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

Mr. Vladimir Stenek
International Finance Corporation (IFC), World Bank

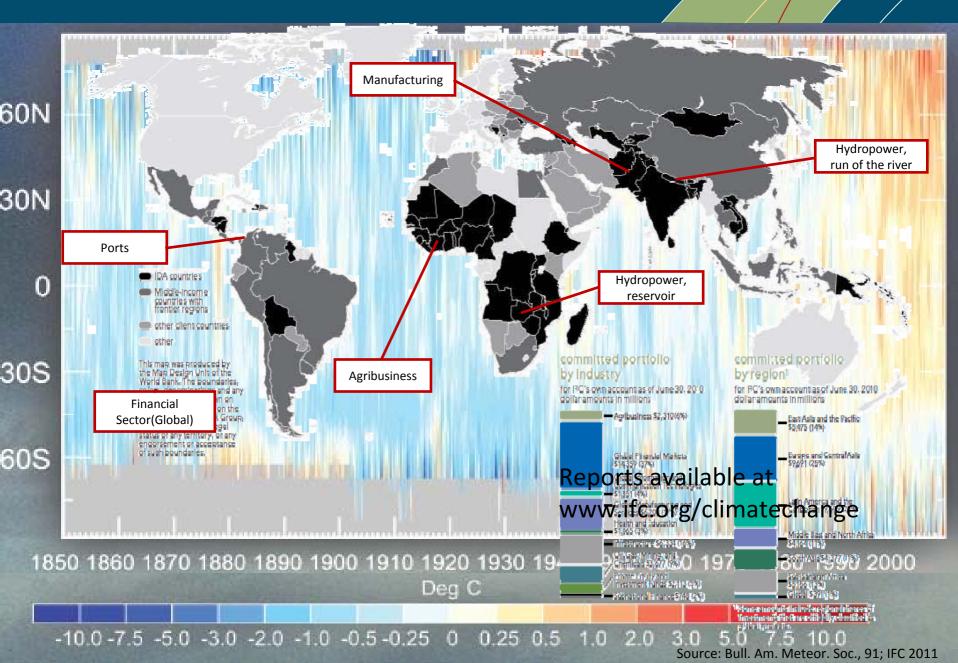
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Climate Risk and Ports

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

International Finance Corporation



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

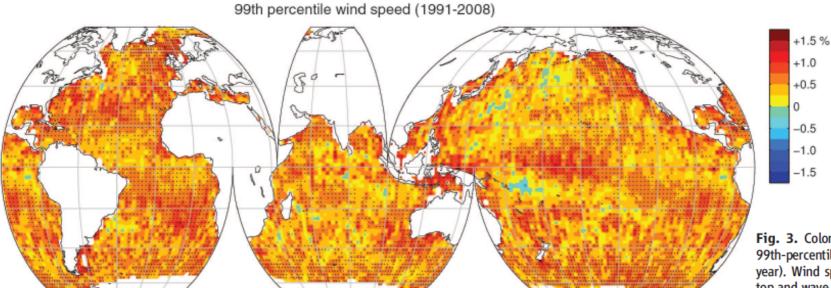
Legal

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

Source: IFC 2010

Observed changes



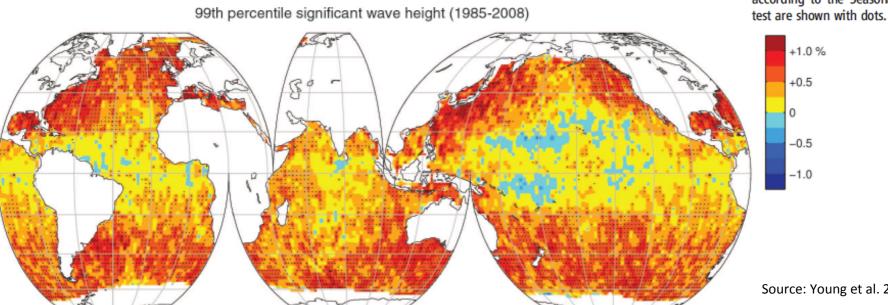
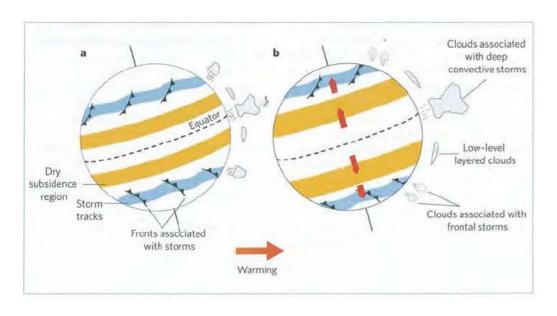


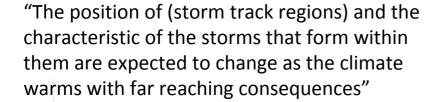
Fig. 3. Color contour plots of the 99th-percentile trend (percent per year). Wind speed is shown at the top and wave height at the bottom. Points that are statistically significant according to the Seasonal Kendall

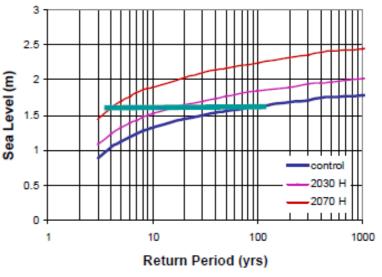
Source: Young et al. 2011

Projected changes



Potential changes in the position of midlatitude storm tracks in a warming climate

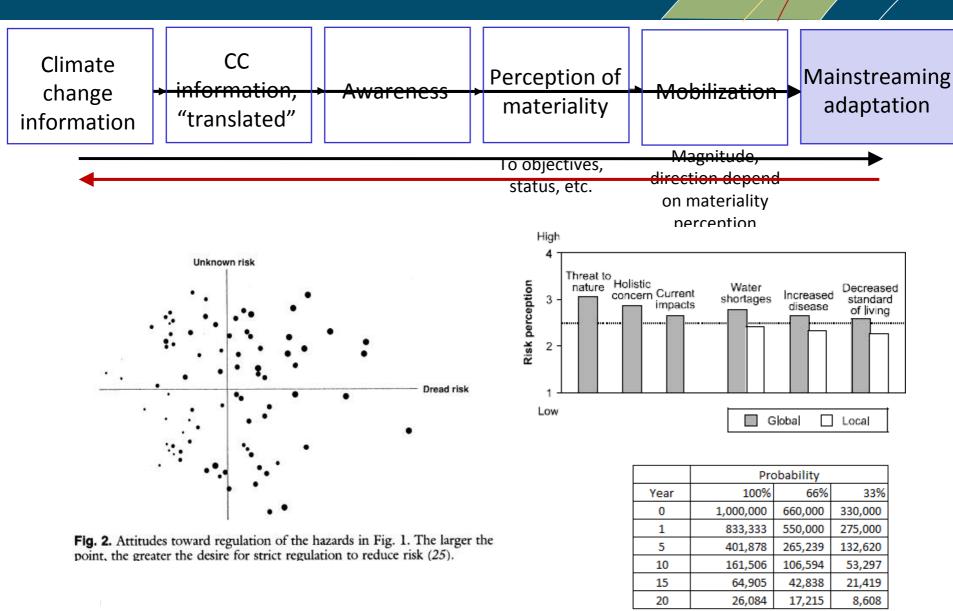




1:100 storm surge heights in Port Welshpool

Source: Stephens 2011, McInnes et al. 2009

Motivation

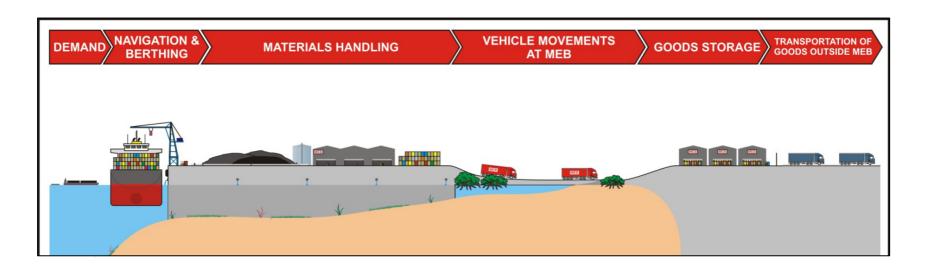


Expected value of 1 million at 20% DR

Sources: Stenek 2010; figures: Slovic 1987; Leiserowitz 2006

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



Source: IFC, 2011

Port Muelles el Bosque (MEB), Cartagena, Colombia







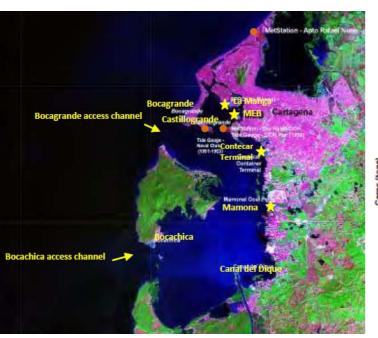


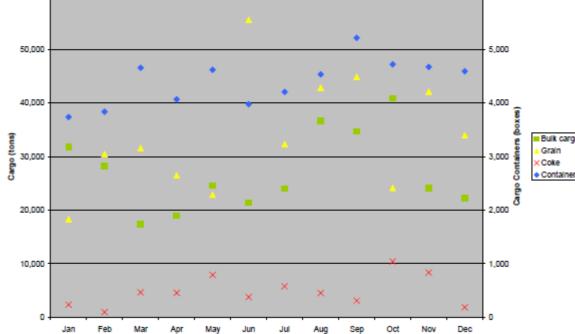
Cartagena: 12% of Colombia's

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 dimate-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:

Risk areas

Demand, trade

for ports

levels and

Navigation,

berthing

shipping and

· 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.

Port sensitivities and

over the longer term)

potential climate change impacts

Supply and demand for products traded through

ports is sensitive to climate change impacts on the

buyers (e.g., increased temperatures may reduce

crop yields, affect price and contribute to trade

Port import and export markets are likely to shift in

(Climatic changes such as increased flood and drought

Customers' perceptions of port service reliability

Navigation depths in coastal ports and shipping

may change in response to increased climatic

channels are sensitive to changes in sea level

incidence may lead to substantial population movement

response to climate-driven population movements.

global economy, production, commodity prices and

- . 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.

Monitor impacts of climate change on supply and

Consider undating assumptions used in business

demand for traded products (e.g., on production and

Over the longer term, identify opportunities for creating

Explore diversification of product lines in response to

positive or negative climate change impacts on supply/

Monitor customer expectations of reliability and concerns

about disruptions, and inform them of plans to address

Monitor changes in sea level and review dredging plans

Engage with those responsible for dredging to ensure changing risks are being managed appropriately

Identify opportunities to accommodate larger ships due

to the nor

new or expanded port facilities in response to population

Adaptation options and opportunities for ports

demand

and schedules

price of existing or potential products)

forecasting and strategy planning

nts in light of d. potentially erthing equipment or ment or replacement

a long design life (e.g.,

nings. Where bridges with them on their plans pacts educed cargo loads,

ng restrictions, and these issues and review dredging

r managing changes in

and navigation sks are being managed

ays and loss of traffic

rt access channels in

on design and

silient protection

nternational shipping

that are projected to and take advantage of nger access periods

ial handling systems in use of closed areas for

na equipment on nt of climate change

ensure nerishables are

re described under

understand their level ility and change, and would cut off supplies

ure condition energy costs to customers e programs ture foundations

taking account of

erature-sensitive

nt materials

ntinuity

to be able to cope with

and transport due to

s to prevent weather-

writers by undertaking

on actions being taken

anagement and

res in light of changing ater recycling and

educing energy

av efficient reefers)

necks/controls for stored

cooling, insulation and Note that this could conflict reduction targets, so be energy efficient or

res in light of changing

olosion risks a operations during icv

from flood risk on site in ate change impacts and

ess continuity plans for

v-lving areas s vulnerable to flooding use water-resistant ipment or move it out of f low-lying areas)

responsible for flood ate change resilience is nt planning coastal flood risk

isks cannot be managed. capacity and elevation

in light of increases in level rise nage system capacity n drainage outlets to sea ess continuity plans for flash

ance for drainage systems surface flood risk ad conditions and

aces to make them more

standards, and

ls for flammable

lying areas s in weathernot be managed,

tional health and described under onmental risks are

aterials and equipment l performance na communities to

ding communities ted thresholds for light ange issues

communities (e.g., be integrated into ontinuity plans ture-sensitive structures understand impacts ratures

conomic conditions.

agement and eduction plans in

nmental nge impacts on transport

pacts on sensitive transport infrastructure ity of the port king to build climate habitats and

sport routes which can on climate change

> surrounding sed adaptation

adaptive capacity g., facilitating their

when appraising

ronmental co-

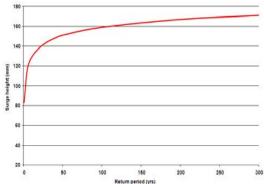
MATERIALS HANDLING GOODS STORAGE THE THE PARTY IN T

Source: IFC. 2011

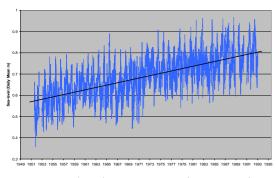
CC information, risk, impacts (internal ops, examples)

Vehicle movement

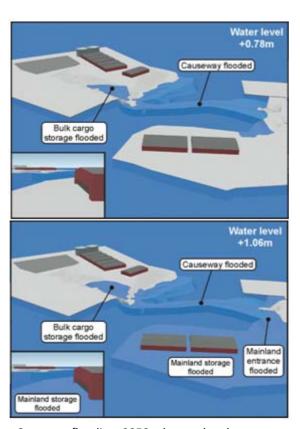
- Goods handling and storage
- Drainage
- Health and safety



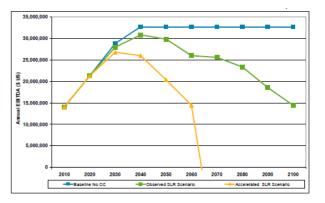
Storm surge height, 1:300 year return period



Sea level, Bahía de Cartagena (1951-1993)



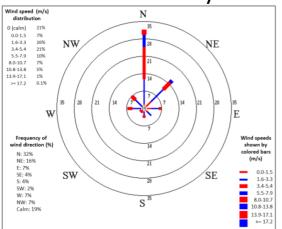
Seawater flooding, 2050, observed and accelerated SLR scenarios



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



20	00 —								
15	00 +						•		
Precipitation mm	00 +		•	•	•				
ۋة 1	00 +	****		,	Para garan San	••	•		
Pre	0 +	•	· ·	••	•	+	•	_	
	194	0	1960	19	80	200	0	202	20
		Pred	cipitati	on, 6ı	nm/y	/ear i	ncre	ase	

Main Water Level (2005) = 45.18+1 Dutted december incoming grows in total age	Area Approx. 41,390m²	Dischage Cartin = 1.50%
Saltin be		
Country's feetures		Open of Sign
ser.	Casa Stranga Ansa	1500
	X	1/1/
	100	**//
Area Approx. 30,808er*		Conveys Road
0 50 100m approx.		Mangorine

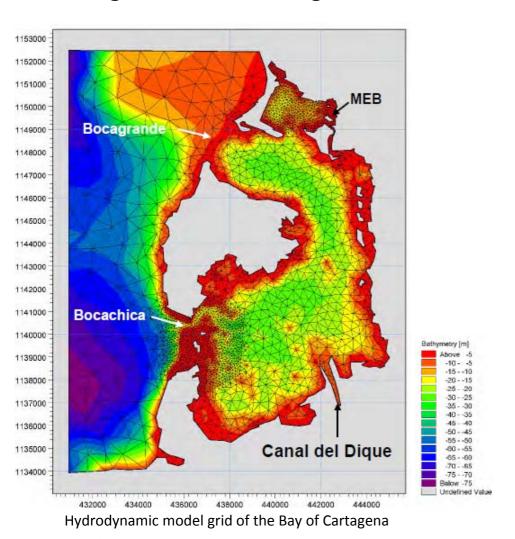
Year	2006	2007	2008	2009	Total
Pterygium		55	37		92
Cutaneous/ skin abscess	31		3	20	56
Hypertension			5	6	11
Heat stroke			2		2

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

Source: IFC 2011; Escuela Naval CIOH 2010

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

Navigation and berthing



Cartagena Bay

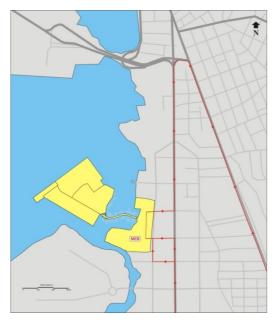
Sediment plumes in the Bay



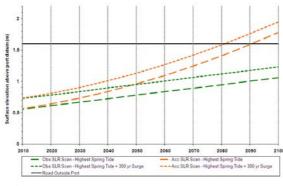
Tropical cyclone track

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

• Inland transport



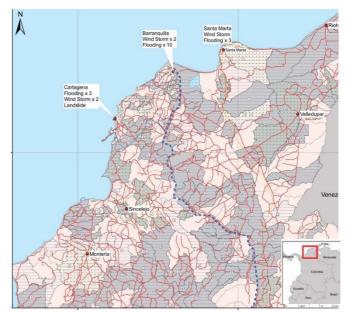
Transport routes



Effects of SLR (1.6m)

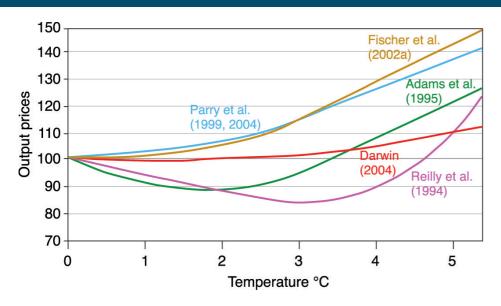


Effects of SLR in Cartagena

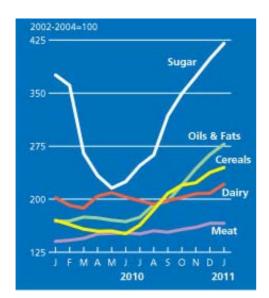


Climate related transport infrastructure hazards

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



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



Сгор	Change in crop suitable area (km²)
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
TOTAL	-346,857

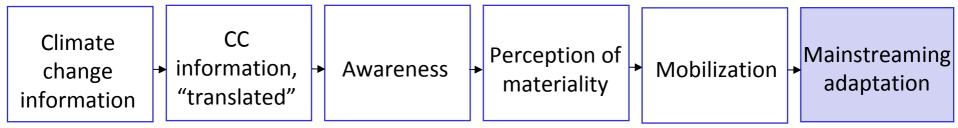
Partnerships

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 Planeacion (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.

Vladimir Stenek vstenek@ifc.org

www.ifc.org/climatechange