Climate Change Resilience – Implementing Practical Approaches for Ports and Harbours

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Climate Risk and Ports

- Definitions and Concepts
- Drivers and Trends
- Approaching Climate Risk and Resilience
- Case Study – Ports North
- Future Directions

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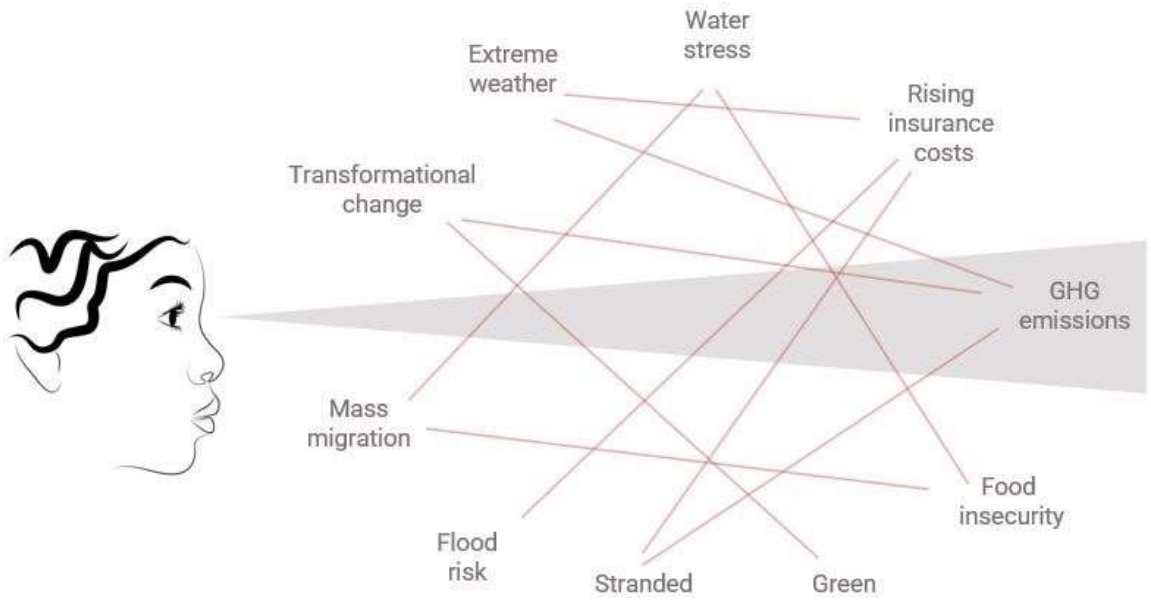
Climate risk tunnel vision



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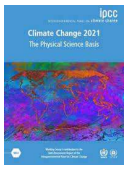
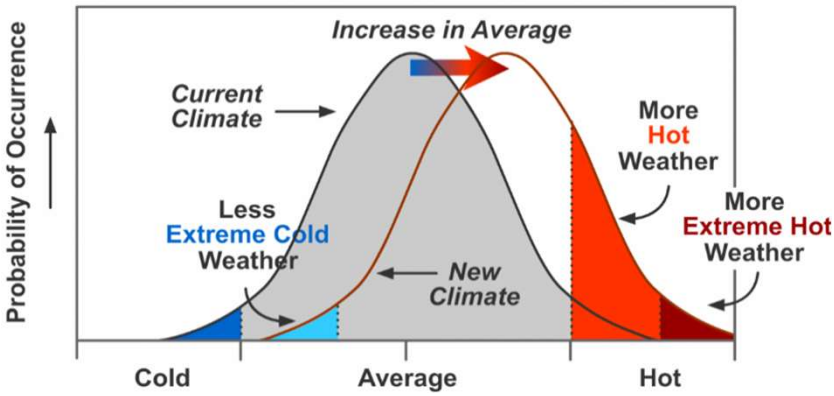


Key Messages – IPCC AR 6 'Science' Report 2021



The effects of extreme weather and climate change are now considered inevitable with a 2+ deg. C increase likely

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Climate Risk Trends Over Time

An increase in the frequency or severity of large storms

- Increased high wind/lightning events
- Increased storm surge events
- Increased major flooding events

Changes to rainfall patterns

- More frequent inundation and/or flooding including at different times to current conditions
- Changes to water supply and availability – increased drought

Increasing temperatures

- Increased incidents of very hot days and heatwaves
- Increased evaporation and fire risk
- Increases to water temperature

Sea level rise

- Increased risk of storm surge and flooding from higher water level
- Saltwater intrusion into water resources
- Permanently inundates coastal assets

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Typical Physical Climate Impacts for Port Facilities

- High wind affecting gantry cranes, lifts and navigation
- Physical damage to coastal infrastructure
- Erosion of foreshores and undermining of seawalls
- Drainage and flooding impacts and corrosion
- Environment impacts from spills or accidents
- Increased maintenance dredging requirement

- Water supply and affordability – drought
- Dust suppression of cargos
- Flash flooding from more intensive rainfall
- Vegetation management and maintenance
- Bushfire risk from surrounding drought areas

- Energy and refrigeration costs increase
- Heat affecting workforces and productivity
- Marine pest incursions with warmer water temps
- New or different shipping lanes and operations
- Warmer temperatures may improve / decrease tourism and cruise markets
- Fog effects on navigation

- Exposure to increased storm tide and erosion processes
- Clearance and safe navigation under bridges
- Changes to quay side, booms and ship levels
- Storm tide and corrosion effects on power supplies
- Impacts on supply chains – road and rail into the port

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Impact Avoidance or Minimisation of Damage

Financial -

- Asset / plant damage
- Increased maintenance / repair costs
- Temporary loss of use or production
- Increased shipping disasters/claims
- Delays to shipping / inaccessibility
- Insurance escalation / damage remediation

Health, Safety, Environment -

- Loss of life and injuries
- Displacement from homes / work
- Loss of work days and productivity
- Hazardous material releases (spills)

Legal / Stakeholders -

- Regulatory – financial disclosure and shareholder demands
- Liability, negligence, class actions

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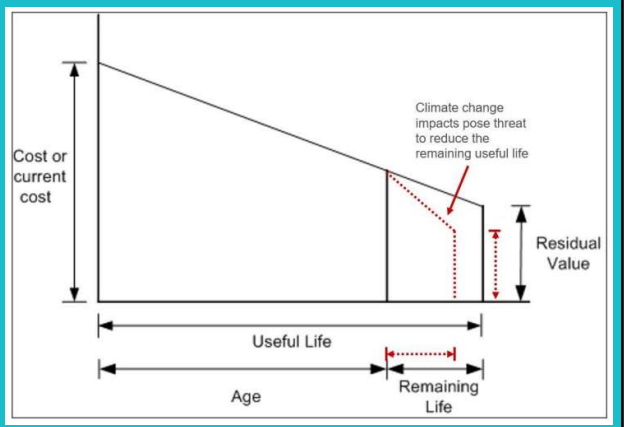
Asset life and function- through a climate lens

- Will reduce practical life of <u>existing</u> assets compared to what was originally designed
- Needs to be considered in terms of design and life of <u>new</u> assets



Adapted from IPWEA (2018)

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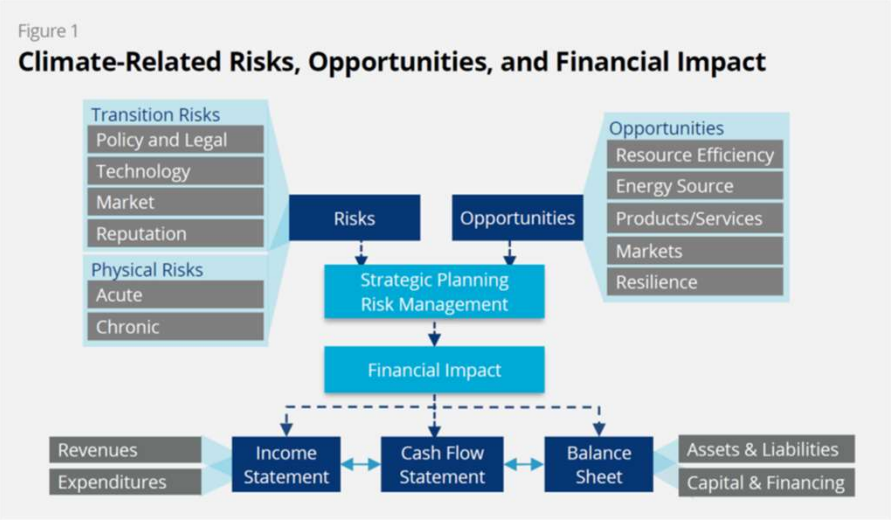
Reporting on Climate Risk – TCFD

'…companies prepared for potential climate change may well have the ability to leverage changes or impacts on competitors to increase market share…'



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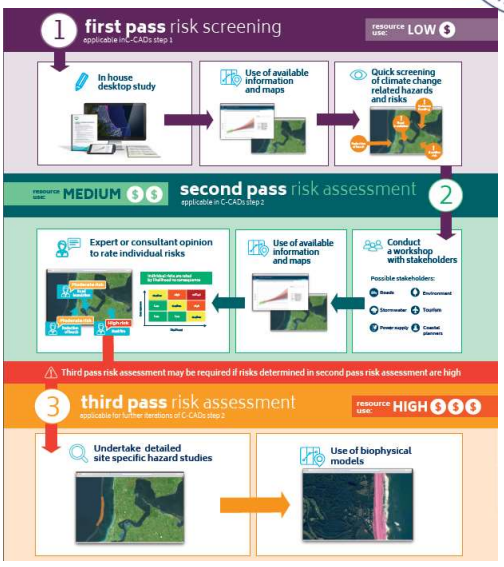
How do we best respond?

AWARE - 1st pass
– how does climate change affect the site(s), assets, operations and workforce (screening level vulnerability)? can we define the scopes of emissions?

UNDERSTAND - 2nd pass
– what is the likelihood and severity of impacts? what are the actions that could be taken to address the risk? when will action be required? can we quantify the scopes of emissions?

TAKE ACTION - 3rd pass
– plan and understand the costs / benefit of decarbonisation and resilience measures and implementation



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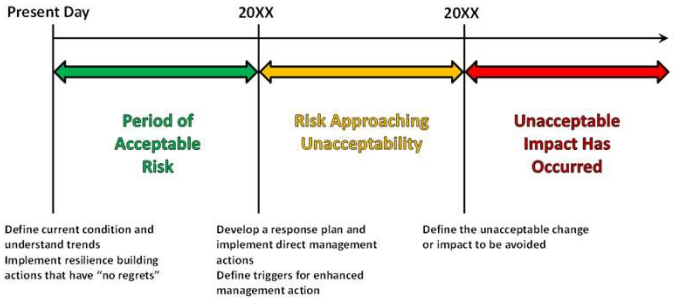
Critical Concepts for Climate Risk Assessment

Likelihood \ Impact	Negligible	Minor	Moderate	Significant	Severe
Very Likely	Low Med	Medium	Med Hi	High	High
Likely	Low	Low Med	Medium	Med Hi	High
Possible	Low	Low Med	Medium	Med Hi	Med Hi
Unlikely	Low	Low Med	Low Med	Medium	Med Hi
Very Unlikely	Low	Low	Low Med	Medium	Medium



Likelihood
- Downscaled climate data and trends
- Hazard Maps

Consequence
- Nature of the impact– major/minor damage, loss of use (for a time), cost of repair versus replace, more frequent maintenance
- Need to unpack the 'magnitude' of impact – what is it's severity, intensity, and duration

Tolerance
- How much damage am I willing to accept?
- How much loss of functionality is allowable?
- How much money am I willing to spend?

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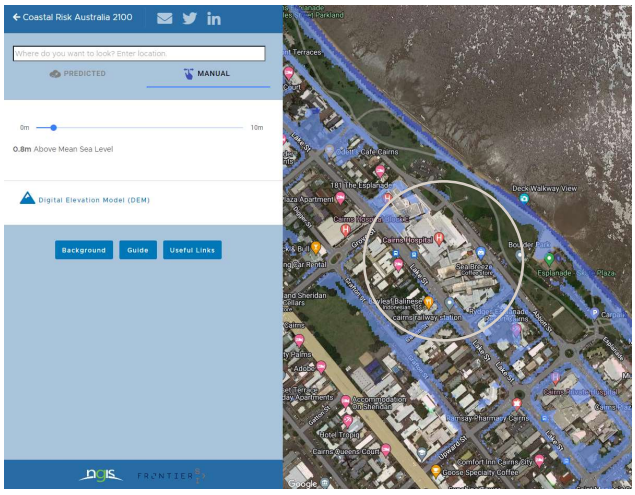
Mapping products are available



Examples
- Coastal Risk Australia
- CoastAdapt
- QCOAST 2100 - Coastal Hazard Adaptation Strategy (CHAS) mapping
- Council flood map considering climate change and SLR

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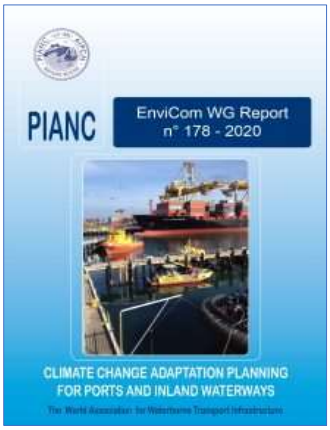
Guidance is growing…



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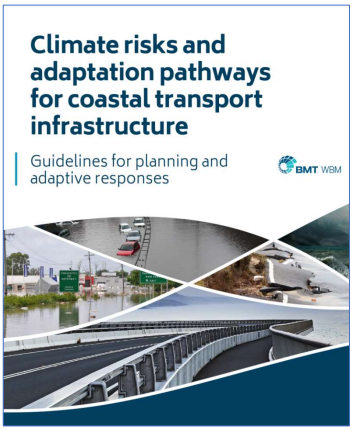

CoastAdapt (www.coastadapt.com.au)

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Case Study
Ports North Sustainability Strategy - Scoping Project

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Objective + Scope of Work

- Building a tangible, practical plan to achieve sustained outcomes
- In scope - Ports of Cairns, Cape Flattery, Karumba, Mourilyan, Skardon River, Quintell Beach, Thursday Island, and Cooktown
- Review issues and approaches across all ports for:
  - Carbon/GHG management
  - Energy supply/usage
  - Physical climate risks (acute and chronic)
  - Waste management
  - Potable water usage
- Baseline of current approaches and practices – gap analysis of areas requiring further work/attention
- Focus on Assets, Operations, Workforce and future business risks from climate (supply chains, effects on cruise and tourism etc.)

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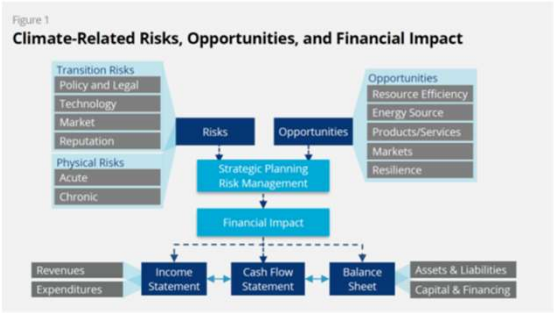
Drivers / Solutions



- GHG Audit – understand current GHG emission sources and quantities
- Manage risk and cost implications of:
  - increased asset damage/maintenance, and
  - impacts on operations from physical risk and extreme weather
- WHS – increase protection of workforce; reduce loss of productivity and claims; reduce cost of disasters and improve recovery time
- Build resilience into new designs and/or inform renewal of existing assets
- Look at opportunities to leverage funding or support and/or in partnership with others
- Assist and guide tenants toward more sustainable operations and outcomes
- Address climate risk reporting (including TCFD) - Queensland Government annual report on Climate Action

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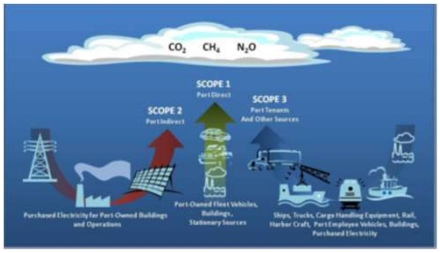
Decarbonisation and Energy

- Defined Scope 1, 2 and 3 categories of GHG emissions from port operations
- Undertook initial audit of Scope 1 and 2 GHG emissions and starting to collect/collate data internally
- Reviewed renewable power opportunities (green energy purchase, solar, wind)
- Blue/green carbon – consider audit of current natural land holdings and carbon sequestration benefits; identify rehabilitation priorities that could increase carbon removal potential



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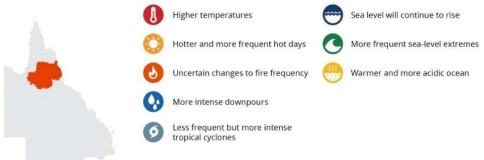
Physical Climate Risk and Extreme Weather

- Identified climate projections and trends at each port including collation of existing hazard mapping
- Initial Climate Risk Assessment –
  - Identification of areas of port land that are highly vulnerable to storm tide/flooding in 2050 and 2100 timeframes (includes facilities at Port of Cairns, Horn/Thursday Island, Mourilyan)
  - Have supplied projected storm tide heights to compare against existing wharf heights
  - Heat will be an issue at each location - with substantial increase in number of hot days predicted

How will climate change affect the Cairns and Hinterland Region?



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Outcomes

- Understand and tracking Scope 1, 2 and 3 emissions
- Set up for a more detailed '2nd pass' risk and resilience planning for identified hot spot areas
- Prepared for Government reporting requirements
- Internal audit of wharf levels can examine risks/opportunities in terms of life of assets and renewal/replacement
- Incorporate climate risk considerations across masterplan/land use plans to guide new development
- Review heat-related WHS policies and procedures
- Workshop/partnership approach with Cairns Regional Council and Cairns Airport for regional climate risk response

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Unlocking Opportunities of Climate Change – Takeaways

- Initial scoping work (as shown by case study) does not need to be arduous or expensive
- Understanding the categories of Scope 1, 2 and 3 emissions bespoke for ports and need to set up systems to collect data over time
- Resilience actions taken now can:
  - extend the life and useability of assets
  - guide renewal decisions and building back smarter/better
  - reduce ongoing maintenance costs
  - reduce operational downtime and service interruption
  - protect workforces and reduce workplace stoppages and injuries
- Integrated studies (across decarbonisation and physical risk) can guide future climate risk reporting
- The most prepared organisations for climate will be ahead of their competitors!

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