

Ad Hoc Expert Meeting on

**Climate Change Impacts and
Adaptation: A Challenge for
Global Ports**

29 – 30 September 2011

**South African Coasts and Ports:
What Will Climate Change Bring?**

Presentation by

Mr. Andrew A. Mather
Project Executive: Coastal Policy
eThekweni Municipality, Durban, South Africa

South African Coasts and Ports: What will Climate Change bring?



Andrew A. Mather
(eThekweni Municipality)
and
Dorian Bilse
(Transnet National Ports Authority)



Presentation Outline

- The South African Port system
- Climate change impacts
- Impacts on SA Ports
- Current work to address these risks



Durban - COP 17 host city

The South African Port and Rail System

An Integrated System of Complementary Regional Ports and Rail Corridors

Port- Rail Corridor
Port Interconnect
Cross-border Interconnect
High volume Feeder
Network operational flexibility

Saldanha Bay

Cape Town

WESTERN PORTS

Mossel Bay

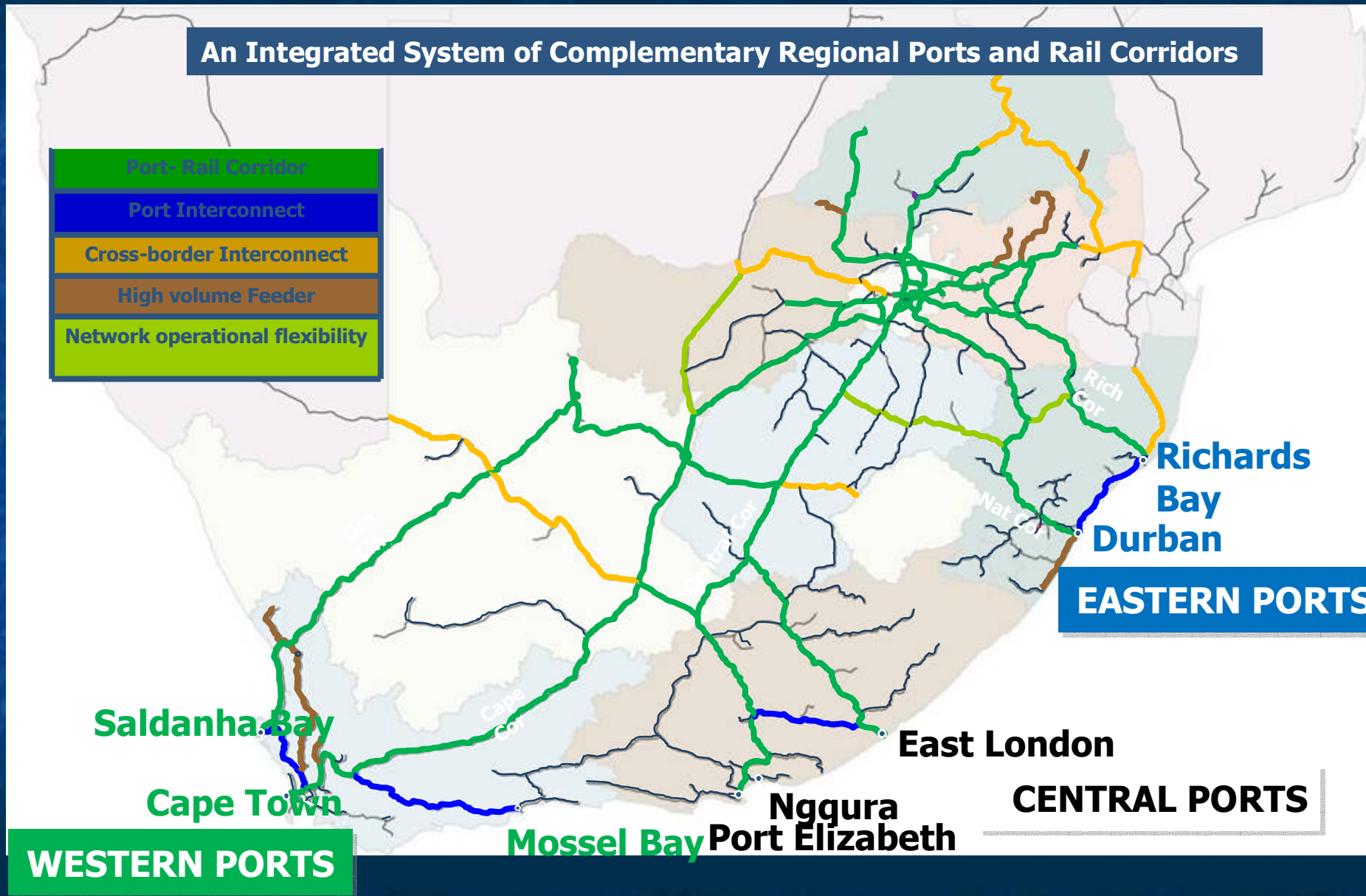
Nggura
Port Elizabeth

East London

CENTRAL PORTS

Richards Bay
Durban

EASTERN PORTS



The South African ports



Climate Change impacts

- Sea Level Rise
- Wind and Wave events
- Rainfall



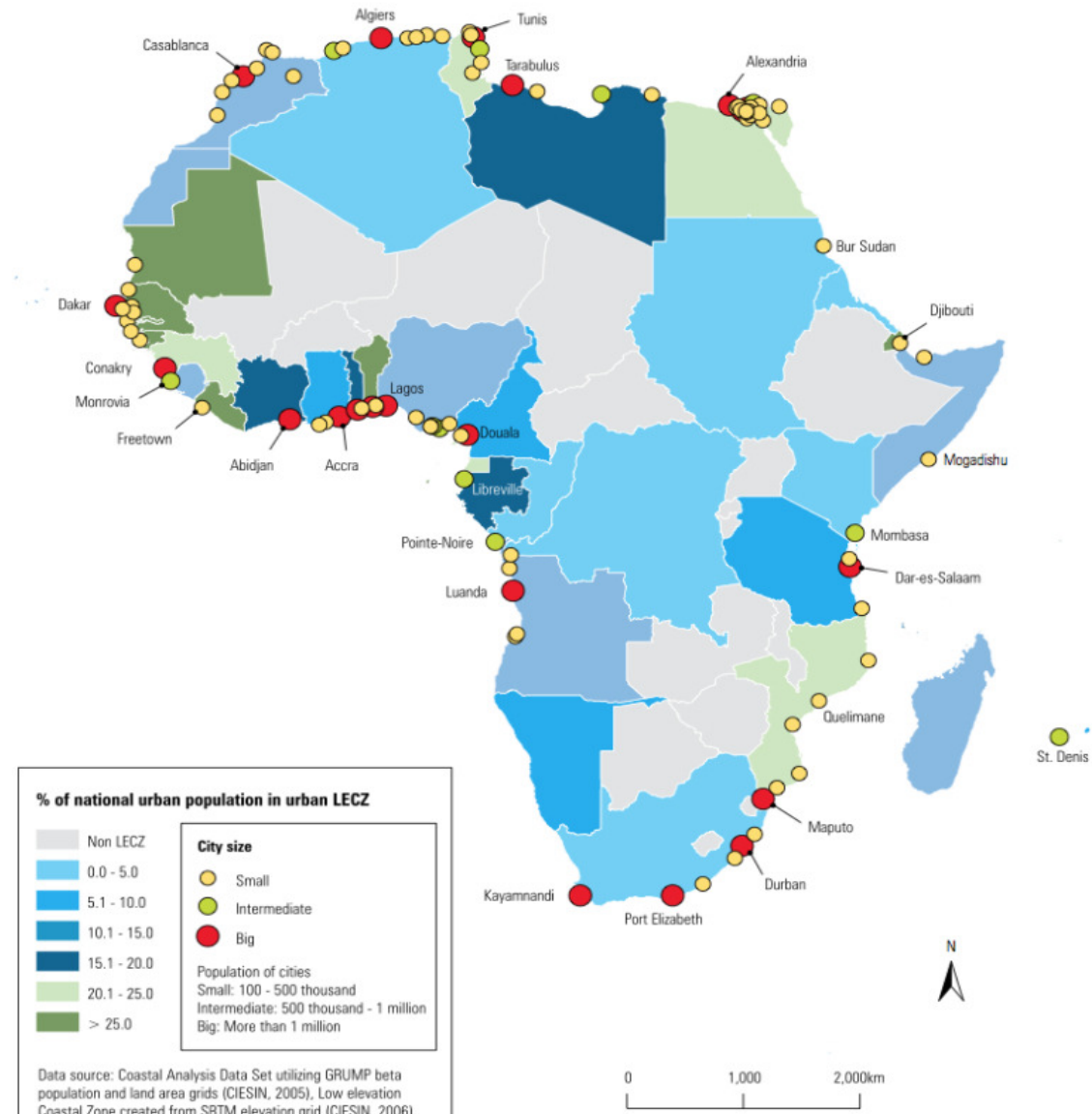
Sea Level Rise

- Sea levels are rising around SA¹
 - West coast ~ 1.8 mm/yr
 - Southern coast ~ 1.5 mm/yr
 - Eastern coast ~ 2.7 mm/yr
- Sea levels are accelerating in the region²
 - Simon's Town $+0.0219$ mm/yr² (51 years)
 - Port Louis $+0.0140$ mm/yr² (68 years)

1. Mather *et al.* 2009. Southern African sea levels: corrections, influences and trends, AJMS, 31(2), 145-156.

2. Mather 2011. Sea level rise for the Southern and Eastern coast of Africa (in review)

AFRICAN CITIES AT RISK DUE TO SEA-LEVEL RISE



Data source: Coastal Analysis Data Set utilizing GRUMP beta population and land area grids (CIESIN, 2005), Low elevation Coastal Zone created from SRTM elevation grid (CIESIN, 2006). GRUMP (Global Rural - Urban Mapping Project) is a project of the Center for International Earth Science Information Network (CIESIN) at the Earth Institute, Columbia University.

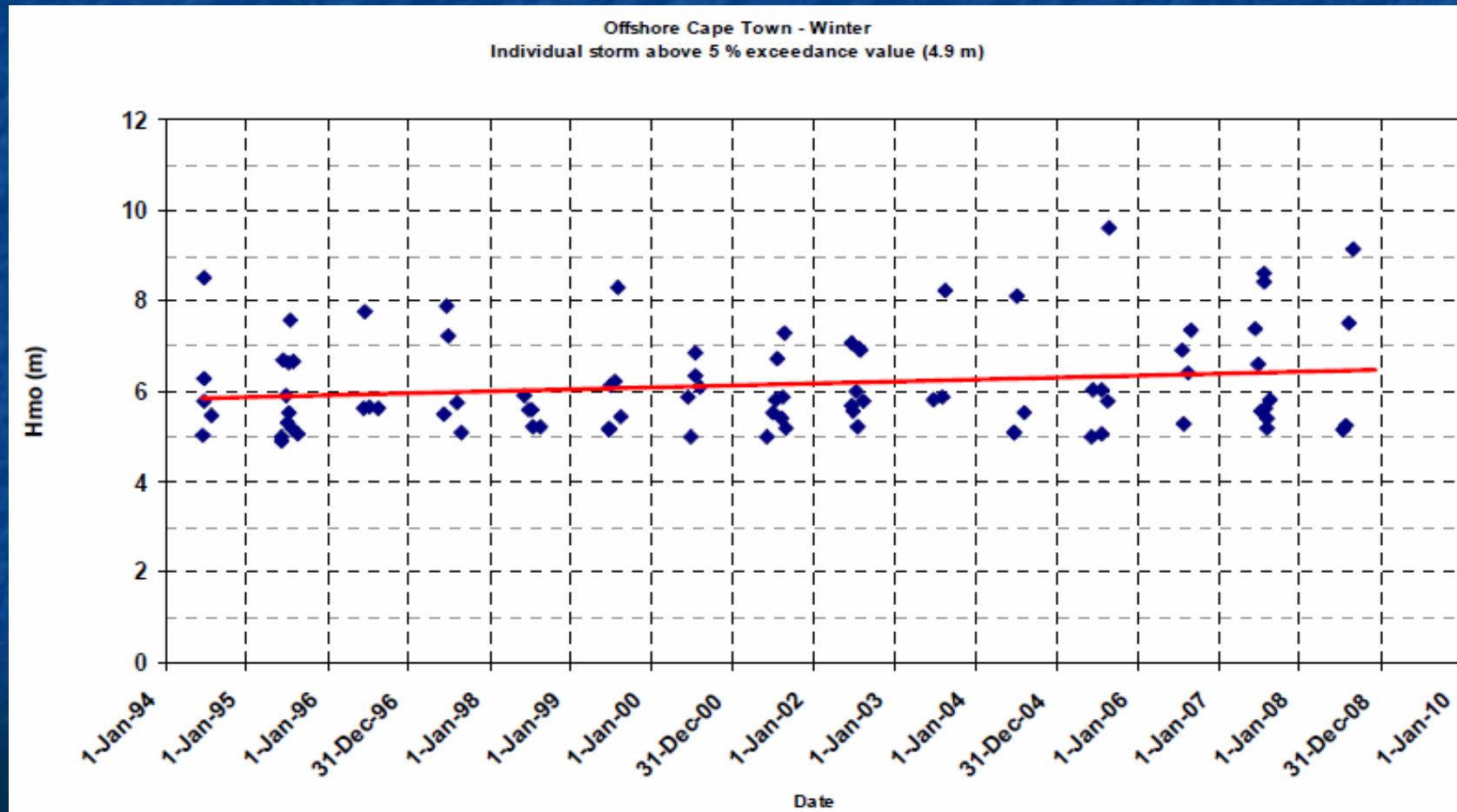
LECZ: Low Elevation Coastal Zones are land areas that are contiguous with the coast and ten metres or less in elevation.

All grids 1km resolution.

Source: UN-HABITAT Global Urban Observatory 2008

Wave events

- Wave heights off Cape Town
 - increasing especially in winter from Southern oceans



Wave events

- Predominate wave direction
 - Summer and winter swell directions are changing at Durban
- Wave period
 - Increased long wave at PE and Ngqura causing operational disruptions

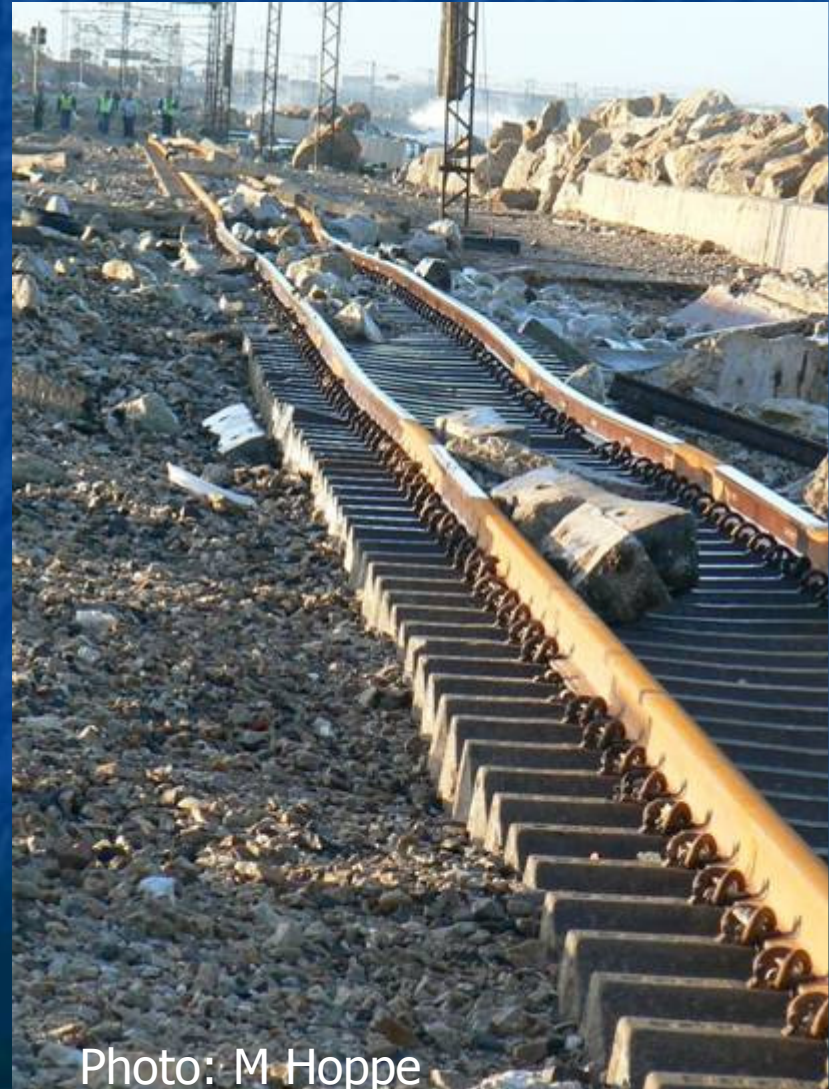
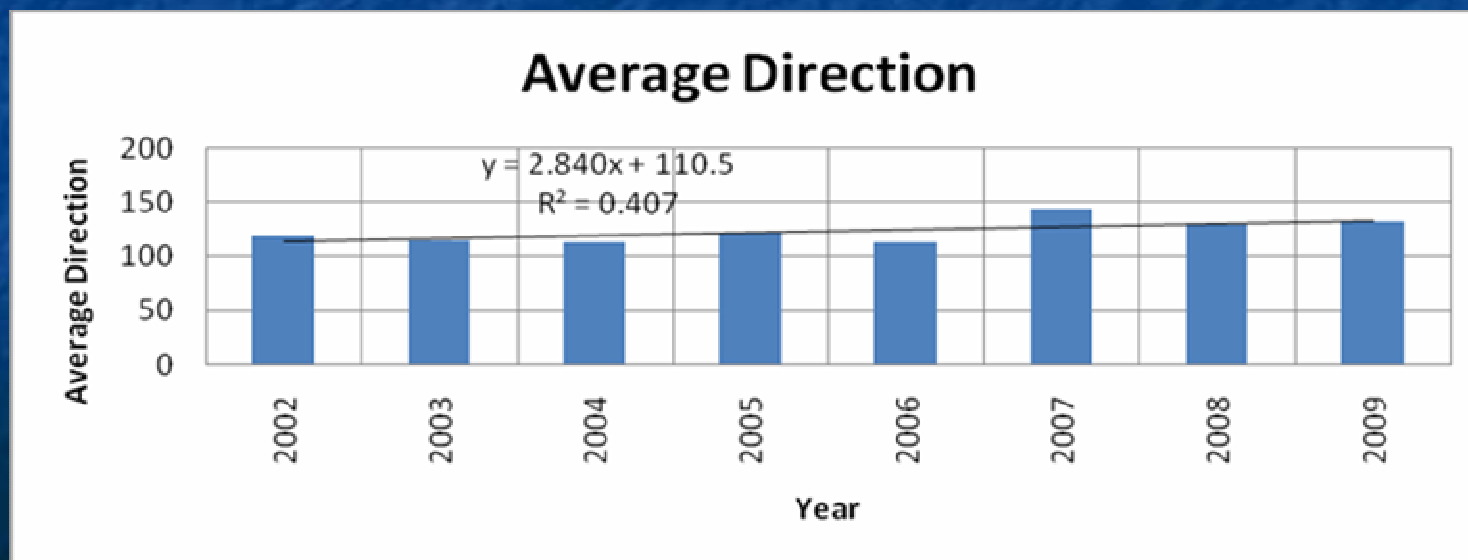
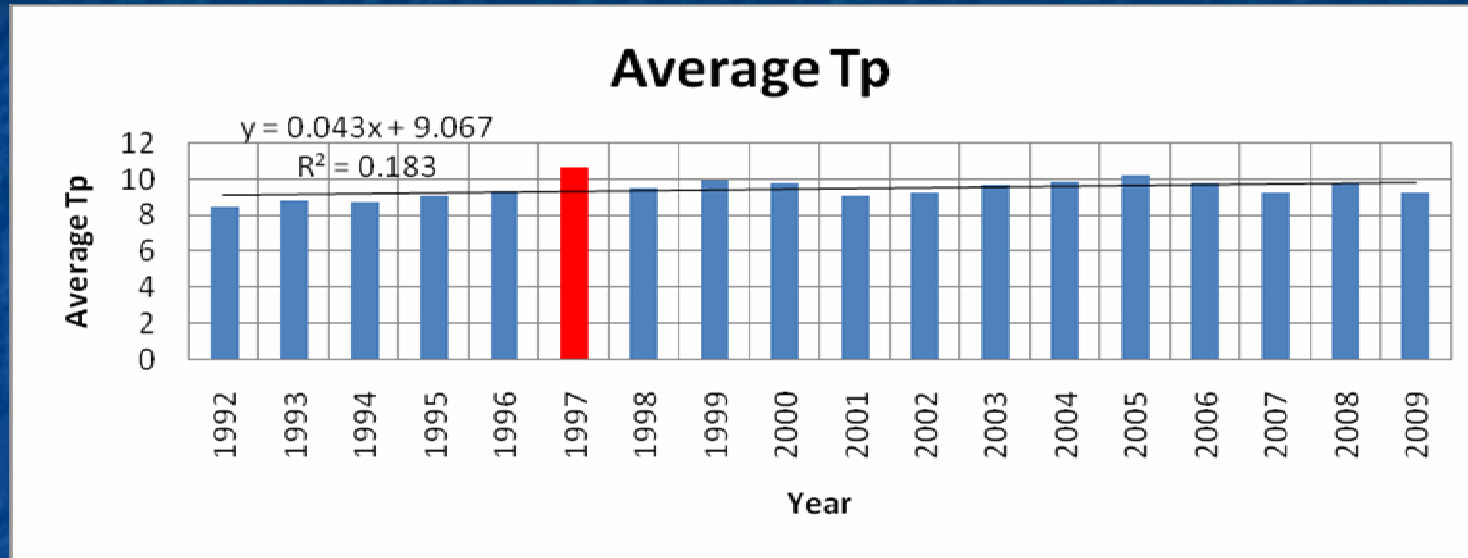


Photo: M Hoppe

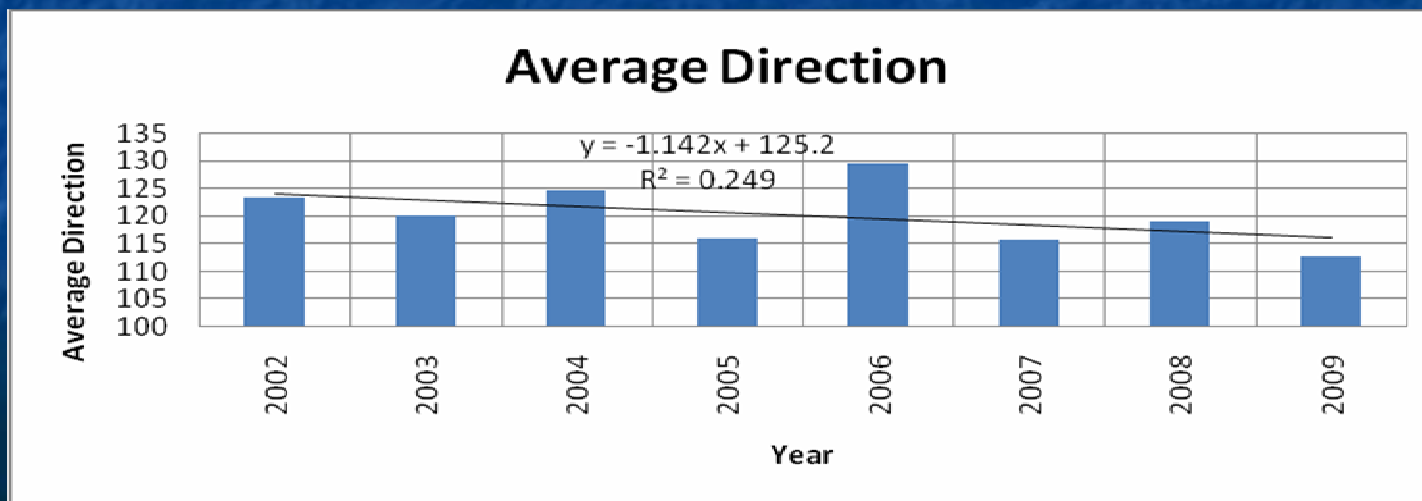
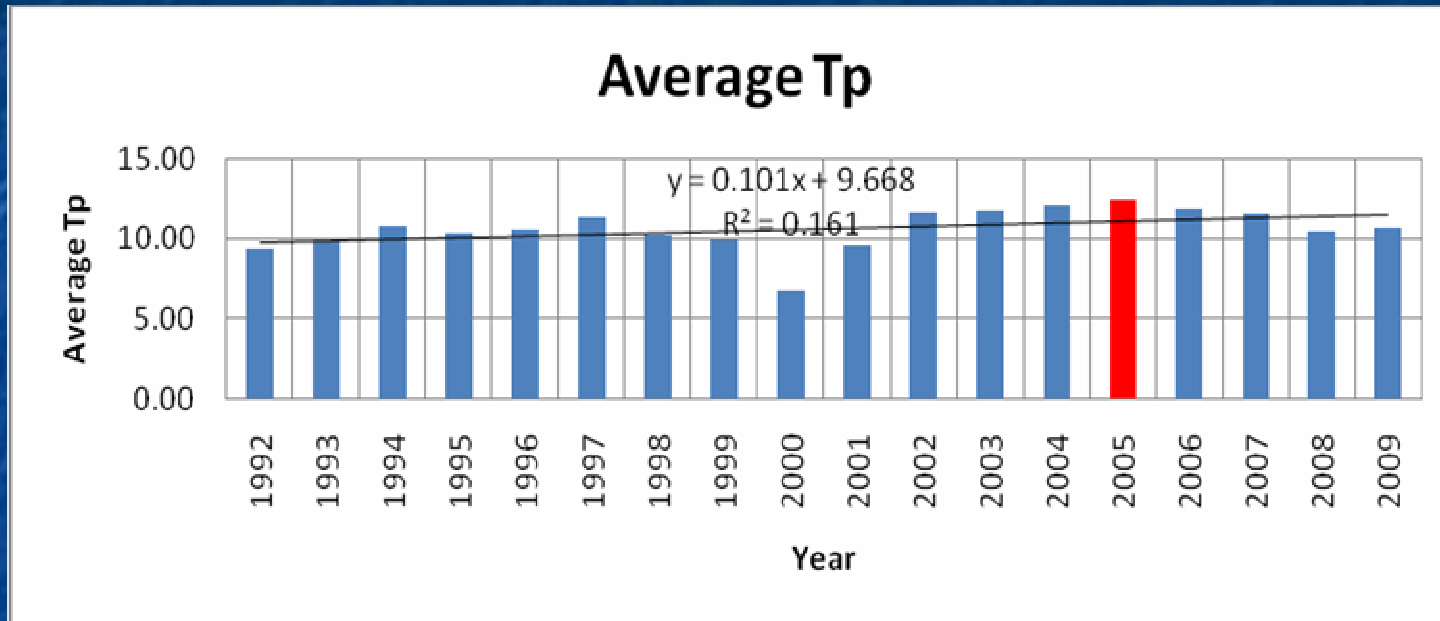
Durban summer swell

(Corbella 2010)



Durban winter swell

Corbella (2010)



Wind

- The met-climatologists think the Western Cape may get drier - probably with more South Easterlies as the ridging High remains for longer period off the S/SW coast
- Loading/offloading in the Port of Cape Town is already affected by the increased frequency of the South Easterly wind.

Rainfall

- Scientist advise that there is no statistical significant change in rainfall patterns currently attributable to Climate change but....
- The Western region is predicted to get dryer
- The Eastern region is predicted to get wetter with more intense storms

Impacts for Ports

- Sedimentation in ports
 - Increased high intensity rainfall will increase silt loads into eastern ports
- Sedimentation of entrance channels
 - Change in predominate wave direction will impact sediment transport rates.

Navigation aspects

- Increased wind & wave energy, together with a change in wave direction, may result in increased delays for navigation of vessels into ports



Phoenix July 2011
Photo: A Mather

SLR

- Not expected to be significant
- Berths have freeboard of 3 to 5 m
- However SLR combined with increased wave heights/energy is expected to impact on entrance channel works

More frequent wave events

- Little impact to port infrastructure
- Marine structure construction works at greatest risk but this risk is relatively low
- Possible impact to shipping movement in and out of entrance channel
- Increased long wave penetration into ports will cause increased ship movements on berths with reduction in ship handling rates

Rainfall

Example of Saldanha ore dust control. Water resources on the West Coast are scarce and it has become necessary to provide a reverse osmosis plant to provide water for dust suppression for iron ore handling.



Rainfall

Almost all ports are in estuaries and with more intense rainfall in the Eastern region, there will be increased siltation of the Port of Durban.



Changes in agricultural products

- Although there is little scientific evidence, there is a possibility that as a result of changed rainfall patterns, agricultural production may change. This could impact the logistics with reversal of imports and exports.

Matrix of factors and likely impacts

Factor	Entrance channel navigation	Berths Utilisation	Shipping movement	Shipping Operations	Commodities
SLR	Low	Low	Low	Low	Low
Rainfall	Low	Low	Low	Medium	High
Sedimentation	High	High	Medium	High	Low
Wave direction	High	High	Low	High	Low
Wave heights/energy (long wave)	Medium	High	Low	Medium	Low

Current work to address these risks

- Risk assessment of the SA ports
- Design standards for new ports being reviewed

Thank you

