Ad Hoc Expert Meeting on

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

29 – 30 September 2011

# Climate Change Threats to Ports and Other Transport Facilities: An Overview

Presentation by

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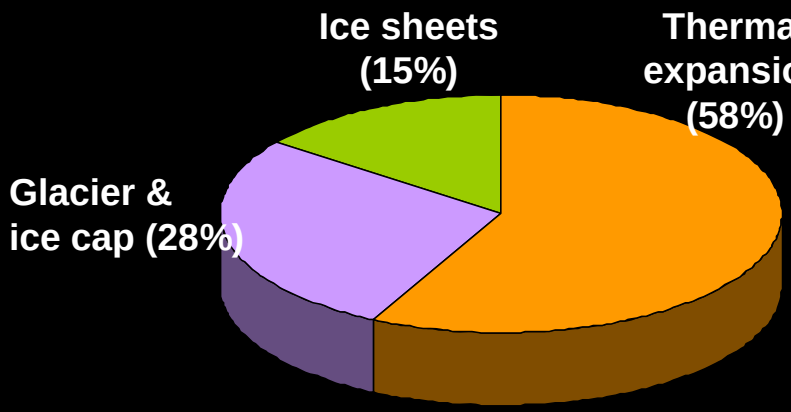
# "Climate change threats to ports and other transport facilities: an overview"

**UNCTAD Ad Hoc Expert Meeting**
**Geneva, 29 September 2011**

Pascal Peduzzi
UNEP/GRID-Europe

# Driver 1: sea level rise




| | 1961 - 2003 | 1993 - 2003 |
|---|---|---|
| Observed rate of sea level rise [mm/year] | 1.8 ± 0.5 | 3.1 ± 0.7 |

Sources: IPCC, AR4, Climate Change 2007: Working Group I: The Physical Science Basis.

**By 2100: 0.22 m to 0.5 m (some experts says up to 1 m!)**

## Impacts on transport through:

- **Coastal erosion (retreat)**
- **Coastal flooding**

# Glaciers



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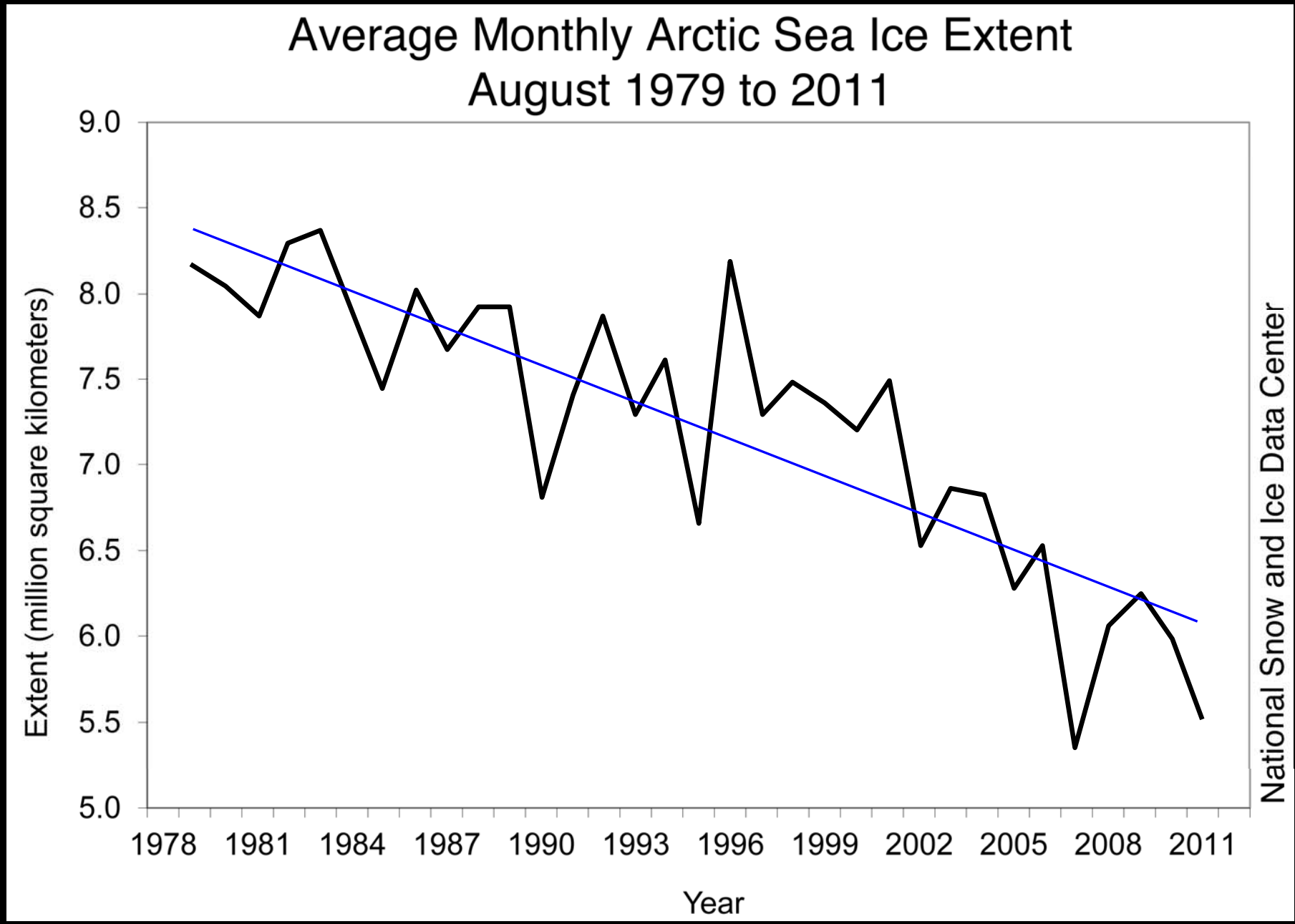
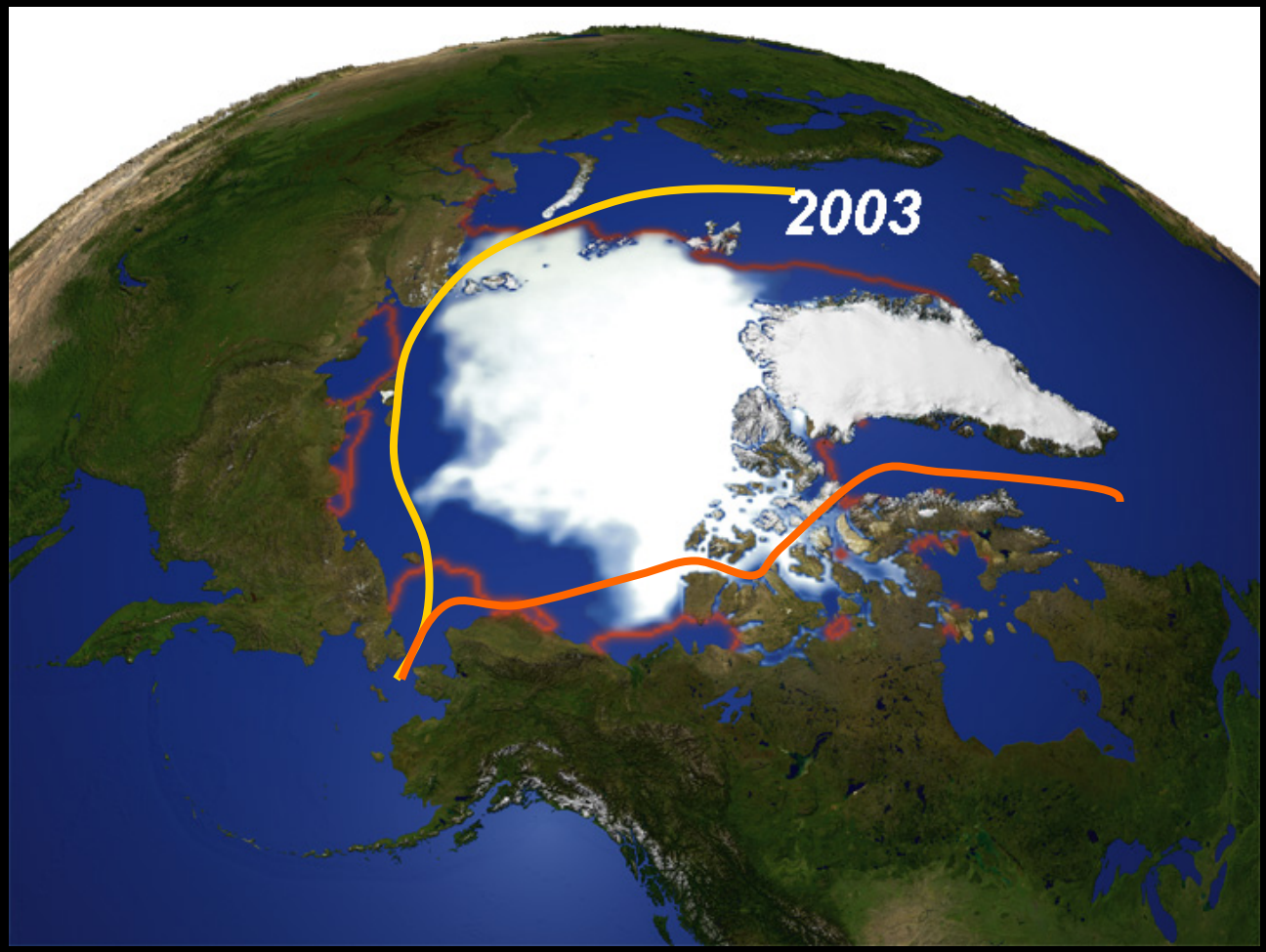

Average Monthly Arctic Sea Ice Extent
August 1979 to 2011
Extent (million square kilometers)
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
1978
1981
1984
1987
1990
1993
1996
1999
2002
2005
2008
2011
Year
National Snow and Ice Data Center

# Arctic ice retreat: new shipping road(s)




1979-2003: Progressive loss of ice in arctic ocean

Sources: UNEP (2005) *One planet Many People*





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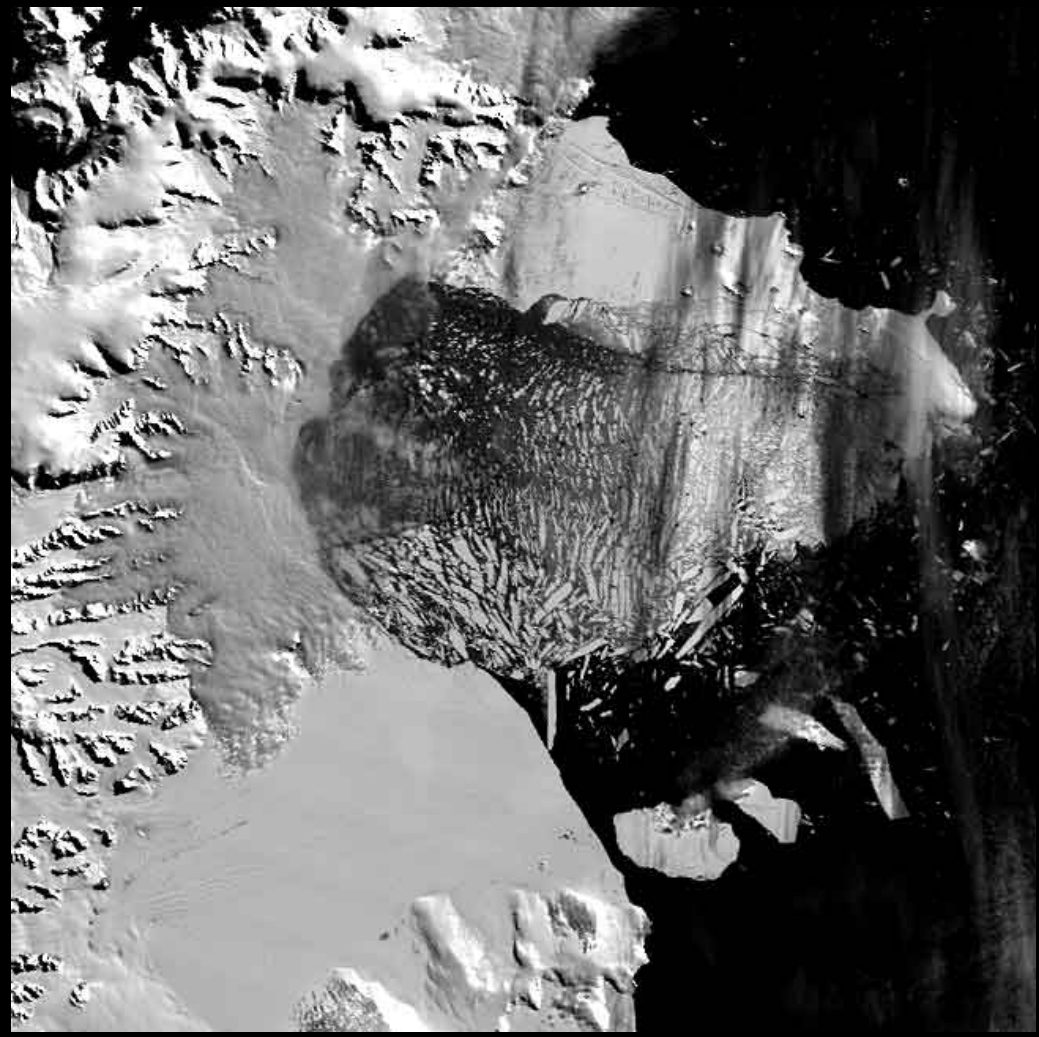
# Remember the Titanic?

Climate warming will also induce a multiplication of iceberg formation







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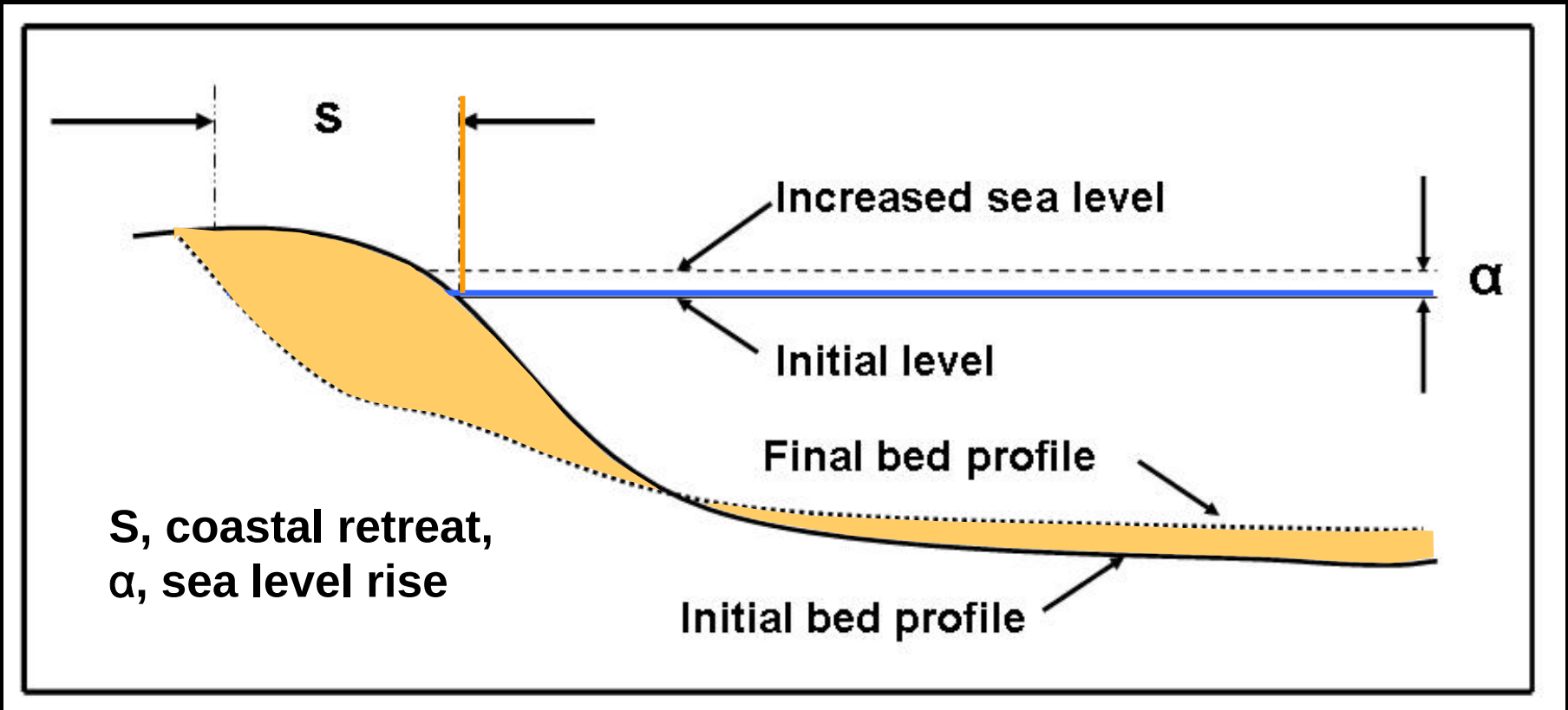
# Driver 1: Sea level rise (ASLR), process




**Beach erosion (defined as irreversible coastline retreat) due to increased sea level**

# Driver 2: extreme events

| Phenomenon and direction of trend | Likelihood that trend occurred in late 20th century (typically post 1960) | Likelihood of a human contribution to observed trend | Likelihood of future trends based on projections for 21st century using SRES scenarios |
|---|---|---|---|
| Warmer and fewer cold days and nights over most land areas | Very likely | Likely | Virtually certain |
| Warmer and more frequent hot days and nights over most land areas | Very likely | Likely (nights) | Virtually certain |
| Warm spells/heat waves. Frequency increases over most land areas | Likely | More likely than not | Very likely |
| Heavy precipitation events. Frequency (or proportion of total rainfall from heavy falls)increases over most areas | Likely | More likely than not | Very likely |
| Area affected by droughts increases | Likely in many regions since 1970s | More likely than not | Likely |
| Intense tropical cyclone activity increases | Likely in some regions since 1970 | More likely than not | Likely |

Sources: IPCC, AR4, Climate Change 2007: Working Group I: The Physical Science Basis.





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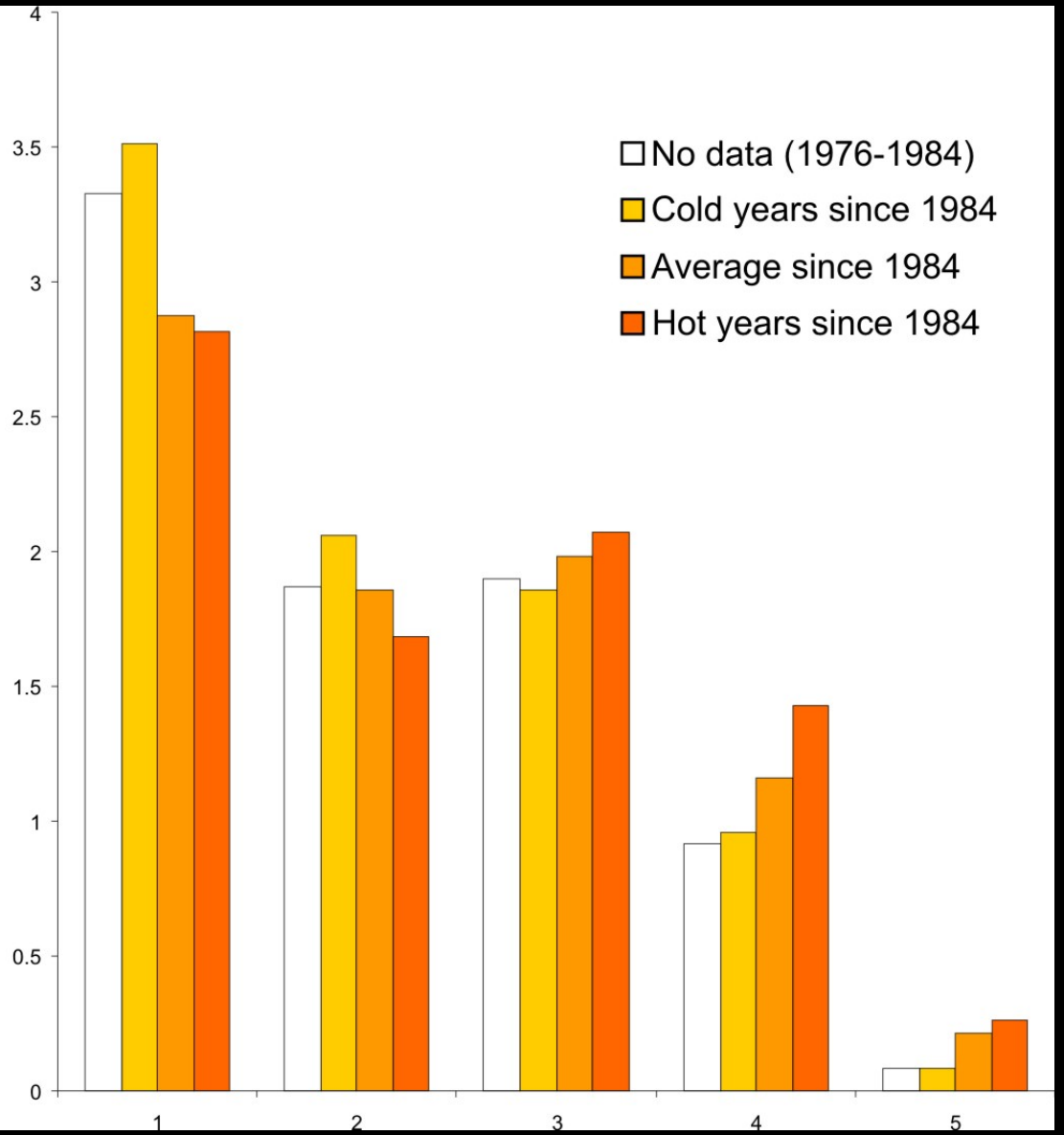
# Sea surface temperatures and cyclones maximum intensity

**Annual average tropical cyclone occurrence 1977-1984 and 1985- 2006**





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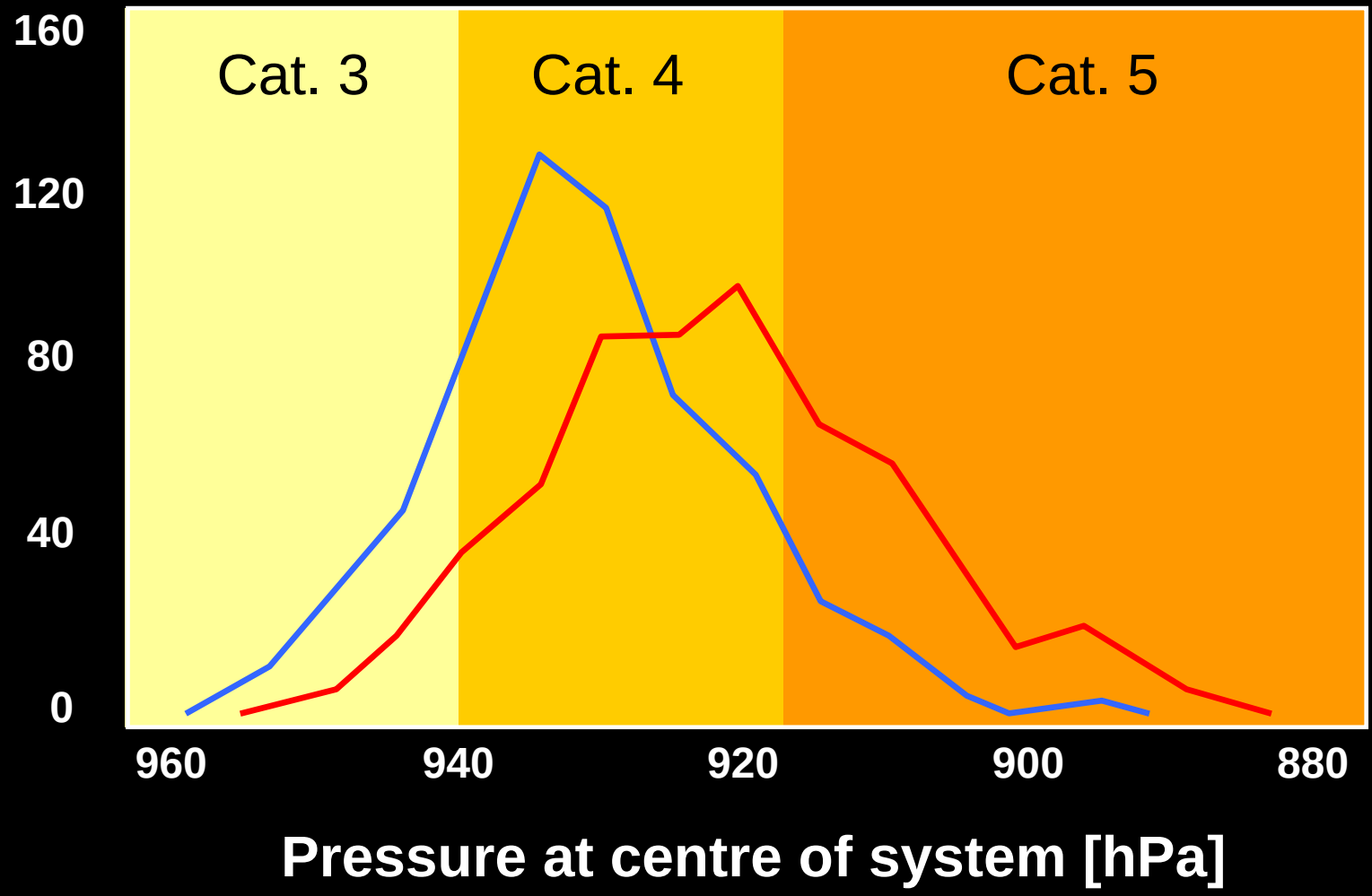
# Tropical Storms




Source(s): K. Emmanuel, Science 2006.

# Main transport at threat: harbours



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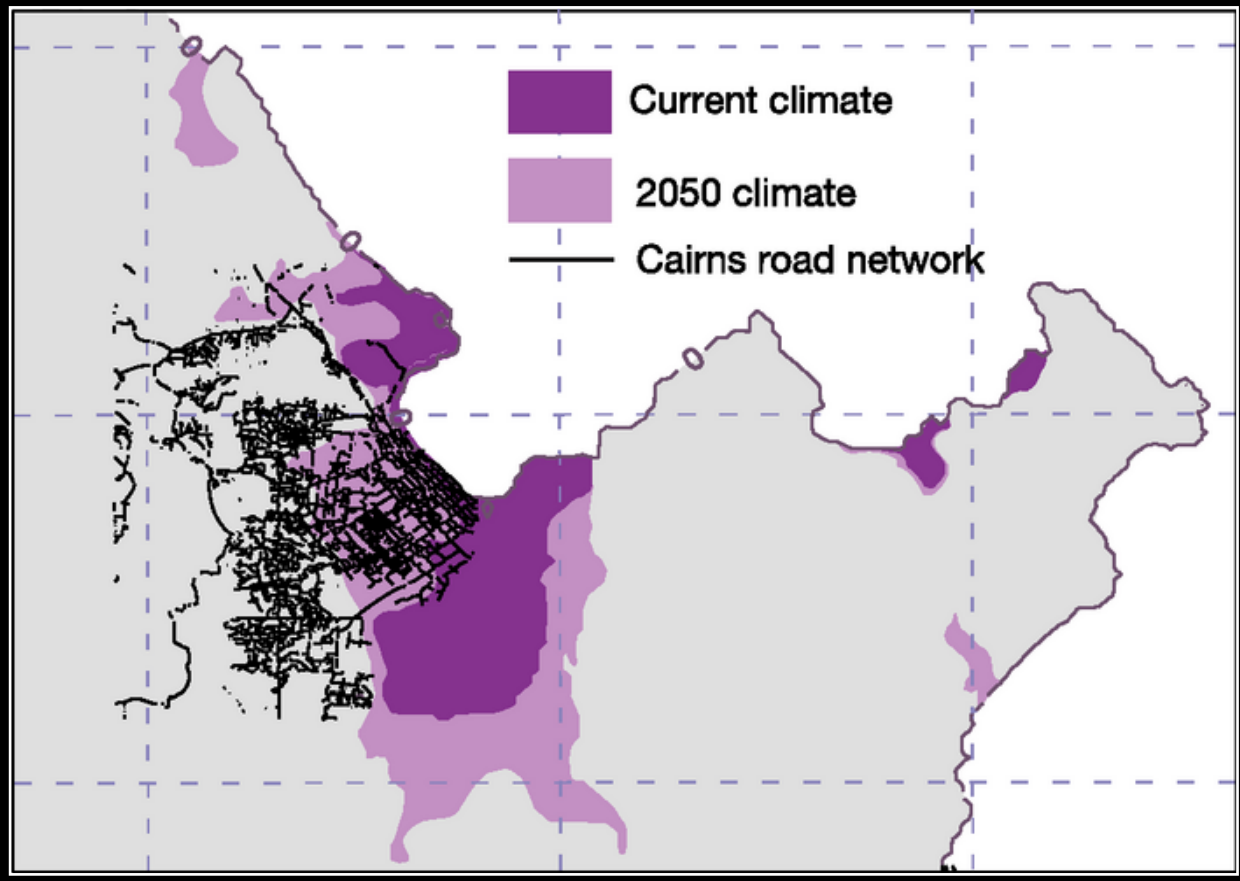


Figure 6.5. Flooding around Cairns, Australia during the >100 year return-period event under current and 2050 climate conditions based on a 2xCO2 scenario. The road network is shown in black (based on McInnes et al., 2003).

# Sea level rise impacts on harbors


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# Drought & boat transport





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# Panama canal


- In 2009, nearly 300 million tons of shipping. Yearly shipping may increase to 340 million tons in 2012.




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- **Every lock going downward requests more than 100,000 m3 of water to operate.**
- **Water management is a critical issue, both floods and droughts need to be controled.**





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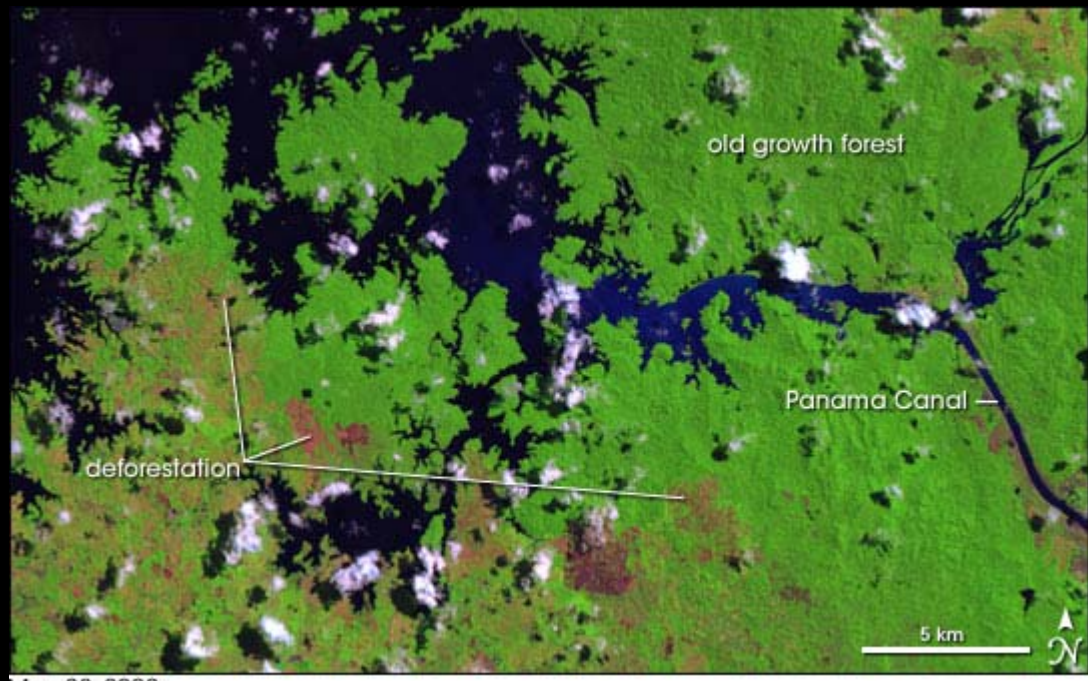
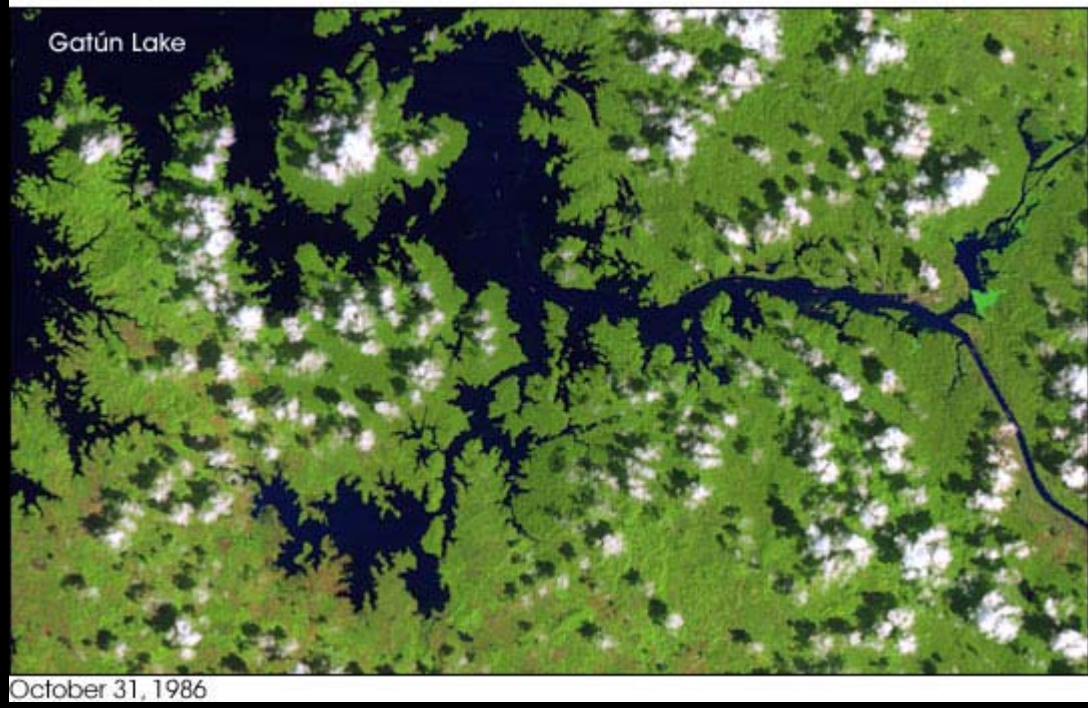
Deforestation might induce local change in precipitation patterns





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# Increasing coastal exposure : Dakar (Senegal)




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# Sea level rise & airports: Honk Kong (China)

# Sea level rise & airports: Kingston (Jamaica)

# Sea level rise & coastal erosion: roads





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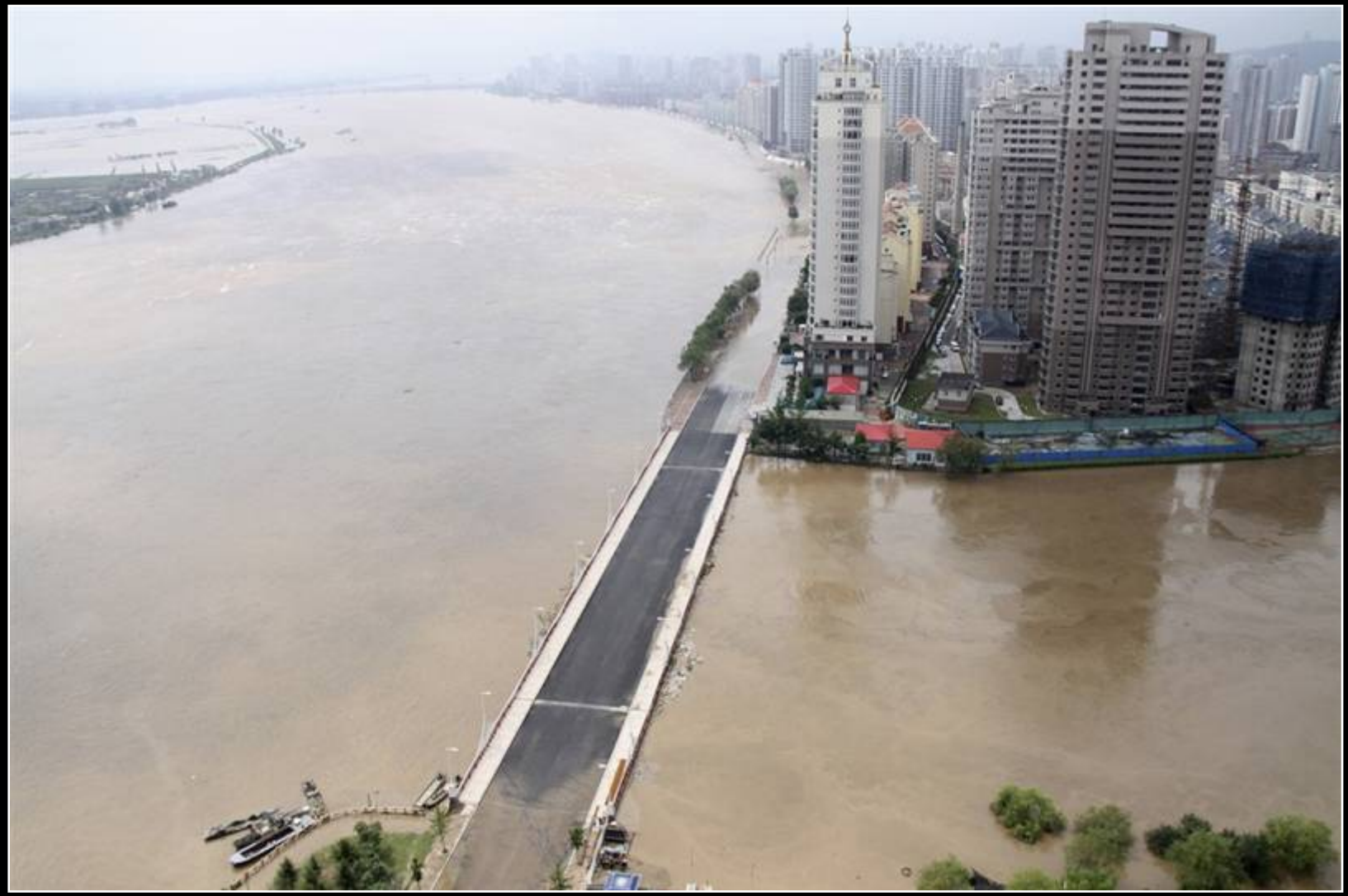
# Coastal flooding: impacts on roads







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# Landslides in mountainuous areas





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# Heatwaves, destabilisation of north slopes in high altitude areas: rock fall & impacts on roads





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# Melting permafrost in mountainuous areas & high latitudes: impacts on roads

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# Melting permafrost in mountainuous areas & high latitudes: impacts on pipelines





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# Extreme precipitations in mountainuous areas: impacts on roads and rails (Peru)






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# Heat & train: rail dilatation

Badly designed railways can suffer from extreme temperatures





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# Heat & train: rail dilatation in Canada





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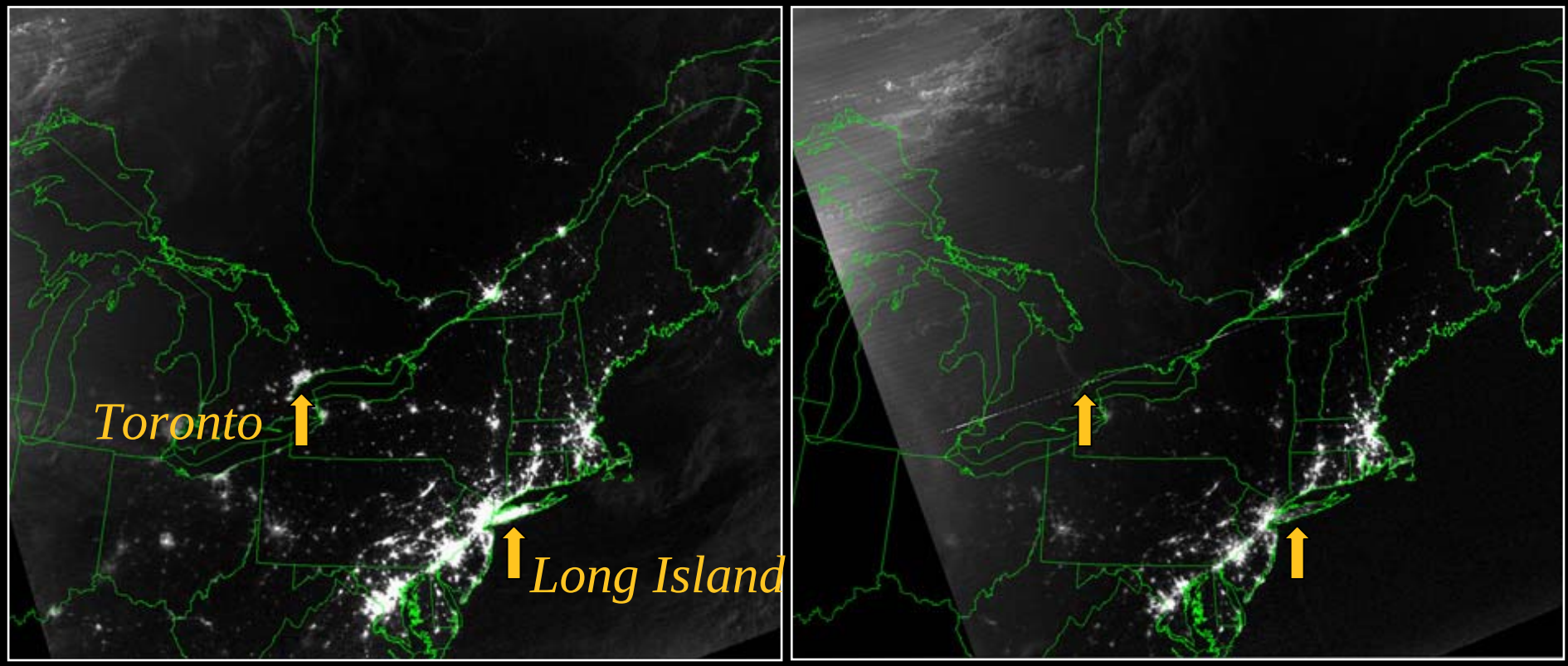
Sources: transportation safety board of Canada: http://www.tsb.gc.ca

# Heat & electricity: high demand for air. Con. Led to blackout blocking trains and subways




14 August 2003, part of north-east USA and South-east Canada had a major blackout: 65 millions people affected.

# Drought & electricity production: nuclear power Plant in France (some shut down during 2003 heatwave)

The nuclear power plants of Saint-Alban (Isère), Golfech (Tarn-et-Garonne), Cruas (Ardèche), Nogent-sur-Seine (Aube), Tricastin (Drôme) and Bugey (Ain) continued functioning, although the upper legal limits were exceeded.

Santa Maria de Garona (Spain) was shut down in summer 2006) due to lack of cooling water.





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# Drought & electricity production



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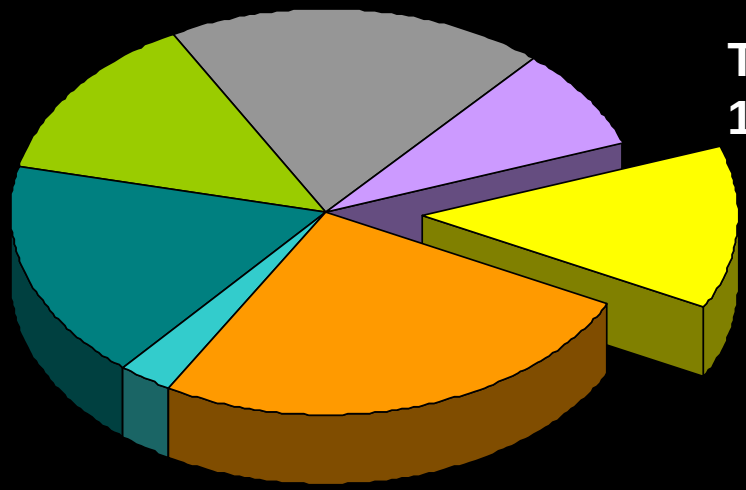
# Transport is not only a victim from climate change

## GHG Emissions by sectors




- Agriculture
- Forestry, deforestation
- Waste
- Energy supply
- Transport
- Residential
- Industry

Sources: IPCC, AR4, Climate Change 2007: Working Group I: The Physical Science Basis.

# Conclusions

- Transport activities will be affected by climate change.
- Main drivers are sea level rise and extreme events.
- Coastal, mountainous and high latitude areas will face the highest consequences.
- But:…transport is partly responsible for climate change.

# Conclusions

**Due to :**

- Climate change impacts on transport
- Impact of transport on climate
- The energy crisis
- Current waste in transport practices

A shift in transport policies is needed !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