



# Climate Change **World Vision**

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## **Asia Pacific Realities**

APRO Multi-Emergency Learning Event, Bangkok, 11-12 February 2010

(Photo: Felix Mückel)

**Presentation available:**

<http://luetz.com>

**P**rotect Development  
**R**esearch Priorities  
**E**mpower Communities  
**P**artner And Network  
**A**dvocate Justice And Change  
**R**einforce Disaster Defences  
**E**ducate Children



WORLD VISION  
**PREPAREDNESS STUDY**



## ISLAND OF MATSUNGAN

**Matsungan, Papua New Guinea:** Island Chief John Kela (right) standing on what he says was formerly dry ground.

Photo: Johannes Luetz

**Chief Kela, Matsungan:** “What will the future hold for our children and grandchildren?” Island Chief John Kela (right) doesn’t understand the science of climate change. But he sees that the ocean surrounding his island is rising.



Carteret Islander and Director of Tulele Peisa NGO, Papua New Guinea



Photo: Pip Starr

**Ursula Rakova, Carterets:** “Storm surges regularly overtop our islands – then the sea and low-lying land become ‘level.’ The time for adaptation and mitigation has run out. The time for migration and relocation has come. Resettlement is underway. It is so sad to leave.”



Photo: Johannes Luetz

**Puwamo/Labutali, Papua New Guinea:**  
“Climate change refugees” who abandoned their coastal village “because of rising sea levels.”



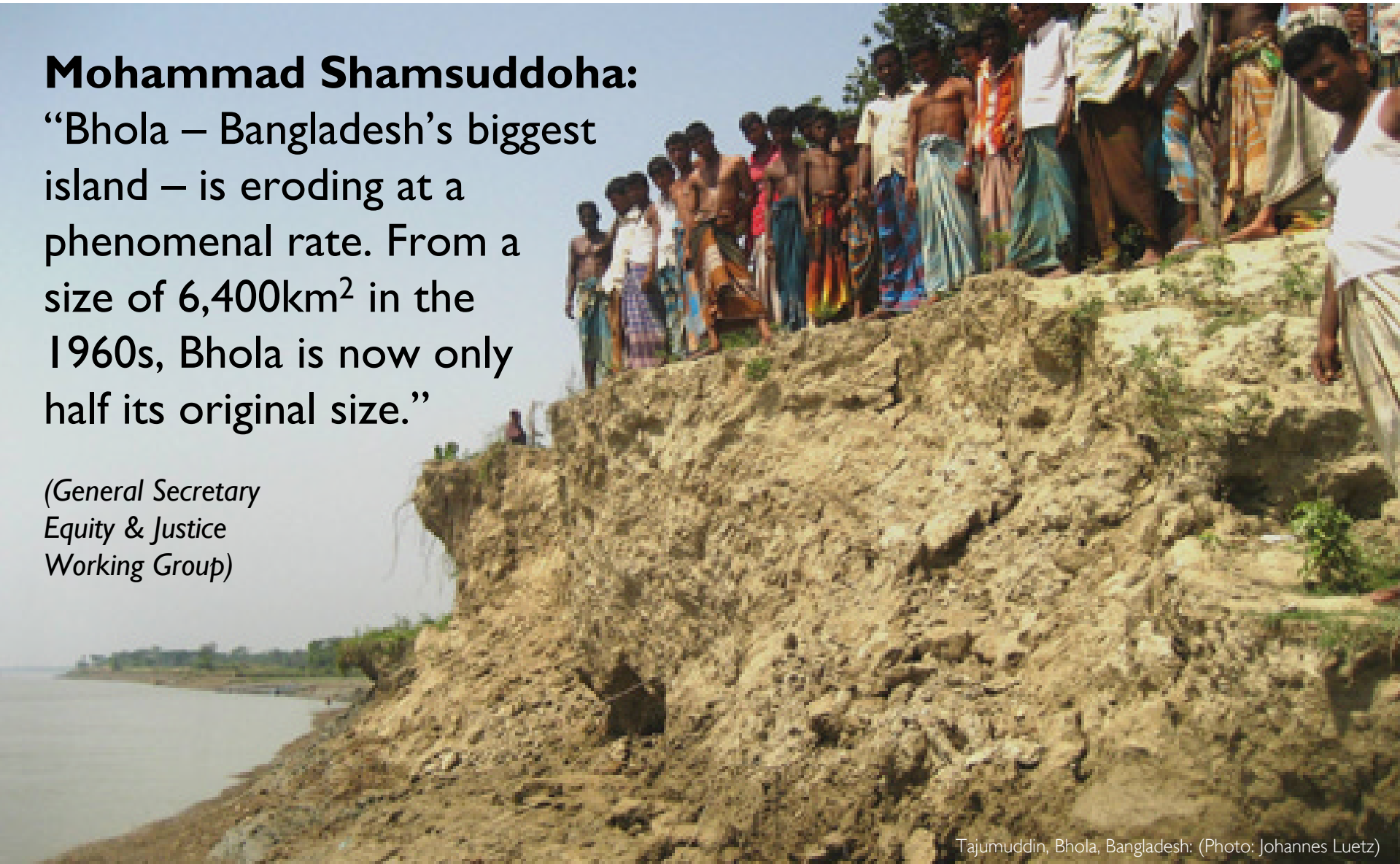
Photo: Johannes Luetz

**Albert Nai:** “The bush is better than the beach!”  
(At his new home with two of his grandchildren)

## **Mohammad Shamsuddoha:**

“Bhola – Bangladesh’s biggest island – is eroding at a phenomenal rate. From a size of 6,400km<sup>2</sup> in the 1960s, Bhola is now only half its original size.”

*(General Secretary  
Equity & Justice  
Working Group)*



Tajumuddin, Bhola, Bangladesh: (Photo: Johannes Luetz)



**Present:** 100,000 displaced p.a.

**SLR 1m:** 65 million

**SLR 3m:** 92 million


**SLR 5m:** 128 million

Bangladesh, Island of Bhola

Tajumuddin, Bhola, Bangladesh: (Photo: Johannes Luetz)

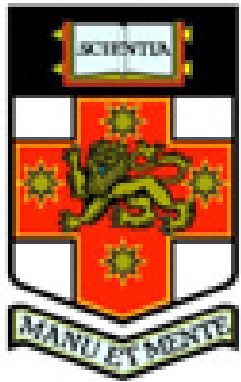
**Abdul Mannan:** “The place where I was born lies 5 kilometres out in the sea. I’ve already moved my home and family four times. People are constantly moving back.” Community elder Abdul Mannan (centre) points out signs of extreme erosion.





**Abdul Mannan:**  
“People are constantly moving back. This family left last week. Only the toilet pit is left.”

Tajumuddin, Bhola, Bangladesh: (Photo: Johannes Luetz)



# UNSW

THE UNIVERSITY OF NEW SOUTH WALES

**PhD:** “Climate Change Management”

**Name:** Johannes M. Luetz

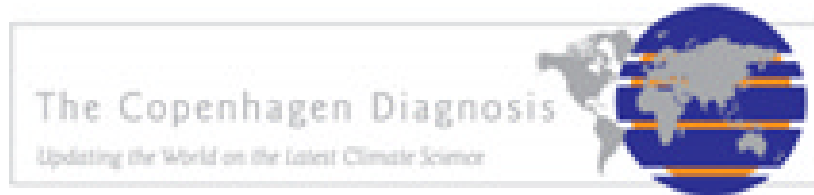
“If emissions follow a business-as-usual scenario, sea level rise of at least two meters is likely this century. Hundreds of millions of people would become refugees.” —Dr. James Hansen, Director NASA Goddard Institute, Adjunct Professor Columbia University

PhD  
Study

“ *For tomorrow belongs to the people who **PREPARE** for it today.* ”

—*African Proverb*

1. **The latest climate science**
2. Asian climate disaster hotspots
3. Synthesis and outlook
4. Policy implications for WVI



## **The Copenhagen Diagnosis, 2009: Updating the World on the Latest Climate Science**

Ian Allison, Nathan Bindoff, Robert Bindshadler, Peter Cox, Nathalie de Noblet-Ducoudre , Matthew England, Jane Francis, Nicolas Gruber, Alan Haywood , David Karoly , Georg Kaser, Corinne Le Quéré, Tim Lenton, Michael Mann, Ben McNeil, Andy Pitman, Stefan Rahmstorf , Eric Rignot, Hans Joachim Schellnhuber, Stephen Schneider, Steven Sherwood, Richard Somerville, Konrad Steffen, Eric Steig, Martin Visbeck, Andrew Weaver.





Photo: NASA

**Derived from Latin “contextus”:**  
(*con-* “together” + *texere* “to weave”)

“The circumstances that form the setting for an event, statement or idea, and in terms of which it can be fully understood and assessed.” (Oxford Dictionary, page 367)

## **Tackling climate change is difficult because:**

1. Climate change-relevant activities are “pleasant”
2. GHGs invisible – “out of sight, out of mind.”
3. Today’s pollution will be tomorrow’s pain



**Flight:** Berlin – Bangkok (9,252km)

**It Jet Fuel Burned  
= 3.157t CO<sub>2</sub> Emissions**

**Two Flight Segments:**

1. Berlin – Munich (481km)
2. Munich – Bangkok (8,771km)

Top of Atmosphere as seen from space at 335km altitude  
(Photo: NASA Earth Observatory)

**Total trip per-capita emissions: 1.78t CO<sub>2</sub>**

**\* 2.7 (RFI) = ~ 5t CO<sub>2</sub>**

## **1st Segment Berlin – Munich:**

Jet fuel burned: 3.4t

Constant \* 3.157

**Total CO<sub>2</sub>: 10.7t**

Passengers: 124

CO<sub>2</sub> emissions p.p.: 0.09t

Roundtrip \* 2

**Total CO<sub>2</sub> p.p.: 0.18t**

## **2nd Segment Munich – Bangkok:**

Jet fuel burned: 95.2t

Constant \* 3.157

**Total CO<sub>2</sub>: 300.5t**

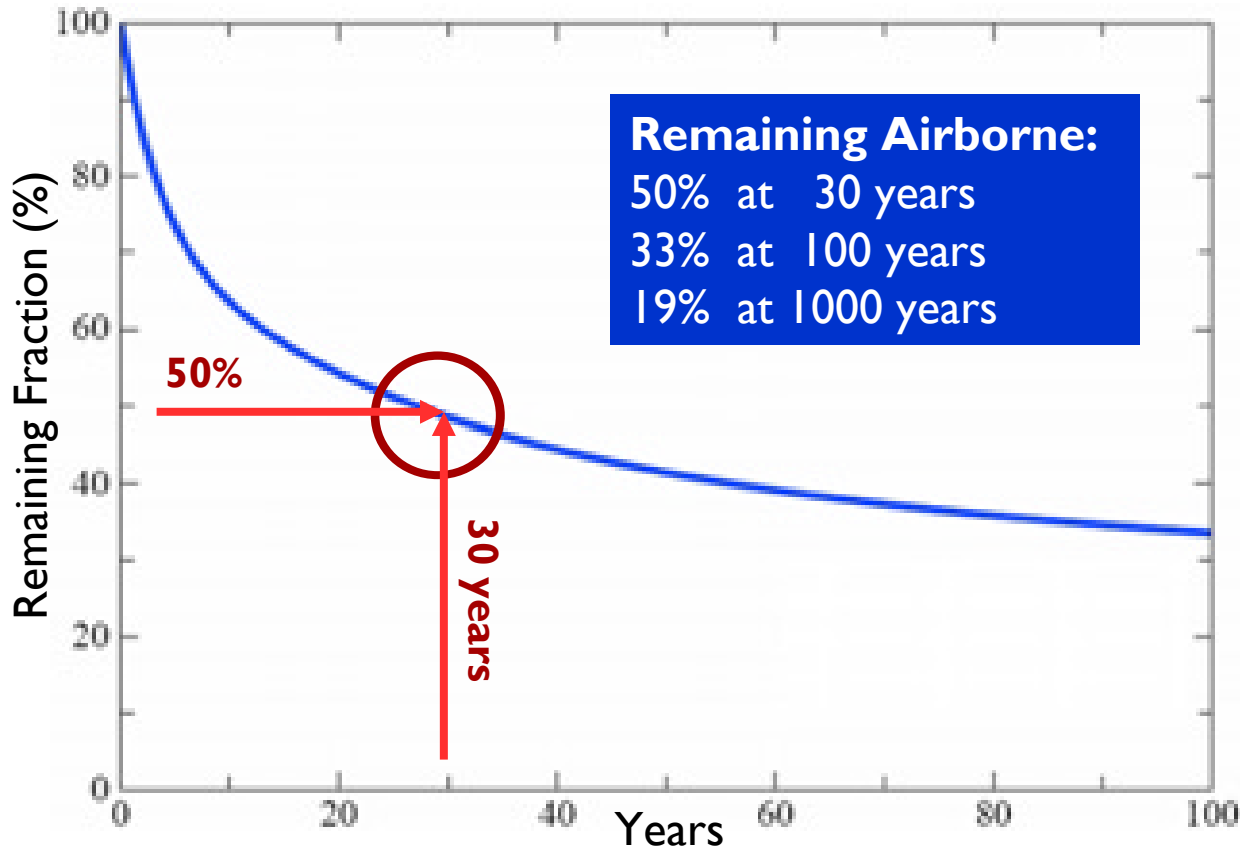
Passengers: 375

CO<sub>2</sub> emissions p.p.: 0.8t

Roundtrip \* 2

**Total CO<sub>2</sub> p.p.: 1.6t**

## Slow decay of fossil fuel CO<sub>2</sub> emissions

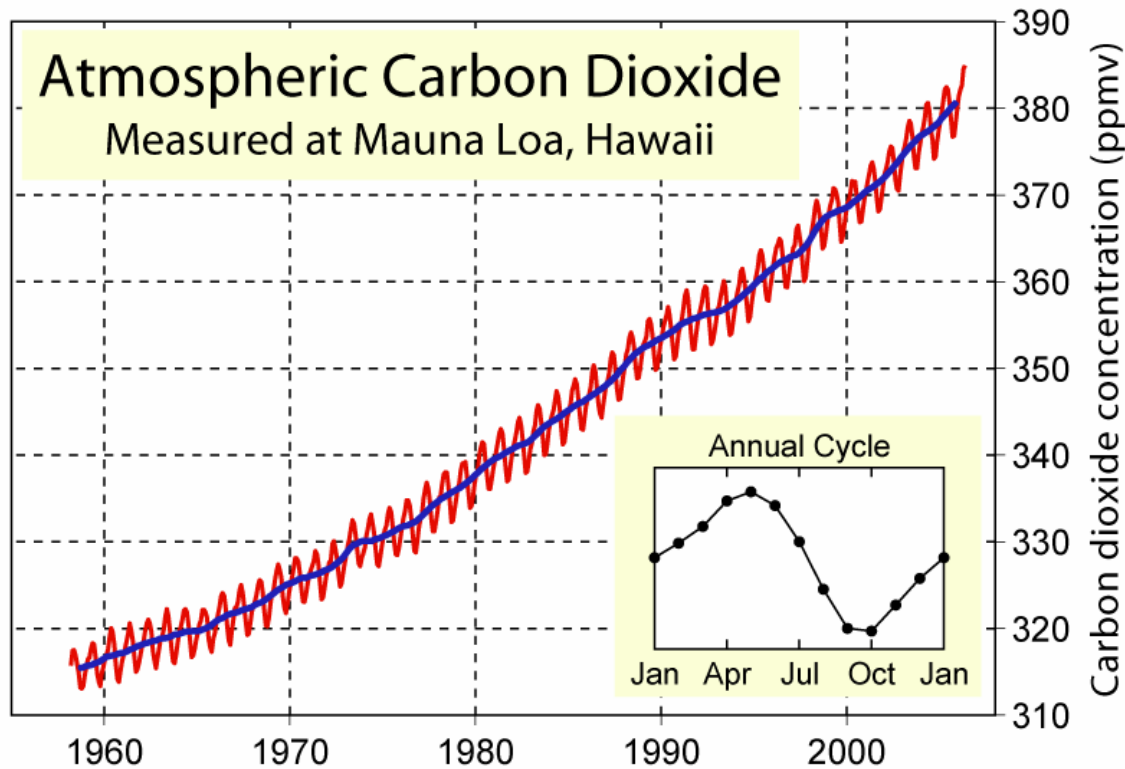


**Total CO<sub>2</sub> from Bangkok flight:**  
2010: 1.78t CO<sub>2</sub>

**CO<sub>2</sub> fraction still airborne in future:**  
2040: 0.89t CO<sub>2</sub>  
2110: 0.58t CO<sub>2</sub>  
3010: 0.33t CO<sub>2</sub>

The fraction of CO<sub>2</sub> remaining in the air, after emission by fossil fuel burning, declines rapidly at first, but 1/3 remains in the air after a century and 1/5 after a millennium.

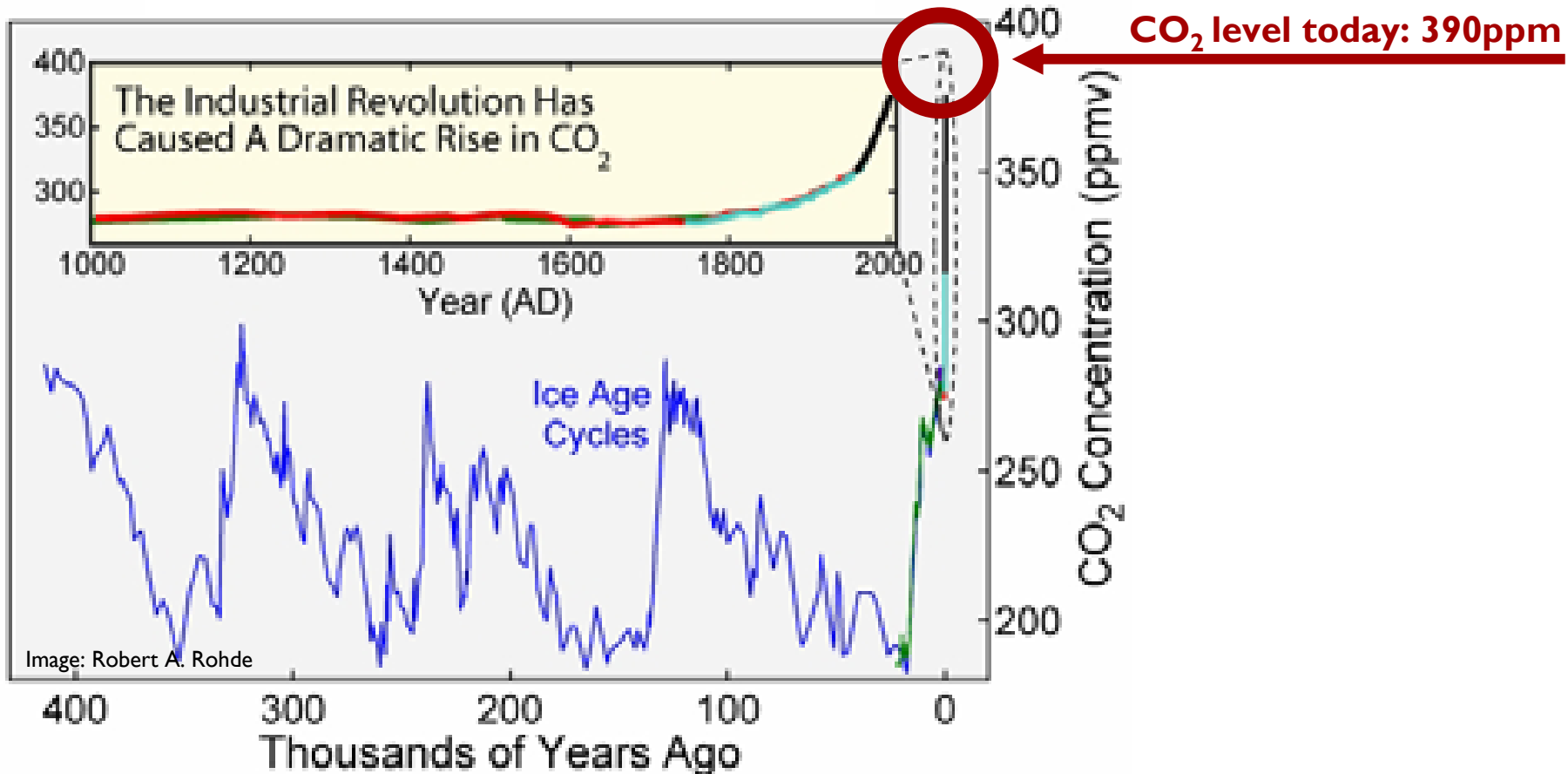
(*Atmos. Chem. Phys.* **7**, 2287-2312, 2007).



**The Keeling curve** is an essential piece of evidence of anthropogenic greenhouse gas increases. The longest such record exists at Mauna Loa, Hawaii.

(Source: National Oceanic and Atmospheric Administration -- [ftp://ftp.cmdl.noaa.gov/ccg/co2/trends/co2\\_mm\\_mlo.txt](ftp://ftp.cmdl.noaa.gov/ccg/co2/trends/co2_mm_mlo.txt)).

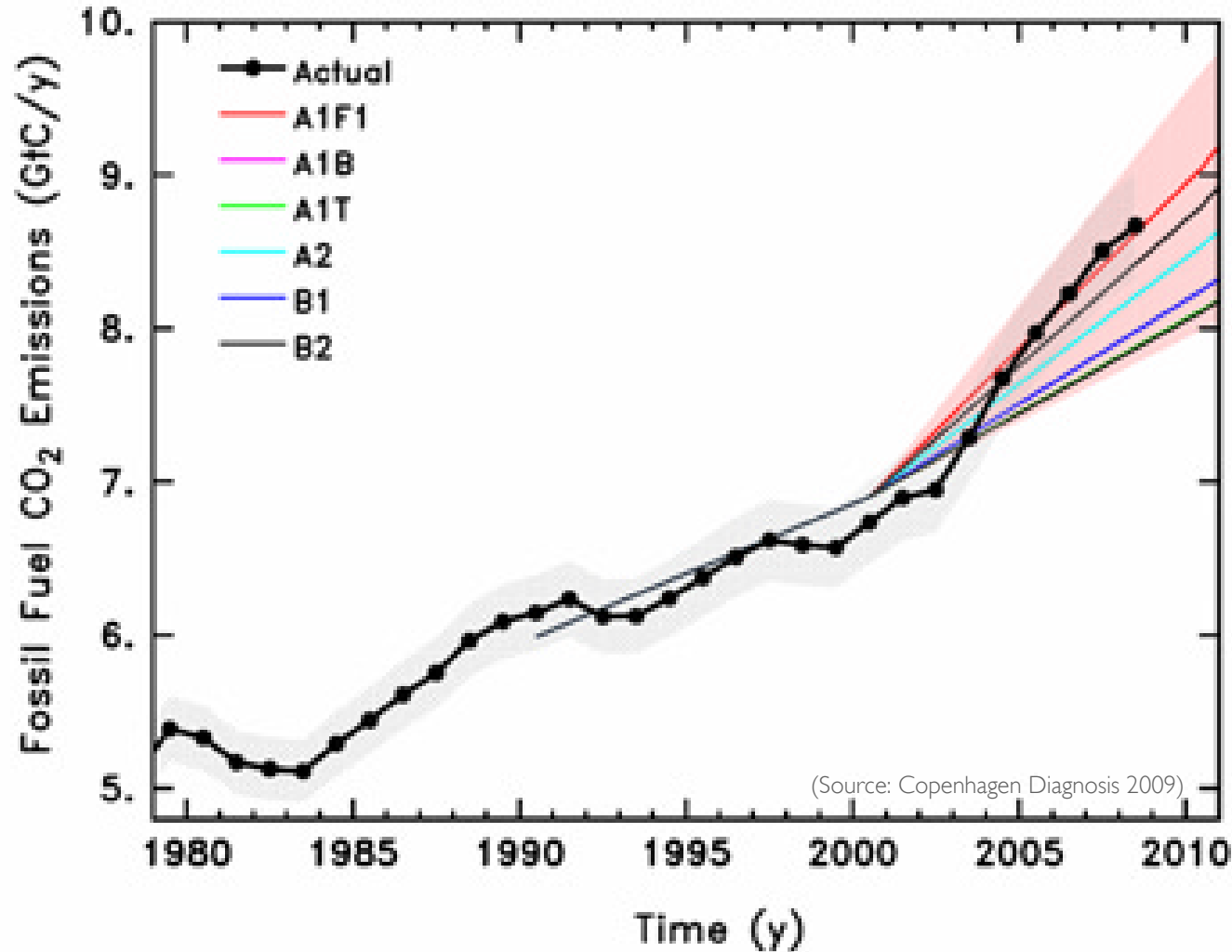
# RECORD CO<sub>2</sub> CONCENTRATION



Dramatic increase of CO<sub>2</sub> in the atmosphere, reaching levels unprecedented in the last 800,000 years (400,000 year scale).

(Sources: 1. (blue) Vostok ice core. 2. (green) EPICA ice core. 3. (red) Law Dome ice core. 4. (cyan) Siple Dome ice core. 5. (black) Mauna Loa)

## Global CO<sub>2</sub> emissions from fossil fuels



Forest canopy on Barro Colorado Island, Panama  
(Photo: Christian Ziegler)

**Emissions absorbed  
by “CO<sub>2</sub> sink”  
reservoirs have likely  
decreased by 5% in  
the past 50 years**



**North Atlantic**  
CO<sub>2</sub> sink decrease ~50% since 1990

**Southern Ocean**  
No CO<sub>2</sub> sink increase since 1981



Deforestation in the Amazon  
(Photo: Luoman)

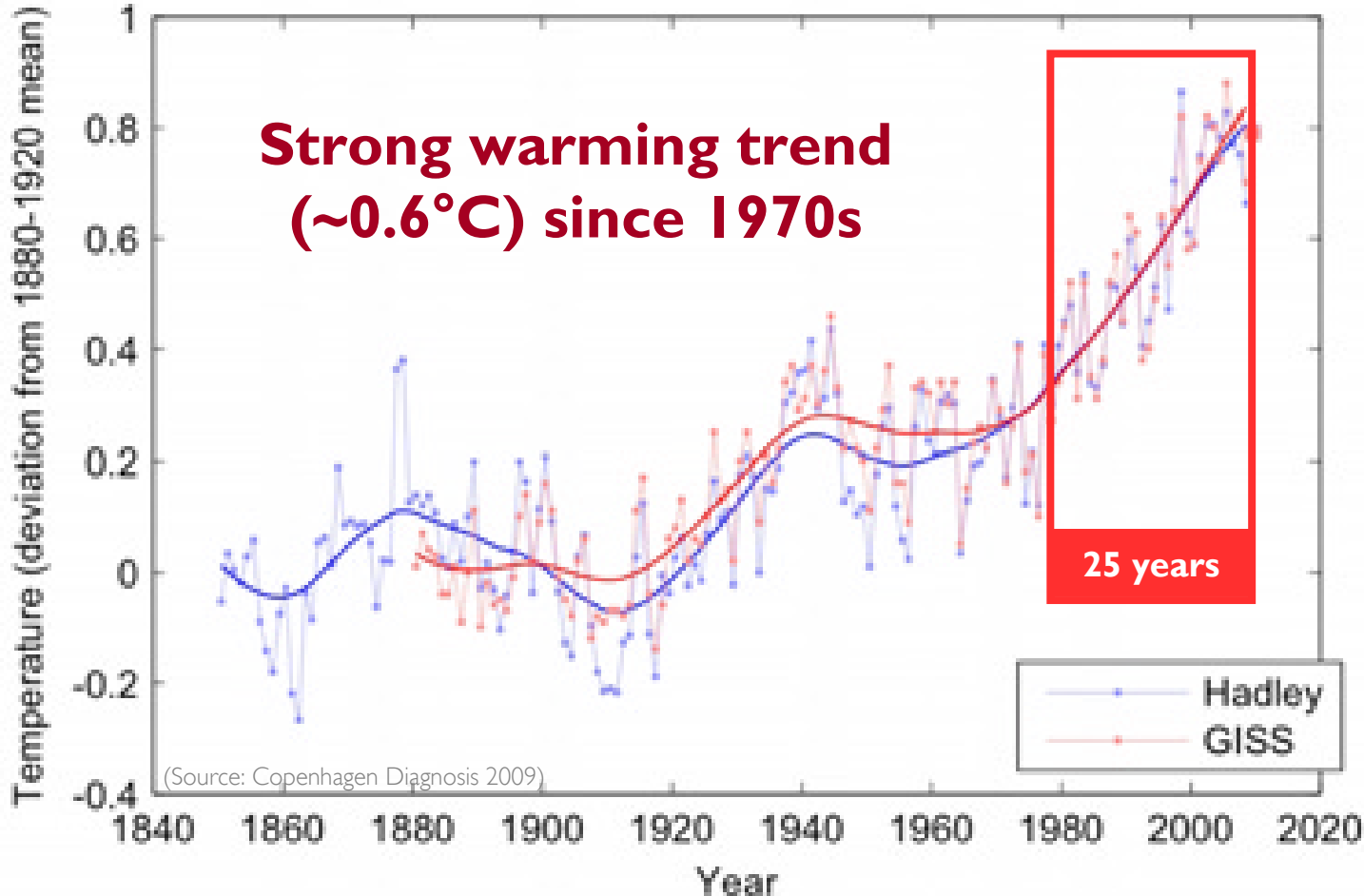
## Synthesis:

- CO<sub>2</sub> emissions increasing
- CO<sub>2</sub> removal decreasing

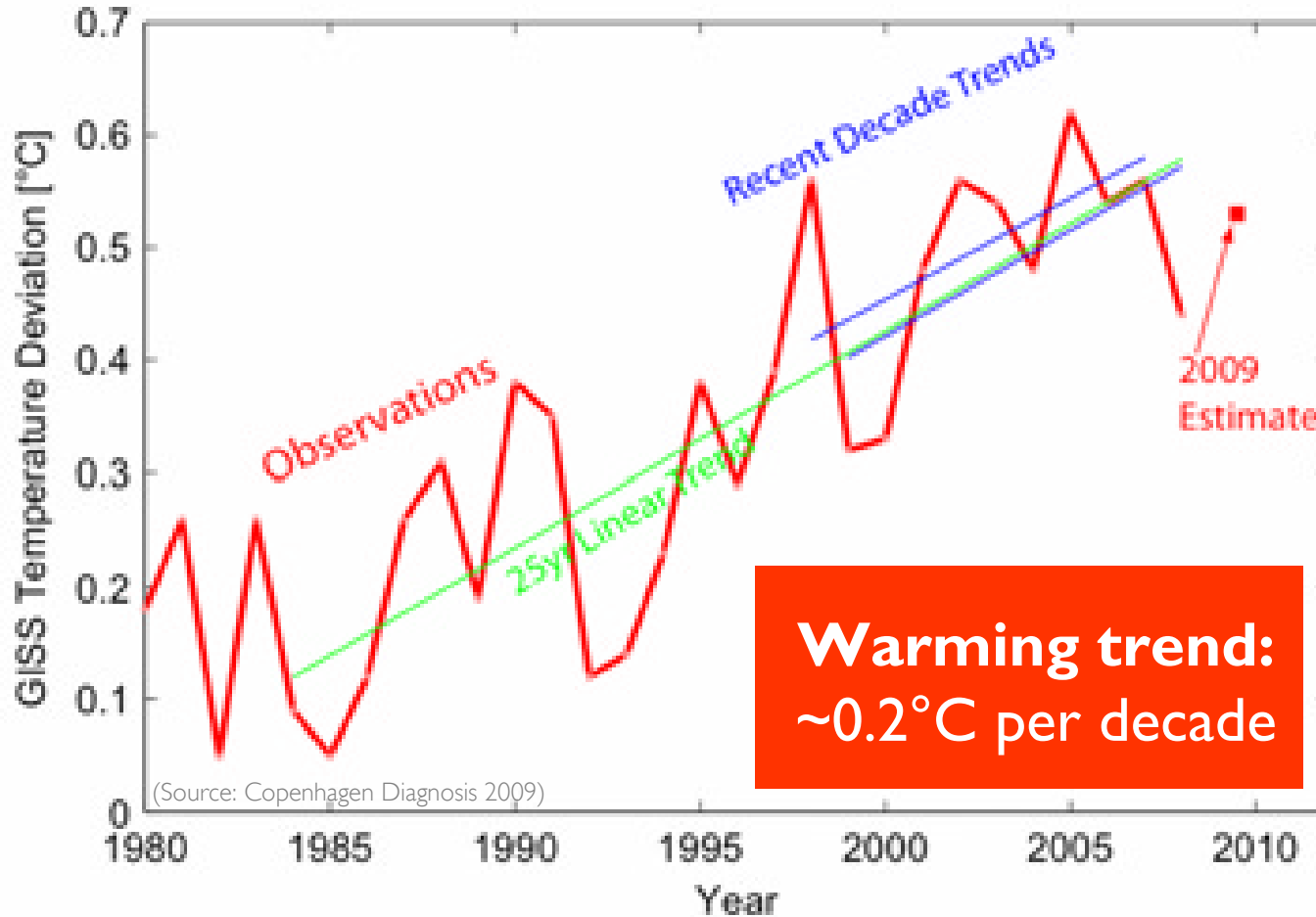
**Result:**

Amplified global warming ~5-30%

## Global average temperature 1850-2009



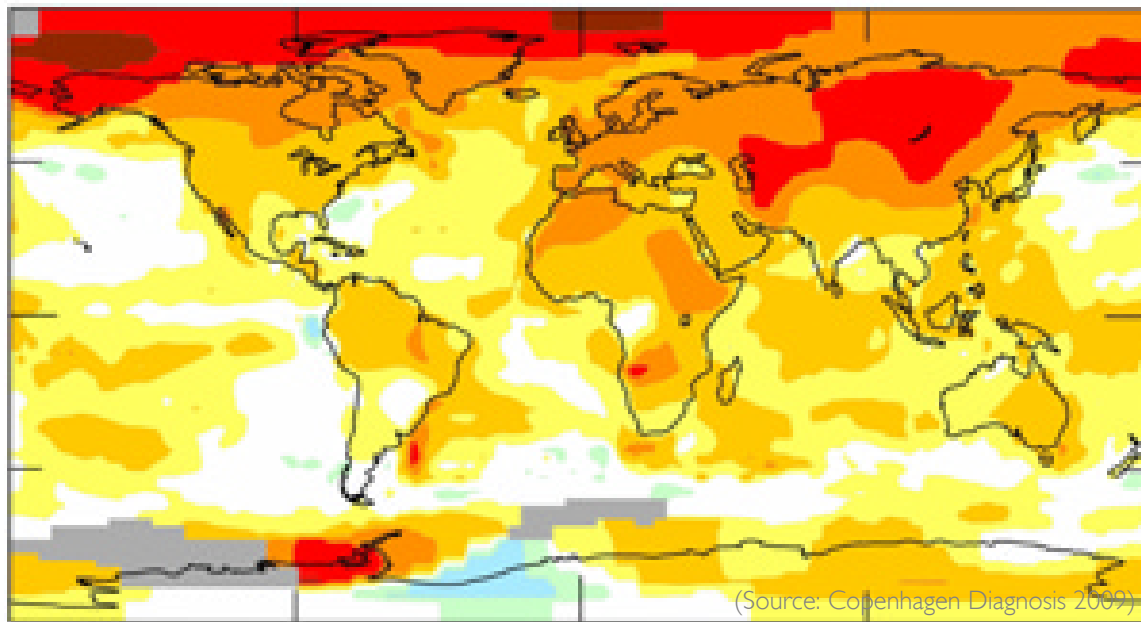
## Global temperature change 1980-2009



(Source: Copenhagen Diagnosis 2009)

(Source: NASA GISS data)

## Mean temperature change between 1950's and 2000's



Among  
top 10  
warmest  
years

2001

2002

2003

2004

2005

2006

2007

2008

2009



South Africa  
Western Cape  
21 July 2002

Photo: NASA

## **Intergovernmental Panel on Climate Change (IPCC):**

1. More heat waves and droughts over wider areas
2. More frequent heavy precipitation events
3. More intense tropical cyclone activity



South Africa  
Western Cape  
21 July 2003

Photo: NASA

**“Climate change will make it harder to manage the world’s water.** People will feel many of the effects of climate change through water. The entire water cycle will be affected. While the world as a whole will get wetter as warming speeds up the hydrological cycle, increased evaporation will make drought conditions more prevalent. Most places will experience more intense and variable precipitation, often with longer dry periods in between. The effects on human activity and natural systems will be widespread.” —*World Bank, World Development Report 2010*

**Precipitation rate  
increase by 5-10% per  
°C warming**



Khailshabunia (Bangladesh)  
under water



Photo: Jon Warren / World Vision

## DRIEDUP

**Kerkorisogal, Kenya:** Children learn English under a tree, taught by teacher James Nakure Etot (36). Kerkorisogal is named for the river that runs through it. But the river hasn't flowed in a year and a half. Ekurichanait Naborkut (34), head teacher at Kerkorisogol School, says hunger often hits his classroom hard: "When there is no food, the children become sleepy and are absent."





Photo: World Vision Philippines

**Cainta / Pasig, Philippines:** Two days after Typhoon Ketsana/Onday's landfall, World Vision Philippines, with the help of a Coast Guard helicopter, drops 75 relief packs. Flood waters remain high, trapping thousands of people. (September 2009)

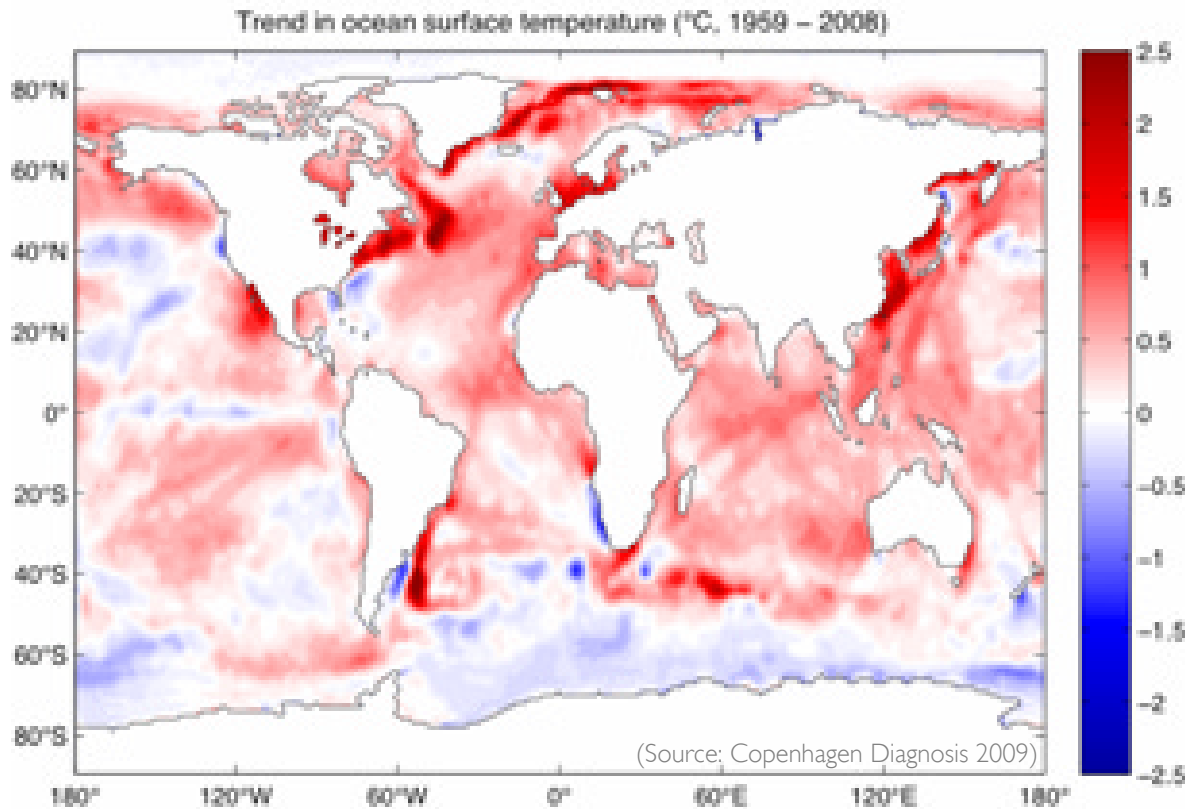
## WATERED **DOWN**

26 September 2009

# Tropical Storm Ketsana over the Philippines

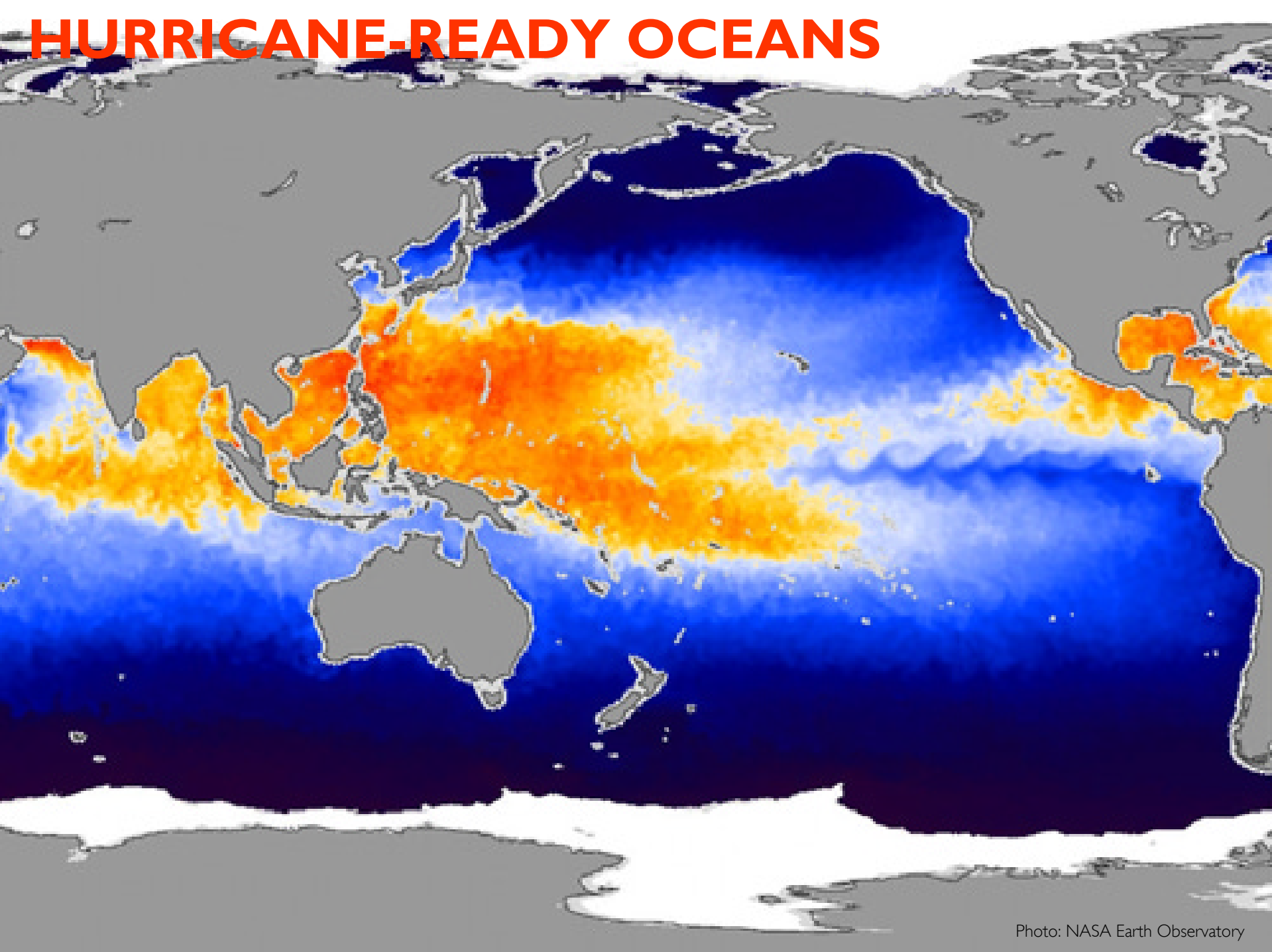
**New Study: 1°C  
global warming =  
30% increase in  
tropical cyclones**

## Ocean heat uptake 50% higher than previous calculations

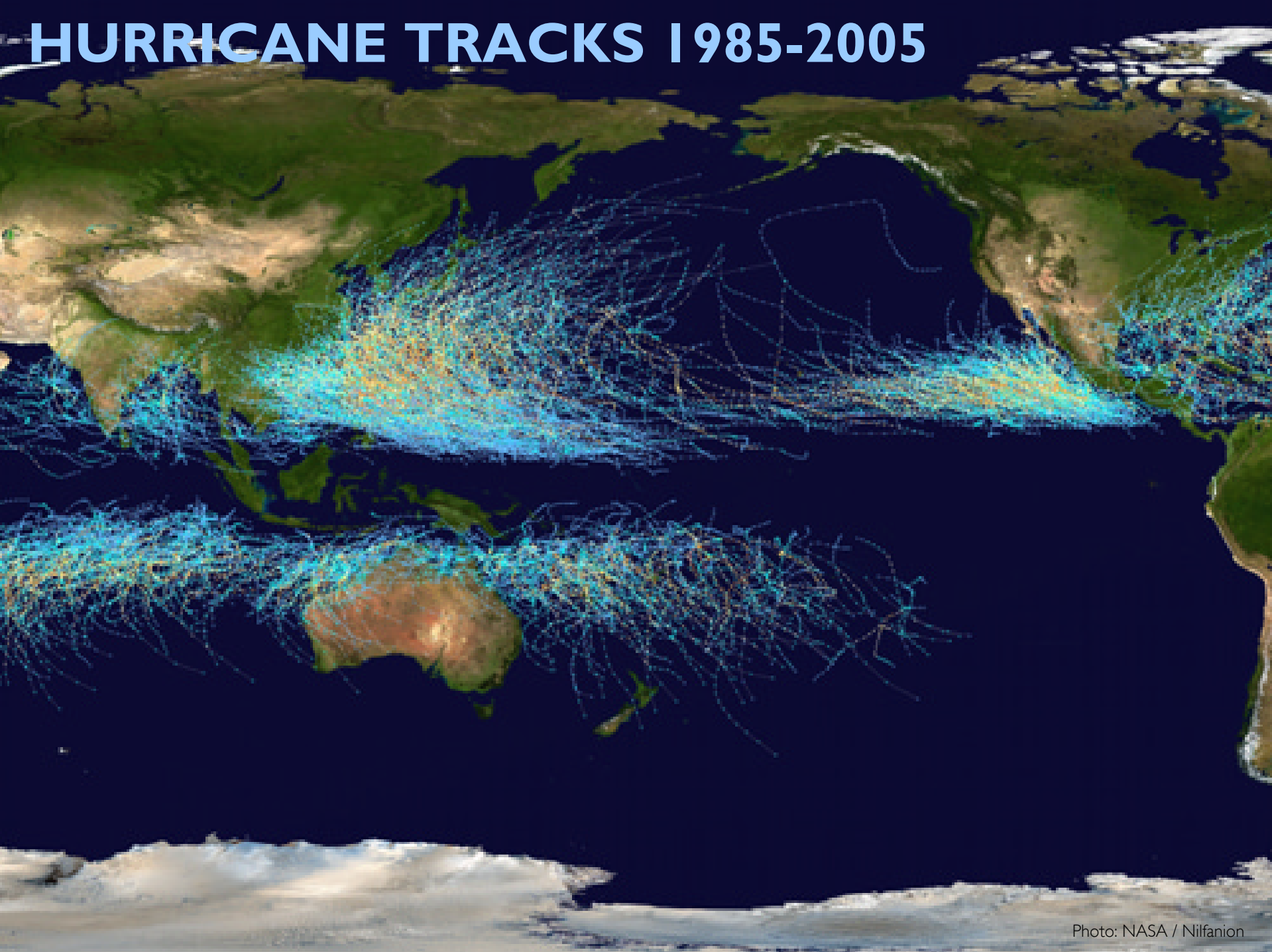


**2007:**  
warmest year  
ever  
recorded

# HURRICANE-READY OCEANS



# HURRICANE TRACKS 1985-2005





## Irrawaddy Delta Before Cyclone Nargis

15 April 2008

Photo: NASA/MODIS Rapid Response Team



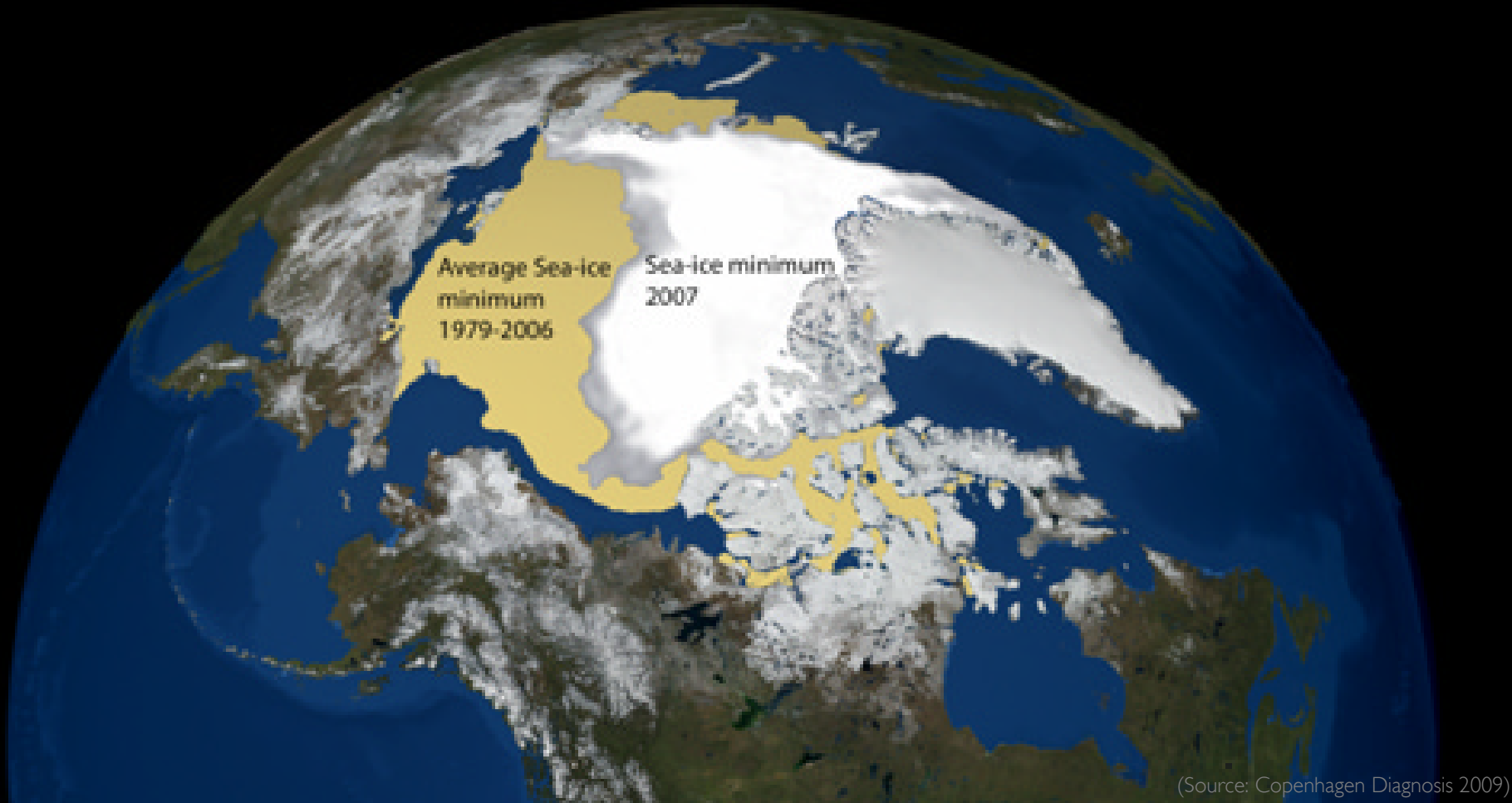
## Irrawaddy Delta After Cyclone Nargis

5 May 2008

Photo: NASA/MODIS Rapid Response Team

**Climate change exacerbates storm surge risk:** “By far the most certain aspect of climate change that will influence surge characteristics is global-mean-sea-level-rise ... The overall conclusion is that the surge hazard will evolve significantly during the 21 century.”

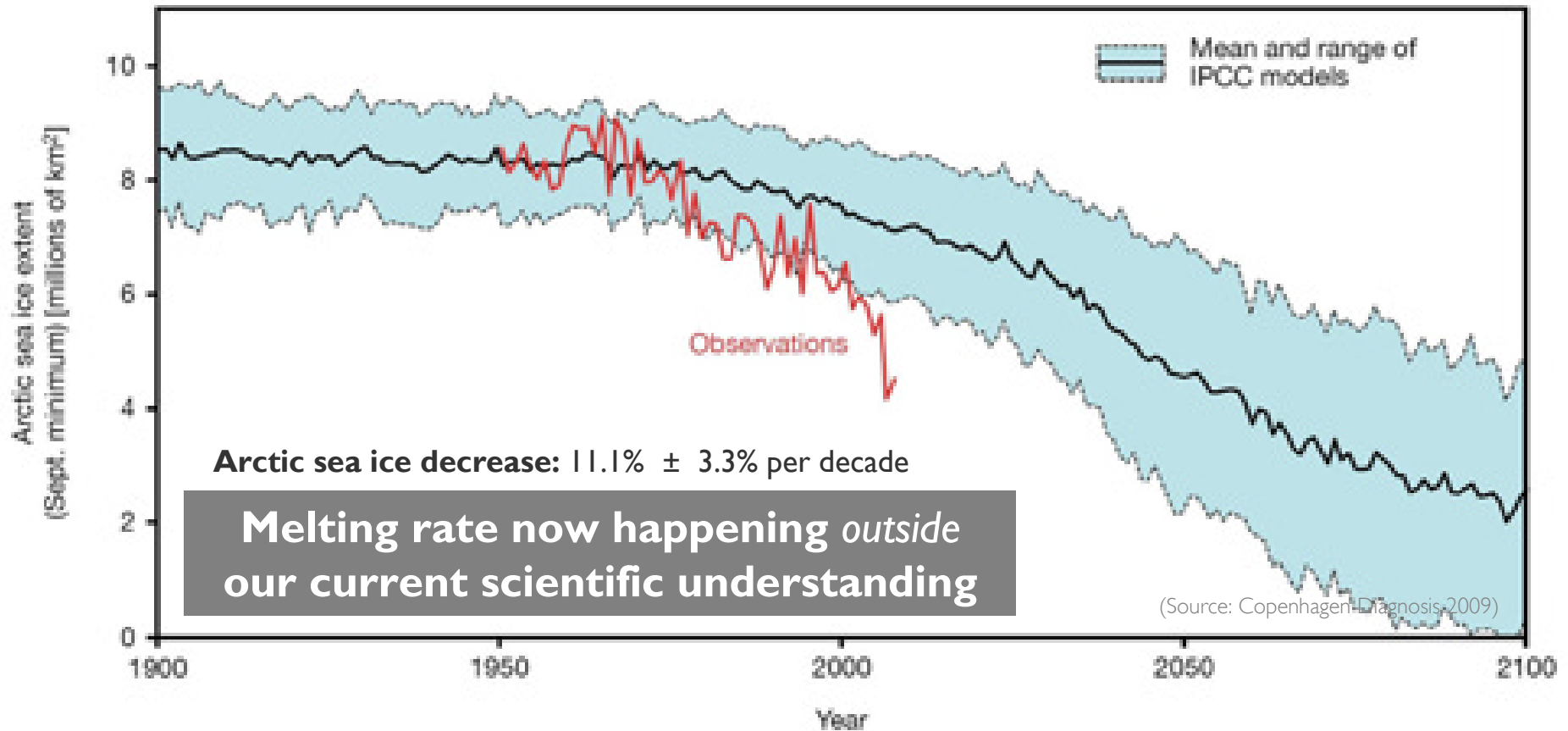
—*World Bank Report, Natural Disaster Hotspots*



## Minimum arctic sea-ice extent from 1979 to 2007



## Observed and modeled Arctic sea-ice extent



# “POLE POSITION”

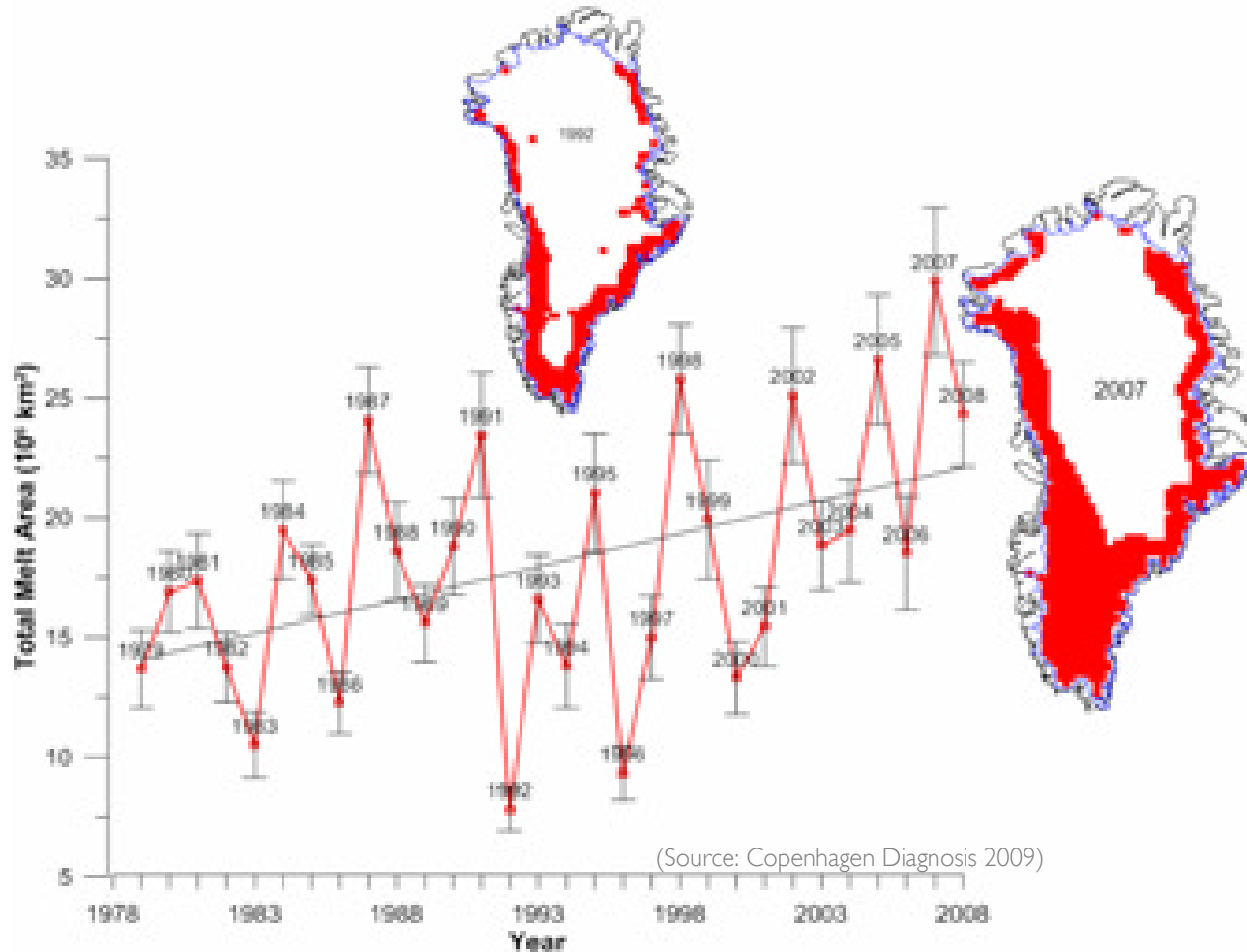
2007, 2008 and 2009: lowest summer  
Arctic sea ice cover ever recorded



Projected:  
**Ice-free Arctic summers**

According to a recent scientific study, polar bears have been found drowning, swimming longer distances from floe to floe.

## Greenland ice-melt since 1979



**2002-2009:**  
Greenland ice mass  
loss doubled

**2007:**  
melting area 50%  
of total ice sheet

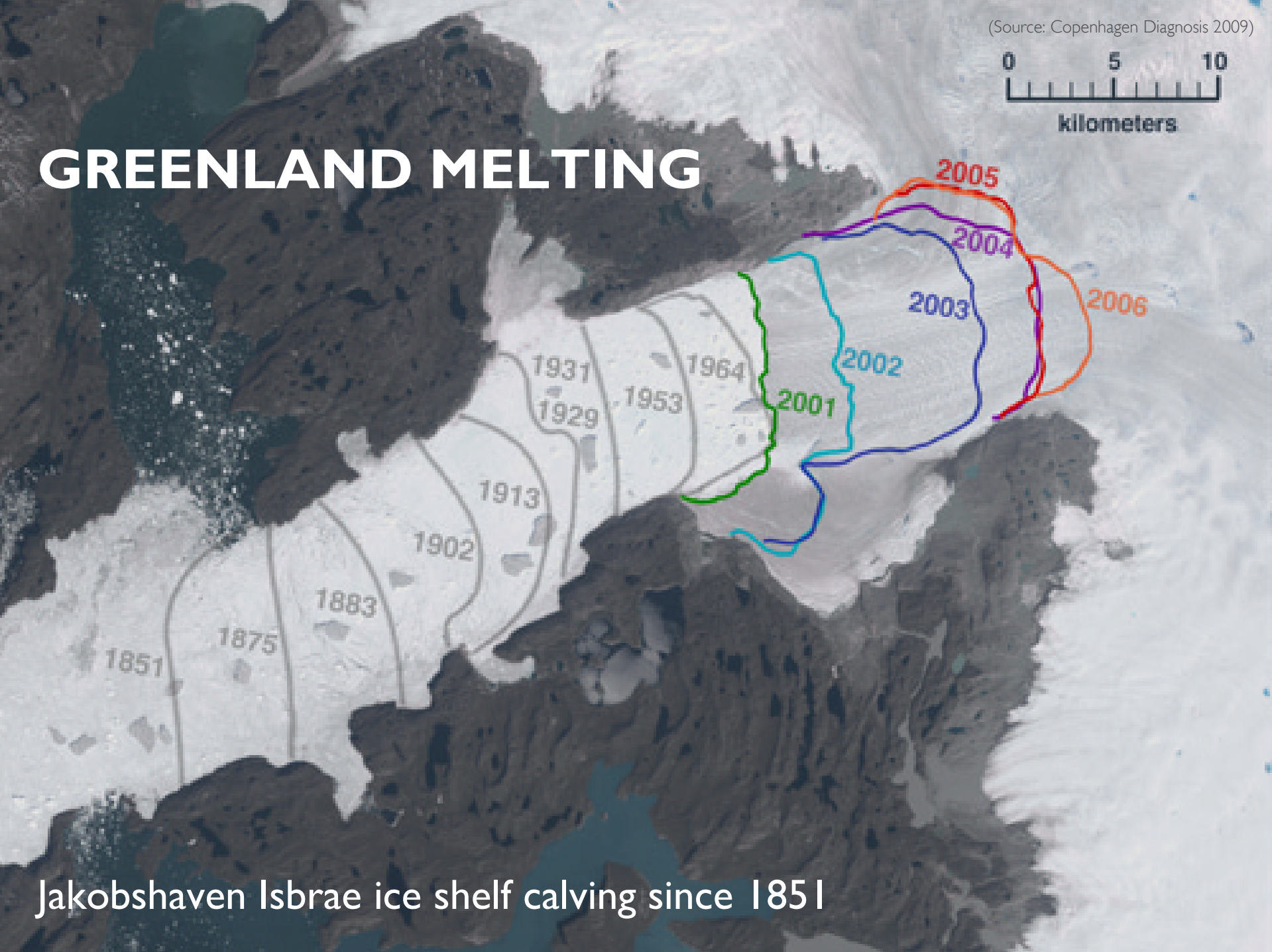
**6.6 metres:**  
Greenland's total  
SLR potential

(Source: Copenhagen Diagnosis 2009)



kilometers

# GREENLAND MELTING



Jakobshaven Isbrae ice shelf calving since 1851

**Destabilisation** of floating ice shelves widespread along Antarctic Peninsula

# LARSEN B BREAK-UP



**7 Collapses in last 20 years**

(Photo: Armin Rose)


# Antarctic Warming Trend (°C/decade) from 1957-2006

**SLR:  
3m**

**SLR:  
7m**

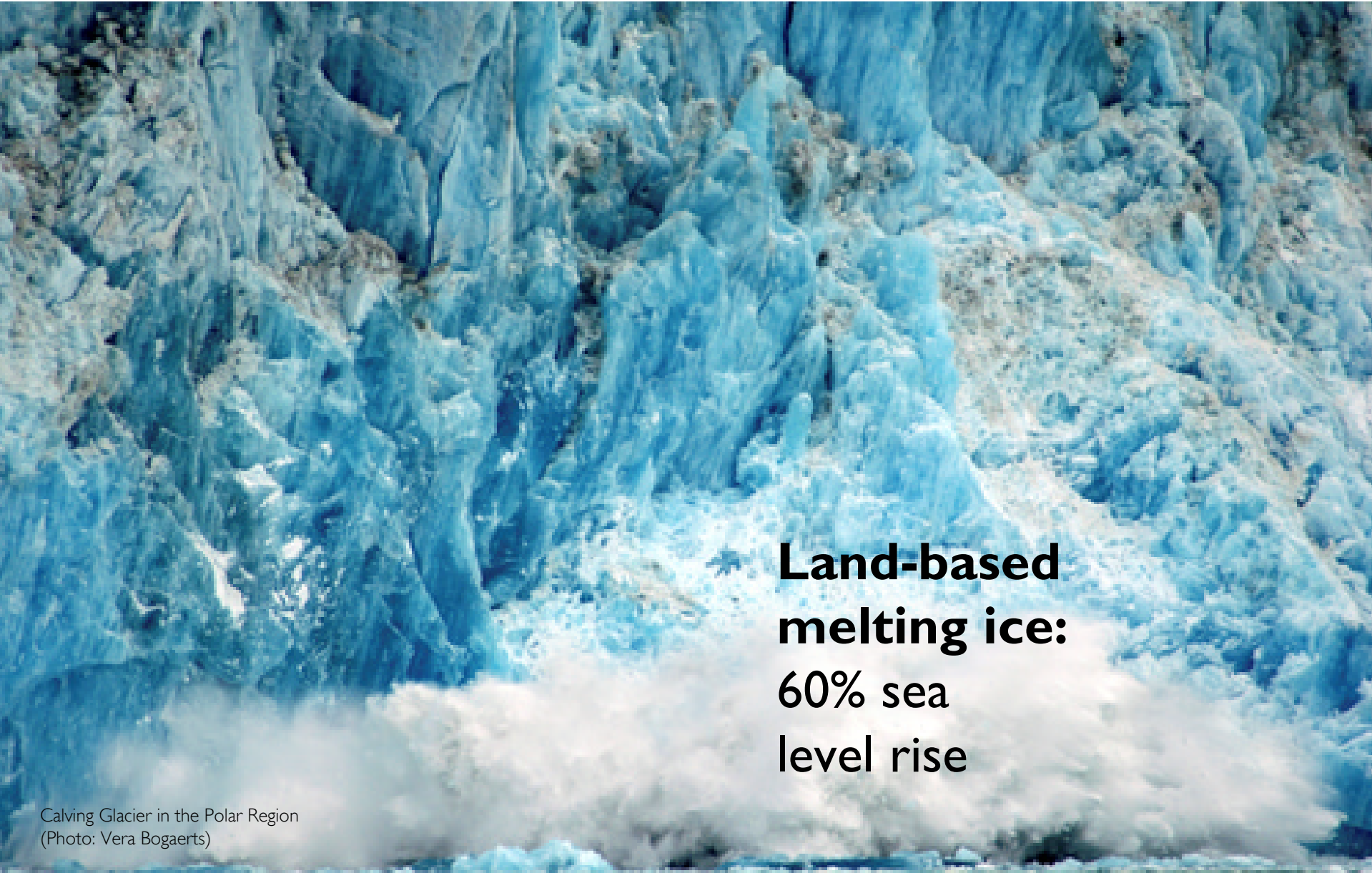
**SLR:  
50m**





**Thermal  
expansion:  
40% sea  
level rise**

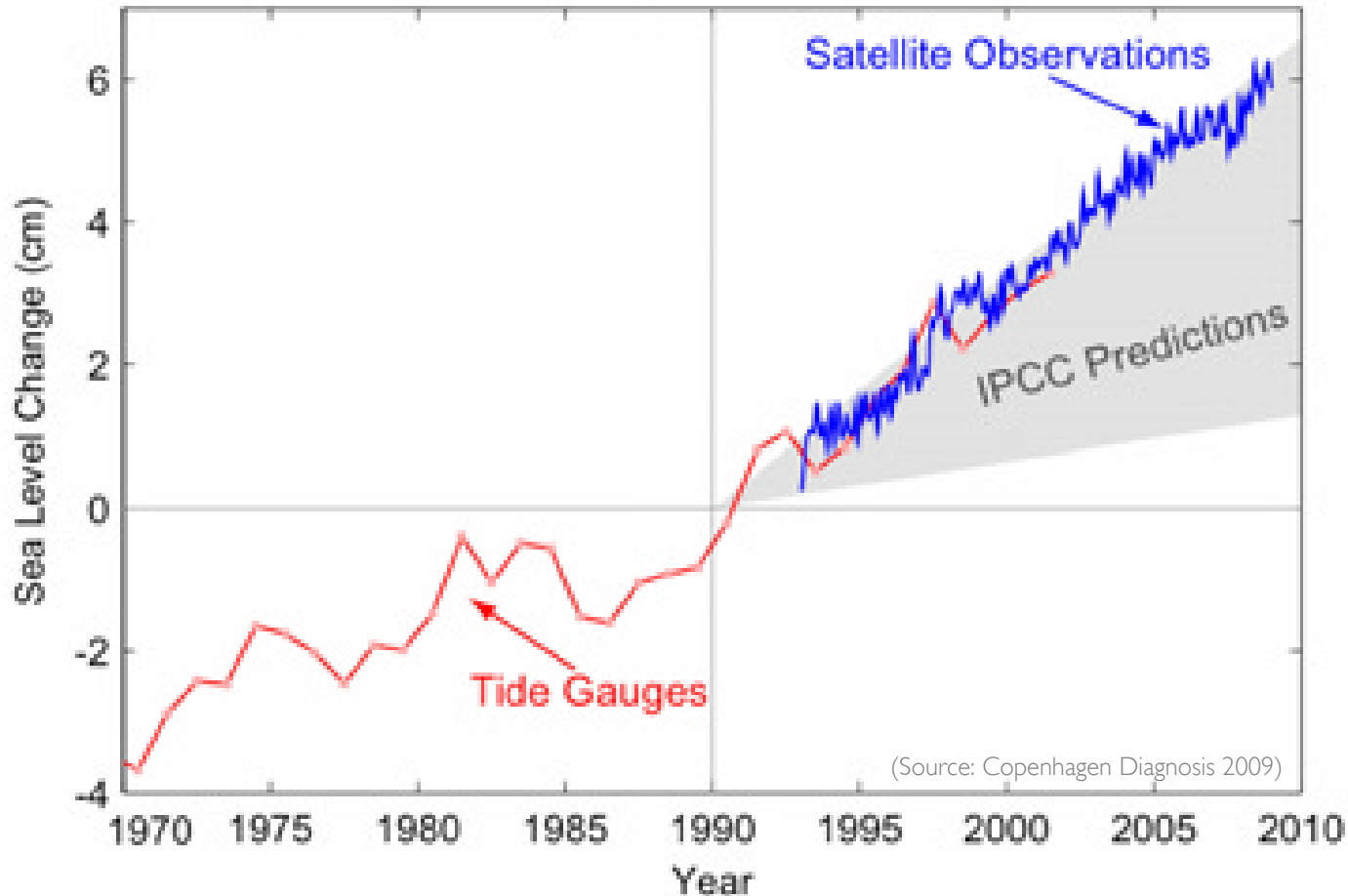




★ **Land-based  
melting ice:  
60% sea  
level rise**

Calving Glacier in the Polar Region  
(Photo: Vera Bogaerts)

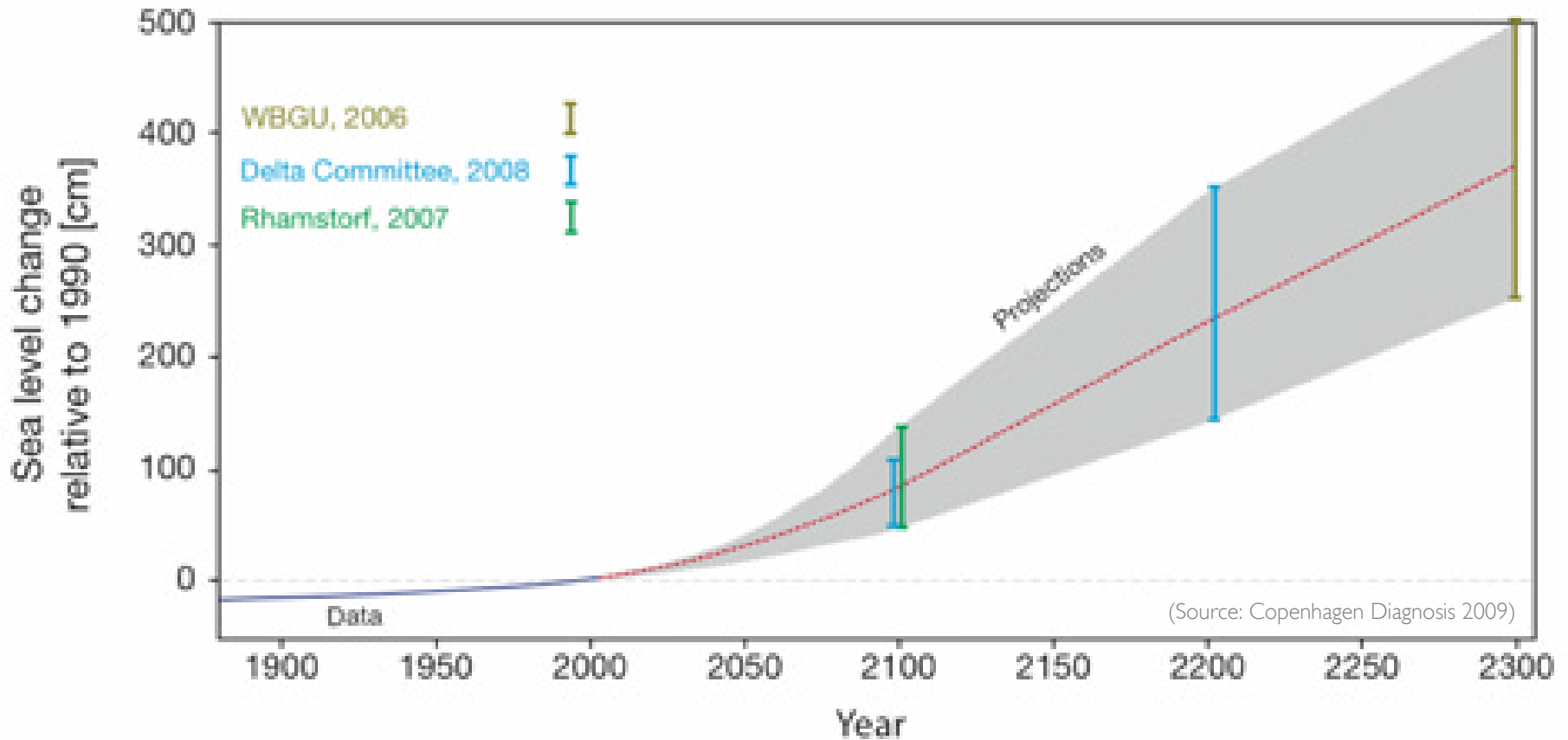
## Global sea level change 1970-2010



**SLR by  
2100:  
1-2m**

**SLR by  
2300:  
up to 5m**

## Future sea-level projections





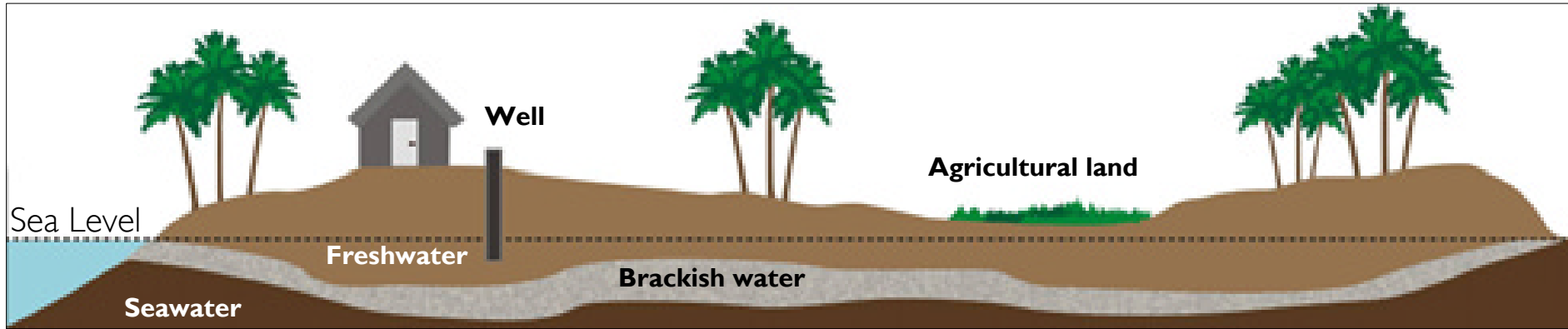
**WATER**  
IS LIFE

Intergovernmental Panel on Climate Change (IPCC)

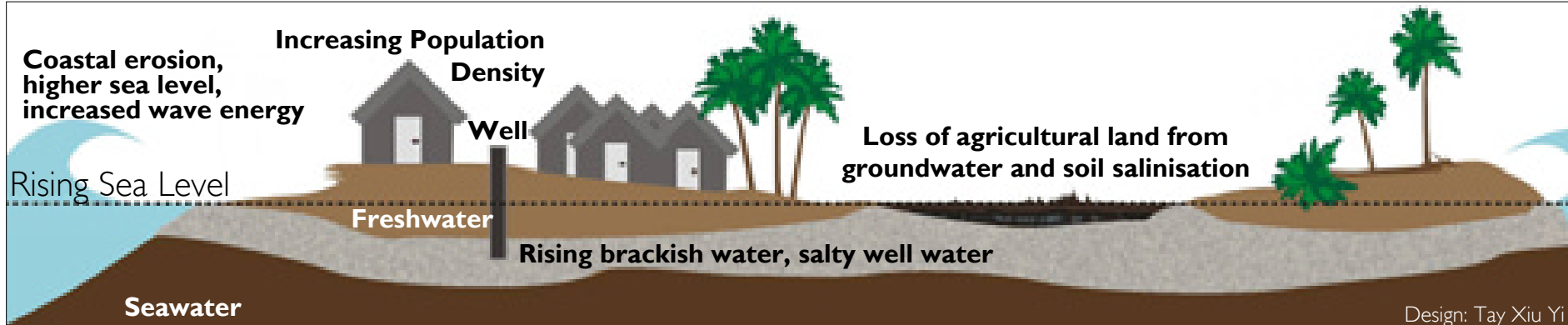
Island near Fiji (Photo: Wikipedia)

**Fourth Assessment Report, 2007:** “By mid-century, climate change is expected to reduce water resources in many small islands, e.g. in the ... Pacific, to the point where they become insufficient to meet demand during low-rainfall periods.”

**Figure 1:** Normal sea level



**Figure 2:** Rising sea level



Design: Tay Xiu Yi

Photo: Johannes Luetz

Island of Petats

OPEN  
WELL

Papua New Guinea: Island of Petats, contaminated open well

**Luke Rutsie (36), Petats:** “The well water tastes very salty – islanders now use it only for cooking and bathing.”



Island of Pororan

CLOSED  
WELL

Photo: Johannes Luetz

Papua New Guinea, island of Pororan, contaminated closed well

**Francis Giran (59), Pororan:** “The well water has become salty and unfit for consumption. This World Vision-built pump is brown with rust.”



**Mosquito breeding swamps**

# CARTERET ATOLL

Photos: Tulele Peisa, Courtesy Pip Starr and Ursula Rakova



Slicing through



# CARTERET ATOLL

Photos: Tulele Peisa, Courtesy Pip Starr and Ursula Rakova



## PACIFIC ATLANTIS CARTERET ATOLL



Ursula Rakova, Carteret Islander and Director of Tulele Peisa NGO, Papua New Guinea

Photo: Pip Starr

**Ursula Rakova, Carterets:** “After Huene was sliced in two, my family settled on Huene One (right). There are three houses there. On Huene Two (left) there are only gardens. The channel keeps widening.”



**Island of Buka**

Photo: Johannes Luetz

## **ISLAND ADAPTATION THROUGH SEA WALLS?**



## Island on Carterets

Photo: Johannes Luetz

**Island Fact 1:** uninhabitable long before submergence

**Island Fact 2:** difficult to “adapt/protect” long-term

## Paradise Lost?

Photo: Tammy Peluso

**Island Fact 3:** eventually evacuation only escape route

**Island Fact 4:** 10 million islanders affected in Asia Pacific



Malé, Maldives

**Malé, Maldives:** As the country with the lowest "highest point" on Earth the Maldives is extremely vulnerable to rising sea levels, 80% of land area is less than 1 metre above sea level. (Photo: Shahee Ilyas)

## **Mohamed Nasheed, President of Maldives:**

“We do not want to leave the Maldives, but we also do not want to be climate change refugees living in tents for decades.” (80% land < 1m above sea level)

# Island of Dhuvafaaru, Maldives

Island of Dhuvafaaru, Maldives  
(Photo: Johannes Luetz)



# Island of Dhuvafaaru, Maldives



Island of Dhuvafaaru, Maldives  
(Photo: Johannes Luetz)



# Island of Dhuvafaaru, Maldives



Island of Dhuvafaaru, Maldives  
(Photo: Johannes Luetz)



Photo: Tammy Peluso

“No matter how aggressive future climate change mitigation strategies may be, we can be sure that by the end of the century there will be millions of ‘boat people’ from developing countries looking for safer ground.” —Dr. S. Byravan and Dr. S. C. Rajan

“ *For tomorrow belongs to the people who **PREPARE** for it today.* ”

—*African Proverb*

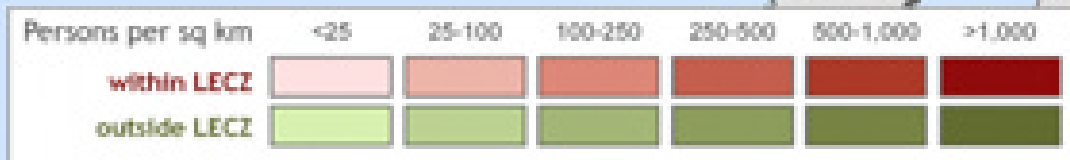
1. The latest climate science
- 2. Asian climate disaster hotspots**
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# COASTAL HAZARDS

## Low Elevation Coastal Zone (LECZ):

Red shaded areas denote densely settled population centres no higher than 10 metres above sea level.

- Coastal population densities: 3x higher than global average
- 160 million within 1 meter of sea level



(Source: Center for International Earth Science Information Network (CIESIN), Columbia University)



**Jakarta:** One of many cities that needs to prepare for sea level rise. With 40% of the city below sea level, there have already been calls to relocate the Indonesian capital to Bandung, 180km away.

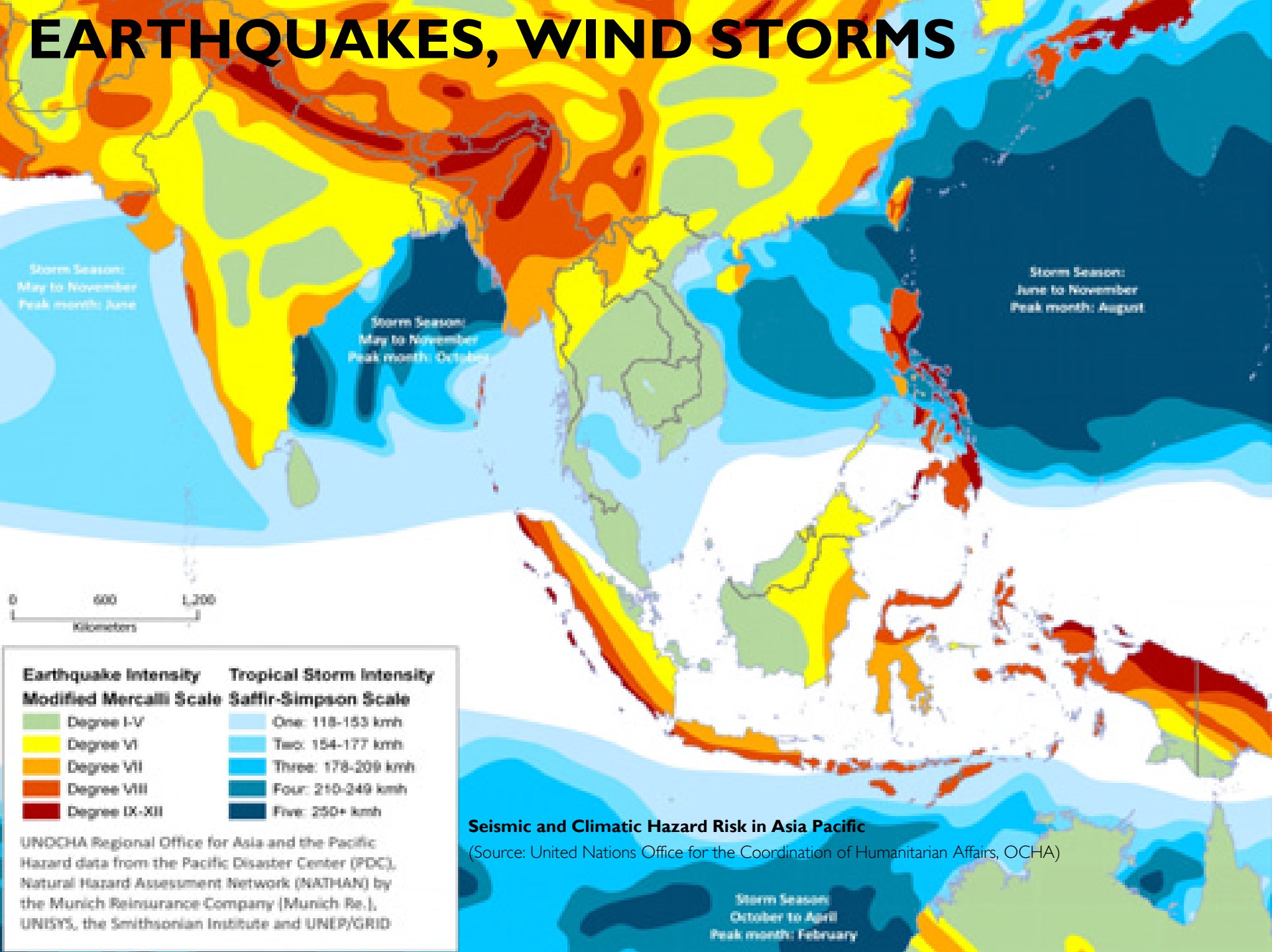


**With its 13 rivers floods in Jakarta can be devastating. The February 2007 flood made 450,000 people homeless. More than 70 percent of the city was inundated.**

Photo: Abi Hardjatmo

**Jakarta:** One of many cities that needs to prepare for sea level rise. With 40% of the city below sea level, there have already been calls to relocate the Indonesian capital to Bandung, 180km away.

# EARTHQUAKES, WIND STORMS



Storm Season:  
May to November  
Peak month: June

Storm Season:  
May to November  
Peak month: October

Storm Season:  
June to November  
Peak month: August

0 600 1,200  
Kilometers

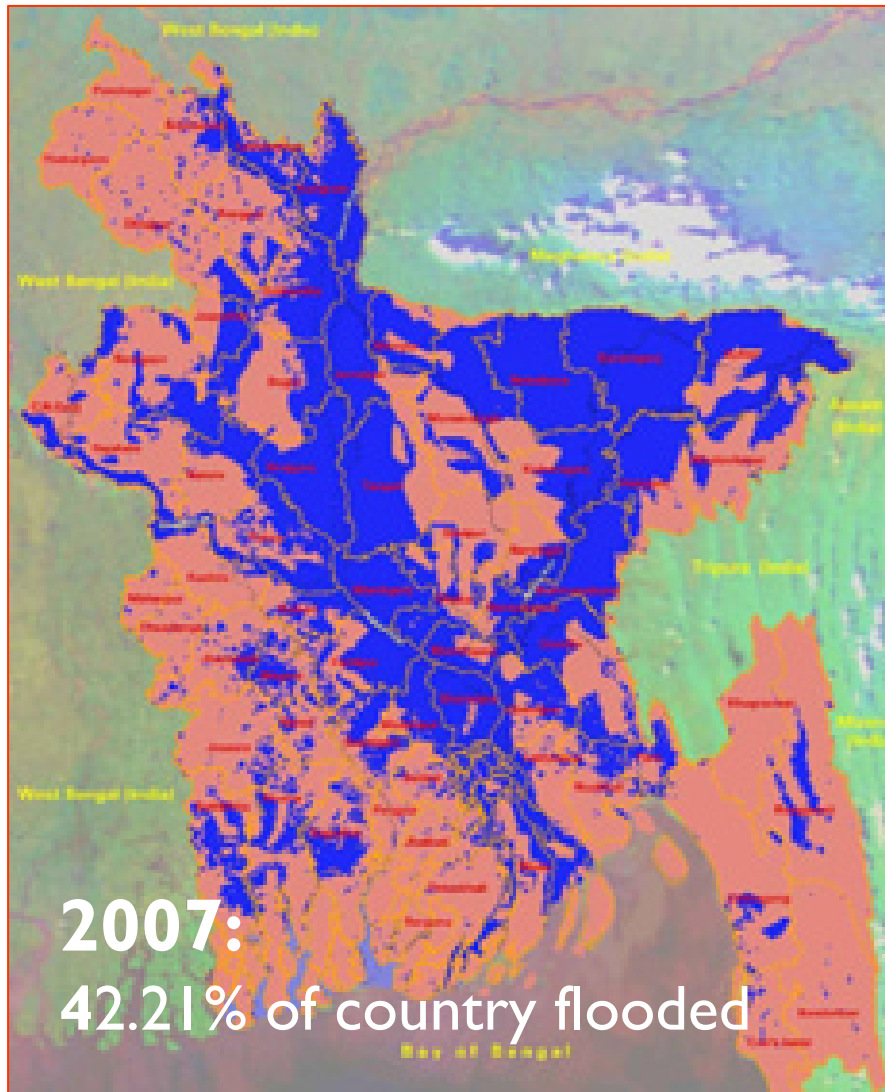
Earthquake Intensity Modified Mercalli Scale	Tropical Storm Intensity Saffir-Simpson Scale
<span style="color: green;">■</span> Degree I-IV	<span style="color: lightblue;">■</span> One: 118-153 kmh
<span style="color: yellow;">■</span> Degree V/VI	<span style="color: cyan;">■</span> Two: 154-177 kmh
<span style="color: orange;">■</span> Degree VII	<span style="color: blue;">■</span> Three: 178-209 kmh
<span style="color: red;">■</span> Degree VIII	<span style="color: darkblue;">■</span> Four: 210-249 kmh
<span style="color: darkred;">■</span> Degree IX-XII	<span style="color: black;">■</span> Five: 250+ kmh

UNOCHA Regional Office for Asia and the Pacific  
Hazard data from the Pacific Disaster Center (PDC),  
Natural Hazard Assessment Network (NATHAN) by  
the Munich Reinsurance Company (Munich Re.),  
UNISYS, the Smithsonian Institute and UNEP/GRID

## Seismic and Climatic Hazard Risk in Asia Pacific

(Source: United Nations Office for the Coordination of Humanitarian Affairs, OCHA)

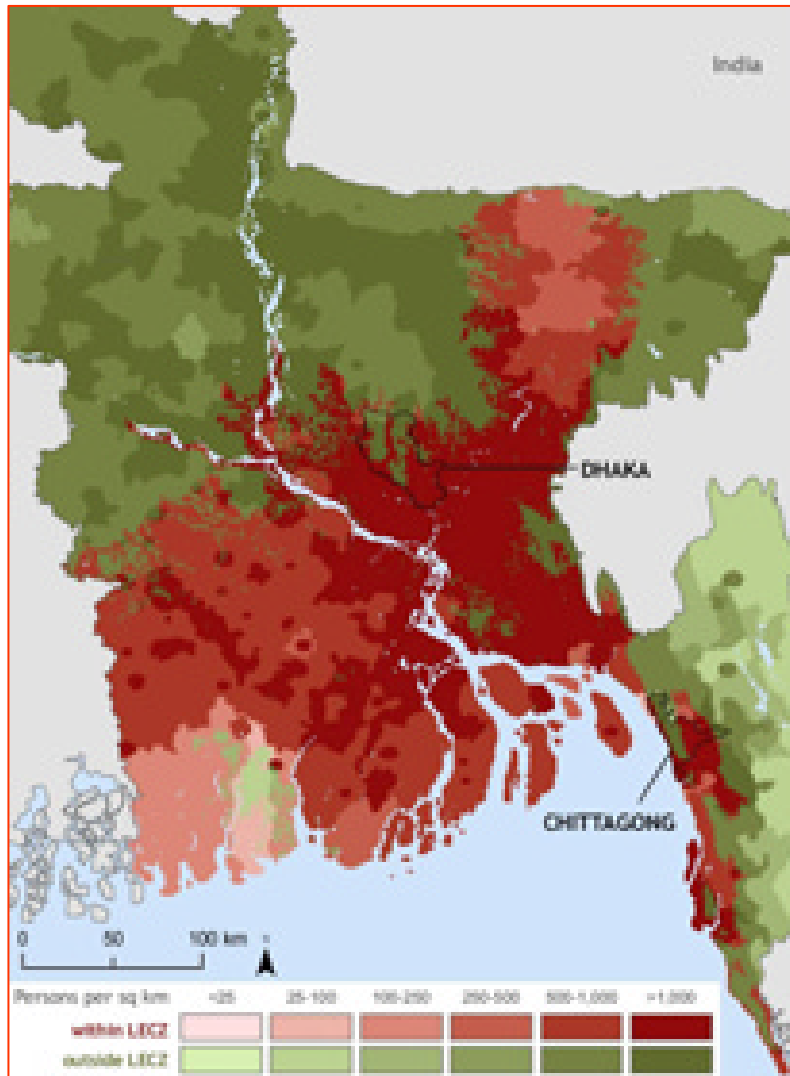
Storm Season:  
October to April  
Peak month: February



**Bangladesh,  
world's largest  
river delta:**  
One-third floods  
annually during  
the monsoon.  
Extreme floods  
cover up to two-  
thirds of the  
country.

Bangladesh Space Research and Remote Sensing Organization (SPARRSO). Satellite image: August 2,3,4,5,7 & 8, 2007





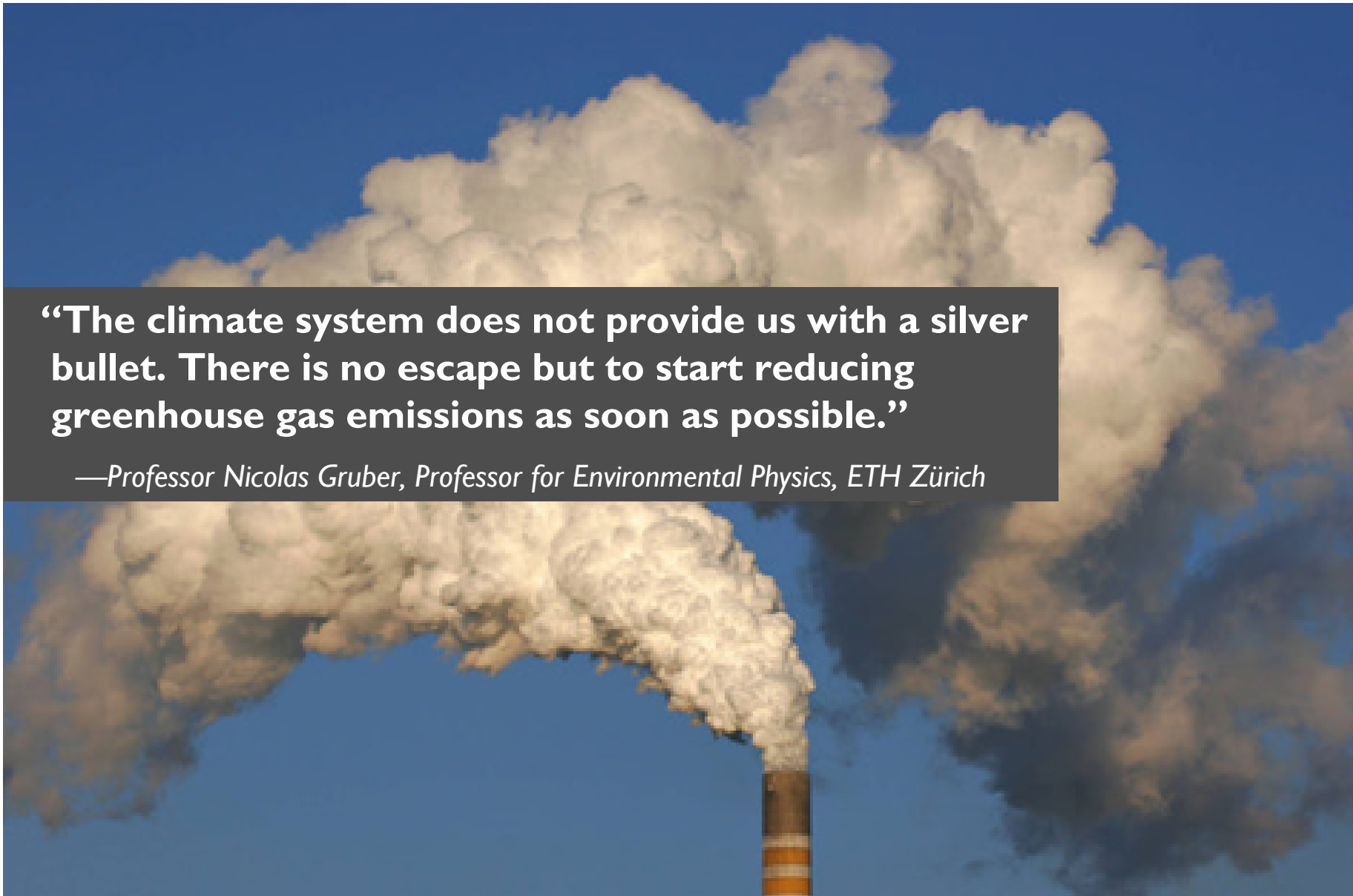
**Low Elevation Coastal Zone (LECZ):** Red shaded areas denote densely settled population centres no higher than 10 metres above sea level.

Graphic: Centre for International Earth Science Information Network (CIESIN), Columbia University

“ *For tomorrow belongs to the people who **PREPARE** for it today.* ”

—*African Proverb*

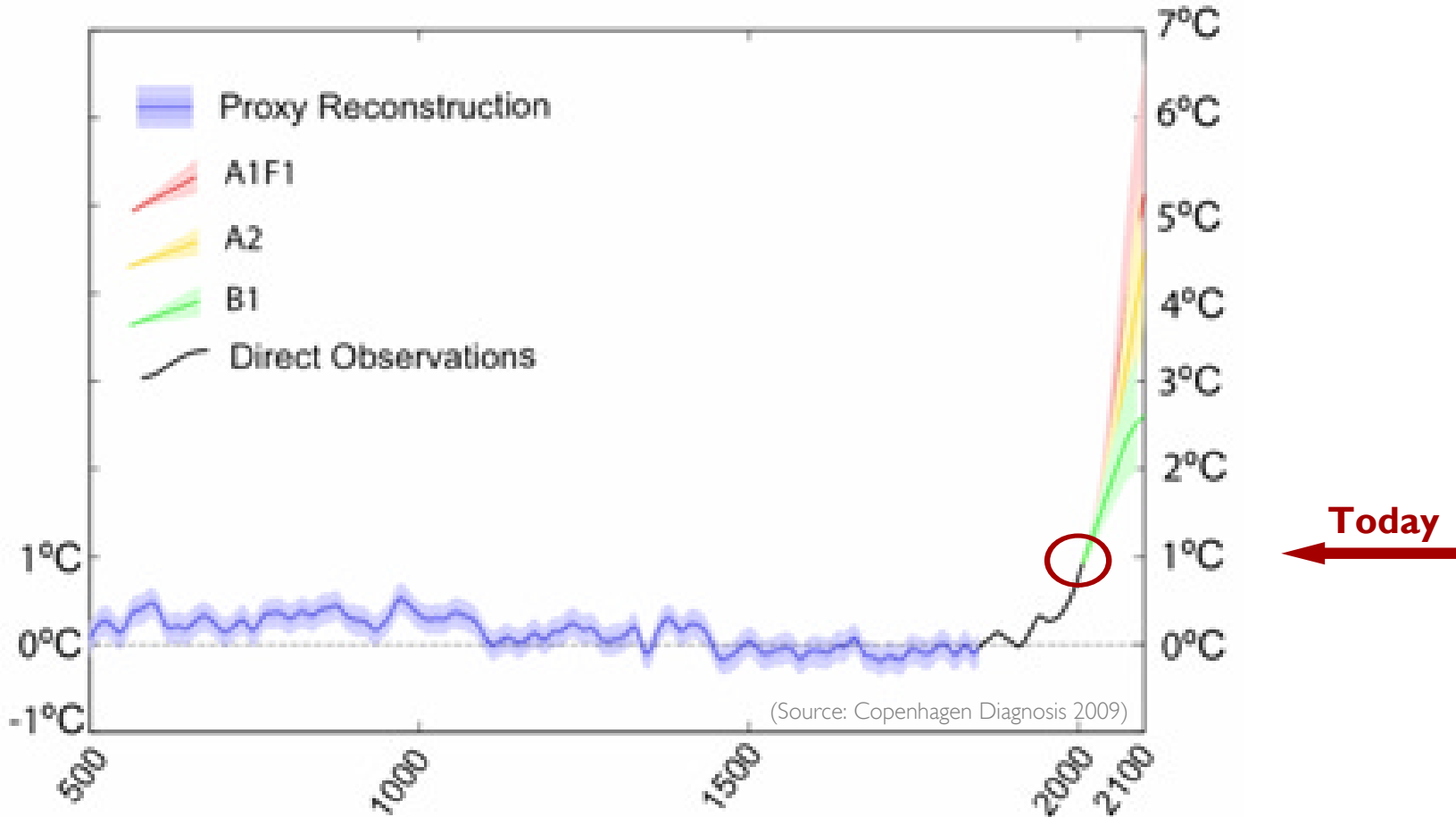
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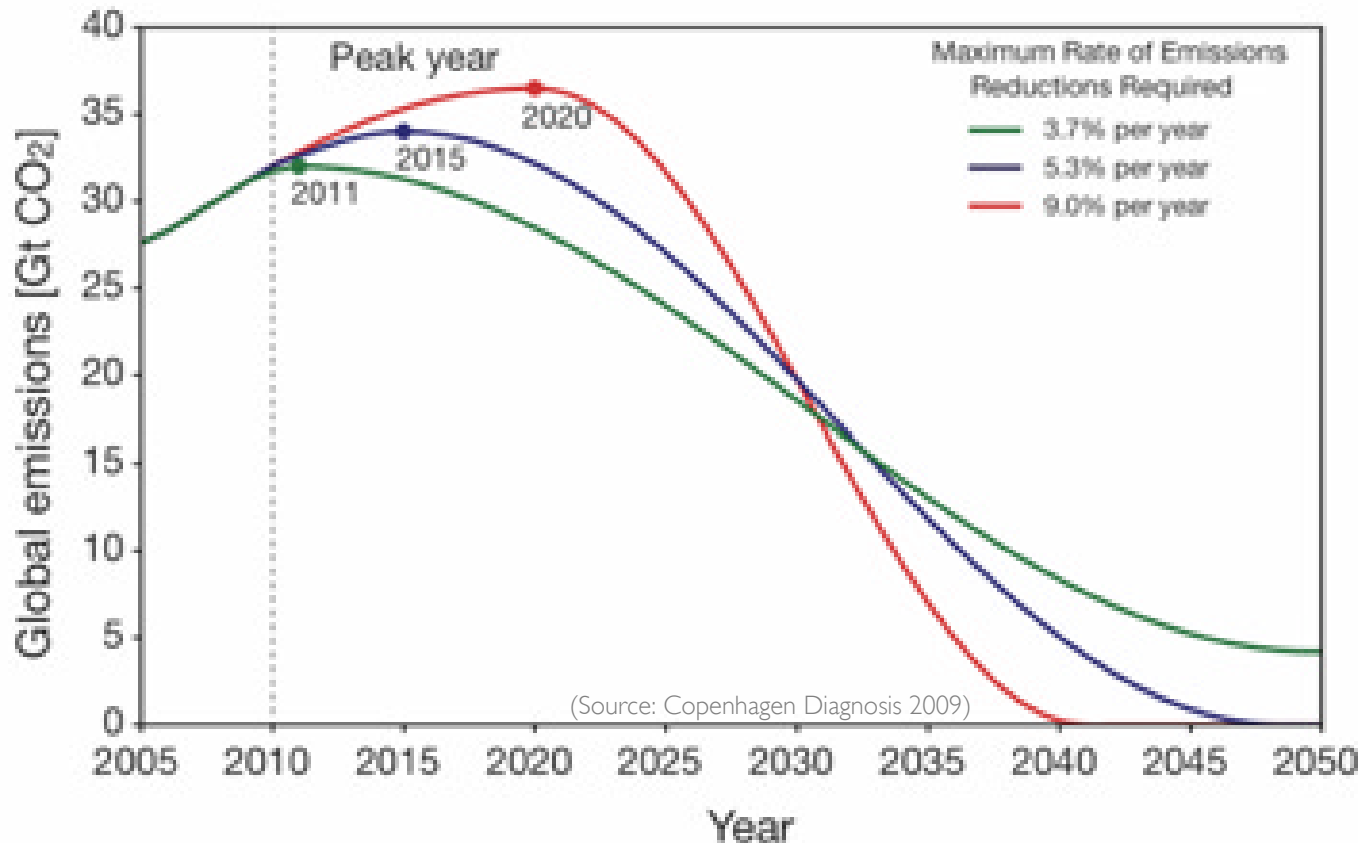
**“The climate system does not provide us with a silver bullet. There is no escape but to start reducing greenhouse gas emissions as soon as possible.”**

*—Professor Nicolas Gruber, Professor for Environmental Physics, ETH Zürich*

## Reconstructed, observed and future warming projections



## Emissions pathways leaving 75% chance of limiting global warming to 2°C



**By 2050,  
annual per  
capita  
emissions  
very likely  
will need  
to be  
below 1  
ton.**

## Comparison:

**2010 → Per-capita CO<sub>2</sub> emissions from Bangkok trip:  
well over 2 tons**

**2050 → Cumulative annual per-capita CO<sub>2</sub> emissions:  
well under 1 ton**

# Thank You

“ *For tomorrow belongs to the people who **PREPARE** for it today.* ”

—*African Proverb*

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4. **Policy implications for WVI**

## Getting ready for the “new normal”

**“What we are witnessing is not an aberration, but rather a ‘curtain raiser’ on the future. These events are not abnormal; they’re what I call the ‘new normal.’ The number of recorded disasters has doubled from approximately 200 to over 400 per year over the past two decades. Nine of out every ten disasters are now climate related. Last year, my office at the UN issued an unprecedented 15 funding appeals for sudden natural disasters, five more than the previous annual record. 14 of them were climate-related.”**

*—Sir John Holmes, UN Under-Secretary General for Humanitarian Affairs and Emergency Relief Coordinator.*

Photo: Kirill Putchenko



**250 million climate exiles by 2050** *(Norman Myers)*

**“Our results reveal that hundreds of millions of people in the developing world are likely to be displaced by Sea Level Rise within this century.”**

*(World Bank Study)*

Darfur Blanek Feeding  
(Photo: World Vision)



**Moral authority through  
organisational CO<sub>2</sub> emissions cuts**

**“We need to be the change  
we wish to see in the world.”**

—Gandhi

Bangkok, 11-12 February 2010

## **World Vision Multi Emergency Learning Event:** Keynote Speech -- Climate Change in Asia Pacific

Prepared by PhD Candidate Johannes M. Luetz  
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**For World Vision internal use**

**Presentation available:**

<http://luetz.com>

**Report and background material:**  
<http://www.copenhagendiagnosis.org>