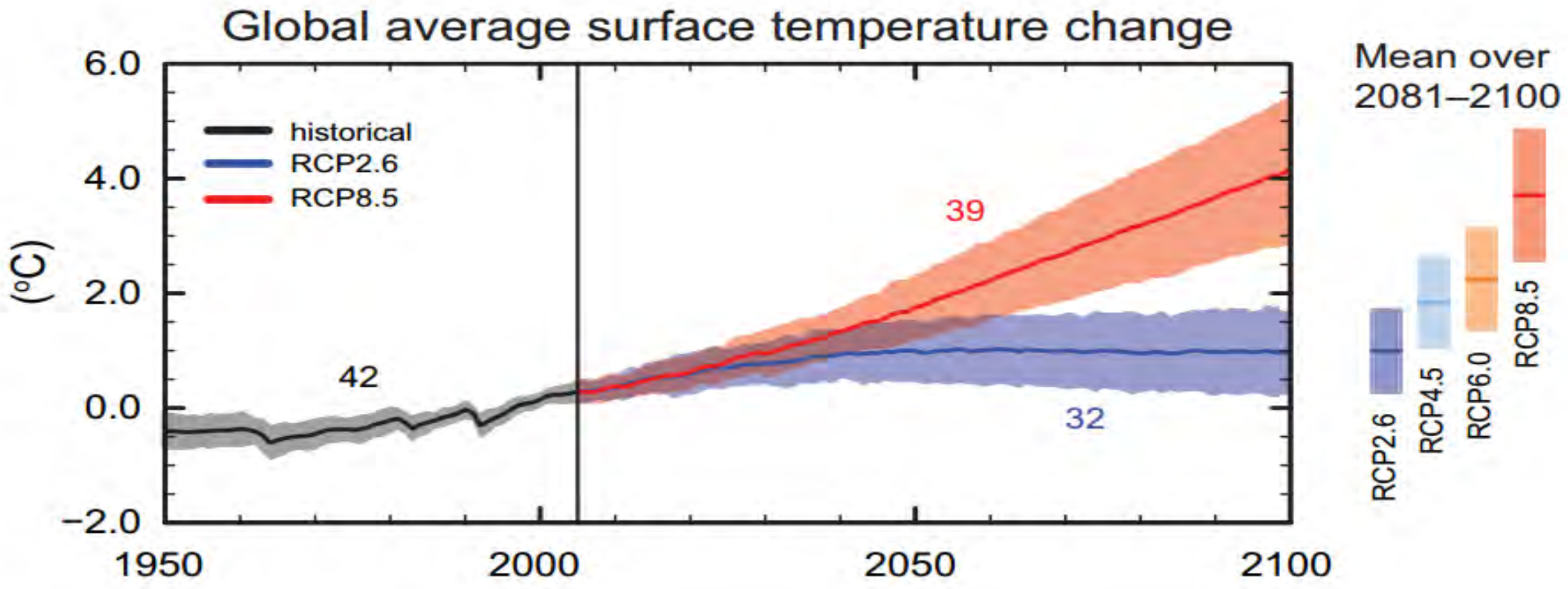
AR5 introduced Representative Concentration Pathways (RCP's) in place of the Special Report on Emissions Scenarios (SRES) projections published in earlier IPCC reports

The RCPs represent emissions target levels for 2100 and comprise of four scenarios which include; a mitigation scenario leading to a low forcing level (RCP2.6), two medium stabilisation scenarios (RCP4.5/RCP6) and one high baseline emission scenario (RCP8.5).

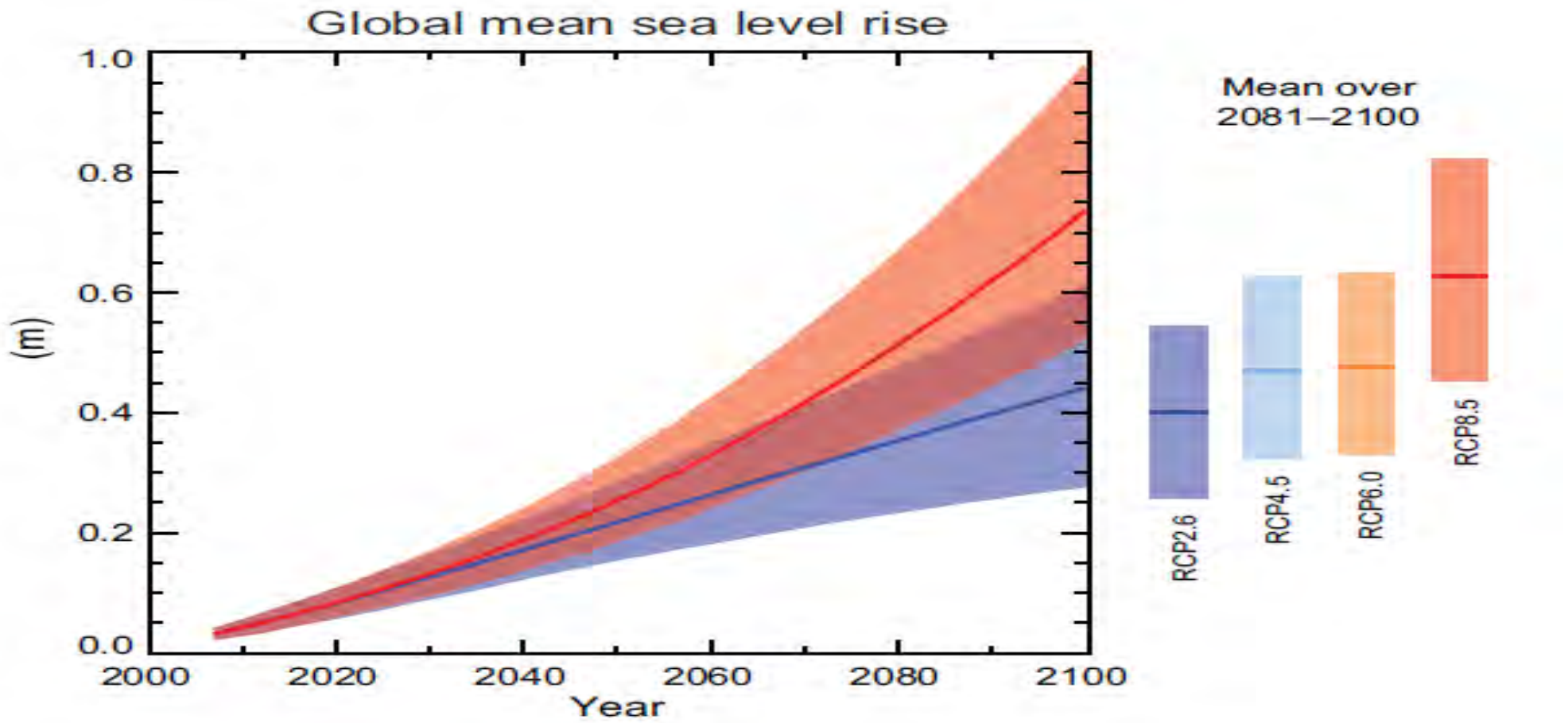
The RCPs are represented as alternative emissions of global greenhouse gas and aerosol concentrations and are named after a possible range of radiative forcing values in the year 2100 relative to pre-industrial values

RCP8.5 represents a radiative forcing of 8.5 Watts/m^2 and is often referred to as "business as usual"

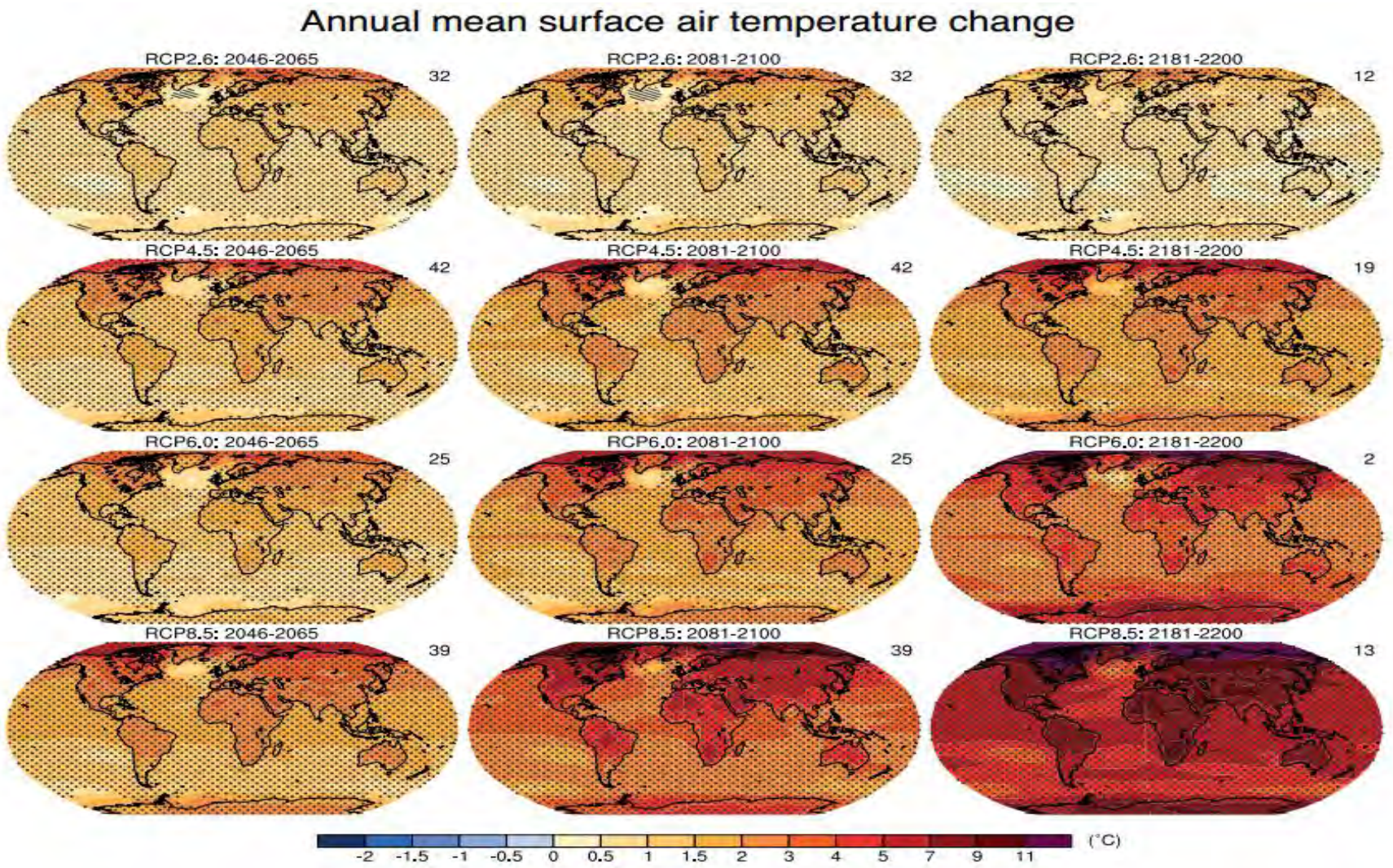
Increasing temperatures



Rising sea levels

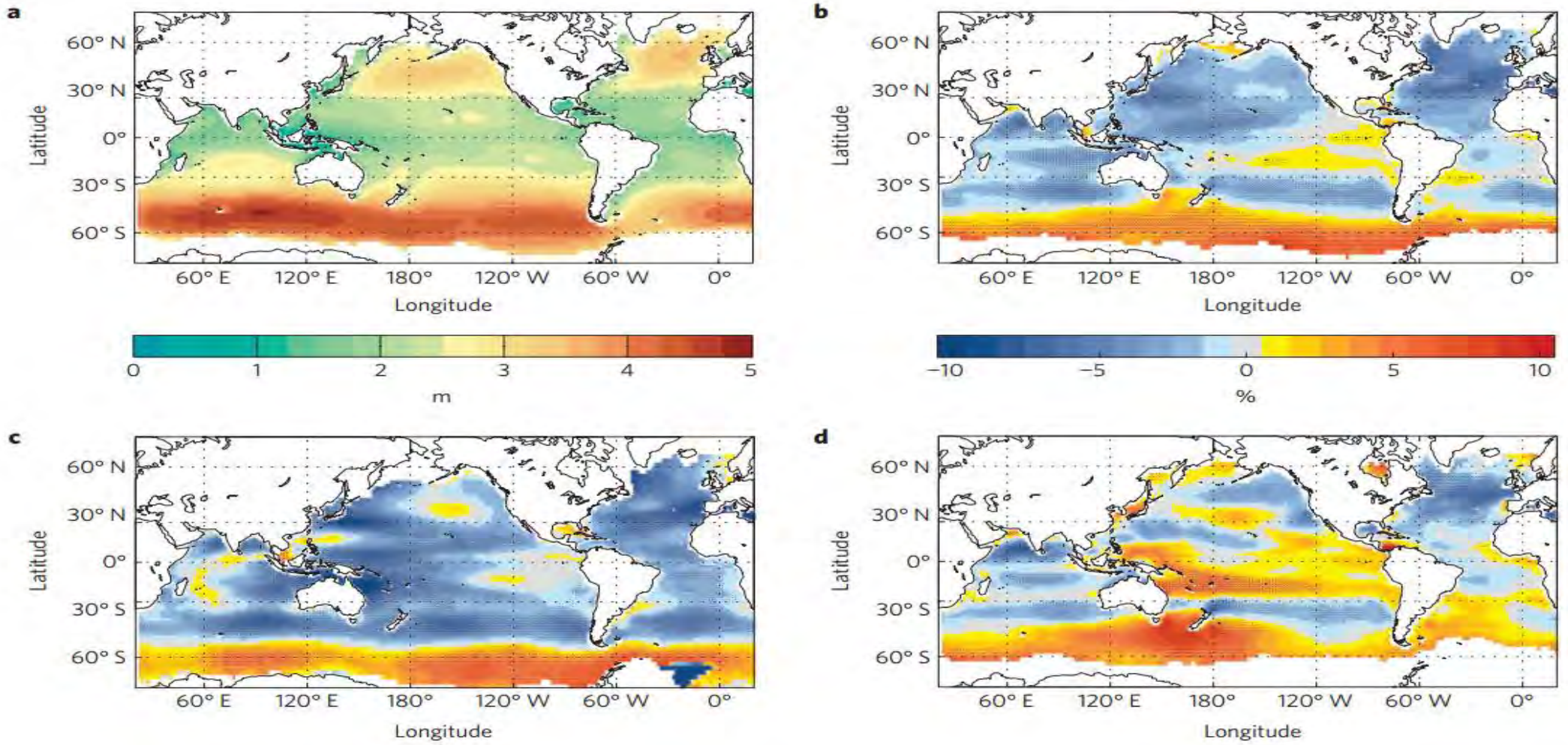


Regional differences with scenarios over time (AR5 Fig 12.11)

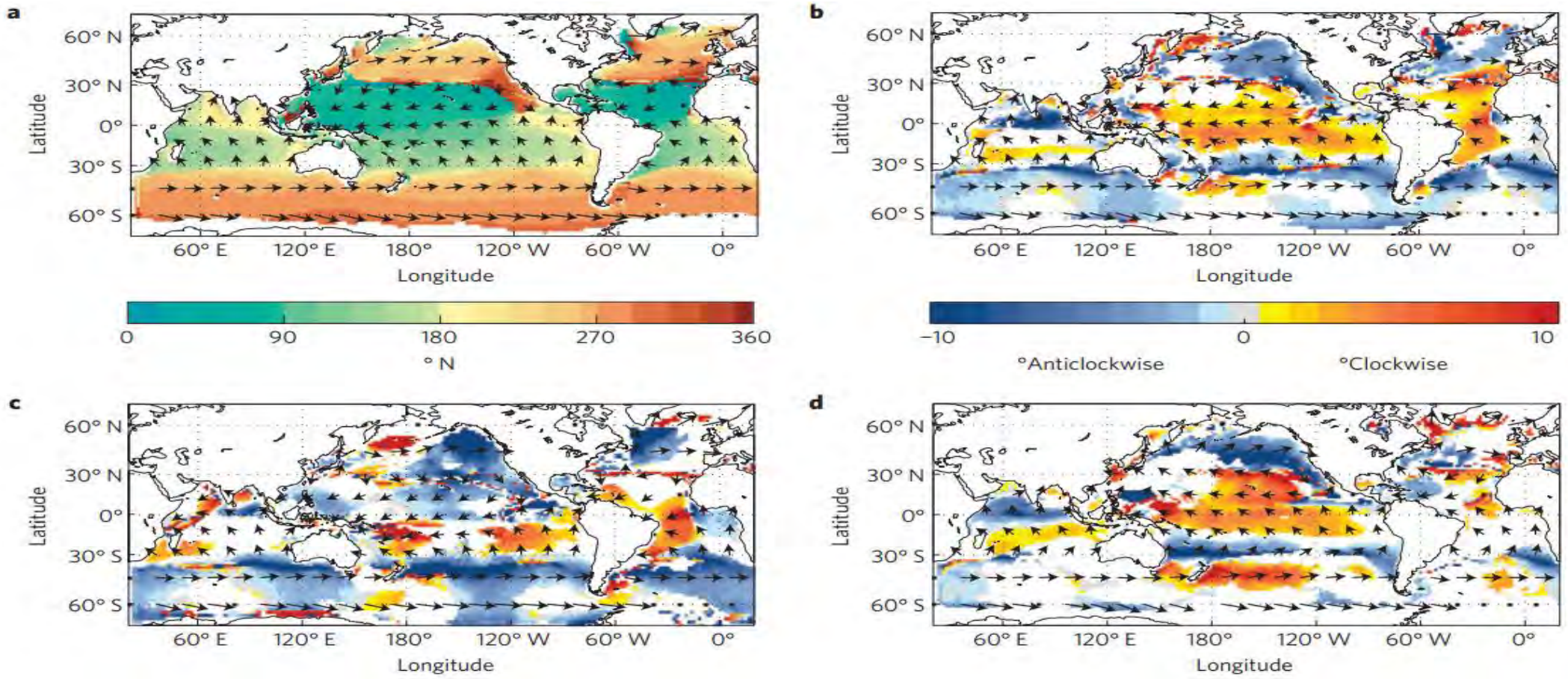


World wave height projections (Hemer etal 2013)

a present 1979-2009, b % annual change to 2070-2100, c JFM, d JAS



Changing wave direction >> shoreline alignments

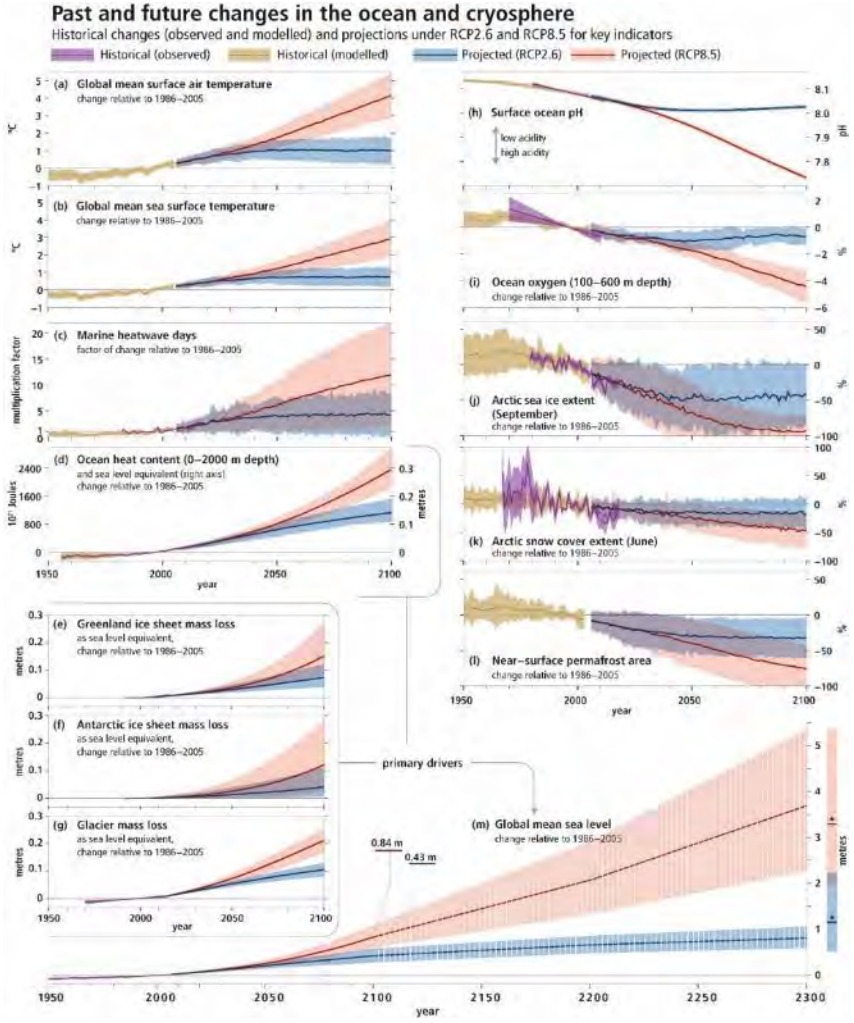


IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (IPCC SROCC, 2019)

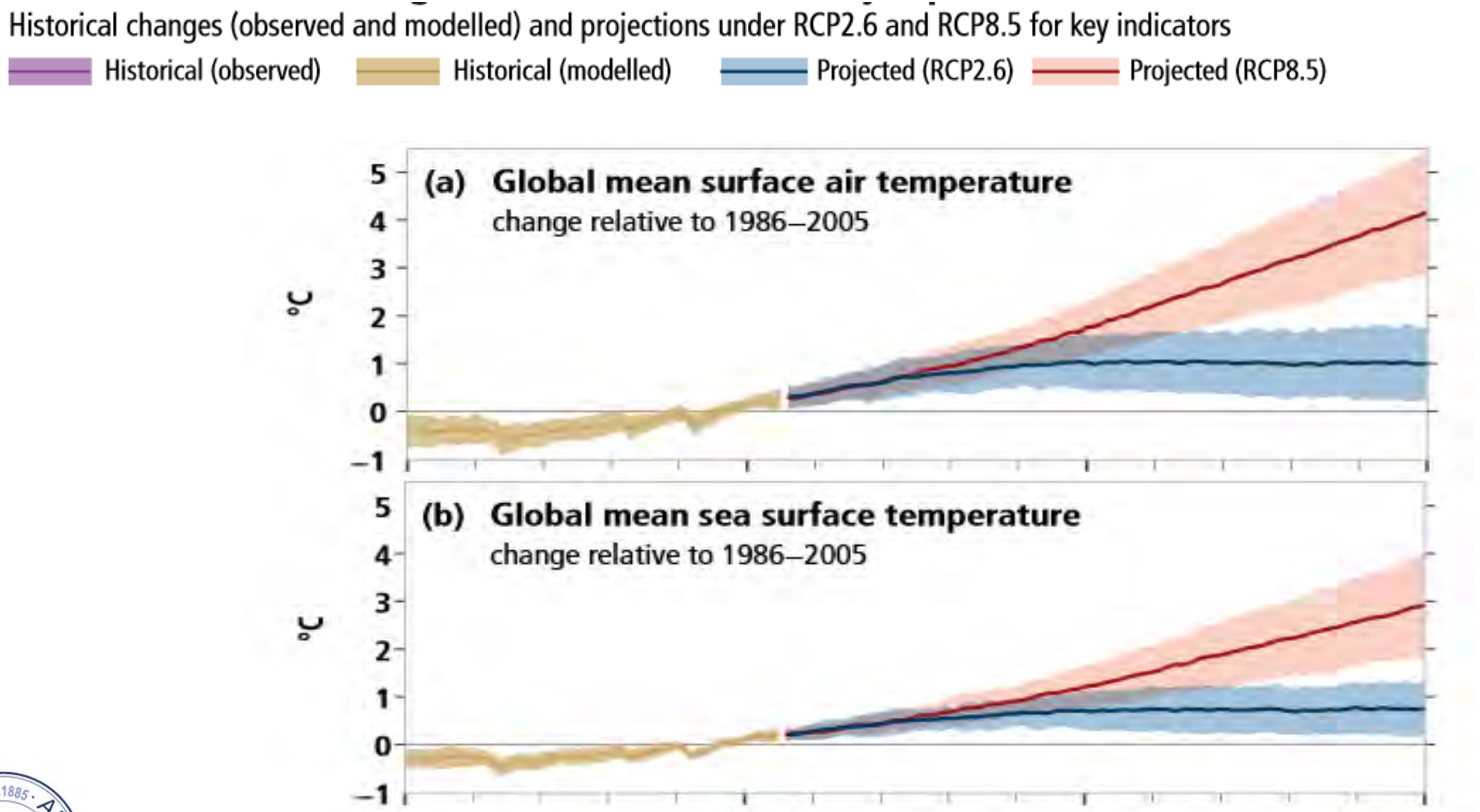
The IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (IPCC SROCC, 2019) is particularly relevant to the navigation sector as it specifically looks in detail at oceans and the cryosphere (sea and ice).

Figure SPM-1from IPCC SROCC, (2019) summarises some of the important climate and system projected responses: complex figure with much information

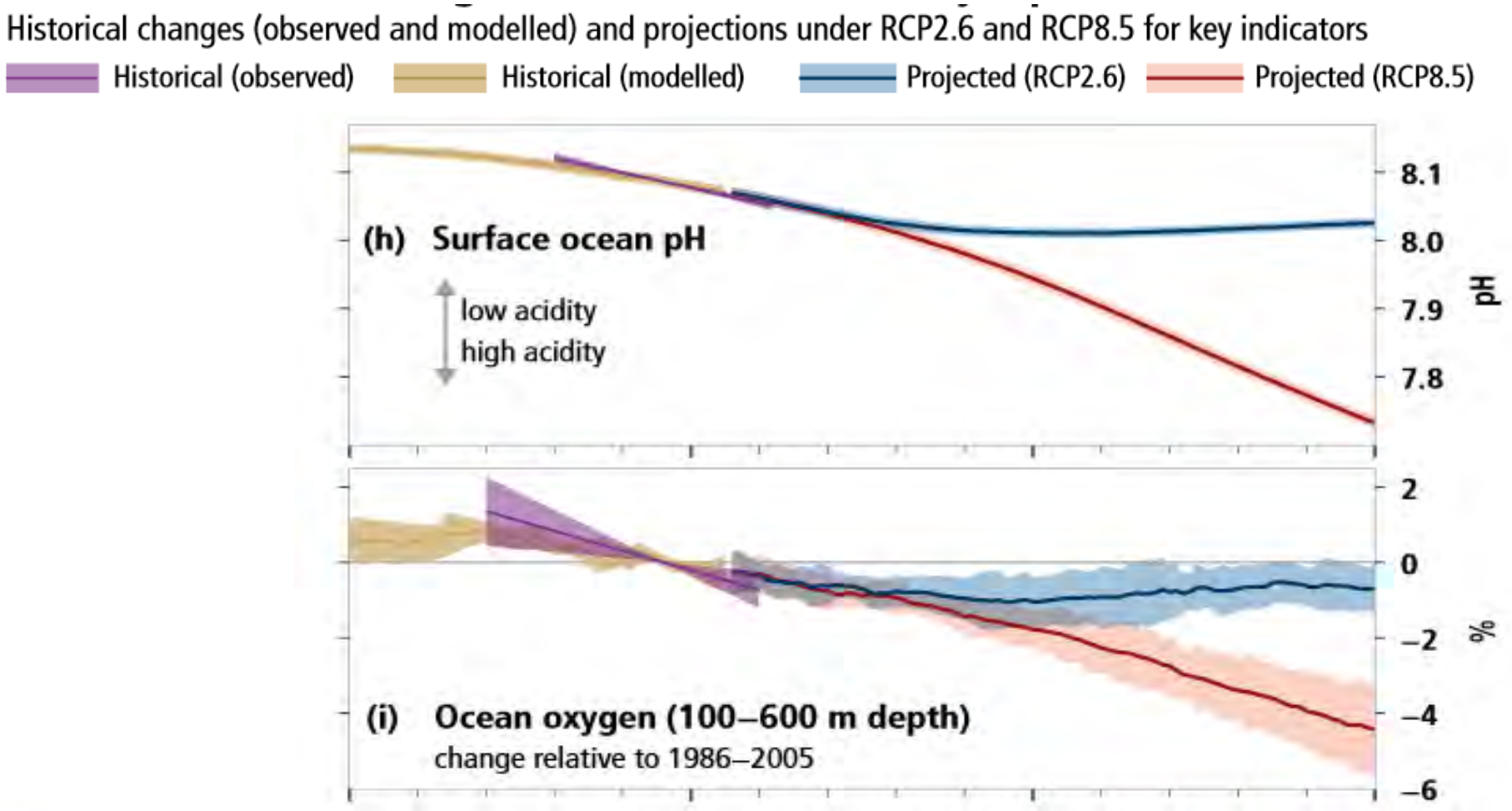
Past and future changes in the oceans and cryosphere
(reproduced from IPCC SROCC, 2019 Figure SPM-1)



RCP8.5 to 2100 - 3to5 deg C in air – 2to4 deg C in sea

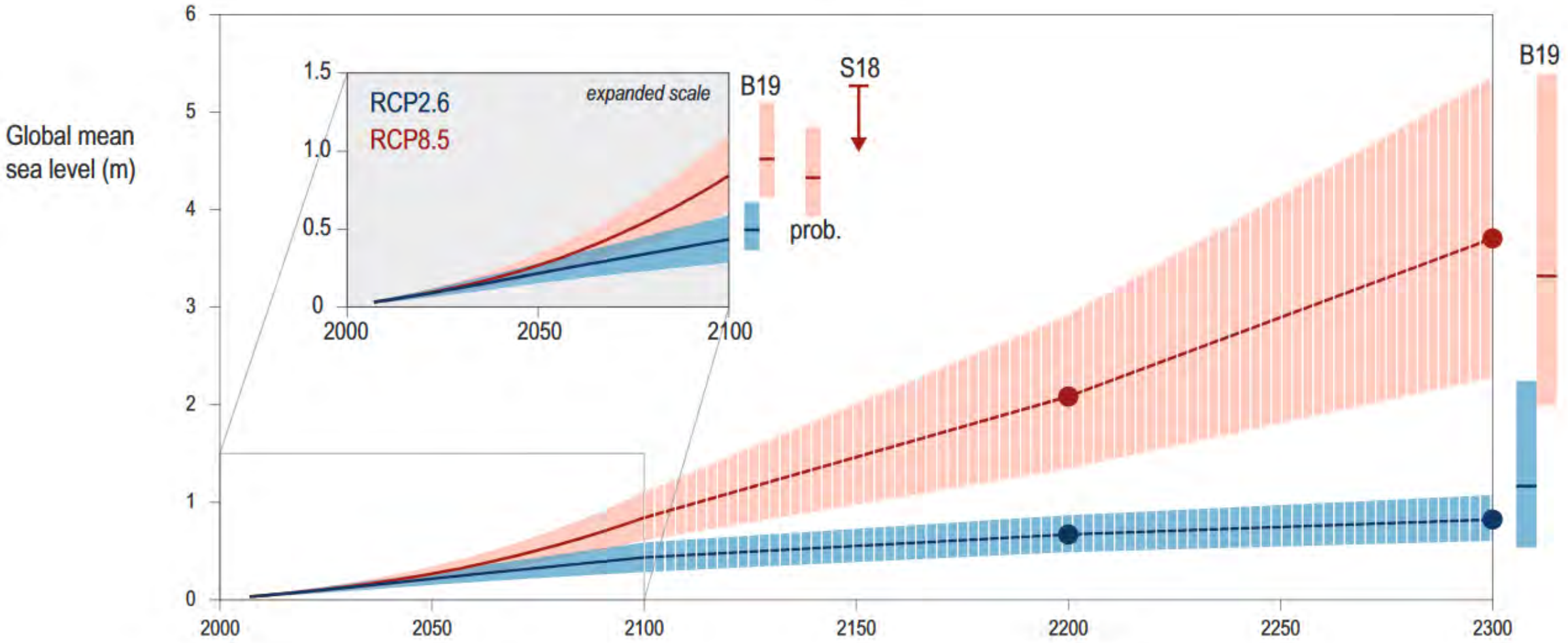


RCP 8.5 to 2100 – increased ocean acidity and reduced oxygen



SLR RCP 8.5 – 0.8m to 2100 continues to increase in 2300 to 3.7m

–



Update of Climate science with IPCC AR6 (2021)

GCCMs getting better with reduced uncertainty

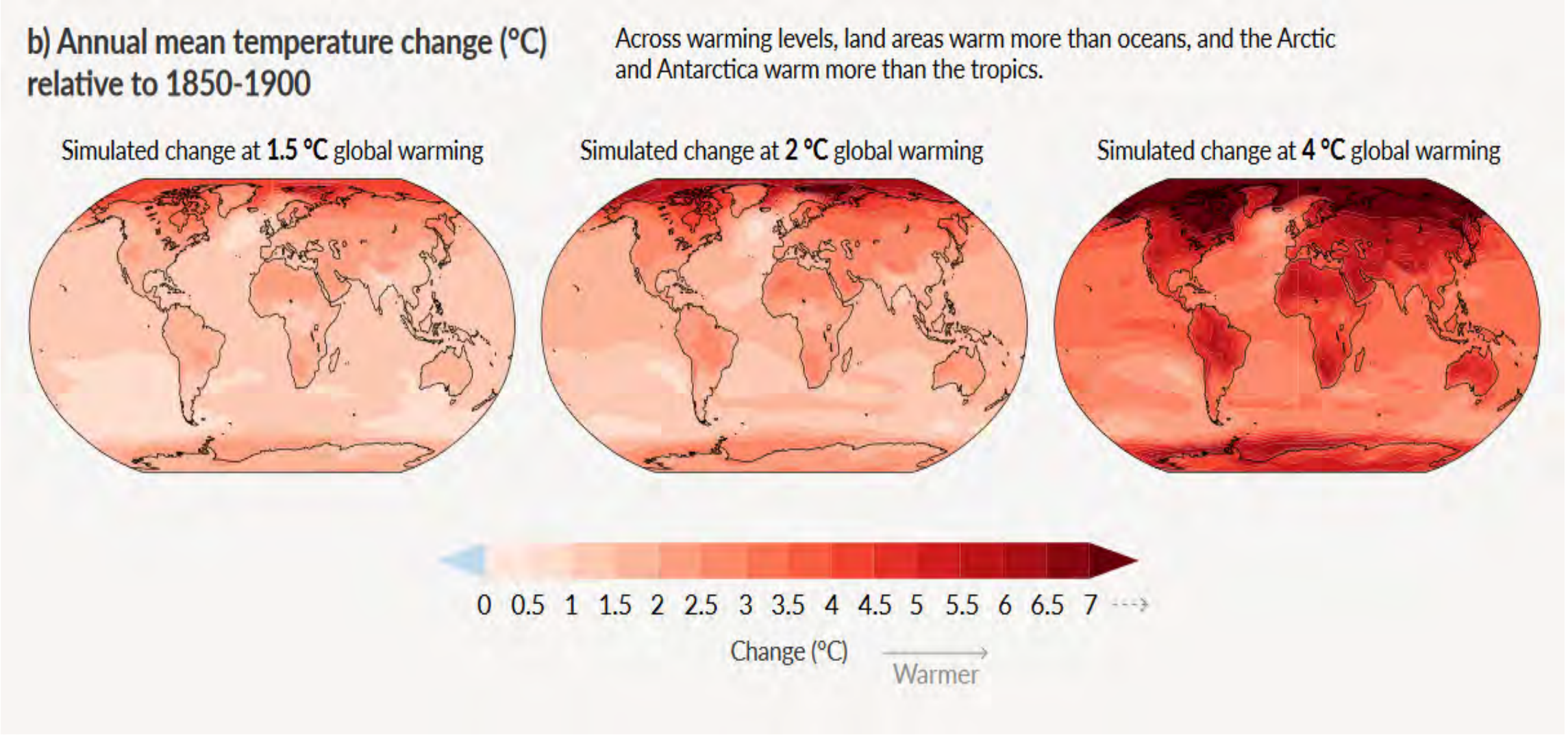
Higher resolution with spatial and temporal variability

Global average changes from AR4 are however not great

Projections for 2100 suggest a global mean sea level rise of 0.4 to 0.8 m and a greater frequency and intensity of extreme weather events.

Even if emissions of greenhouse gases stop today, these changes would continue for many decades and in the case of the sea level for centuries.

Regional differences in warming (AR6 Fig SPM.5b)

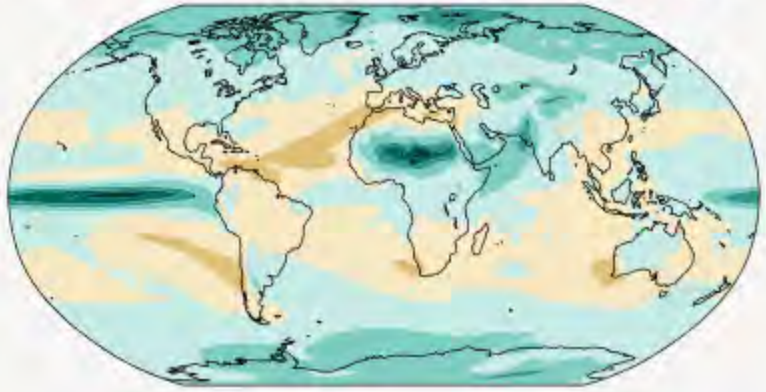


Regional differences in precipitation (AR6 Fig SPM.5c)

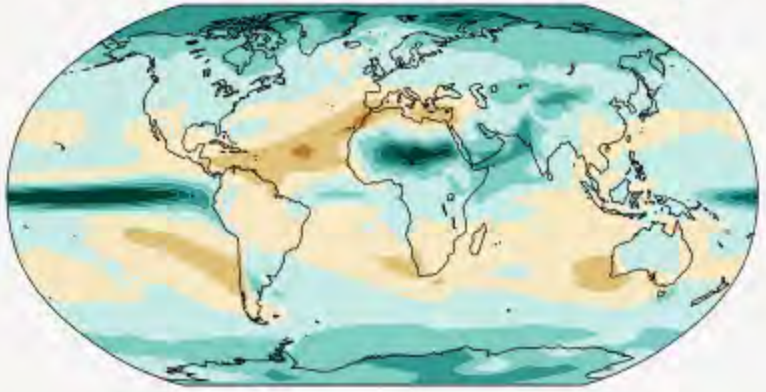
c) Annual mean precipitation change (%) relative to 1850-1900

Precipitation is projected to increase over high latitudes, the equatorial Pacific and parts of the monsoon regions, but decrease over parts of the subtropics and in limited areas of the tropics.

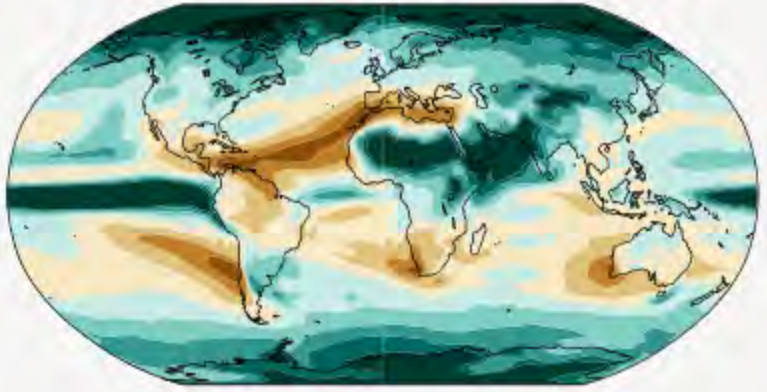
Simulated change at **1.5 °C** global warming



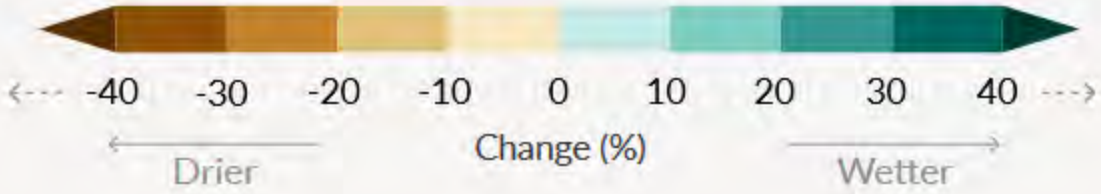
Simulated change at **2 °C** global warming



Simulated change at **4 °C** global warming



Relatively small absolute changes may appear as large % changes in regions with dry baseline conditions



Update to TG3 (2008) – Published October 2023

Waterborne transport, ports and waterways: A 2023 update of climate change drivers and impacts

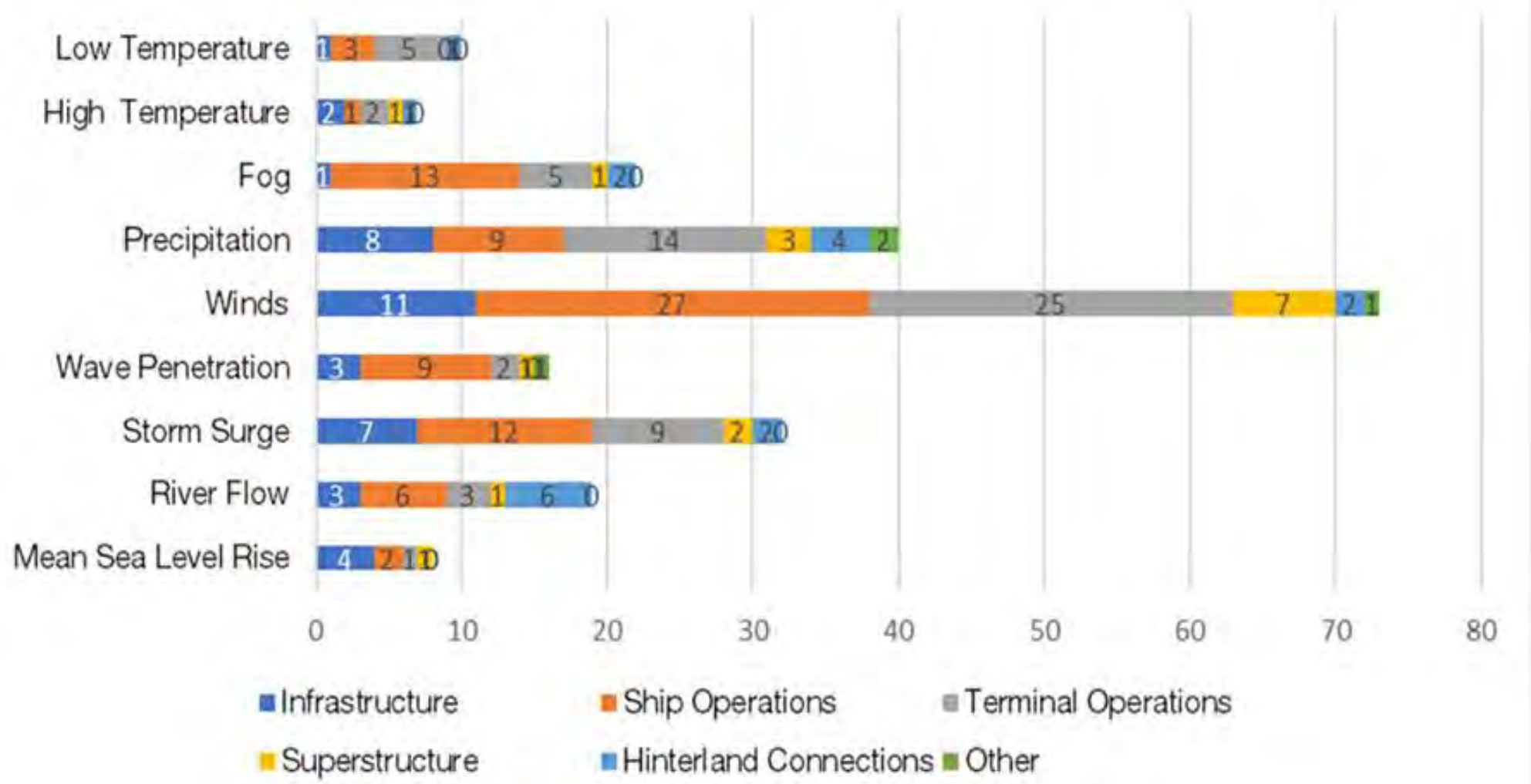
Incorporating IPCC

- **AR5 2013**
- **SR15 2018**
- **SROCC 2019**
- **AR6 2021**

Climate interactions with port assets and operations – WG178

	Navigation zone	Protection infrastructure	Manoeuvre area and berthing	Load/ unload area	Port equipment	Storage	Processing	Hinterland connections
IMPACTS	Agitation Water depth Wind patterns Visibility	Coastal flooding Overtopping Wave loads Water temperature Salinity/acidity	Agitation Currents Water depth Wind patterns Visibility Water temperature Salinity/acidity Heat	Coastal flooding Overtopping Agitation Wind patterns Visibility Precipitation Heat	Coastal and inland flooding Wind patterns Precipitation Visibility Heat Contamination		Coastal and inland flooding Wind patterns Precipitation Heat	Coastal and inland flooding Wind patterns Precipitation Visibility Heat Low water
CLIMATE PARAMETERS	Mean sea level Astronomical tide Storm surge Waves Wind Fog Precipitation	Mean sea level Astronomical tide Storm surge Waves Wind Temperature	Mean sea level Astronomical tide Storm surge Waves Wind Fog Precipitation Temperature				Mean sea level Astronomical tide Storm surge Waves Wind Precipitation Temperature	Mean sea level Astronomical tide Storm surge Waves Wind Fog Precipitation Temperature

Impact of climate factors on port infrastructure, operations and services
UNCTAD (2017) survey



Related recent PIANC reports

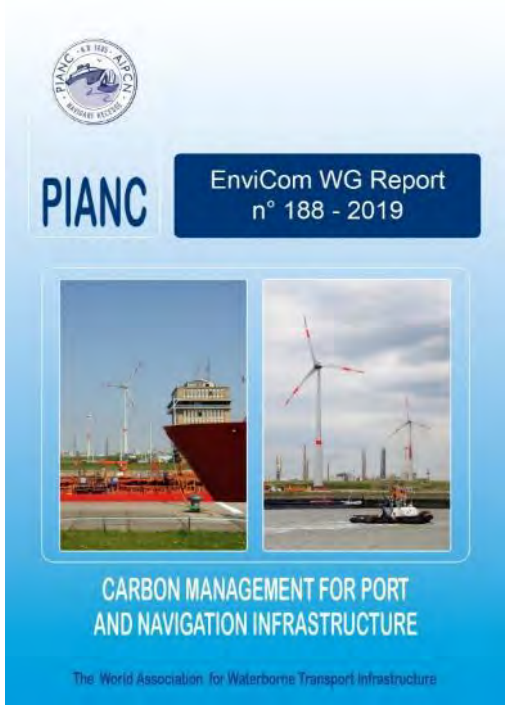
EnviCom 188: Carbon Management for Port and Navigation Infrastructure (2019)

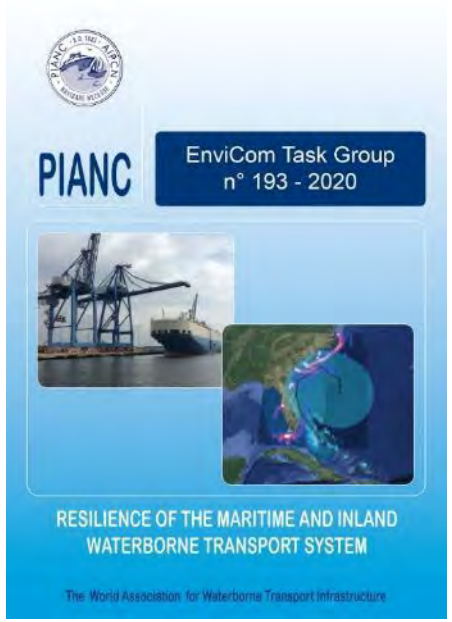
EnviCom TG193: Resilience of the Maritime and Inland Waterborne Transport System (2020)

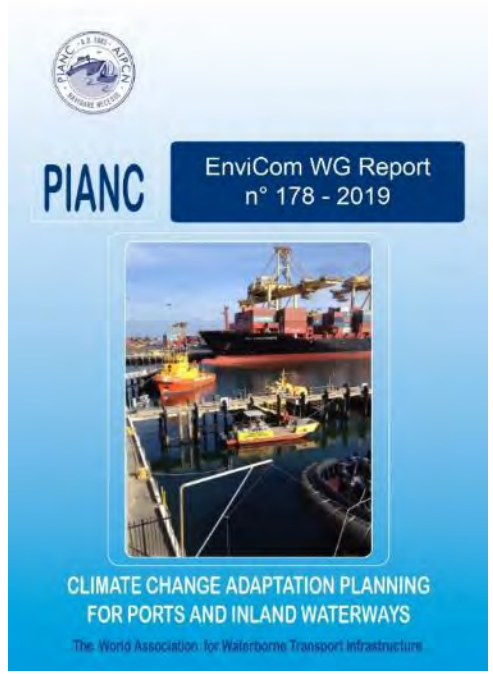
EnviCom WG 178: Climate Change Adaptation Planning for Ports and Inland Waterways (2020)

PTGCC Technical Note 1: Managing Climate Change Uncertainties in Selecting, Designing and Evaluating Options for Resilient Navigation Infrastructure (2022)

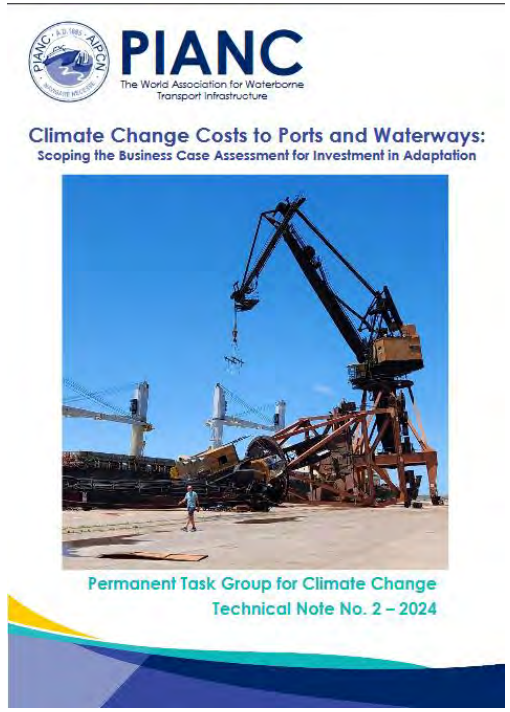
PTGCC Technical Note 2: Climate Change Costs to Ports and Waterways :Scoping the business case assessment for investment in adaptation (2024)


PIANC
EnviCom WG Report
n° 188 - 2019
CARBON MANAGEMENT FOR PORT
AND NAVIGATION INFRASTRUCTURE
The World Association for Waterborne Transport Infrastructure

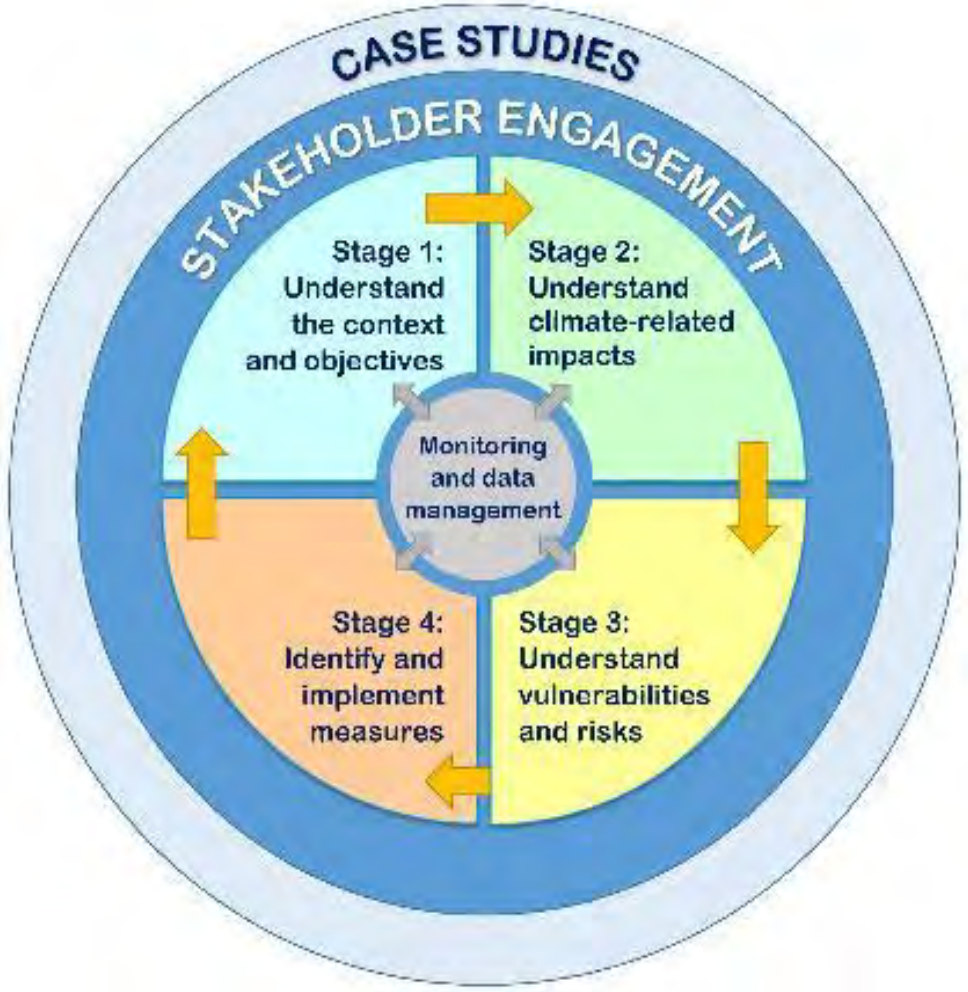

PIANC
EnviCom Task Group
n° 193 - 2020
RESILIENCE OF THE MARITIME AND INLAND
WATERBORNE TRANSPORT SYSTEM
The World Association for Waterborne Transport Infrastructure


PIANC
EnviCom WG Report
n° 178 - 2019
CLIMATE CHANGE ADAPTATION PLANNING
FOR PORTS AND INLAND WATERWAYS
The World Association for Waterborne Transport Infrastructure


PIANC
The World Association for Waterborne Transport Infrastructure
Managing Climate Change Uncertainties
in Selecting, Designing and Evaluating Options
for Resilient Navigation Infrastructure
Permanent Task Group for Climate Change
Technical Note No. 1 - 2022


PIANC
The World Association for Waterborne Transport Infrastructure
Climate Change Costs to Ports and Waterways:
Scoping the Business Case Assessment for Investment in Adaptation
Permanent Task Group for Climate Change
Technical Note No. 2 – 2024

WG 178: Climate Change Adaptation Planning for Ports and Inland Waterways (2020)



Climate change adaptation: Why, what and when?

Jan Brooke

PIANC Working Group 178, Climate change adaptation for ports and inland waterways - January 2020

Update of Selected slides from Presentation to Smart Rivers, Pittsburgh, USA. 19th September 2017

http://navclimate.pianc.org/

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WHY ? Your choice!
Generational equity
Corporate responsibility
Good financial sense

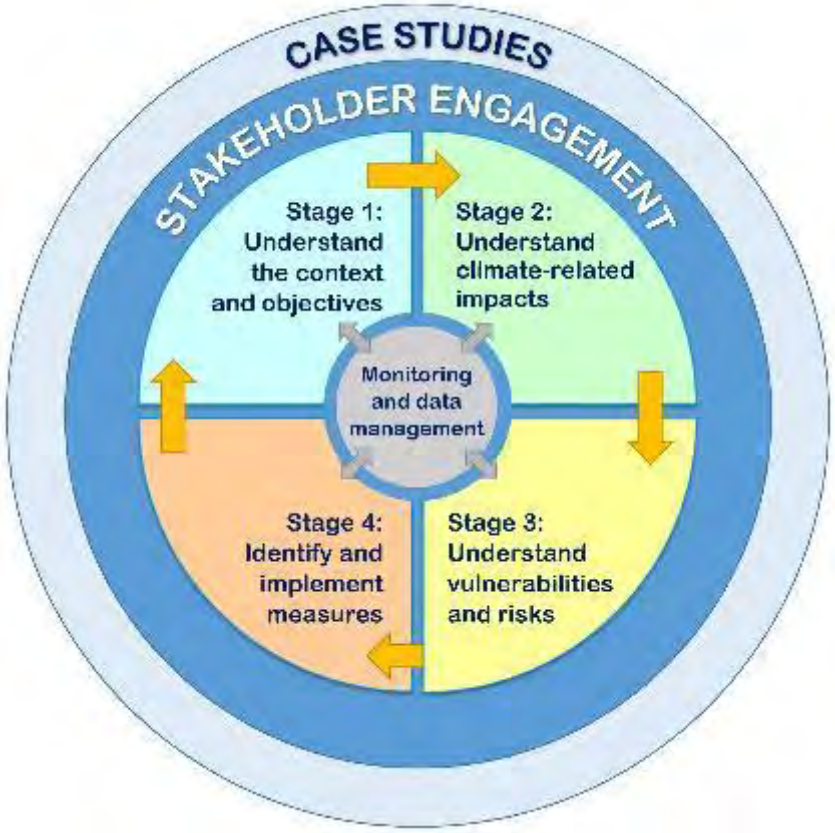
OR

What to do?

PIANC WG 178 guidance comprises a **four stage methodological framework**

- the **context** and **objectives**
- **climate-related impacts**
- **vulnerabilities** and **risks**
- climate change **adaptation and resilience measures**

Reference is also made to **case studies**; the role of **monitoring** and **data management**; and the importance of **stakeholder engagement**



Stage 1
Context and objectives

STEPS

Engage with relevant internal and **stakeholders** (e.g. via a meeting or workshop) …

- Develop **climate change adaptation and resilience goals**
- Compile an **infrastructure inventory**, identifying critical assets, operations and systems, and highlighting their current status
- Establish adaptation **roles and responsibilities**
- Set specific adaptation and resilience **objectives**, recognising boundaries, constraints and possible opportunities

Stage 2
Climate related impacts

STEPS

Work with stakeholders to develop an understanding of **projected changes in relevant climate-related parameters** …

- Highlight weather, hydro-meteorological or oceanographic parameters to which **each critical asset**, operation or system is **sensitive.** Is asset performance is already affected e.g. by extreme events and how often?
- Identify and review projected future changes in these parameters using global or regional information; refer to locally-relevant **downscaled data** if these exist, but acknowledge any uncertainties and data inadequacies
- Understand **how** the projected **changes could affect the critical infrastructure** (i.e. identify potential impact mechanisms)
- **Implement monitoring** to understand local trends in key parameters and to inform future decision making

Stage 3
Vulnerabilities and risks

STEPS

Work with stakeholders to **identify and assess the potential risks** to critical infrastructure assets, operations and systems …

- Does location or setting mean the critical asset or operation is **exposed**?
- Is the critical asset / operation **vulnerable** if climate parameters change?
- Is existing and future **adaptive capacity** adequate or is there is a need to **strengthen resilience**
- What are the financial/economic, environmental and social consequences of each scenario; the potential **costs and consequences of inaction**?
- **When** might these consequences be expected?

Prepare an **overview** of the **main risks** to critical infrastructure assets, operations and systems

Stage 4
Adaptation measures

STEPS

Work with relevant stakeholders to **identify**, **evaluate**, **implement** and then **monitor** measures to strengthen resilience or adapt …

- Identify possible short-term/interim and long-term measures: refer to the **portfolio of measures**
- Screen a long list of potential options to focus in on a **shortlist** for more detailed evaluation
- Develop, agree and apply option evaluation criteria
- Prepare an **adaptation** plan, **strategy** or programme for implementation: adaptation is likely to be a **phased** exercise
- Develop **monitoring** programmes and effective **data management** to inform decisions on *when* action is needed

Portfolio of measures

Measure types

- **Physica**l (engineered structures, technology, systems, services)
- **Social** (people, operations, education, behaviour, information)
- **Institutional** (governance, economic, regulatory, policy)

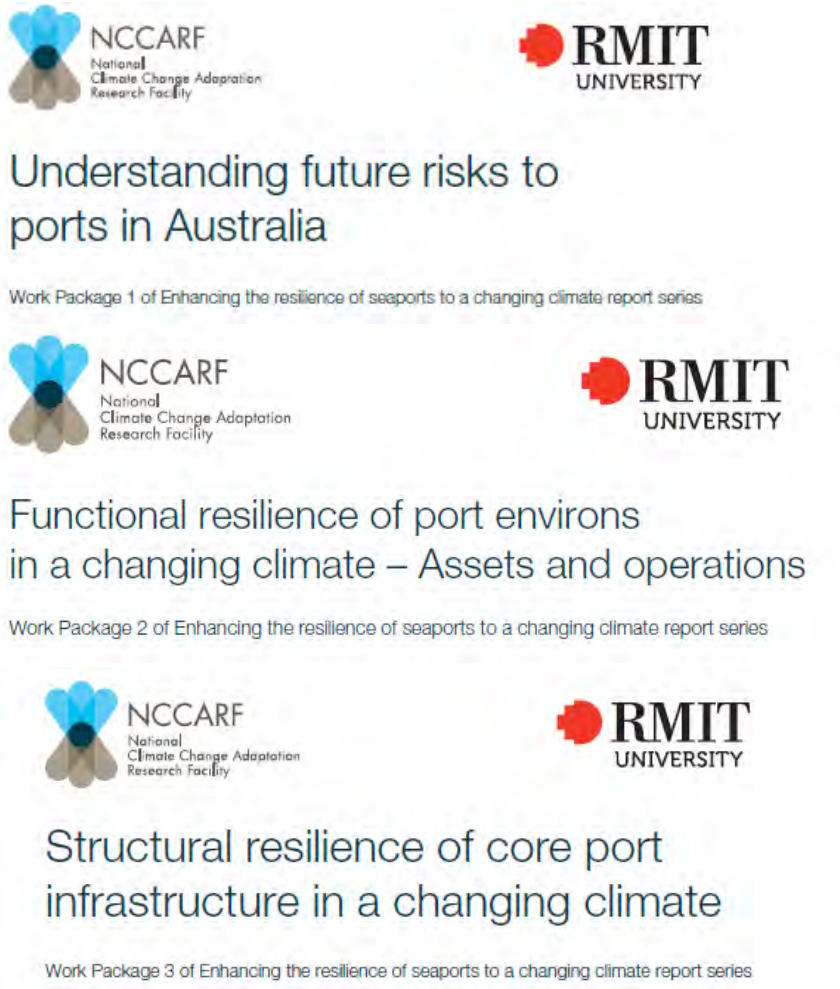
Climate-related impacts addressed

- Frequency, severity or duration of flooding
- Extreme, high or low river flow or wave conditions
- Sediment or debris transport and deposition, erosion
- Visibility
- Wind
- Air temperature change: extreme heat or cold
- Water chemistry, acidity, salinity
- Biological temperature induced changes

WHEN – Now and asap
Working Group 178 Key messages

- **Do what you can and prepare for what you can't**. Monitor, modify infrastructure, prepare and communicate residual risks. Use combinations of measures.
- Promote **adaptive management** and **flexibility** in infrastructure design using appropriate methods
- Engage all stakeholders for **integration**, **interconnectivity** and improved **efficiency**
- Review and refocus **business case development and investment financing criteria** to facilitate delivery of climate-resilient infrastructure
- Facilitate information exchange, share evolving **good practice** and feed back into industry guidelines and standards

NCCARF 4 Reports



The gamechanger – 2016/17 - world investment funds, big banks, rating agencies require inclusion of climate risk in management and investment decision making

'Demonstrable fluency'

APRA warning – the game has changed
Climate Change really matters –SMH Julien Vincent Dec 2017

Last week, APRA Executive Board member Geoff Summerhayes warned the transition to a low carbon economy is already underway and “institutions that fail to adequately plan for this transition put their own futures in jeopardy, with subsequent consequences for their account holders, members or policyholders.”

The Task Force on Climate-related Financial Disclosures (TCFD) has set the standard for climate risk disclosure since its draft recommendations were released a year ago.

Its final recommendations were backed by over 100 companies in Australia with a combined market capitalisation of over $3 trillion, which should give an idea to how seriously the TCFD is being taken.

Scenario analysis and stress testing to include climate change

Dealing with uncertainty ! What if ?

Accidents still happen !

Concluding remarks

Under current circumstances (and without both substantially increased carbon reduction targets under the Paris Agreement and accelerated development of negative emission technologies) neither the RCP2.6 nor the 1.5°C warming targets are likely to be achieved.

In addition to contributing to international and national action on emissions reduction (PIANC WG188, 2019), the owners and operators of waterborne transport infrastructure need to take urgent action to strengthen resilience and adapt navigation assets and activities (PIANC WG178, 2020).

In planning for climate change, it is important that decision making includes sensitivity testing of outcomes to the full range of possible scenarios over various time periods.

Questions

Ron Cox

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Luke Campbell & Adam van der Beeke

Facilitated Session: Learnings & Next Steps

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