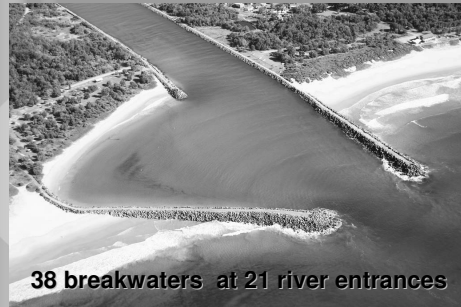


Management of NSW Breakwaters in Response to Climate Change



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Breakwater Assets ^(1/2)

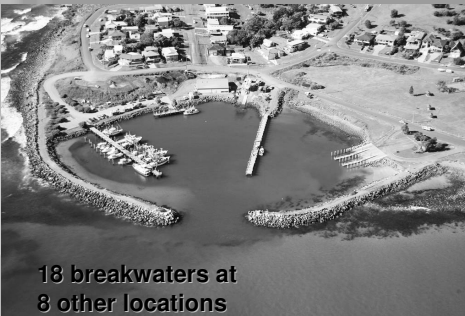


38 breakwaters at 21 river entrances



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Breakwater Assets ^(2/2)



18 breakwaters at 8 other locations



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Historical Context ^(1/2)



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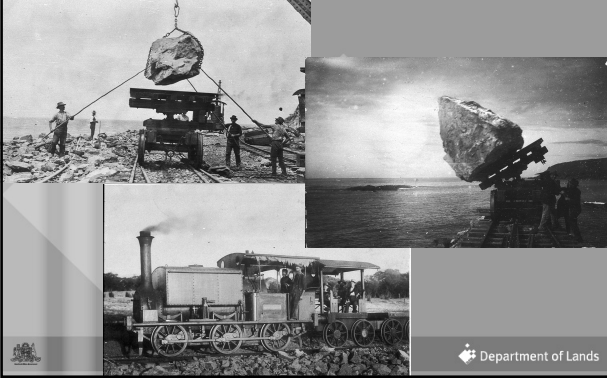
North Coast Breakwaters

Location	Length
Tweed North / South	465m / 400m
Ballina North / South	500m / 590m
Clarence North / South	1350m / 1160m
Macleay South	746m
Harrington North	1160m
Tuncurry	424m
Forster	380m



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Historical Context (2/2)



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Post 1965 Breakwaters

Location	Breakwater Length
Cudgen N/S	146m / 150m
Wooli N/S	270m / 152m
Crowdy N/S	266m / 150m
Nelson Bay	172m
Wollongong Northern	250m
Ulladulla N/S	140m / 315m
Narooma N/S	300m / 230m
Eden	330m

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Coastal Harbours

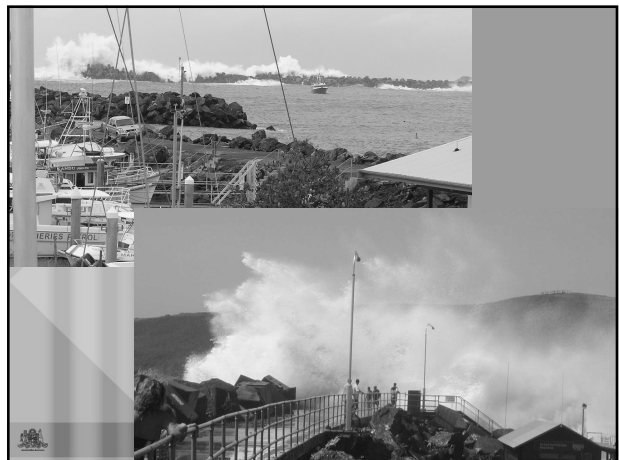


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Comparison of Actual / Design Armour

Location	Crest level	Existing Armour	Design Armour
Tweed North	6.5m	20 T	15 T
Clarence South	5.1m	25 T	85 T
Coffs East	8.5m	40 T	110 T
Ulladulla South	5.6m	15 T	58 T
Eden	6.0m	22T	63T

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Climate Change Impacts

- Low and high range scenarios for sea level rise (18 cm to 91 cm by 2100)
- Impact of increased water depth, wave height and overtopping
- Sample breakwaters
- Indicative only – simplified assumptions – no optimisation



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Climate Change – Armour Size

Location	Existing	Low Range	High Range
Tweed North	20T	17T	24T
Clarence South	25T	89T	111T
Coffs Harbour East	40T	114T	139T
Ulladulla South	15T	61T	78T
Eden	22T	66T	79T



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Climate Change – Overtopping Volumes

Location	Current	Low Range	High Range
Ballina South	0.373	0.506	1.54
Clarence North	1.470	1.830	4.21
Coffs Harbour East	0.059	0.087	0.39

(cubic metres / sec / metre)



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Climate Change – Run Up

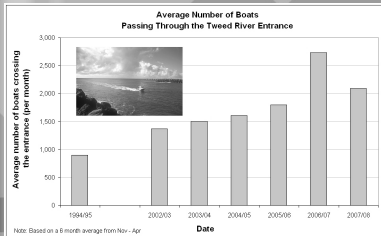
Location	Ballina South	Clarence North	Coffs Harbour East
Crest Level	5.5m	5.1m	8.5m
Low Range	7m	12.2m	11.2m
High Range	10.4m	13.9m	12.1m



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Values (1/4)

- Navigation and Shelter
 - Boats and Infrastructure
 - Changing User Needs
 - Regional economies



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Values (2/4)

- Access for Recreation and Tourism



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Values (3/4)



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Values (4/4)



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Management Options

- Retain access / structural stability – current practice
- Reduced access
- Reduced access and structural stability

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Next Steps

- Assess strategic importance
- Review values and functions
- Confirm climate change impacts
- Risk exposure and vulnerability
- Prioritise effort

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Conclusion



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