PIANC Environmental Commission Working Group 218:

PIANC
The World Association for Waterborne Transport Infrastructure

The implications of invasive alien species for waterborne transport infrastructure

Nicki Stokes, Australian Representative

1

I acknowledge the Traditional Owners and Custodians of the land on which we meet today, the Wurundjeri People.

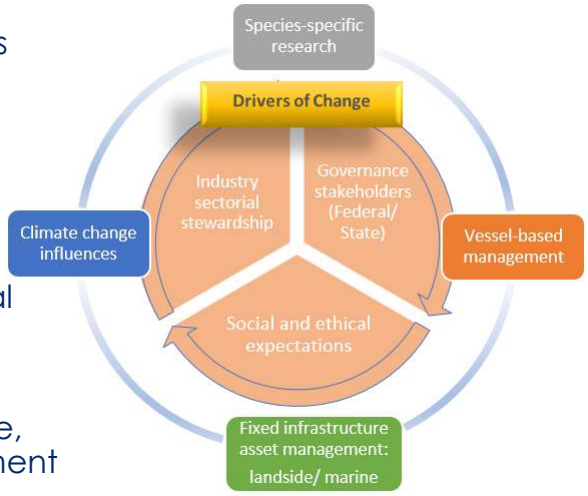
I also pay my respects to their Elders past and present.

I acknowledge their country, land and sea, their culture and their values.

2

The implications of invasive alien species for waterborne transport infrastructure

- **Develop** practical guidance – IAS risks
  - Business
  - Liability
  - Health and safety
- **Audience** - port managers, harbour masters, engineers and environmental scientists
- **Complements**, but does not duplicate, work focused on vessel risk management



5 countries – academic & industry organisations

3

What are marine IAS?

- Non-native plants and animals - marine
- Increase prolifically on introduction
- Invasion pathways – movement of water & organisms
  - Vessel based (Ballast water & Biofouling)
  - Aquaculture trade
  - Aquarium trade

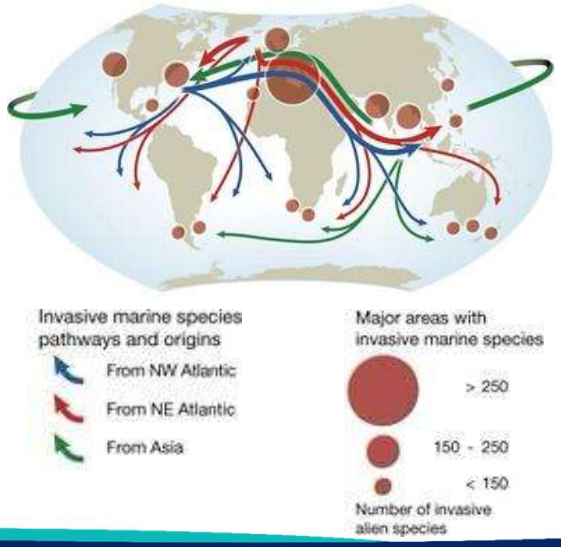


Image: https://creativecommons.org/ 4

4

5

So what?

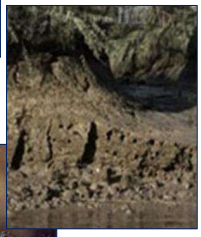
- Protecting unique values of Port environs
- Australian perspective:
  - Outstanding Universal Values of the Great Barrier Reef World Heritage Area – 12 of 16 QLD Ports are adjacent
  - $251.52 billion/yr of benefits from Australian assets vulnerable to IAS
  - Up to $13.4 billion/yr potential damage cost without biosecurity controls
- Globally – aquatic invasions costing the economy US$345 billion, with these costs principally related to asset damages (up to 70%)

Values cited from Dodd, A. et al, 2020 and Cuthbert, R et al, 2021; image: https://national-parks.org/australia/great-barrier-reef

6

Risks to Port Infrastructure

- Compromised infrastructure – blocking pipes / weighing down floating infrastructure
- Navigational safety - bank structural integrity
- Altering hydrodynamics and sedimentation rates – impacting maintenance activities such as dredging


Images: www.gollaschconsulting.de. & www.nhm.ac.uk 7

7

Operational impacts

- Fouling


Didemnum vexillum

Ficopomatus enigmaticus

- Restriction to operational activities

Marenzellaria neglecta

- Clogging

Rhopilema nomadica

8

8

Structural impacts

- Burrowing

Teredo navais

- Clogging

Pacifastacus leniusculus

- Fouling

Ficopomatus enigmaticus

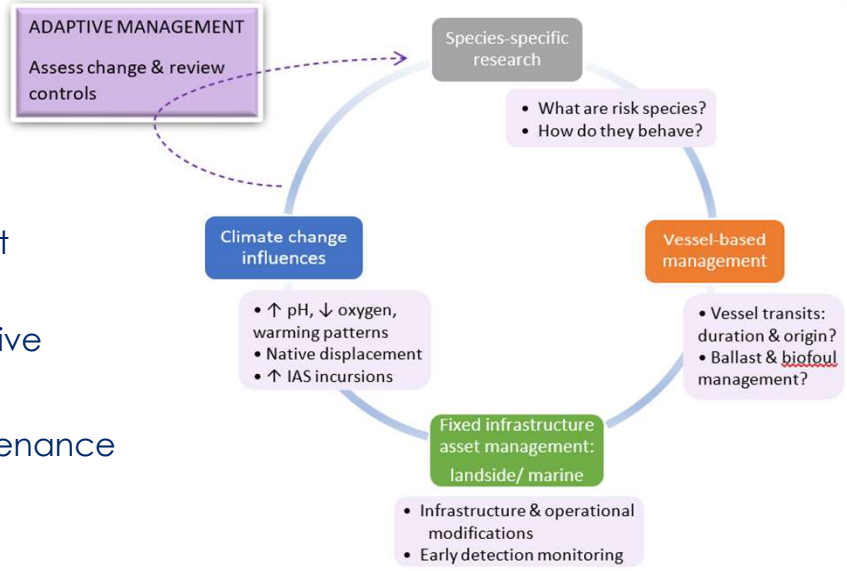
Dreissena polymorpha

Business and commercial continuity

- Statutory liability
  - Direct – non-compliance
  - Indirect – third party actions / unknown vector
- Reputational liability
  - Social licence to operate
  - Loss of trade opportunities – lower risk trade route alternatives
  - Increased financial impost for ongoing management

Biosecurity Planning

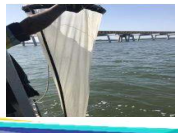
- Biosecurity Planning – risk assessment
  - Baseline Surveys
  - Pathway Assessment
  - Species Risk Profiles
- Monitoring and Adaptive Management Plan
- Operations and Maintenance plans

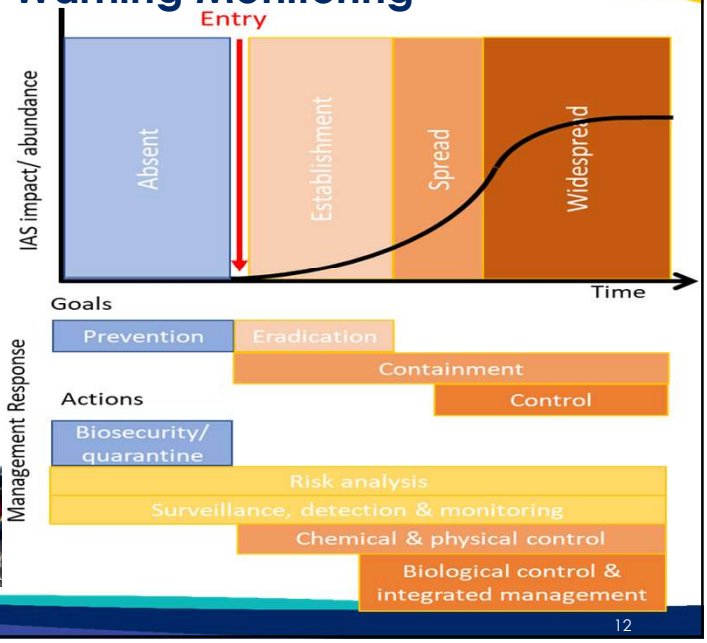


11

Proactive: Early Warning Monitoring

- Invasion Curve
- Early Warning Monitoring
  - Rudimentary – visual inspections, fouling extents
  - Modern advances – molecular approaches
  - Seasonality considerations
  - Geographic extent

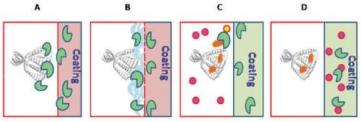



12

Prevention: Proactive control

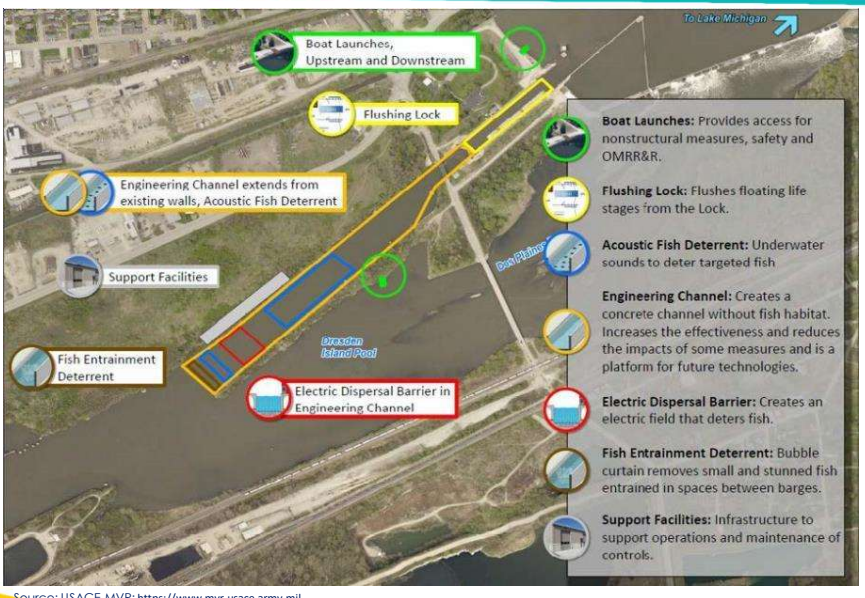
- Infrastructure Modifications & Controls
  - Physical locks & barriers
  - Deterrents – electric, acoustic/ ultrasound, bubble streams
  - Physiochem manipulation – light, water properties
  - Biofouling prevention coatings
- Feasibility analysis—location, costs, IAS risks & probabilities
- Design & Implementation – targeting establishment or spread control
- Non-target effect considerations

DOI: 10.7717/peerj.11323/fig-10



Images: Sukanya, P et al. (2018) 13

13



Source: USACE-MVR; https://www.mvr.usace.army.mil

Integrated control

- Brandon Road Interbasin Project
- Maximize IAS control
- Minimize navigation impacts
- Network of lock and dams
- Efficient design
- Adaptive management

14

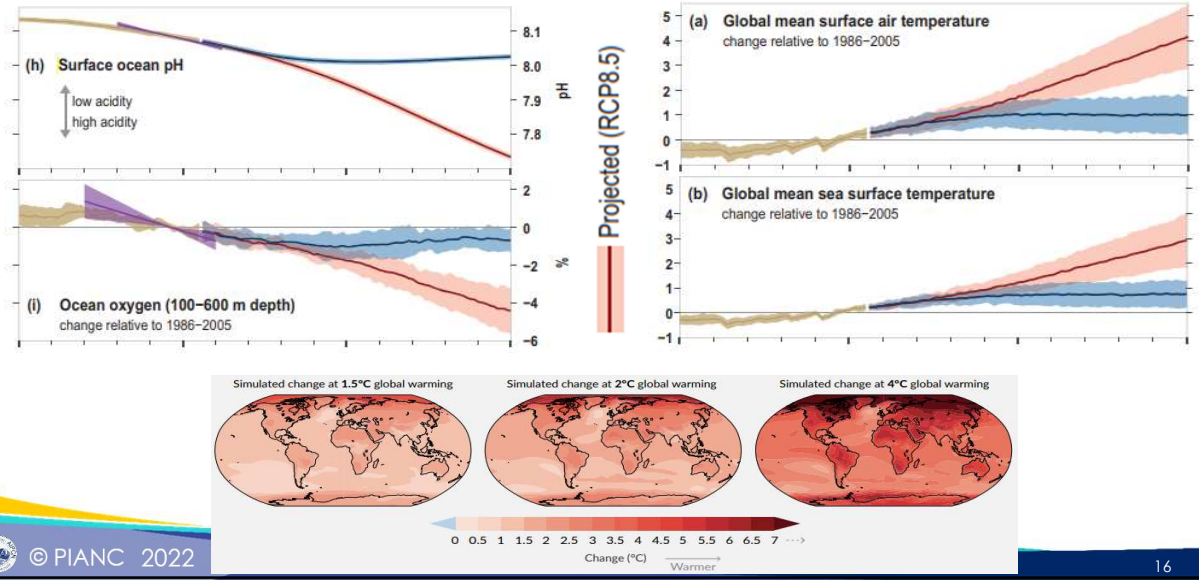
14

Challenges

- Stakeholder engagement & buy in
  - Ports operators
  - Regulators – cohesive industry/ regulatory strategy
  - Customers
  - Community
- Biosecurity management – efficacy, practicality, currency & adaptability
  - Risk profiling (species risk tables)
  - Monitoring – technological complexities & access, potential opportunities for combining general & active surveillance resources
  - Education – port-face workers, customers, community

15

Climate Change
IPCC AR6 (2021) and SROCC (2019) – RCP8.5



16

Climate Change – Challenges for IAS Management

- How does climate change facilitate spread?:
  - Increasing temp – warming patterns
  - Extreme climatic events
  - Shift in seasons
  - Opening of new pathways – Arctic shipping passages
- Resulting influence of climate change to IAS introduction/ spread:
  - Introduction of new IAS
  - Northward range expansion of IAS
  - Unknown future invaders 'sleeper species;
  - Reduced resilience of native species
  - Challenges of management

17

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18