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**Maritime Transport and
the Climate Change Challenge**

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**Aspects of Potential Climate Change
Impacts on Ports & Maritime Operations
around the Southern African Coast**

Presentation by

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UNCTAD - Intergovernmental Expert Meeting on "Maritime Transport and the Climate Change Challenge"

Aspects of Potential Climate Change Impacts on Ports & Maritime Operations around the Southern African Coast

by
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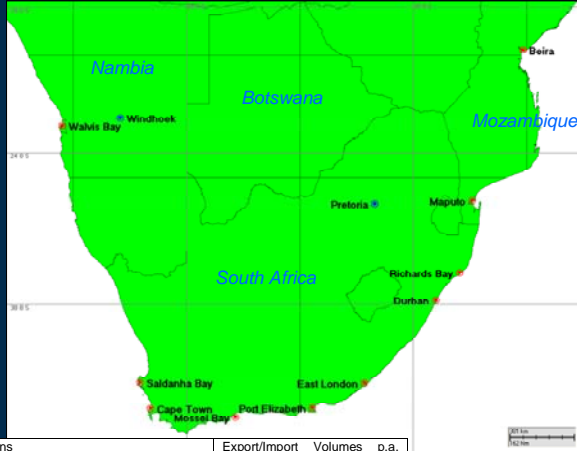
Outline of presentation

- Overview of: general shipping
weather & wave climate
- Vulnerability of Maritime activities to Weather conditions and Climate Change effects
- Climate Change: Present Studies on SA Wave Climate
- Potential Implications and Possible Adaptation Measures for SA Marine Region

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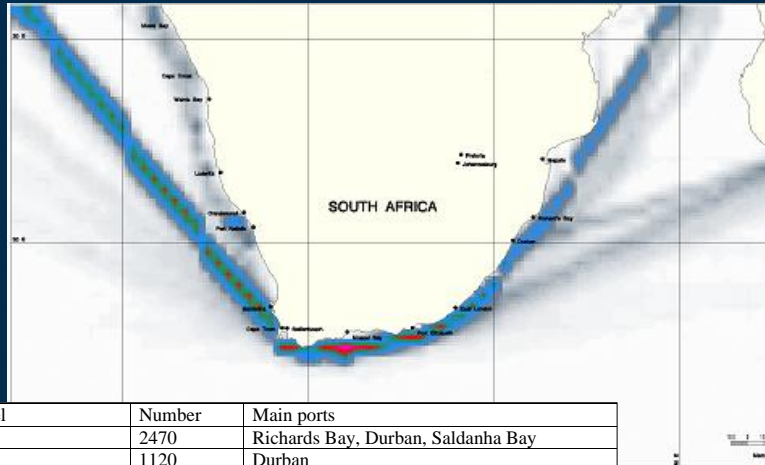
Southern African coast – major ports



| Country | Port | Main functions | Export/Import Volumes p.a. (2007) |
|--------------|----------------|--------------------------------------|-----------------------------------|
| Namibia | Walvis Bay | Containers & fishing | 3.9 Mt (0.13 MTEU) |
| | Luderitz | Fishing & zinc export | 0.5 Mt (0.01 MTEU) |
| South Africa | Saldanha Bay | Iron ore export | 43.7 Mt |
| | Cape Town | Containers, fishing & repair works | 4.1 Mt (0.76 MTEU) |
| | Mossel Bay | Fishing & export of oil products | 1.8 Mt |
| | Port Elizabeth | Containers, cars & fishing | 5.5 Mt (0.42 MTEU) |
| | East London | Cars & containers | 1.8 Mt (0.04 MTEU) |
| | Durban | Containers & cars, oil import & food | 41.9 Mt (2.48 MTEU) |
| | Richards Bay | Coal export | 84.5 Mt |
| Mozambique | Maputo | Coal, containers & sugar | 6.3 Mt (0.10 MTEU) |
| | Beira | Containers, oil import & fishing | N/A |

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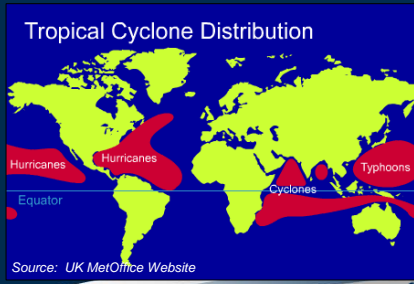
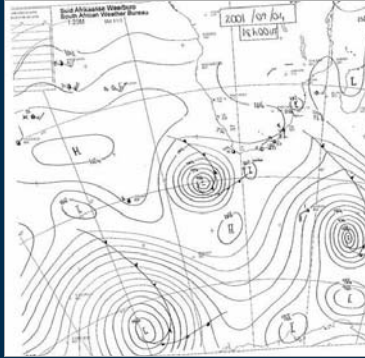
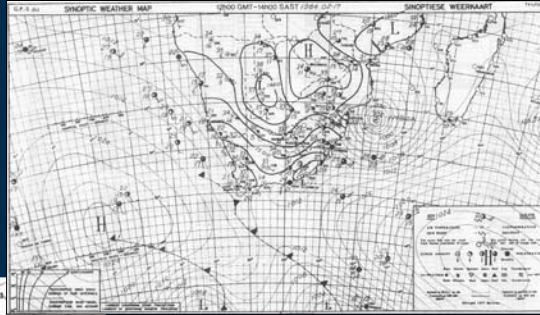
Shipping routes around SA coast (based on VOS observations)



| Type of vessel | Number | Main ports |
|---------------------|--------|-------------------------------------|
| Bulk carriers | 2470 | Richards Bay, Durban, Saldanha Bay |
| Oil tankers | 1120 | Durban |
| General cargo ships | 1350 | Durban |
| Container carriers | 3396 | Durban, Cape Town, Port Elizabeth |
| Car carriers | 616 | Durban, Port Elizabeth, East-London |
| Fishing trawlers | 2985 | Mossel Bay, Cape Town |

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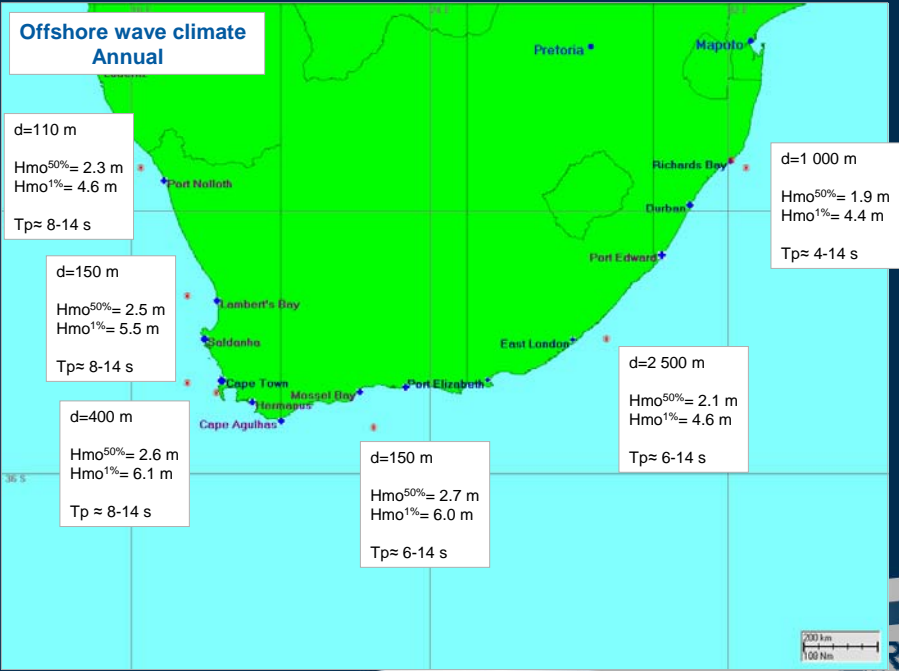
General SA Weather and Wave Climate



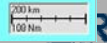
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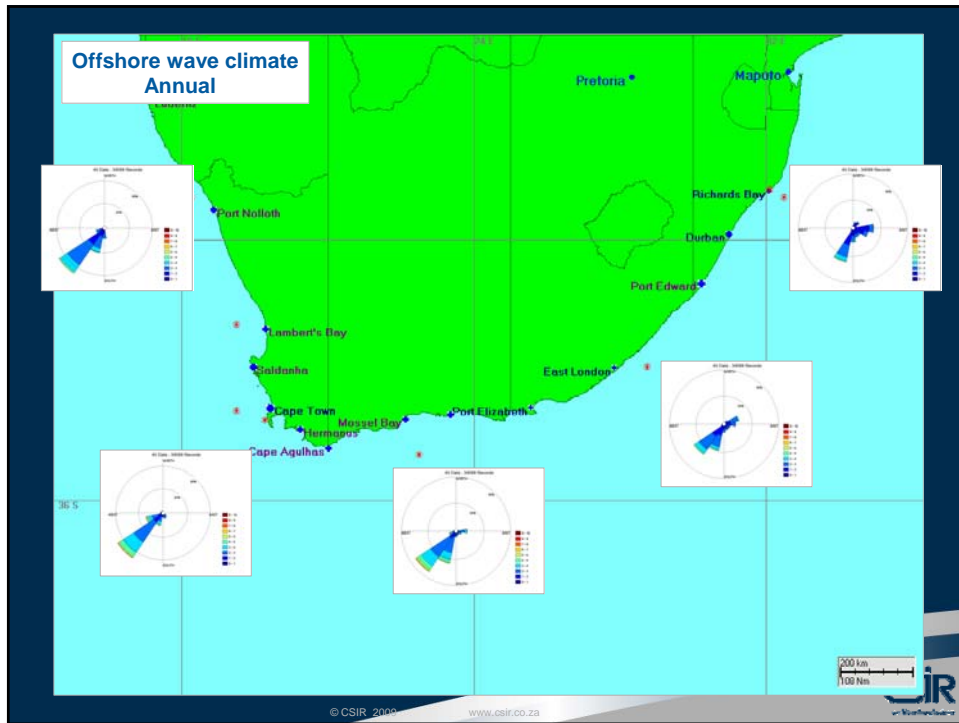


Offshore wave climate Annual



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Vulnerability of Maritime activities to Weather conditions and Climate Change effects

(i) Shipping around the SA coast

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Statistics on casualties to ships for the period 2003/2004 (SAMSA)

| Type of vessel | Fire | Capsize | Grounding | Collision | Vessel sank | Equipment failure | Total |
|----------------------|----------|-----------|-----------|-----------|-------------|-------------------|-----------|
| Small vessels | 1 | 10 | 1 | 6 | 4 | 1 | 23 |
| SOUTH AFRICAN | | | | | | | |
| Passenger | | | | | | | |
| Mining | 1 | | 1 | | | | 2 |
| Harbour Craft | | | 1 | 1 | | | 2 |
| Fishing | 4 | | 1 | 3 | 1 | 6 | 15 |
| FOREIGN | | | | | | | |
| Cargo | 3 | | 1 | 12 | | | 16 |
| TOTAL | 9 | 10 | 5 | 22 | 6 | 7 | 59 |

SAMSA: South African Maritime Safety Authority

Approximate value of SA maritime industry: € 50 milliard

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Agulhas current-wave interaction

M/T Atlas Pride in Table Bay - 25 September 1991
photo courtesy Leon van der Westhuizen/
Marine PhotoBank

- Will impact of current-wave interaction increase or decrease due to CC effects ?

(ii) Port operations



*Walvis Bay:
breaching of protective sand-spit*

*Increased risk due SLR and
increasing storminess*



*Saldanha Bay: excessive ship-motion
impacting on mooring-lines due to long-
waves – likely to increase due to CC & SLR*

(iii) Ports and infrastructure



waves breaking over the railway line
- North End - Port Elizabeth
1-9-08

photo courtesy
Ivor Markman

*Gordons Bay: significant overtopping
of breakwater*

Algoa Bay: shore-protection / revetments

- Need to quantify how much worse it will get due to CC





Dredging operations at Port of Durban

(iv) Impact on coastlines adjacent to ports

KwaZulu-Natal coast:
Impact of March 2007 storm



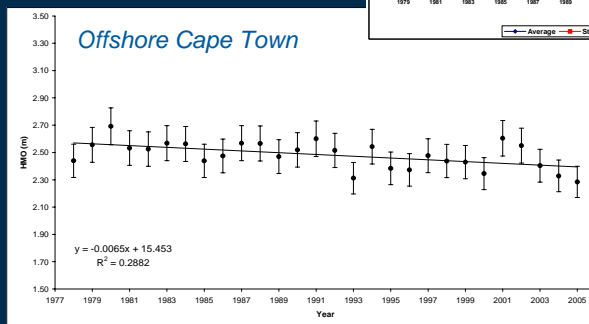
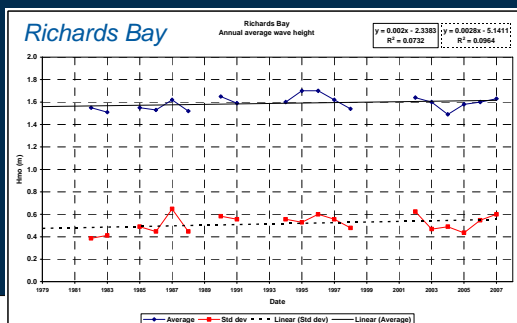
- Quantify CC effects on Sediment budgets and harbour dredging/bypassing rates

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Climate Change: Present Studies on SA Wave Climate

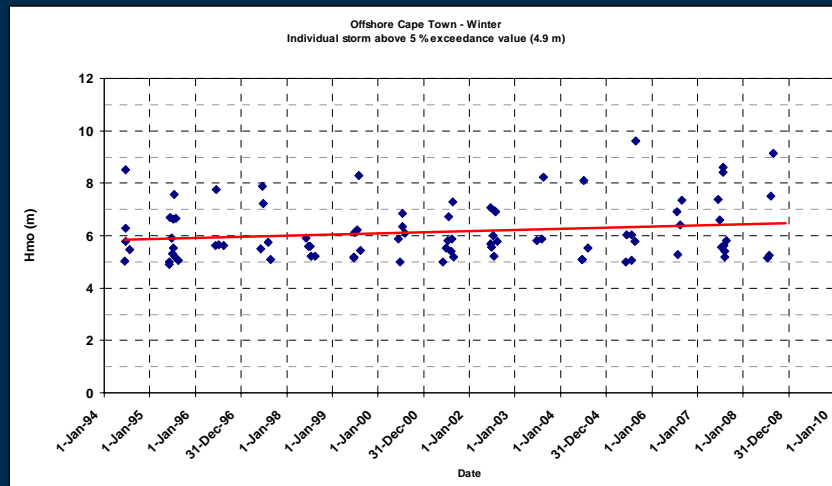


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Climate Change: Present Studies on SA Wave Climate



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Climate Change: Present Studies on SA Wave Climate

Aspects to be addressed:

- (i) evaluating similar trends around the entire coastline,
- (ii) consider not just the trends in magnitude/intensity but also in frequency of events,
- (iii) consider the persistence of these events, i.e. are the duration of storm events increasing or decreasing,
- (iv) review the occurrence of cyclones along the East coast,
- (v) review the trends in energy flux and not just the wave height
- (vi) Quantify future run-up levels & overtopping rates

The evaluation of these aspects need to be combined with the present estimates of the sea level rise, which will lead to a better understanding of the potential risks

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Potential Implications and Possible Adaptation Measures for SA Marine Region

(based on UNCTAD – Table 3, 2008)

| Climate change factor | Potential implications | Adaptation measure |
|--|---|--|
| Rising sea levels <ul style="list-style-type: none"> • Flooding and inundation • Erosion of coastal areas | <ul style="list-style-type: none"> • Challenge to service reliability and increased dredging, reduced safety and sailing conditions • Changes in water levels in harbours | <ul style="list-style-type: none"> • Revise quay and wharf levels including infrastructure, e.g. buildings |
| Extreme weather conditions <ul style="list-style-type: none"> • Tropical cyclones • Storms • Floods • Increased/decreased precipitation • Wind | <ul style="list-style-type: none"> • Increased damage to ships as a result of wave-current interaction | <ul style="list-style-type: none"> • Raising of existing breakwater-structure to counter additional overtopping • Increase monitoring of the state of infrastructure Conditions – e.g. CSIR breakwater monitoring programmes • Strengthen foundations, raising dock and wharf levels – redevelopment programmes • Redesigning new ports • Revising dredging maintenance programmes • Amended beach nourishment programmes • Revision of pilot-transfer operations • Revision in ship mooring operations and equipment in ports • Alterations to ports to compensate for additional wave action (swell induced or long period waves) |

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Conclusions

- Climate Change expected to impact SA coast and maritime operations
- To mitigate these detrimental impacts, research is and should increasingly be directed at an improved understanding of what is happening to our coastline and what is likely to happen as climate change intensifies.
- Locally applicable methods have to be developed urgently to quantify realistically the impacts of climate change.
- To mitigate these impacts, we have to understand the adaptation options available to southern African society, which is considerably different from first world approaches, and still largely undefined.
- Quantitative information remains largely unavailable and the resulting somewhat speculative discussions and predictions presented here are uncertain.



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