

Ad Hoc Expert Meeting on

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

29 – 30 September 2011

**Climate Risk and Ports**

Presentation by

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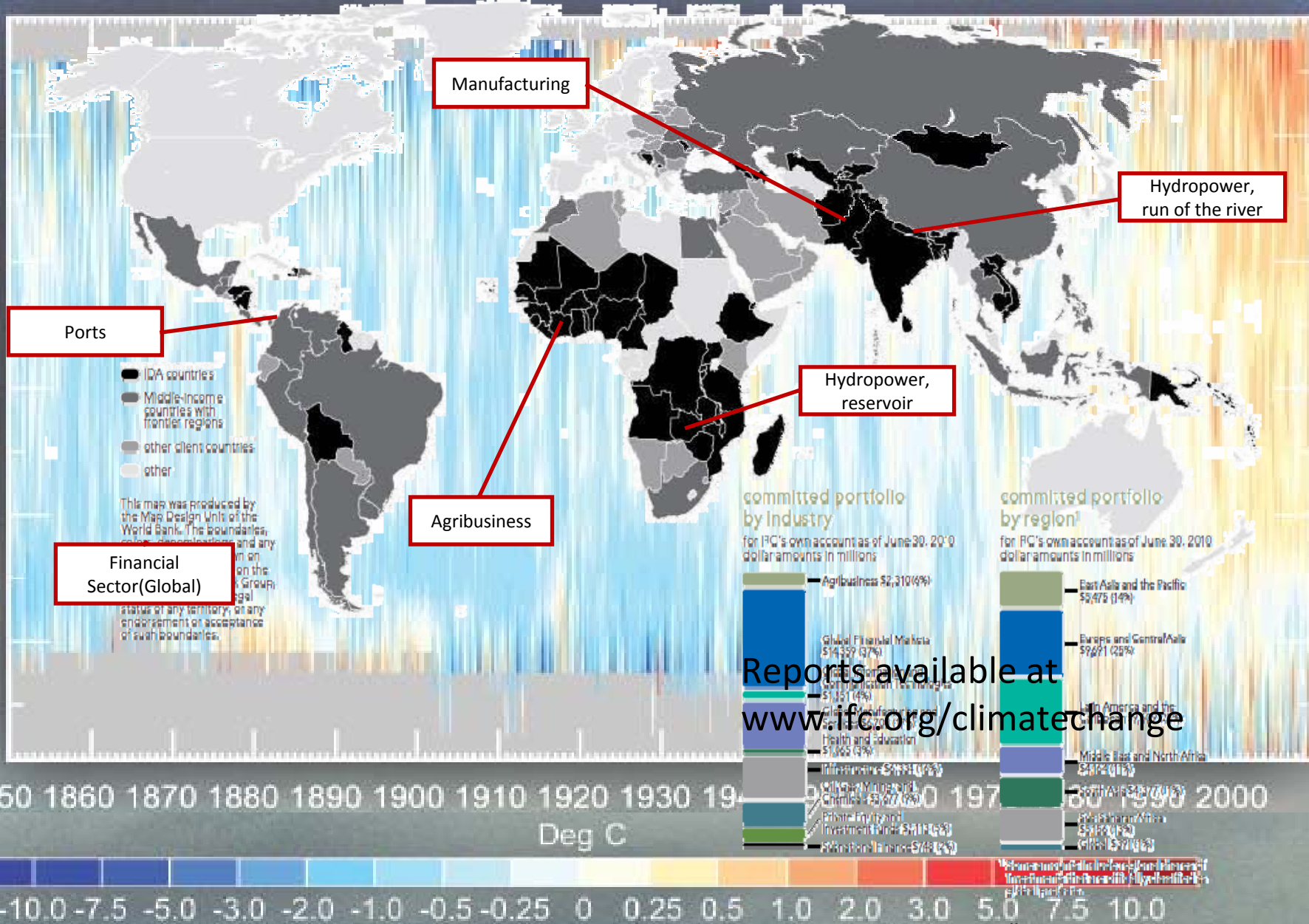


# Climate Risk and Ports

Ad Hoc Expert Meeting, UNCTAD

Geneva, September 29, 2011

# International Finance Corporation



Reports available at [www.ifc.org/climatechange](http://www.ifc.org/climatechange)

# Climate risk and investments

## Financial and Credit

Market conditions

Project costs

Asset depreciation

Efficiency and performance

Outputs

Loss contingencies

Country risk

## Operational

## Strategic and developmental

## Environmental and Social

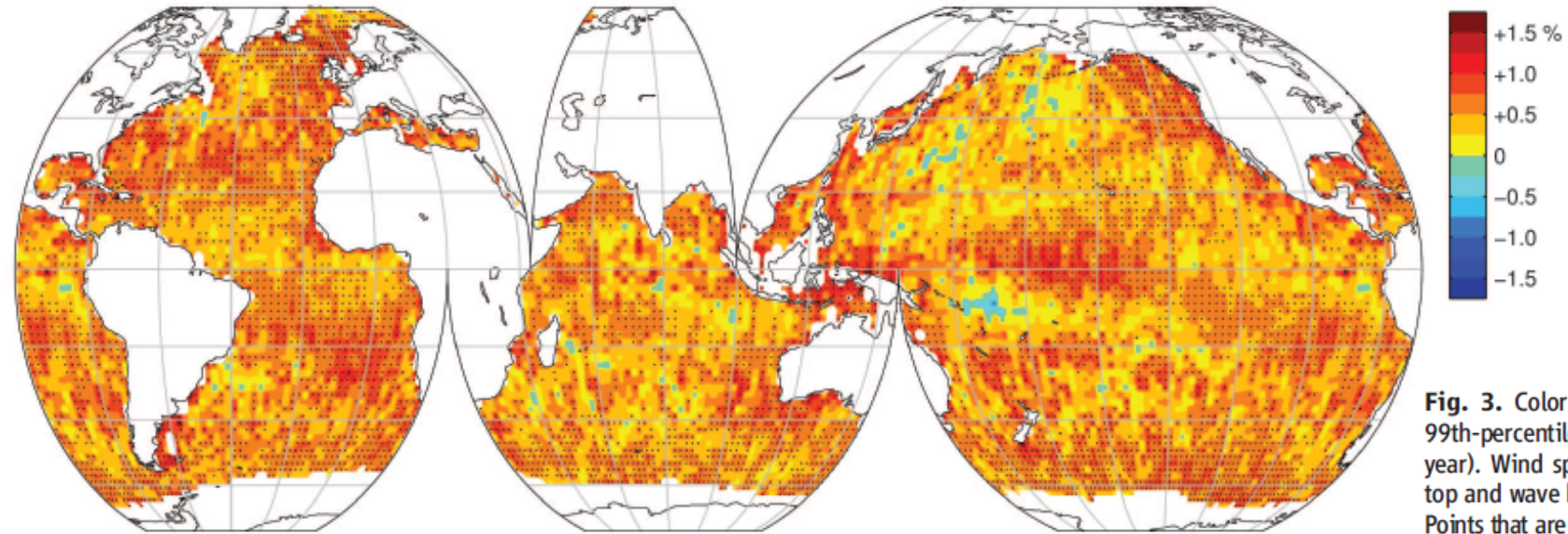
## Legal

## Reputational

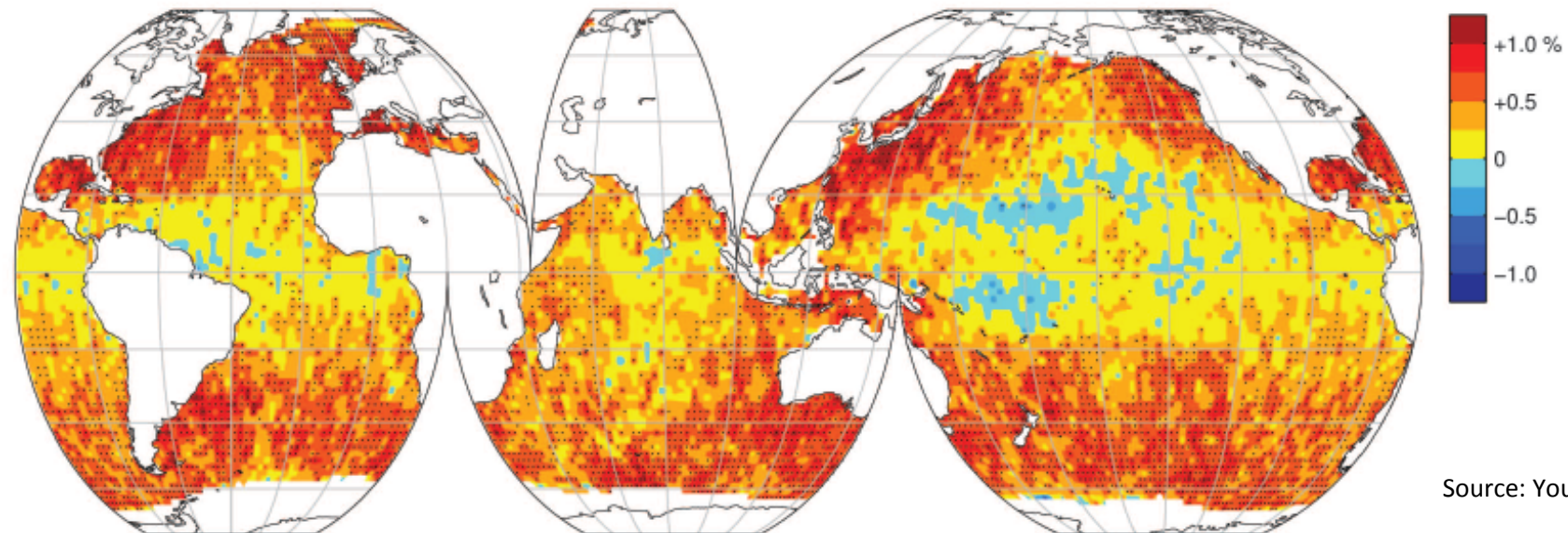
- Underlying cash flow values may be significantly altered by climate related impacts
- Equity: changes in valuation
- Supply and demand, futures prices
- Depreciation: financial models may overestimate useful lives of physical assets
- Change in insurance costs and availability
- Fiduciary and legal implications
- Investment institutions, regulatory focus
- Overall sustainability and development

# Observed changes

99th percentile wind speed (1991-2008)

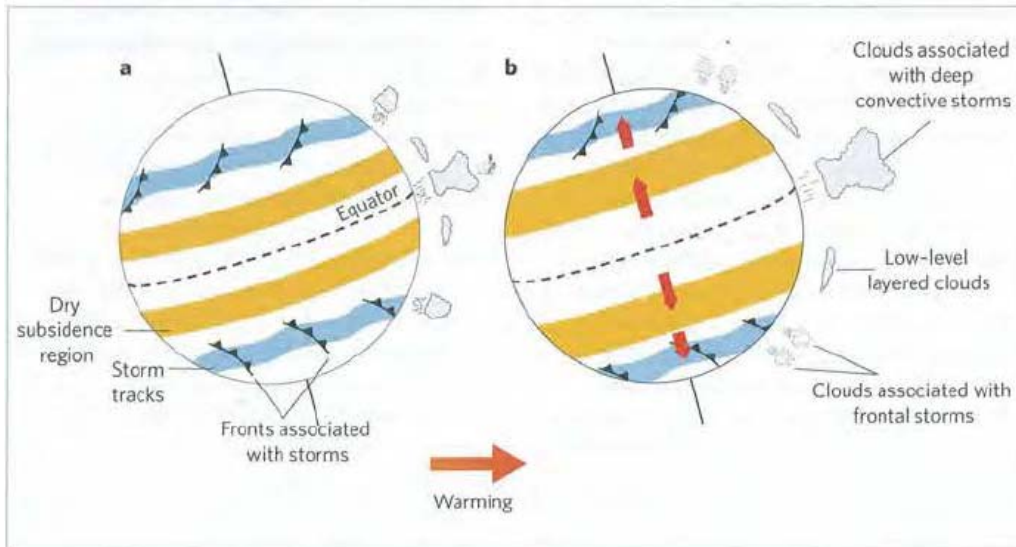


99th percentile significant wave height (1985-2008)



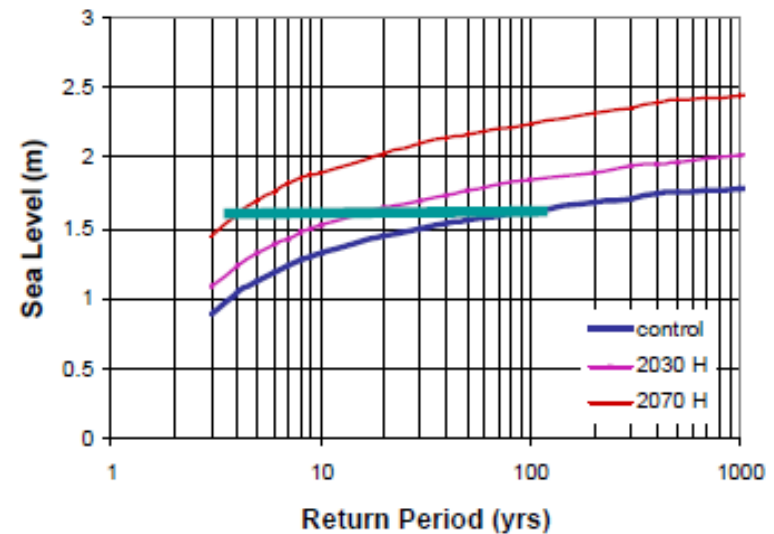
**Fig. 3.** Color contour plots of the 99th-percentile trend (percent per year). Wind speed is shown at the top and wave height at the bottom. Points that are statistically significant according to the Seasonal Kendall test are shown with dots.

# Projected changes



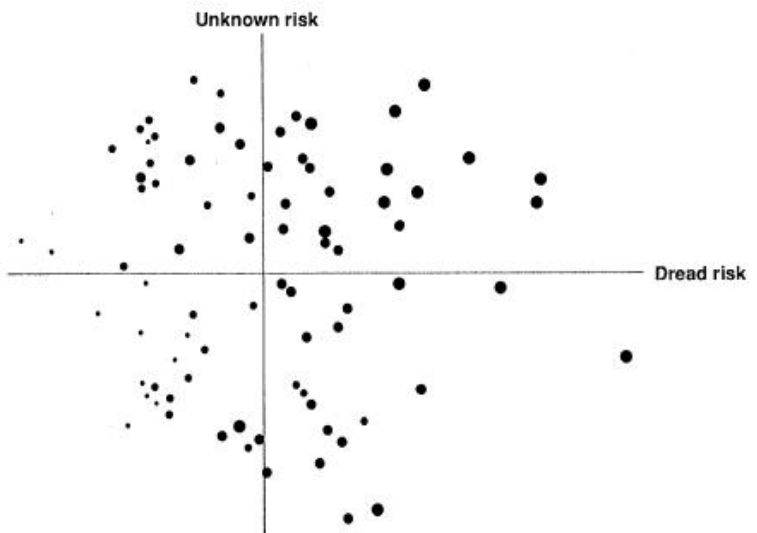
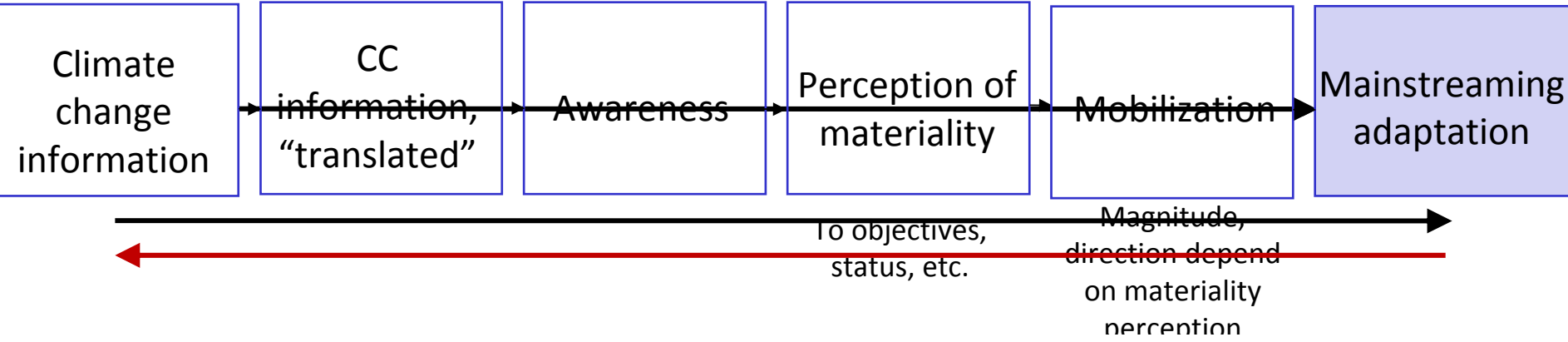
Potential changes in the position of mid-latitude storm tracks in a warming climate

“The position of (storm track regions) and the characteristic of the storms that form within them are expected to change as the climate warms with far reaching consequences”

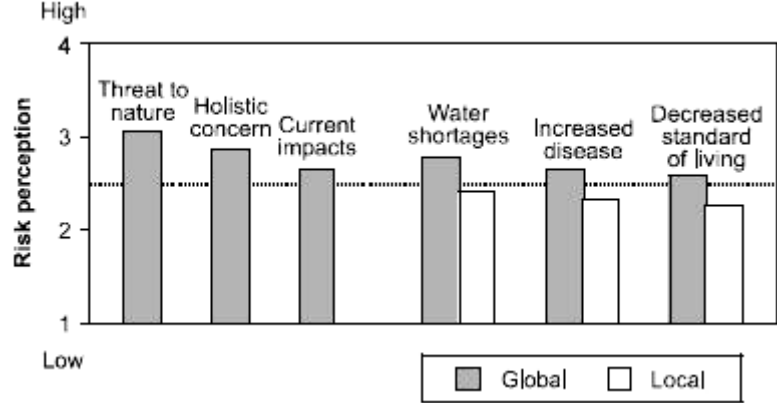


1:100 storm surge heights in Port Welshpool

# Motivation



**Fig. 2.** Attitudes toward regulation of the hazards in Fig. 1. The larger the point, the greater the desire for strict regulation to reduce risk (25).

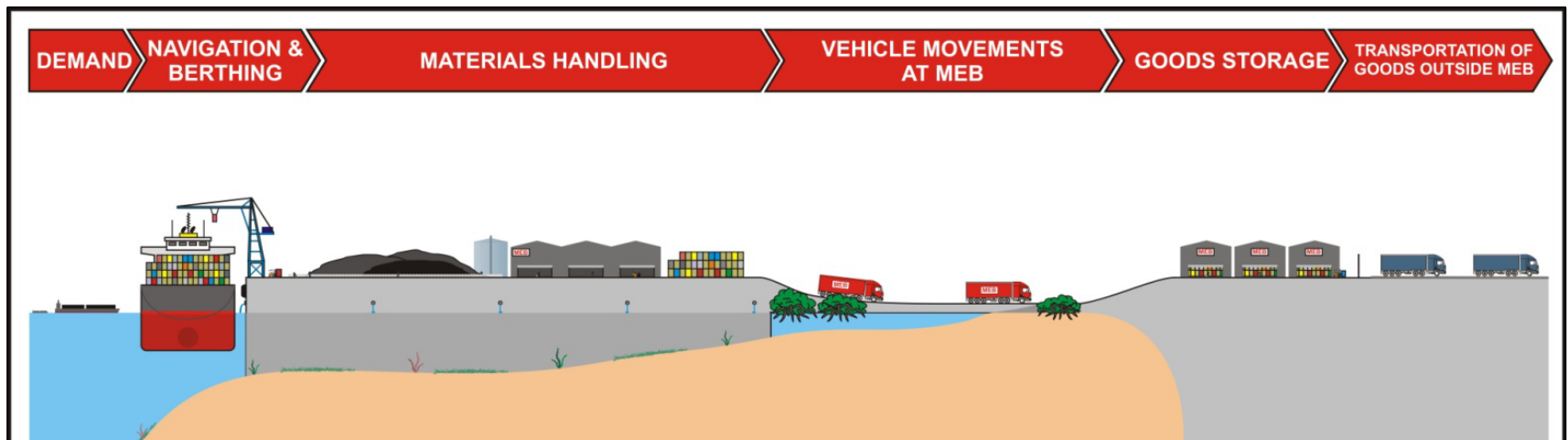


Year	Probability		
	100%	66%	33%
0	1,000,000	660,000	330,000
1	833,333	550,000	275,000
5	401,878	265,239	132,620
10	161,506	106,594	53,297
15	64,905	42,838	21,419
20	26,084	17,215	8,608

Expected value of 1 million at 20% DR

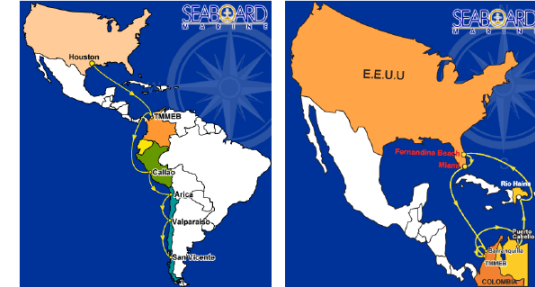
# Ports sensitivity to climate (change)

- Long lifetimes of key assets, sensitive to climate
- Locations exposed to climate impacts
- Dependence on trade, shipping and inland transport which are also climatically-vulnerable
- Indirect impacts can be as important as direct
- Understanding of key vulnerabilities to climate change

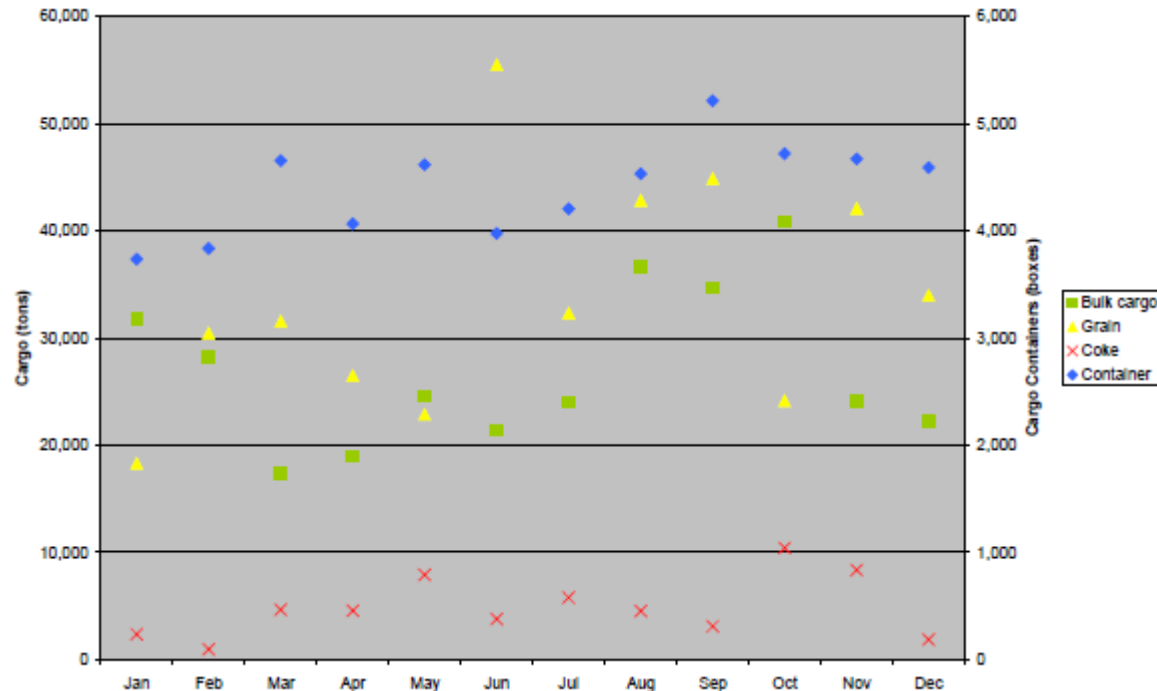




# Port Muelles el Bosque (MEB), Cartagena, Colombia



Cartagena: 12% of Colombia's international trade  
 MEB: 1% of Colombia's international trade (in tonnage)



Source: IFC, MEB 2011

# Risks and adaptation options: materiality

## Climate risk and adaptation checklist

The analyses undertaken for MEB in this study have shown that climate change can have material business implications for ports. Though some of the risks analyzed in this study are likely to be specific to MEB and may not apply to other ports, a number of them will be of broad relevance to the industry around the world.

The existing climate change research base often addresses port cities, rather than operational ports themselves. To help port operators and their stakeholders to identify climate-related risks and possible adaptation options, a checklist is provided below. It is based on the findings of the study on MEB and a comprehensive literature review. While it is focused on cargo ports, many of the issues it raises will be relevant to other types of port facilities.

This checklist:

- Categorizes climate impacts (risks and opportunities) according to the key operations undertaken at cargo ports (navigation, berthing, goods handling, etc.), along with other factors related to port performance, such as demand, insurance availability and environmental and social performance.

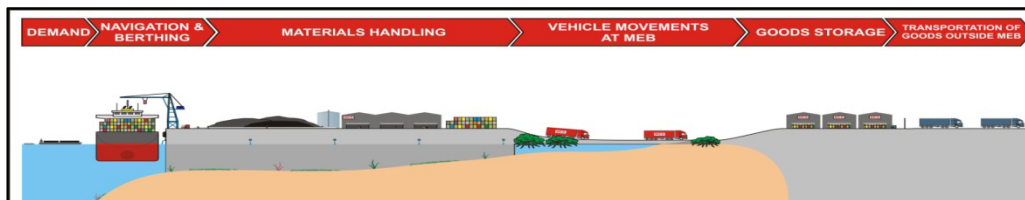
- Gives an overview of the climate-related sensitivities and thresholds of cargo ports in general, and also outlines some impacts which are specific to ports in particular environments (e.g., tropical and polar regions).
- Provides a list of adaptation measures which can be considered by port operators in response to climate change risks and opportunities. These include actions which help to build adaptive capacity (such as improved monitoring of climate impacts) as well as the implementation of physical adaptation measures (such as modifications to port infrastructure).

Notes on the checklist:

1. The climate-related sensitivities and critical thresholds for which the MEB study undertook risk assessments are highlighted in blue. For more information refer to the full study report.
2. There is not a one-to-one mapping between columns 2 and 3. For instance, for some climate-related risks, the checklist provides more than one adaptation option.

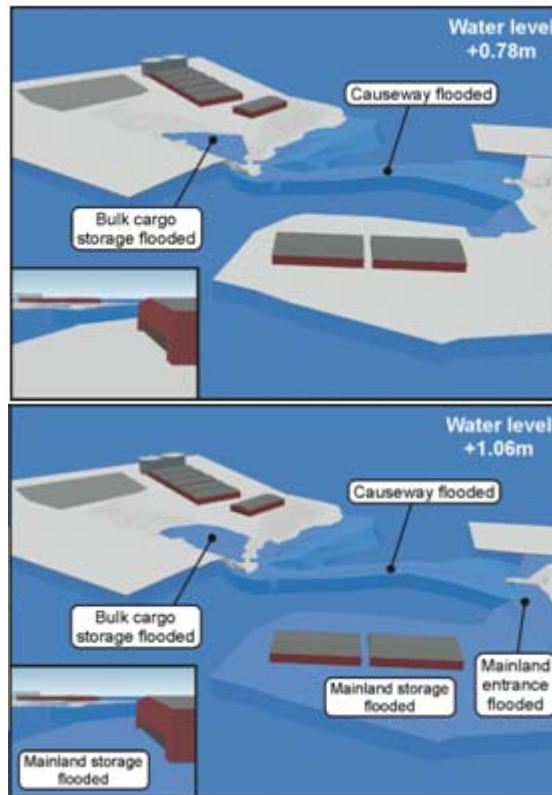
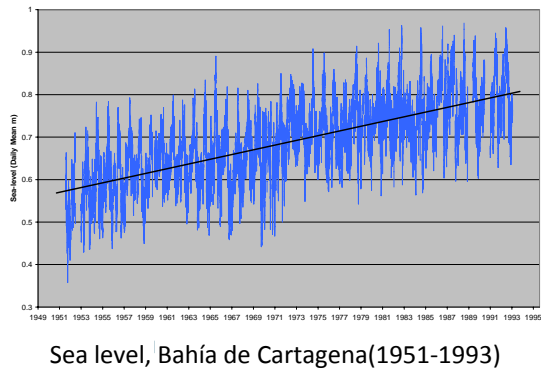
Risk areas for ports	Port sensitivities and potential climate change impacts	Adaptation options and opportunities for ports
<b>Demand, trade levels and patterns</b>	<p>Supply and demand for products traded through ports is sensitive to climate change impacts on the global economy, production, commodity prices and buyers (e.g., increased temperatures may reduce crop yields, affect price and contribute to trade fluctuations)</p> <p>Port import and export markets are likely to shift in response to climate-driven population movements. (Climatic changes such as increased flood and drought incidence may lead to substantial population movement over the longer term)</p> <p>Customers' perceptions of port service reliability may change in response to increased climatic disruptions</p>	<p>Monitor impacts of climate change on supply and demand for traded products (e.g., on production and price of existing or potential products)</p> <p>Consider updating assumptions used in business forecasting and strategy planning</p> <p>Over the longer term, identify opportunities for creating new or expanded port facilities in response to population movements</p> <p>Explore diversification of product lines in response to positive or negative climate change impacts on supply/demand</p> <p>Monitor customer expectations of reliability and concerns about disruptions, and inform them of plans to address these issues</p>
<b>Navigation, shipping and berthing</b>	<p>Navigation depths in coastal ports and shipping channels are sensitive to changes in sea level</p>	<p>Monitor changes in sea level and review dredging plans and schedules</p> <p>Engage with those responsible for dredging to ensure changing risks are being managed appropriately</p> <p>Identify opportunities to accommodate larger ships due to sea level rise</p>

and increased energy demand for cooling) to the port

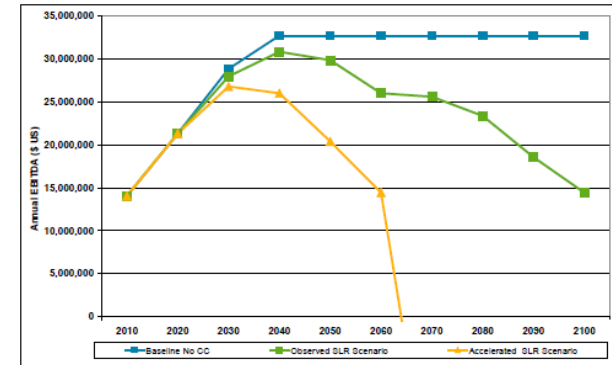


# CC information, risk, impacts (internal ops, examples)

- Vehicle movement
- Goods handling and storage
- Drainage
- Health and safety



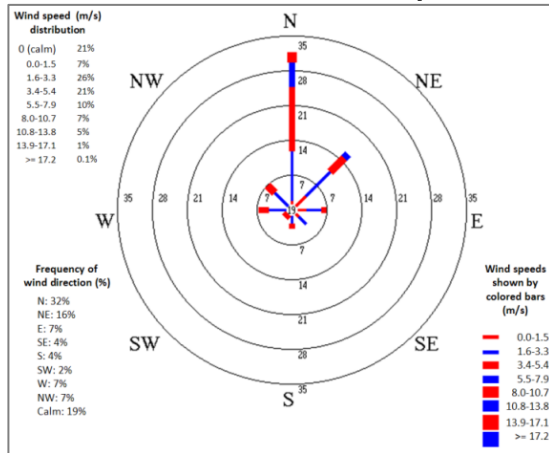
Seawater flooding, 2050, observed and accelerated SLR scenarios



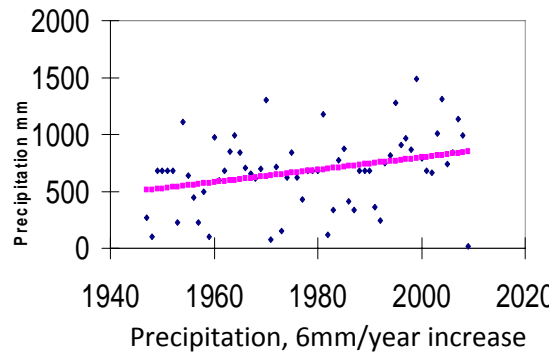
Financial analysis of the impacts

# CC information, risk, impacts (internal ops, examples)

- Vehicle movement
- Goods handling and storage
- Drainage
- Health and safety

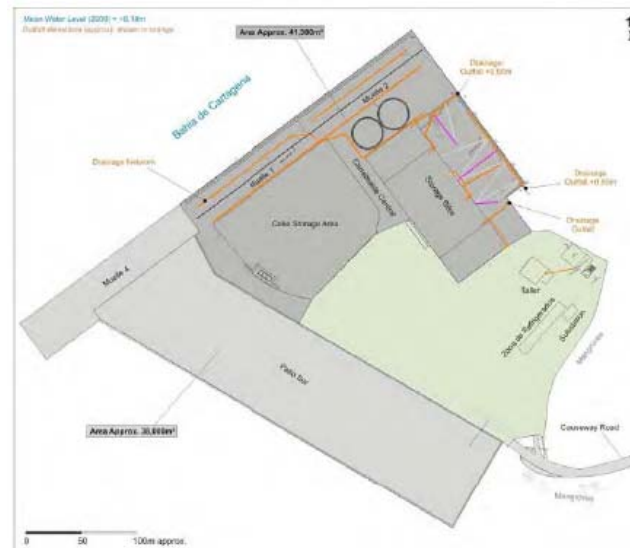


Wind rose, 19 years of data



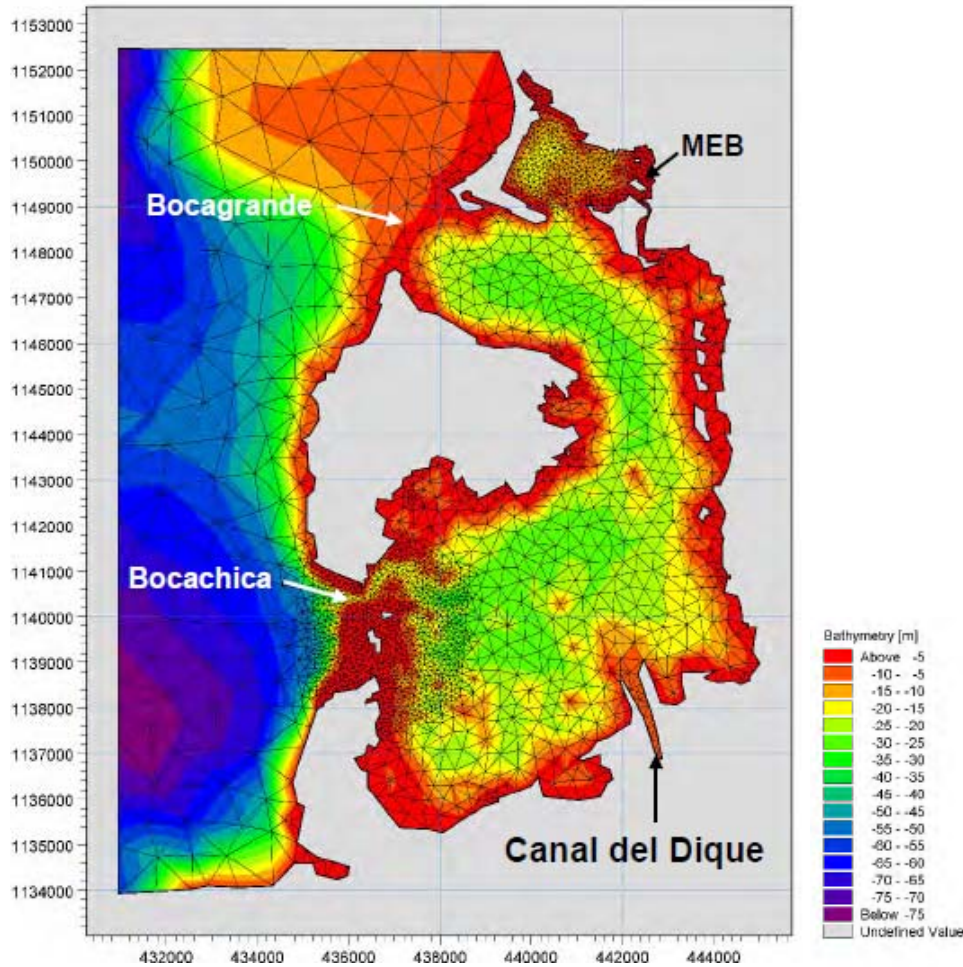
Year	2006	2007	2008	2009	Total
Pterygium		55	37		92
Cutaneous/ skin abscess	31		3	20	56
Hypertension			5	6	11
Heat stroke			2		2

Health problems potentially aggravated by climate change (days of absence)



# CC information, risk, impacts (external ops, examples)

- Navigation and berthing



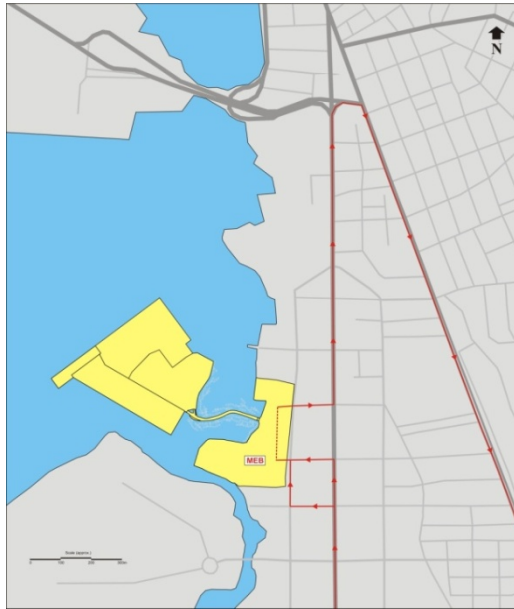
Sediment plumes in the Bay



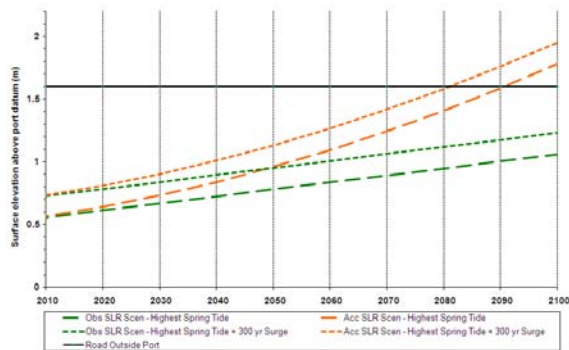
Tropical cyclone track

# CC information, risk, impacts (external ops, examples)

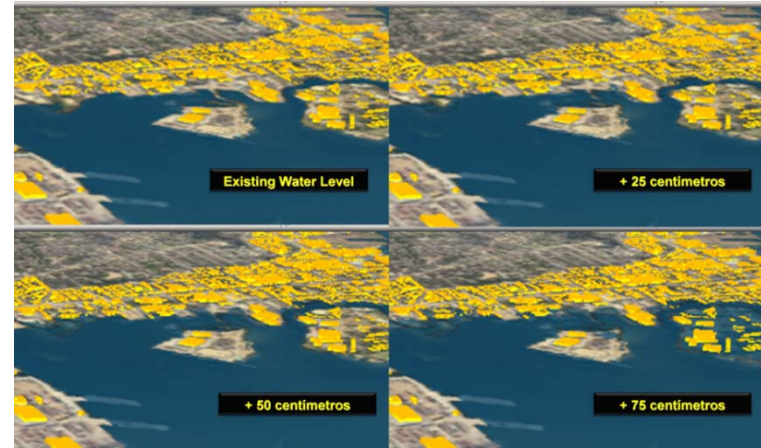
- Inland transport



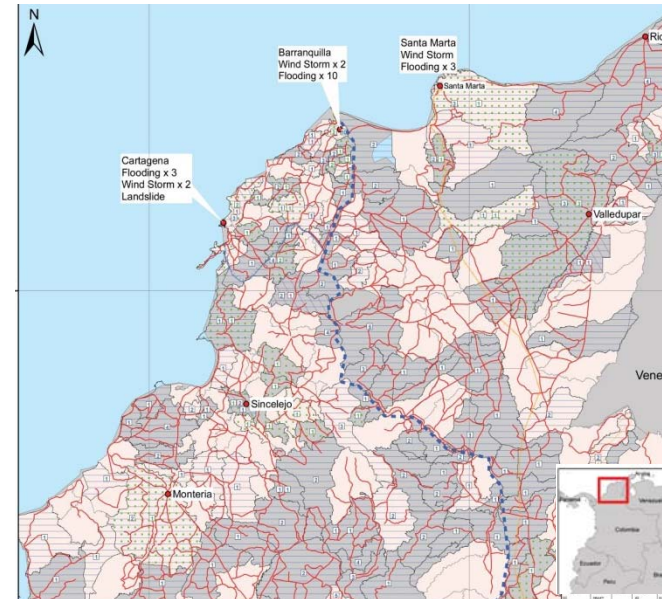
Transport routes



Effects of SLR (1.6m)

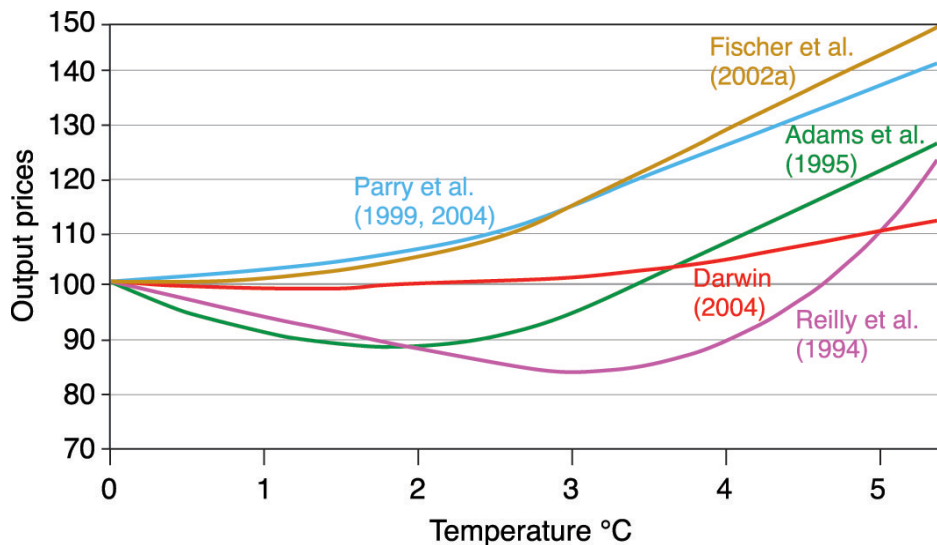


Effects of SLR in Cartagena

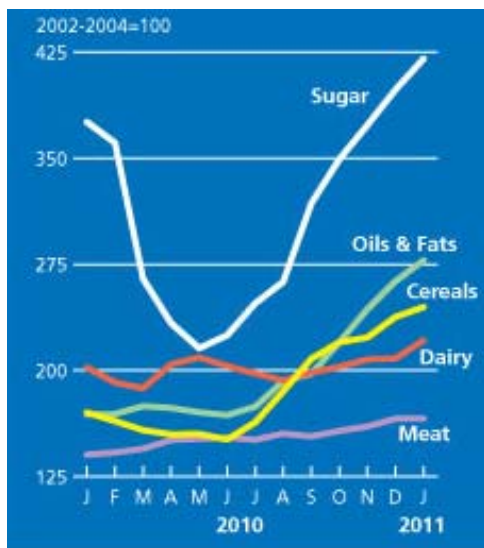


Climate related transport infrastructure hazards

# CC information, risk, impacts (demand, supply, examples)



Cereal prices (% of baseline) versus global mean temperature change for major modeling studies



Crop	Change in crop suitable area (km <sup>2</sup> )
Sesame	1,720
Cotton*	-4,301
Rice	-23,227
Bananas*	27,270
Coffee*	-221,516
Cane sugar*	-45,680
Barley	-27,872
Coconut	10,839
Beans	-8,689
Maize	4,989
Potatoes*	-7,398
Plantain*	22,195
Sorghum	602
Tobacco*	-7,054
Wheat	-4,043
Cassava	-23,142
Cocoa*	-13,850
Yam	-13,850
Oil Palm*	-13,850
<b>TOTAL</b>	<b>-346,857</b>

# Partnerships

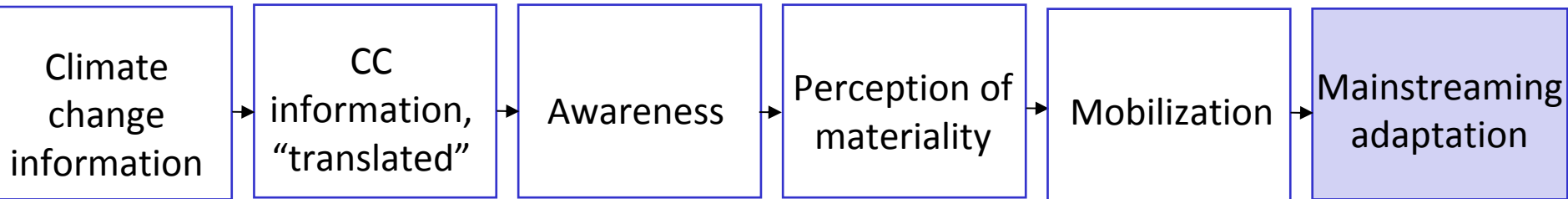
- **IFC**

- Trust Fund for Environmentally and Socially Sustainable Development (TFESSD)
- Acclimatise
- WorleyParsons
- U. of Oxford, Environmental Change Institute
- Synergy
- Muelles el Bosque
- Alcaldía de Cartagena
- Centro de Investigación de la Caña de Azúcar de Colombia (CENICAÑA)
- Centro de Investigaciones Oceanográficas e Hidrográficas (CIOH)
- Centro Internacional de Agricultura Tropical (CIAT)
- Centro Nacional de Investigaciones de Café (CENICAFE)
- Corporación Autónoma Regional del Canal del Dique (CARDIQUE)
- Corporación Colombiana de Investigación Agropecuaria (CORPOICA)
- Departamento Nacional de Planeación (DNP)

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- Dirección General Marítima (DIMAR)
- Exploraciones Oceanicas de Colombia (EXOCOL)
- Federacion Nacional de Cafeteros
- Fundacion Natura
- Instituto Colombiano Agropecuario (ICA)
- Instituto de Hidrología, Meteorología y Estudios Ambientales (IDEAM)
- Instituto de Investigaciones Marinas y Costeras (INVEMAR)
- Ministerio de Agricultura y Desarrollo Rural
- Ministerio de Ambiente, Vivienda y Desarrollo Territorial
- Puerto de Mamonal
- Sociedad Portuaria Regional de Cartagena (SPRC)
- Universidad de Cartagena
- Universidad de los Andes (CIDER)
- Universidad Nacional de Colombia



# Climate risk and ports



- Priority initiatives? E.g.
  - climate information “translated” for the needs of port and shipping operations,
  - awareness about impacts and risks,
  - detailed exploration of key vulnerabilities in ports operations (design standards, essential equipment, etc.),
  - specific tools,
  - adaptation solutions, etc.



Thank you.

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[www.ifc.org/climatechange](http://www.ifc.org/climatechange)