

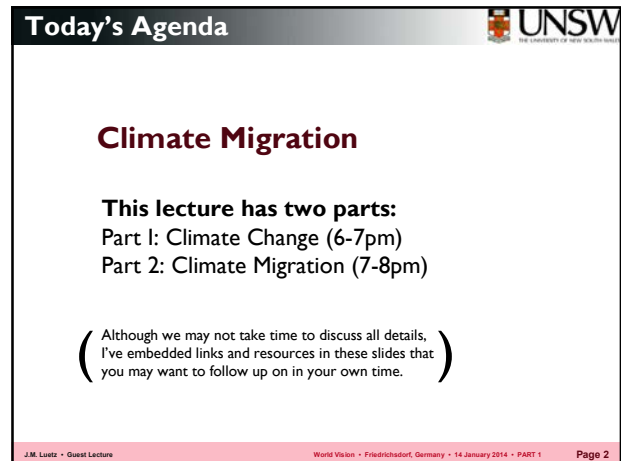
**Climate Change  
Mitigation, Adaptation  
and Migration**

World Vision • Friedrichsdorf, Germany • 14 January 2014

Guest Lecture • Part I

Dr. Johannes M Luetz  
j.luetz@unsw.edu.au

Photo: Erwin Guttenberger / Stockphoto



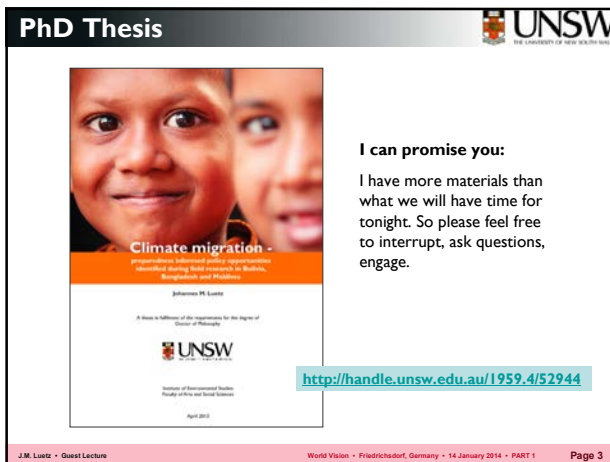
**Today's Agenda**

**Climate Migration**

**This lecture has two parts:**  
Part 1: Climate Change (6-7pm)  
Part 2: Climate Migration (7-8pm)

( Although we may not take time to discuss all details,  
I've embedded links and resources in these slides that  
you may want to follow up on in your own time. )

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**PhD Thesis**

**I can promise you:**  
I have more materials than what we will have time for tonight. So please feel free to interrupt, ask questions, engage.

**Climate migration -**  
preparatory, individual policy opportunities identified during field research in Pacific, Bangladesh and Thailand

Johannes M. Luetz

A thesis in fulfillment of the requirements for the degree of  
Doctor of Philosophy

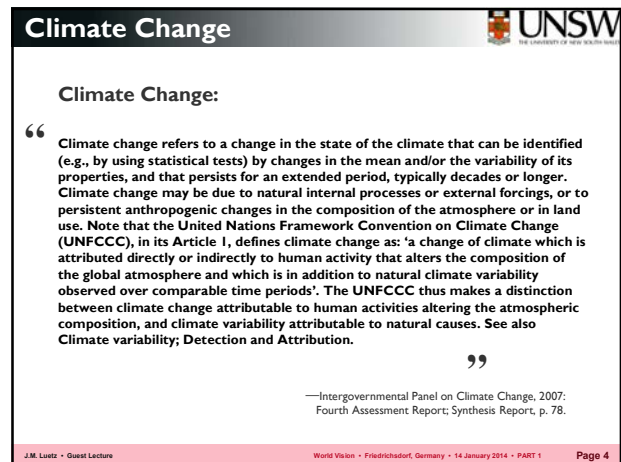
UNSW  
The University of New South Wales

Faculty of Environmental Studies  
Policy, Urban and Social Sciences

April 2012

<http://handle.unsw.edu.au/1959.4/52944>

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**Climate Change**

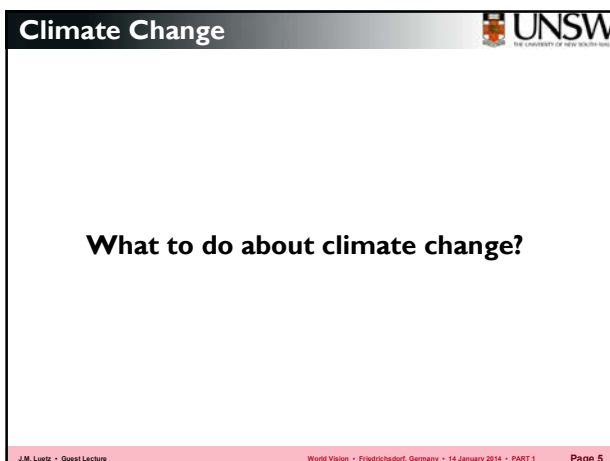
**Climate Change:**

“ Climate change refers to a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use. Note that the United Nations Framework Convention on Climate Change (UNFCCC), in its Article 1, defines climate change as: 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods'. The UNFCCC thus makes a distinction between climate change attributable to human activities altering the atmospheric composition, and climate variability attributable to natural causes. See also Climate variability; Detection and Attribution.

”

—Intergovernmental Panel on Climate Change, 2007: Fourth Assessment Report; Synthesis Report, p. 78.

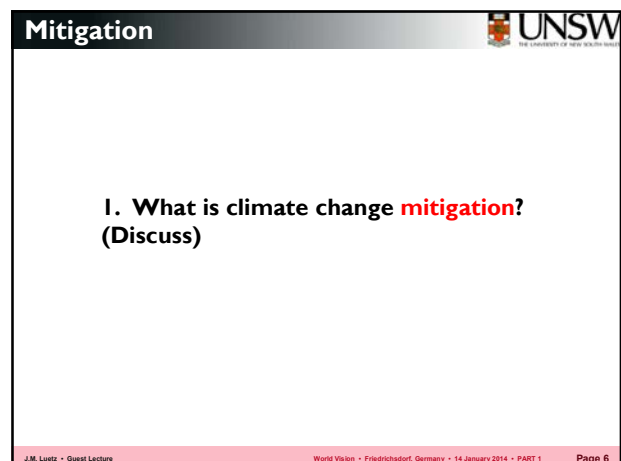
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**Climate Change**

**What to do about climate change?**

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**Mitigation**

**1. What is climate change mitigation?  
(Discuss)**

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**Mitigation**

**“ Mitigation:**  
Technological change and substitution that reduce resource inputs and emissions per unit of output. Although several social, economic and technological policies would produce an emission reduction, with respect to **Climate Change, mitigation means implementing policies to reduce greenhouse gas emissions and enhance sinks.** ”

—Intergovernmental Panel on Climate Change, 2007:  
Fourth Assessment Report; Synthesis Report, p. 84.

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**Adaptation**

**I. What is climate change adaptation?  
(Discuss)**

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**Adaptation**

**“ Adaptation:**  
Initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change effects. Various types of adaptation exist, e.g. anticipatory and reactive, private and public, and autonomous and planned. Examples are raising river or coastal dikes, the substitution of more temperature-shock resistant plants for sensitive ones, etc. ”

—Intergovernmental Panel on Climate Change, 2007:  
Fourth Assessment Report; Synthesis Report, p. 76.

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**Strategic importance?**

**Which is more important for tackling climate change: mitigation or adaptation?  
(Discuss)**

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**Strategic importance?**

These concepts are inseparably intertwined (examples?). Eg, “better insulation” can be concurrently “mitigation” (saving energy) and “adaptation” (stable indoor temperatures).

Imagine mitigation and adaptation as two sides of the same (climate) “coin”.

Plus: implementing them costs (and saves) money.

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**Mitigation + Adaptation**

**“ The only near certain conclusion we can draw from the changing climate and people’s response to it is that there is little time left in which to act. Therefore my plea is that **adaptation** is made at least equal in importance to policy-driven attempts to **reduce emissions.** ”**

—James Lovelock, 2009; p. 75:  
*The Vanishing Face of Gaia*

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**Rationale...**

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Why should this generation be serious about climate change mitigation and adaptation?

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**Weather ≠ Climate**

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THE CHINESE BELIEVED NOTHING  
[Source: ppt Stephen H. Schneider]

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**Weather ≠ Climate**

UNSW  
THE UNIVERSITY OF NEW SOUTH WALES

UNSW-produced video scripted for Leadership Networks for Climate Change (LNCC) to highlight difference between weather and climate

Is there a Doctor in the Greenhouse?

<http://tv.unsw.edu.au/04E68CE0-08D5-11E1-832C0050568336DC>

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**Weather ≠ Climate**

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Slush for Brains  
WHERE'D HE GO?  
[Source: ppt Stephen H. Schneider]

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**Weather ≠ Climate**

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"Hundreds Gather to Protest Global Warming"

[Source: ppt Stephen H. Schneider]

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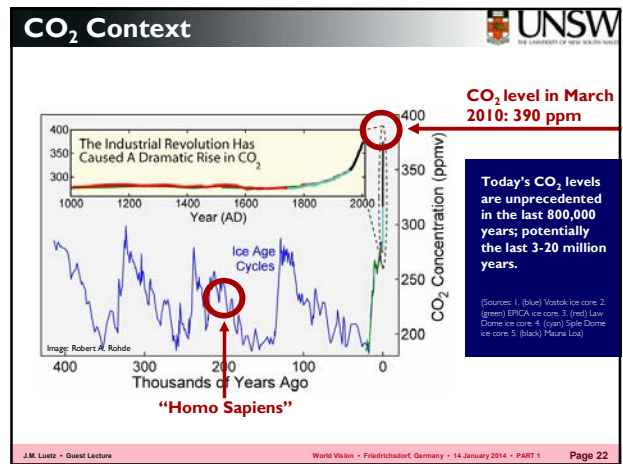
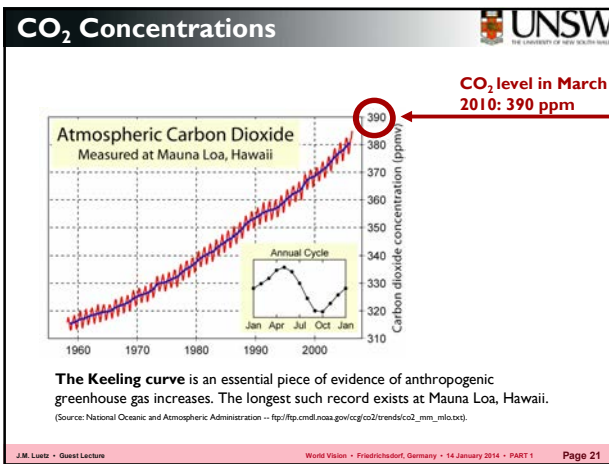
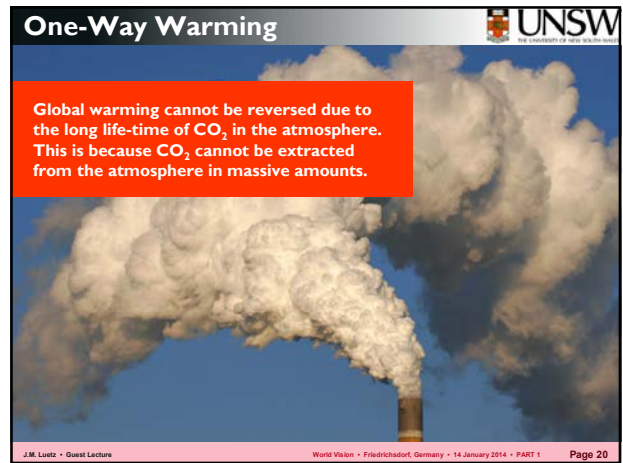
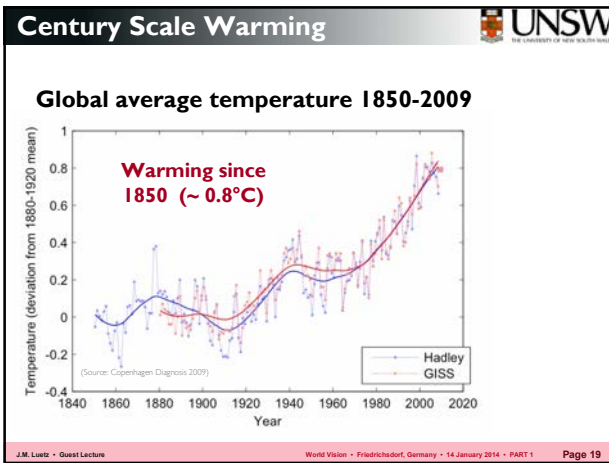
**Decadal Scale Warming**

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Global temperature change 1980-2009

GISS Temperature Deviation [°C]  
Year  
Observations  
Recent Decade Trends  
25% Uncertainty  
2009 Estimate  
Warming trend: ~0.2°C per decade  
[Source: NASA GISS data, In: Copenhagen Diagnosis 2009]

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### Stopping Distance

UNSW-produced video scripted for Leadership Networks for Climate Change (LNCC) to explain that climate change cannot be stopped overnight; early action is therefore urgent.

<http://tv.unsw.edu.au/video/hit-the-brakes>

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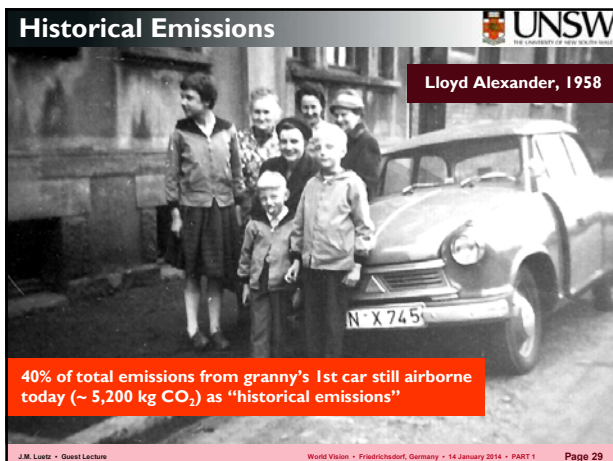
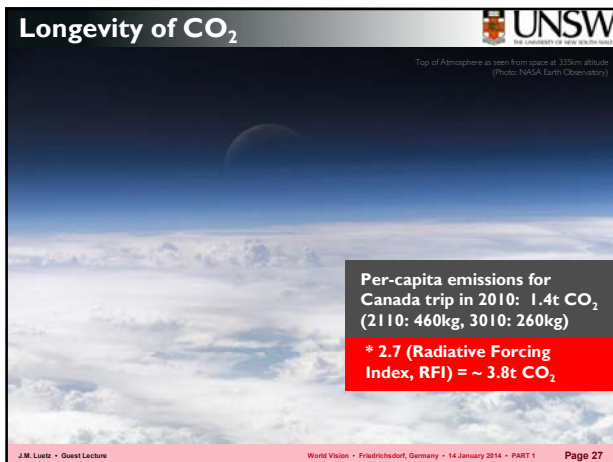
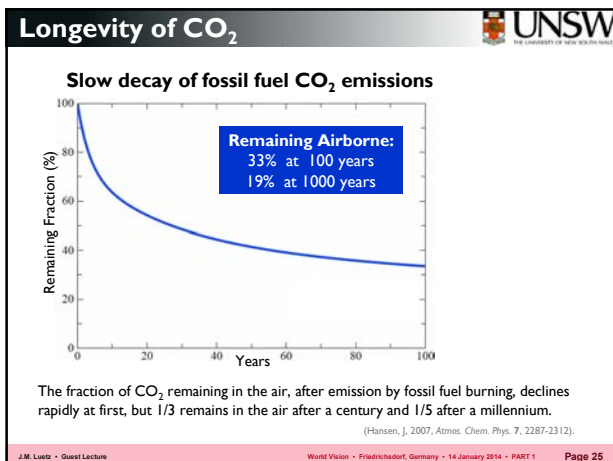
### Mitigation

“ There is a window of opportunity for avoiding the most damaging climate change impacts, but that window is closing: the world has **less than a decade** to change course. Actions taken – or not taken – ...will have a profound bearing on the future. ”

2007/2008 UN Human Development Report

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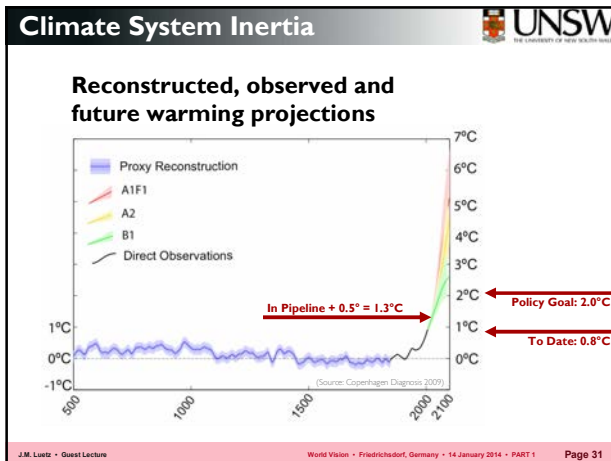
### Historical Emissions

**Cumulative CO<sub>2</sub> Emissions 1850-2006**

Rank	Country	Mt CO <sub>2</sub> e	% of World Total
1	United States of America	333,747.8	29.00%
2	European Union (27)	305,750.1	26.57%
3	China	99,204.2	8.62%
4	Russian Federation	93,081.6	8.09%
5	Germany	[80,377.0]	[6.99%]
6	United Kingdom	[68,235.8]	[5.93%]
7	Japan	44,535.2	3.87%
8	France	[32,278.6]	[2.81%]
9	India	27,433.6	2.38%
10	Canada	25,133.1	2.18%
<b>Top 10</b>	<b>Cumulative Total</b>	<b>928,886</b>	<b>80.71%</b>

CAIT, World Resources Institute  
CAIT GHG data are derived from CDIAC, EDGAR, EIA, EPA, Houghton, IEA, and WRI.

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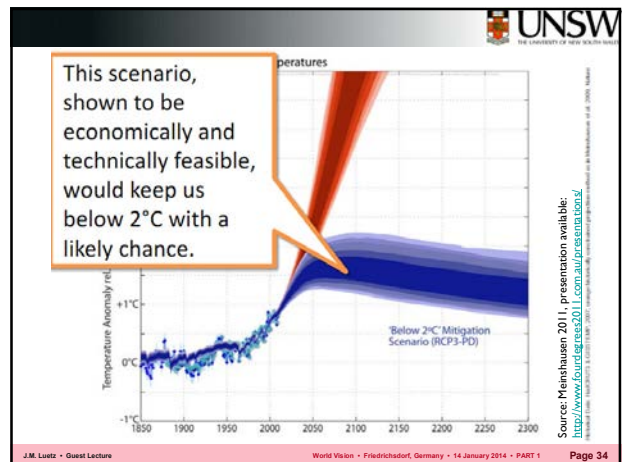
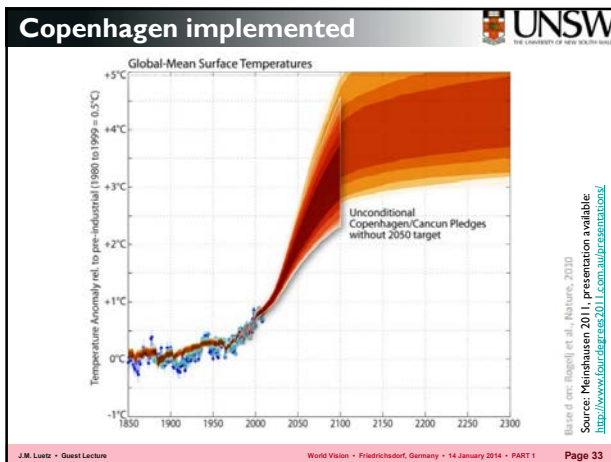
### Four degrees or more?

Available resources:

- Audio files
- Presentation files

Conference  
12-14 July 2011, Melbourne  
**FOUR DEGREES OR MORE?  
AUSTRALIA IN A HOT WORLD**  
[www.fourdegrees2011.com.au](http://www.fourdegrees2011.com.au)

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### Bad News

Global warming cannot be reversed due to the long life-time of CO<sub>2</sub> in the atmosphere. This is because CO<sub>2</sub> cannot be extracted from the atmosphere in massive amounts.

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### Good News

Global warming can be completely stopped. The temperature at which global warming will finally stop depends mainly on the total amount of CO<sub>2</sub> released into the atmosphere since industrialisation.

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### The Challenge



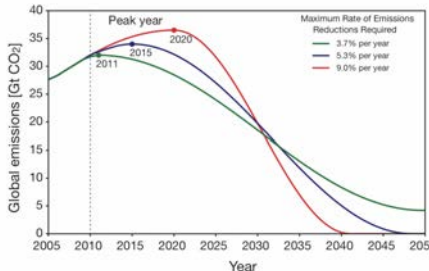
The sooner emissions stop, the lower the final warming will be.

**Zero Emissions? Zero Regrets!**

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### Global decarbonisation

Exemplary emissions pathways which remain within 750Gt and leave a 67% chance of limiting global warming to 2°C



Global emissions (Gt CO<sub>2</sub>)

Year

Peak year

Maximum Rate of Emissions Reductions Required

- 3.7% per year
- 5.3% per year
- 9.0% per year

Solving the climate dilemma: The budget approach; WBGU Special Report 2009

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### “Great Transformation”

#### Mitigation



**World in Transition: Social Contract for Sustainability**

Flagship Report 2011

<http://www.wbgu.de/en/home>

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### Bill McKibben, 2012



<http://350.org>

<http://youtu.be/KuCGVwJIRd0>

**Global Warming's Terrifying New Math:**  
Three simple numbers that add up to global catastrophe – and that make clear who the real enemy is

**The First Number: 2° Celsius** □ (threshold considered “dangerous” climate change)  
**The Second Number: 565 Gigatons** □ (fossil fuels remaining in 2°C cumulative budget)  
**The Third Number: 2,795 Gigatons** □ (remaining in the ground, ready for exploitation)

<http://www.rollingstone.com/politics/news/global-warmings-terrifying-new-math-20120719>

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### Development ⇌ Climate Change

“ The climate change that the world is already locked into has the potential to result in large-scale development setbacks, first slowing, then stalling and reversing progress in poverty reduction, nutrition, health, education and other areas ... ”

—2007/2008 UN Human Development Report: Fighting climate change : Human solidarity in a divided world.

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### Adaptation


“ The climate change that the world is already locked into has the potential to result in large-scale development setbacks, first slowing, then stalling and reversing progress in poverty reduction, nutrition, health, education and other areas ... ”


**Hoping – and working – for the best while preparing for the worst, serves as a useful first principle for adaptation planning.** ”

—2007/2008 UN Human Development Report: Fighting climate change : Human solidarity in a divided world.

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### Adaptation Critical





**Climate Adaptation Masterclass**  
Friday, 20 May 2011, Queensland Museum, Brisbane

**Available resources:**

- Audio files
- Presentation files

**Masterclass**  
20 May 2011, Brisbane

**FROM THEORY TO IMPLEMENTATION**

<http://www.nccarf.edu.au/content/masterclass-climate-adaptation-theory-implementation>

**Available resources:**

- Audio files
- Presentation files


**Masterclass**  
20 May 2011, Brisbane

**FROM THEORY TO IMPLEMENTATION**

<http://www.nccarf.edu.au/content/masterclass-climate-adaptation-theory-implementation>

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### Notion of Sustainability




“ *sustainable:*  
**able to be maintained**  
at a certain rate or level.  
Ecology: conserving an  
ecological balance by  
avoiding depletion of  
natural resources... ”

—Oxford Dictionary, Second Edition, 2005, p. 1703

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### Sustainable Development?



**Our Common Future: Brundtland Report 1987, pp 24-25**

**27. Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs...**


28. Meeting essential needs requires not only a new era of economic growth for nations in which the majority are poor, but an assurance that those poor get their fair share of the resources required to sustain that growth...

29. Sustainable global development requires that those who are more affluent adopt life-styles within the planet's ecological means — in their use of energy, for example. Further, rapidly growing populations can increase the pressure on resources and slow any rise in living standards...

30. Yet in the end, sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs. We do not pretend that the process is easy or straightforward. Painful choices have to be made. Thus, in the final analysis, sustainable development must rest on political will.

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### Opportunities



**Which are some climate change mitigation and adaptation opportunities?**

**(Discuss)**

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### Opportunities





**CLIMATE SUMMIT**

WHAT IF IT'S A BIG HOAX AND WE CREATE A BETTER WORLD FOR NOTHING?

- ENERGY INDEPENDENCE
- PRESERVE RAINFORESTS
- SUSTAINABILITY
- GREEN JOBS
- LIVABLE CITIES
- RENEWABLES
- CLEAN WATER, AIR
- HEALTHY CHILDREN
- ETC. ETC.


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### Opportunities



**Borrowing/leasing tools versus owning stuff**  
(eg. car sharing: goget cars in my neighbourhood)

<http://youtu.be/EXZtzsR3OBk>




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**Opportunities**

**Carbon Tax (CT):** <http://youtu.be/kY-ZnpWbjdw>  
**Emissions Trading Scheme (ETS)**

What is the difference between CT and ETS?




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**Opportunities**

**Insulation:**

Thermal imaging reveals where heat energy leaks



“Roofs and window frames are often the most wasteful areas.” (Picture quoted from Gore 2009, p. 263)

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**Problems, Barriers**

1. Multicausality issues impossible to untangle
2. Different values, priorities, capabilities, awareness
3. Risk aversion – risk accommodation?
4. Uneven distribution of impacts
5. Failure of markets to reflect “costs” (≠ “price”) (need to “internalise externalities”)
6. Formidable opposition by “contrarians” / “denialists” / “rejectionists” / special interest groups
7. Misinformation, exaggerations, distortions, “Doubt”

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**Politics of Externalities**

**The need to give economic value to Ecosystem or Biosystem services**

“... important environmental assets tend not to be priced in a market like other assets. These assets are common property – they belong to everybody, and to nobody. Without ownership rights there is not the incentive for any person or group to look after them properly... if the environment has a zero price to users it will eventually be used up.”

(Business Council of Australia, Achieving Sustainable Development: A Practical Framework, BCA, 1991, p. 9. Cited in: Sharon Beder, The Hidden Messages Within Sustainable Development, Social Alternatives, vol.13, no. 2, July 1994, pp. 8-12.)

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**Politics of Externalities**

**How to internalise these costs into the economic or the market system**

“Economic growth can be made compatible with environmental enhancement only if the emission of pollution is less than that which can be assimilated and transformed by the natural environment.”

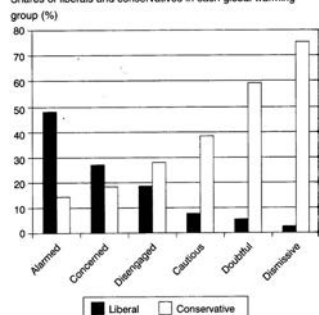
Pereira, W & Seabrook, J. 1989, Red Ink in the Blueprint for a Green Economy, Anusandhan, December, p.2. Cited in: Sharon Beder, 'Economy and environment: competitors or partners?', Pacific Ecologist 3, Spring 2002, pp. 50-56.

Example of externalised costs (from 8:00-10:00 min):  
<http://youtu.be/gLBESQAYXp8>

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**Battle of Ideologies**

Shares of liberals and conservatives in each global warming group (%)



Group	Liberal (%)	Conservative (%)
Alarmed	50	15
Concerned	30	20
Disengaged	20	30
Cautious	10	40
Doubtful	5	60
Dismissive	2	75

Source: Clive Hamilton (2010): Requiem for a species: Why we resist the truth about climate change p110

Source: Based on Table 20 in Edward M. Lazear, Constance Rovee-Kohn and Anthony Leiserowitz, Global Warming: Six Americas' 2009

Note: 'Moderates' are not shown

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### Doubt



Climate Reality with Johannes Luetz

1964

<http://climaterealityproject.org/video/doubtters/>  
<http://youtu.be/YhDacrl1aSA>

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### Doubt



<http://www.merchantsofdoubt.org/>  
<http://www.arts.unsw.edu.au/news-and-events/public-lecture-with-naomi-oreskes-645.html>

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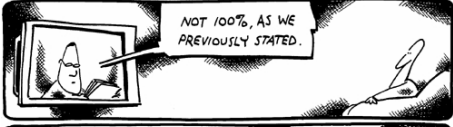
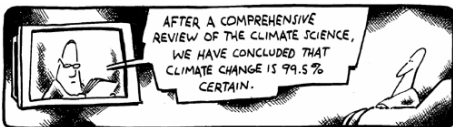
(Source: ppt Stephen H. Schneider)

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(Source: ppt Stephen H. Schneider)

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(Source: ppt Stephen H. Schneider)

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### The Future?

**Intergenerational equity**

*"Those of us alive today are the first generation to know that we live in the Age of Global Warming. We may also be the last generation to have any chance of doing something about it. Our forebears had the excuse of ignorance. Our descendants will have the excuse of helplessness. We have no excuse."*

(William Antholis and Strobe Talbott (2010) Fast Forward: Ethics and Politics in the Age of Global Warming, The Brookings Institution)

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### "200-year present"

**Insight, hindsight, foresight**

*"A favourite concept of mine is the 200-year present, a way of thinking about change. The 200-year present began 100 years ago with the year of birth of the people who have reached their hundredth birthday today. The other boundary of the 200-year present, 100 years from now, is the hundredth birthday of the babies born today. If you take that span, you and I will have had contact with a lot of people from different parts of that span. So think in terms of events over that span and realise how long change takes."*

(Elsie Boulding, Professor Emeritus of Sociology at Dartmouth College and Former Secretary General of the International Peace Research Association, interviewed by Julian Portilla in 2003)

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### Building Pressures

- Longevity of CO<sub>2</sub>
- Environmental Degradation
- Accelerating CO<sub>2</sub> Emissions
- Declining CO<sub>2</sub> Removal
- Escalating Temperatures
- Rogue Weather
- Sea Level Rise
- Historical Emissions
- Inertia of the Climate System
- Population Pressures

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### Capable Remedy

- L**ongevity of CO<sub>2</sub>
- E**nvironmental Degradation
- A**ccelerating CO<sub>2</sub> Emissions
- D**eclining CO<sub>2</sub> Removal
- E**scalating Temperatures
- R**ogue Weather
- S**ea Level Rise
- H**istorical Emissions
- I**nertia of the Climate System
- P**opulation Pressures

**Will there be leadership to meet the challenge...?**

Canada presentation available at:  
[http://luetz.com/docs/leadership-wanted\\_slides.pdf](http://luetz.com/docs/leadership-wanted_slides.pdf)

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### Summary

**Sustainability – time, space, species**

- inter-generation
- inter-geography
- inter-species

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### Measuring Progress?

**Economic growth and quality of life:  
A threshold hypothesis**

*"... for every society there seems to be a period in which economic growth (as conventionally measured) brings about an improvement in the quality of life, but only up to a point – the threshold point – beyond which, if there is more economic growth, quality of life may begin to deteriorate." (Max-Neef 1995; Genuine Progress Indicators GPI; Index of Sustainable Economic Welfare ISEW; Environment and Sustainable Development Indicators ESDI)*

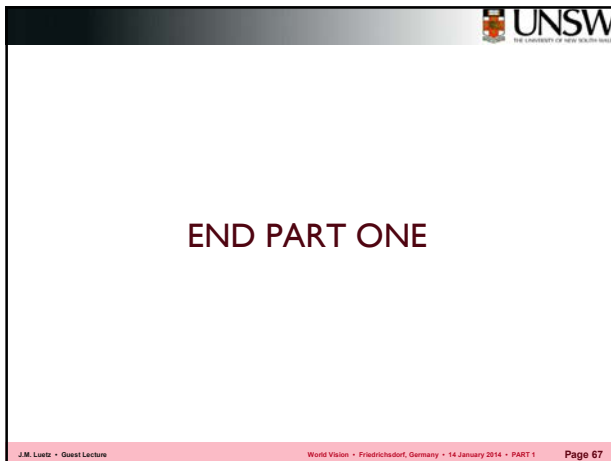
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### The Future

**"When it comes to the future, there are three kinds of people: those who let it happen, those who make it happen, and those who wonder what happened."**

(John M. Richardson, Jr, American Academic, born 1938)

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END PART ONE

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Q&A UNSW  
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**Thank You!**  
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IES INSTITUTE OF ENVIRONMENTAL STUDIES UNSW THE UNIVERSITY OF NEW SOUTH WALES World Vision

<http://planetprepare-videos.blogspot.com.au/>

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# Climate Change Induced Migration

World Vision • Friedrichsdorf • 14 January 2014



Guest Lecture • Part 2

Dr. Johannes M Luetz  
j.luetz@unsw.edu.au

Photo: Pp. Starr


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The University of New South Wales

## Intro: Research Background

### PLANET PREPARE

2008 World Vision Preparedness Study

- 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



[http://wvasiapacific.org/downloads/publications/PlanetPrepare\\_LowRes.pdf](http://wvasiapacific.org/downloads/publications/PlanetPrepare_LowRes.pdf)

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## Intro (2008)

### Island of Matsungan, Papua New Guinea



Chief Kela: "What will the future hold for our children and grandchildren?"

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

Photo: Johannes Luetz

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## Intro (2008)

### Island of Torotsian, Papua New Guinea



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## Intro (2010)

### Island of Torotsian, Papua New Guinea




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## Intro (2008)

### Labutali, Papua New Guinea



Group of environmental or climate change related forced migrants who abandoned their coastal village "because of rising sea levels."

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**Intro (2008)** 





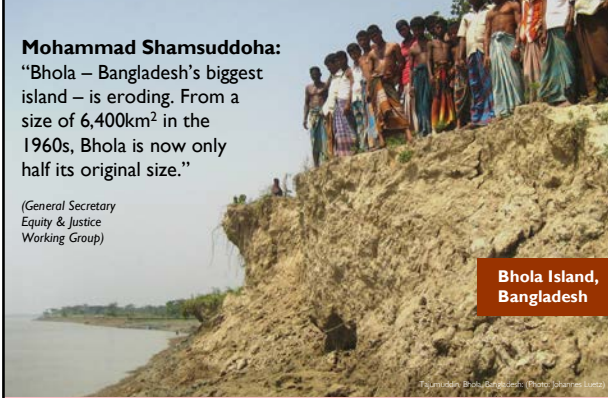
Photo: Johannes Luetz

**Puwamo, Papua New Guinea**

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

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**Intro (2008)** 





**Mohammad Shamsuddoha:**  
"Bhola – Bangladesh's biggest island – is eroding. 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)*

**Bhola Island, Bangladesh**

Tajumuddin Bhola, Bangladesh (Photo: Johannes Luetz)

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**Intro (2008)** 





**Present:** 100,000 displaced p.a.  
**SLR 1m:** 65 million?  
**SLR 3m:** 92 million?  
**SLR 5m:** 128 million?  
(Rajan, 2008)

**Bhola Island, Bangladesh**

**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." Community elder Abdul Mannan (centre) points out signs of erosion.

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**Intro (2008)** 





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

**Bhola Island, Bangladesh**

Tajumuddin Bhola, Bangladesh (Photo: Johannes Luetz)


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**Bridge to "nowhere" (2011)** 



Show field research video footage:  
File name "Bangladesh 1":  
55:00 (1min) – Bridge to "nowhere"

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**Google** 



<http://goo.gl/maps/1huUJ>

← Google Earth: School building still visible

Blue dot (accurate to 3m) indicates our GPS position supposedly 100m from shore

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### Bhola (2011)

Student from that very same school pointing to where class rooms used to be 6 months ago

Show field research video footage:  
File name "Bangladesh 2":  
31:20 (seconds) – Google maps!  
34:00 (3min) – student

This is the same location at the GPS derived Google Earth "blue dot" (accurate to 3m)

(Photo: Johannes Luetz)

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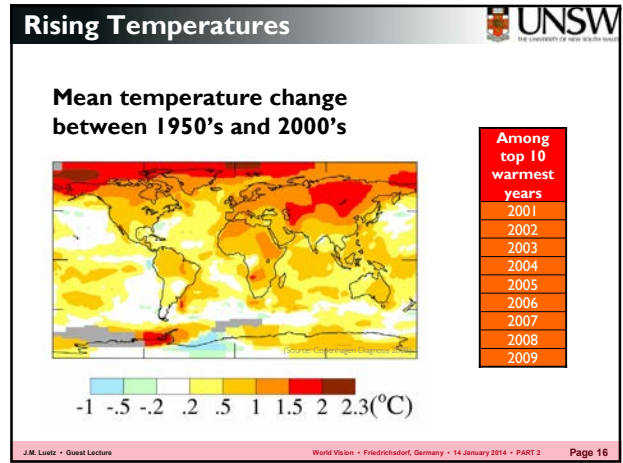
### Dhaka (2011)

Show field research video footage:  
File name "Bangladesh 5":  
46:00 (1min) – Dhaka tenants, settlements  
59:00 (30sec) – Bhola-CEGIS (6km@61min)  
00:00 (3min) – INDIA I: erosion/ accretion

Md. Faruk, migrant from Bhola Island interviewed at Dhaka slum

(Photo: Johannes Luetz)

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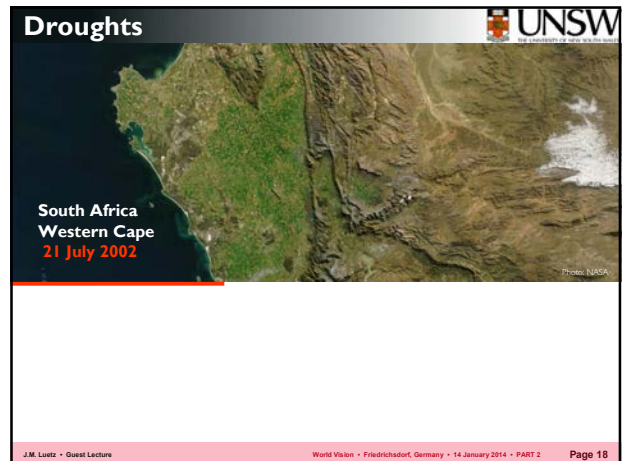


### Impacts

“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

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**Droughts** UNSW

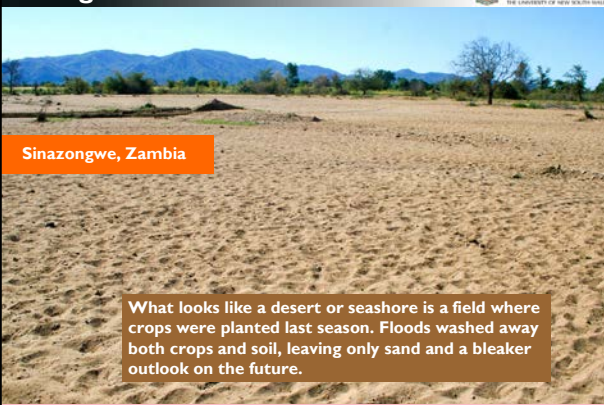


South Africa  
Western Cape  
21 July 2003

Photo: NASA

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**Droughts** UNSW



Sinazongwe, Zambia

What looks like a desert or seashore is a field where crops were planted last season. Floods washed away both crops and soil, leaving only sand and a bleaker outlook on the future.

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**Droughts** UNSW




**DRIED UP** 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 Kerkorisogal School, says hunger often hits his classroom hard: "When there is no food, the children become sleepy and are absent."

Photo: AP/Wide World Photos

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**Floods & Storms** UNSW



**WATERED DOWN** 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)

Photo: World Vision Philippines

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**Floods** UNSW



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

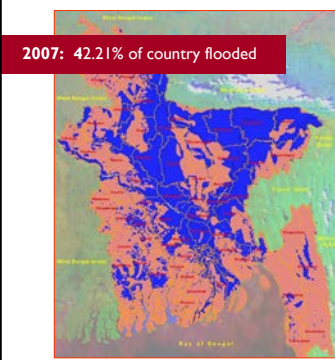
"When it rains, it pours"

Khailshabunia (Bangladesh) under water

Photo: Arno Accorsoni / World Vision

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**Floods** UNSW



2007: 42.21% of country flooded

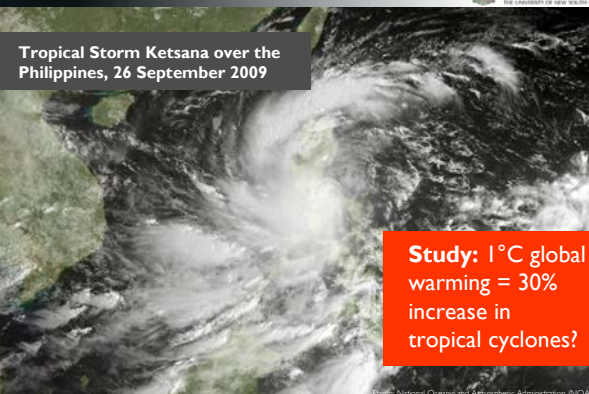
**Bangladesh, world's largest river delta:** One-third floods annually during the monsoon. Extreme floods cover up to two-thirds of the country.

Bangladesh Space Research and Remote Sensing Organization (SPARRSO), Satellite image: August 23,4,5,7 & 8, 2007

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### Storms



Tropical Storm Ketsana over the Philippines, 26 September 2009

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

Photo: National Oceanic and Atmospheric Administration (NOAA)

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### Typhoon Ondoy / Ketsana, 2009



<http://www.chrispforr.net/phils/survivors/survivors.htm>

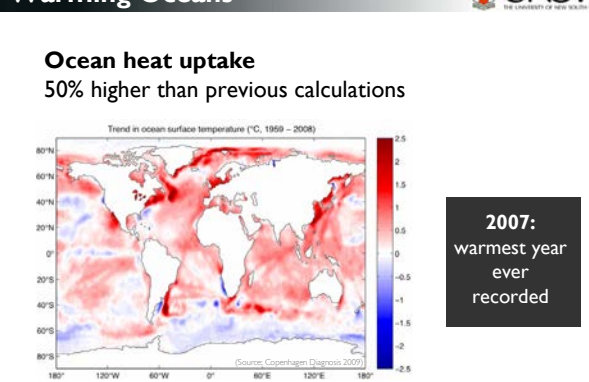
Show field research video footage:

- File name "Philippines 5": 20:30 (1 min) – Typhoon belt shifted south
- 31:00 (1 min) – Wealth accounting
- File name "Philippines 8": 05:00 (1 min) – Severe Tropical Storm Washi

Photo: Chris Pforr

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### Warming Oceans



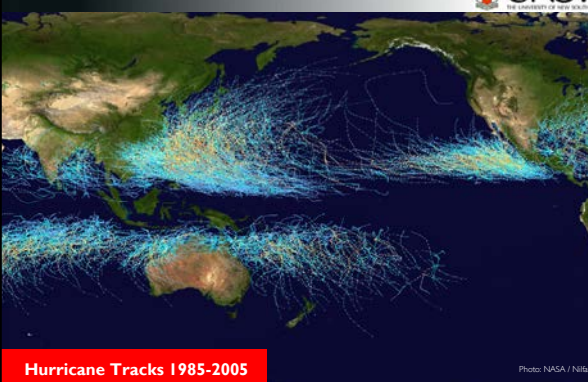
Ocean heat uptake  
50% higher than previous calculations

Trend in ocean surface temperature (°C, 1959 – 2008)

2007: warmest year ever recorded

Source: Copenhagen Diagnosis 2007

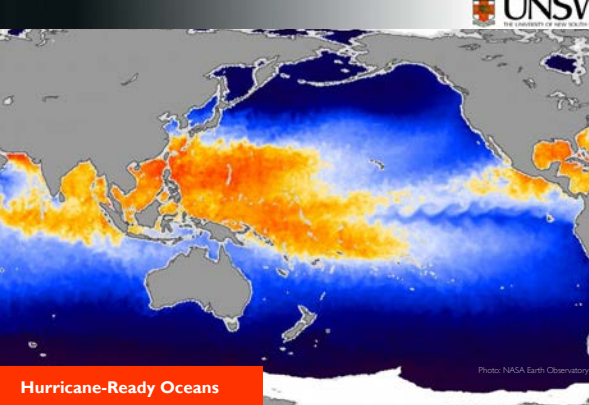
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Hurricane Tracks 1985-2005

Photo: NASA / Niflanson

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Hurricane-Ready Oceans

Photo: NASA Earth Observatory

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### Irrawaddy Delta



Storm Surges

15 April 2008


Before Cyclone Nargis

Photo: NASA/IGDIS Rapid Response Team

**Storm Surges: Most lethal aspect of wind storms.**  
Hydrological conditions can lift sea level by multiple metres and drive a massive flood of sea water many kilometres inland.

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### Irrawaddy Delta



**Storm Surges**

5 May 2008

After Cyclone Nargis

Photo: NASA/NOAA/SeaWiFS

**World Bank Natural Disaster Hotspots Report:**  
"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."

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### Stronger Storms?



"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: Kiri Puterko

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### Coastal Megacities




Photo: Abi Ferdianto

**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.

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### Coastal Megacities



Photo: Abi Ferdianto

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

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### Sea Level Rise



Photo: Tommy Pelco

**Thermal expansion:**  
40% sea level rise  
(1961-2003)

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### Sea Level Rise



Photo: Vera Bogerts

**Land-based melting ice:**  
60% sea level rise  
(1961-2003)

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### Sea Level Rise

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

Average Sea-ice minimum 1979-2006  
Sea-ice minimum 2007

**Minimum arctic sea-ice decline from 1979 to 2007**

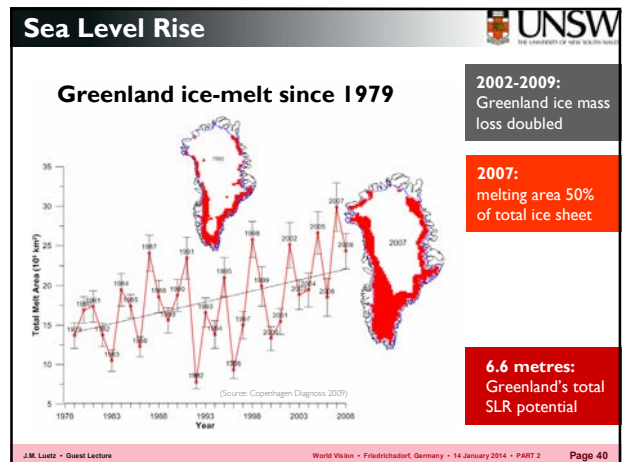
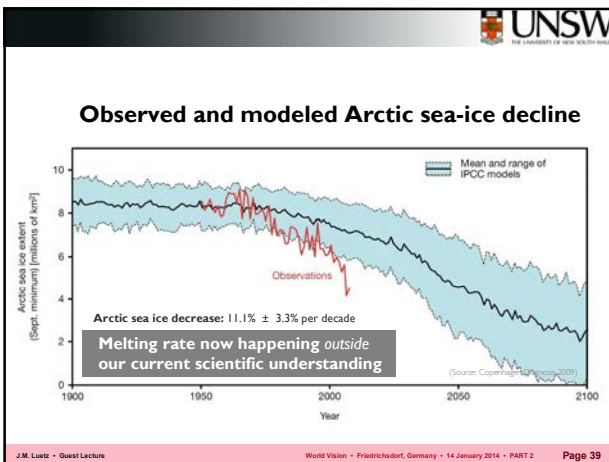
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### Arctic record melting 2012

**2012: New record, in the news now... (see video links below, only a few days old)**

<http://www.bbc.co.uk/news/uk-19498018>  
→ <http://www.bbc.co.uk/weather/features/19417327>  
→ <http://www.bbc.co.uk/news/world-europe-19508906>

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### Sea Level Rise

While Arctic sea-ice decline is sea level neutral, proximity to Greenland is a cause for concern

**Ice-Free Arctic Summers?**

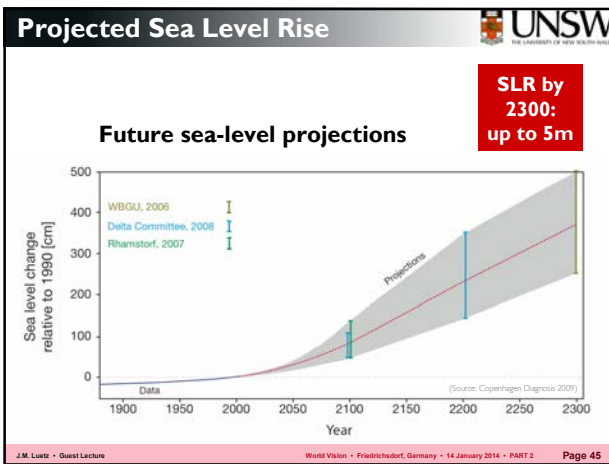
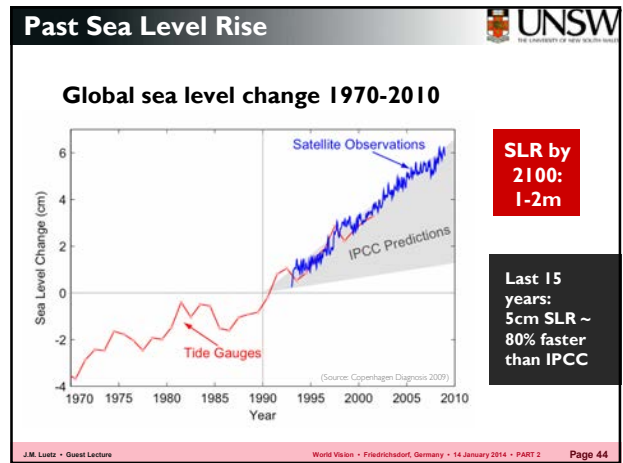
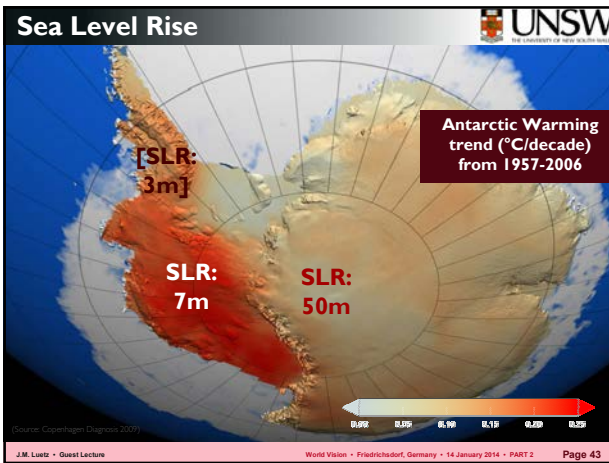
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... THERE GOES THE NEIGHBORHOOD...

ARCTICA

(Source: ppt Stephen H. Schnieder)

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### Small Island States

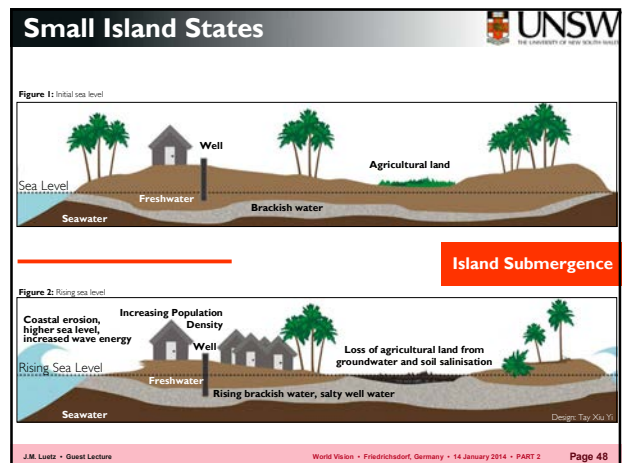
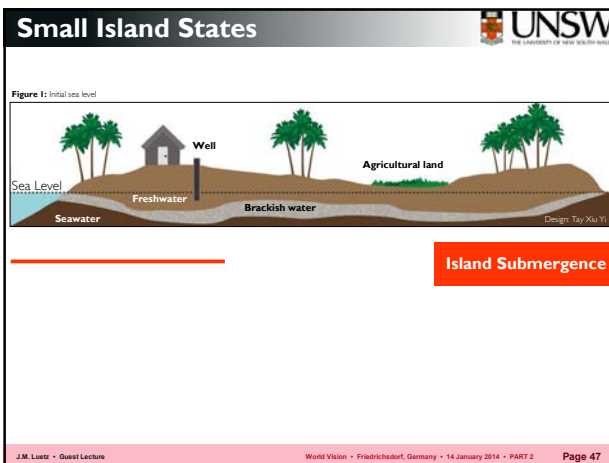
**WATER IS LIFE**

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 ... to the point where they become insufficient to meet demand during low-rainfall periods."**

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### Injustice of sea level rise

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“ This [is] about the injustice of sea level rise ... on average you have about a metre of sea level rise by 2100, ... all over the globe. But the ... very vicious thing is, that this sea level rise will be distributed in a highly inhomogeneous way across the planet. [...] Elementary physics – if Greenland is losing mass, that means its gravitational pull for seawater will be diminished – that means, around Greenland, sea level may even drop, in particular for the north-eastern part of the American continent, while ... the Pacific Islands ... that haven't done anything to contribute to global warming, will again get the brunt of it, will get all the water which is released from Greenland. [...] And those who are most responsible for that, northern Europe, northern America, will be spared sea level rise, at least for a while. So you see nature can be extremely unfair, if humanity is sort of provoking that injustice. ”

*Professor John Schellnhuber CBE, Director Potsdam Institute for Climate Impact Research, Chairman German Advisory Council on Global Change WBGU, Senior Advisor to the German Government, Session 1 at ~ 51:00 @ <http://www.fourdegrees2011.com.au>*

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### Inhomogeneous water distribution

UNSW

Source: Bamber and Riva 2010. World Bank 2012, "Turn Down the Heat", p. 33

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### Small Island States

UNSW

“Overtopping”

**CARTERET ATOLL**

Photos: Tuble-Pesa, Courtesy Pip Starr and Ursula Ralove

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### Small Island States

UNSW

Photo: Johannes Luetz

**Island of Petats: Contaminated 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.”

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### Small Island States

UNSW

Photo: Johannes Luetz

**Island of Pororan: Contaminated Closed Well**

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.”

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### Small Island States

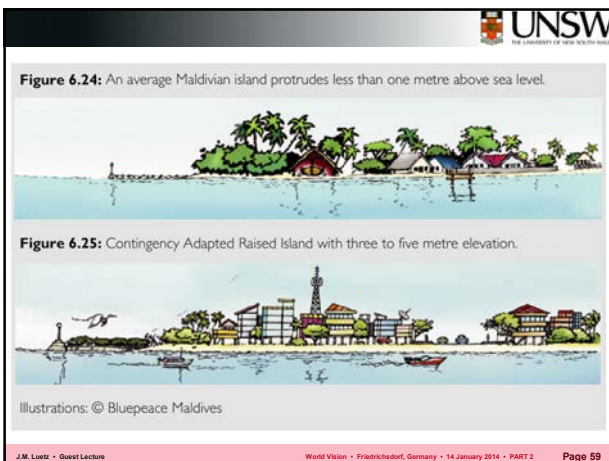
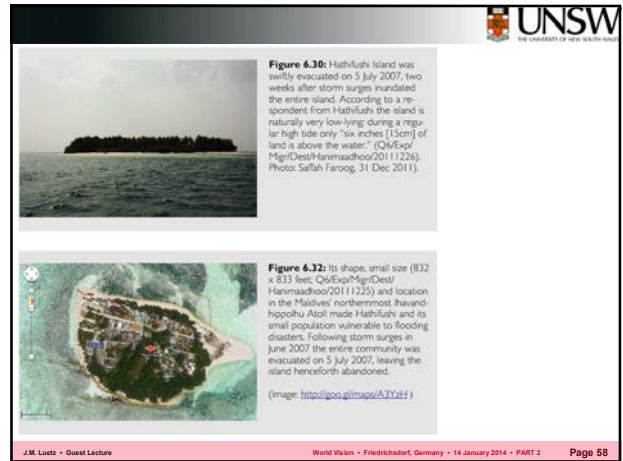
UNSW

**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: Shaheen Ilyas)

**Mohamed Nasheed, President Maldives, 2009:** “We do not want to leave the Maldives, but we also do not want to be climate change refugees living in tents for decades.”

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**Literature Review**

**The study of climate migration is subject to at least four difficulties**

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**Conceptualisations**

**How should we talk about “climate migration”?**



**Any other suggestions ... ?**

“climate refugees”, “environmental refugees”, “climate migrants”, “climate exiles”, “climate evacuees”, “climate displacees/ dislocates”, “forced migrants”, “climigrants” ... ???

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**I. Nomenclature**

**Definitional difficulties**

The list of suggestions is long and growing, and examples listed below are necessarily incomplete:

“climate refugees” (eg. Biermann and Boas 2010; FOE 2007; Walker 2009; EIJF 2012), “climate change refugees” (eg. Docherty and Giannini 2009, p. 361; Bob Brown 2008; Sachs 2007), “refugees” (Hansen 2006, p. 2), “environmental refugees” (eg. Ehrlich and Ehrlich 2013, p. 4; Brown 2011, pp. 72-83; Kent and Myers 1995; Bell 2004; Tickell 1989), “eco-refugees” (Cournil 2011, p. 359), “environmental and climate change refugees” (Dupont and Pearman 2006, p. 55), “sea-level refugees” (WBGU 2006, p. 61), “rising-sea refugees” (Brown 2011, pp. 73, 193), “desert refugees” (Brown 2011, p. 77), “water refugees” (Brown 2011, p. 79), “displaced persons (refugees)” (Westing 1992), “climate refugees” (eg. McAdam 2012; Bettini 2012; Hartmann 2010), “environmentally-displaced persons” (Lopez 2007), “climate migrants” (eg. Gibb and Ford 2012; Leal-Arcas 2012; Rajan 2008), “climate change migrants” (Shamsuddoha and Chowdhury 2010, pp. 3-7), “climate exiles” (eg. Wei 2011), “climate change exiles” (Byravan and Rajan 2006), “environmentally-induced [displaced] populations” (UNHCR 1996), “environmental migrants” (eg. IOM 2007, p. 1 paragr. 6; IOM 2008, p. 399; also CEEMA 2010, p. 5), “climate evacuees” (Cournil 2011, p. 359), “environmental migrants/refugees” (Renaud et al 2007, pp. 14-17), “climate-change victims” (Popovski and Mundy 2012; UNU 2011), “ecomigrants” (Wood 2001, pp. 43), “ecological migrants” (ADB 2012, p. 9), “environmentally displaced persons [or people]” (eg. Cournil 2011, p. 359; UNHCR 1996, p. 9; UNFCCC 2007; ADB 2012, p. 9), “[climate] displaced people” (eg. NRC 2009), “climate change-induced displaced people” (McAdam 2011, p. 18), “forced migrants” (Brown 2007, p. 8), “climate change forced migra[nt]s” (Brown 2008, p. 31), “climate-induced displace[d] people” (Castles 2010), “persons displaced by climate change” (Kalin 2010, p. 97), “[people] forced to leave their homes due to sudden-onset climate-related natural disasters” (UN-OCHA 2009, p. 15); “survival migrants” (Betts 2010), “climigrants” (Bronen 2008b, p. 31; Bronen 2010, p. 89).

(Literature Review, Luetz 2013, pp. 29-30)

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**I. Nomenclature**

**Definitional difficulties**

**Some prominent proposed conceptualisations**

**CLIMATE CHANGE REFUGEE:** “... an individual who is forced to flee his or her home and to relocate temporarily or permanently across a national boundary as the result of sudden or gradual environmental disruption that is consistent with climate change and to which humans more likely than not contributed.” (Docherty and Giannini, 2009)

**CLIMATE REFUGEE:** “... people who have to leave their habitats, immediately or in the near future, because of sudden or gradual alterations in their natural environment related to at least one of three impacts of climate change: sea-level rise, extreme weather events, and drought and water scarcity.” (Biermann and Boas 2007, 2008)

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**I. Nomenclature**

**Definitional difficulties**

**Some prominent proposed conceptualisations**

**ENVIRONMENTAL REFUGEES:** “... persons who can no longer gain a secure livelihood in their traditional homelands because of environmental factors of unusual scope, notably drought, desertification, deforestation, soil erosion, water shortages and climate change, also natural disasters such as cyclones, storm surges and floods. In face of these environmental threats, people feel they have no alternative but to seek sustenance elsewhere, whether within their own countries or beyond and whether on a semi-permanent or permanent basis.” (Myers and Kent 1995, pp 18-19)

**ENVIRONMENTAL MIGRANTS:** “Environmental migrants are persons or groups of persons who, for compelling reasons of sudden or progressive changes in the environment that adversely affect their lives or living conditions, are obliged to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their country or abroad” (International Organization for Migration IOM, 2007).

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**I. Nomenclature**

**Associations, labels, societal perceptions...**

**“Refugee”**

- “Refugee” sometimes seen as a good semantic fit since “people seek refuge; run from”
- No choice?
- Reactive?
- Public empathy? < or vice versa >
- Perceived as “helpless/freeloaders”?
- “Victimisation”?


**“Migrant”**

- “Migrant” sometimes seen to be more legally precise since “people run to”
- Free will?
- Proactive?
- Public mistrust?
- “Cheery picked” migrants?
- “Opportunism”?

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### Typological issues



“ there could be perhaps as many typologies as there are papers on the subject.”

(Richard Black, 2001)

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### 2. Multicausality


**Disaggregational difficulties:**

1. No direct “causal link” of linear nature between environmental degradation and population displacement
2. Cannot uncouple “contributing causes” in migration
3. Factors interrelated: environmental degradation triggers migration – migration causes environmental degradation
4. Future fallout depends on actions taken today

**Bottom Line: relative causal attribution is very difficult to establish**

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### Norman Myers



“ When global warming takes hold, there could be as many as 200 million people overtaken by disruptions of monsoon systems and other rainfall regimes, by droughts of unprecedented severity and duration, and by sea-level rise and coastal flooding. ”

(Norman Myers, 2005)

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### 3. Projections

**Predictive problems**

**Figure 2.1:** “People at risk in a greenhouse-affected world” (Myers and Kent 1995, p. 149)

Country or Region	Total People at Risk (millions)
Bangladesh	13
Egypt	16
China	73
India	20
Island States	1
Agriculturally-Dislocated Areas	50
<b>TOTAL</b>	<b>173</b>

Source: Myers and Kent 1995, p. 149, Table IX.1

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### 3. Projections

**Predictive problems**

**Figure 2.2:** “Migrants (assuming phased movement)” (Rajan 2008, p. 10)

India			
Time	1m SLR	3m SLR	5m SLR
2050	4.4 million	6.1 million	7.9 million
2100	24 million	33.6 million	43.3 million

Bangladesh			
Time	1m SLR	3m SLR	5m SLR
2050	5.7 million	8.0 million	10.3 million
2100	41.6 million	58.3 million	74.9 million

Source: “Estimates of migrants displaced by sea-level rise from Bangladesh and India” (excerpted from Rajan 2008, p. 10)

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### 3. Projections

**Predictive problems**

**Figure 2.3:** Selected commonly quoted figures

Source	Displaced People	Timeframe
IPCC (1995, p. 98; attributed to Myers)	150 million	2050
Myers and Kent (1995, p. 1)	200 million	2050
Christian Aid (2007, p. 48; attributed to Myers)	250 million	2050
Nicholls (2004, pp. 69-86)	50-200 million	2080
IOM (2009; attributed to Myers)	200 million	2050
Stern Review (2006, p. 77; attributed to Myers)	150-200 million	2050
Christian Aid (2007, pp. 1.5.22-23)	“at least” 1 billion	2050

Sources: selected figures quoted from Walker (2007, p. 14) and Walker (2009, pp. 176-177), and contested, eg. by Gemenne (2011, p. 45) and Foresight (2011, p. 28)

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#### 4. Frameworks

### Legal limbo

Under international law, a **“refugee”** is a person who...

“ ... owing to well-founded fear of persecution for reasons of race, religion, nationality, membership of a particular social group or political opinions, is outside the country of his nationality and is unable or, owing to such fear, is unwilling to avail himself of the protection of that country, or who, not having a nationality and being outside of the country of his former habitual residence as a result of such events, is unable or, owing to such fear, is unwilling to return to it. ”

—1951 Convention relating to the Status of Refugees, Art. 1A(2), 1951, as modified by the 1967 Protocol.

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#### 4. Frameworks

### Legal limbo

Currently accepted definition of **“IDPs”**

“ ... persons or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalized violence, violations of human rights or natural or human-made disasters, and who have not ” crossed an internationally recognized State border.

—Guiding Principles on Internal Displacement, E/CN.4/1998/53/Add.2.)

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#### 4. Frameworks

### Legal limbo

**Figure 2.4:** Applicable Frameworks and potential normative protection gaps)

Imaginable Scenarios	Protection Gaps
Rapid onset disasters	(+) HR (+) GP (-) RC (if border crossed)
Slow onset environmental degradation	(+) HR (-) GP (-) RC (if border crossed)
Loss of state territory (eg, sea level rise)	(+) HR (+) GP (-) RC (statelessness?)
Armed conflict over shrinking resources	(+) HR (+) GP (+) RC

Legend: (+)= applicable; (-)= inapplicable; HR=International Human Rights Law; GP=Guiding Principles on Internal Displacement; RC=Refugee Convention. (Adapted from UNFCCC 2008)

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#### Problem Summary

<p><b>Problem components</b></p> <ol style="list-style-type: none"> <li>1. Definitional difficulties</li> <li>2. Disaggregational difficulties</li> <li>3. Predictive problems</li> <li>4. Legal limbo</li> </ol> <p>= Knowledge gaps</p>	<p><b>Problem implications</b></p> <ol style="list-style-type: none"> <li>1. NO agreed definition</li> <li>2. NO agreed attribution</li> <li>3. NO agreed forecasts</li> <li>4. NO agreed framework</li> </ol> <p>= Little or no input from primary stakeholders (ie, “climate migrants”)</p>
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#### Knowledge Gaps

“ The objective of public policy should not be to prevent migration, but rather to ensure that it can take place in appropriate ways and under conditions of safety, security and legality ... [which] makes it all the more urgent to carry out **in-depth micro-level empirical research** to understand the changes that are taking places, how they affect various groups, and what response strategies their groups adopt. ”

—S. Castles, In: *Afterword: What Now? Climate-induced Displacement after Copenhagen*, [Ed.] Jane McAdam, 2010

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#### PhD contribution

**Case study approach incorporating**

1. Local level interviews
2. Interdisciplinary research

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### Research questions

What challenges do you / climate migrants face?  
 What solutions do you / climate migrants seek?  
 What assistance do you / climate migrants desire?  
 What have you / climate migrants learned from the experience of moving? What would make the experience more benign? What advice would you / climate migrants like to give policy makers / scholars / NGOs / etc seeking to address the plight of moving individuals or communities?

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### Hot Spots

**Four “Hot Spot” Categories:**

1. Densely settled deltaic regions
2. Low-lying small island developing states (SIDS)
3. Coastal megacities
4. Glacier-fed / water-stressed inland regions

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### Water stressed regions

**Figure 3.1:** Selected hot spots depicting regions of the world where “[s]ecurity risks associated with climate change ... could develop into crisis hotspots” (WBGU 2007, p. 4). Cf. Clark 2007.

**Bolivia example (video):**  
<http://news.bbc.co.uk/2/hi/science/nature/6394324.stm>

**Conflict contributions in selected hotspots**

- Climate-induced degradation of freshwater resources
- Climate-induced decline in food production
- Climate-induced increase in storms and flood disasters
- Environmentally-induced migration

Map quoted from WBGU (2007, p. 4); WBGU – German Advisory Council on Global Change (2007) World in Transition: Climate Change as a Security Risk. Summary for Policy-Makers. Berlin, WBGU. See also Rubattel et al 2013 and BBC 2013 discussing rapid melting of Andean glaciers. This theme will be developed in Chapter 4.

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### Water stressed regions

**Figure 3.2:** This global map reflects dryness/wetness “using a 6-month Standardized Precipitation Index (April–September 2010)” (UNISDR 2011, p. 58). The map highlights areas of “extreme dryness” in Bolivia.

SPI	Category	Number of occurrences per 100 years
0 to -0.99	Mild dryness	33
-1.00 to -1.49	Moderate dryness	10
-1.5 to -1.99	Severe dryness	5
< -2.0	Extreme dryness	2.5

Source: IRI 2010, Sivakumar 2010, cited in UNISDR (2011, p. 58).

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### Glaciers Retreating

**Declining Water Supply?**

**La Paz, Bolivia**

Photo: Johannes Luetz

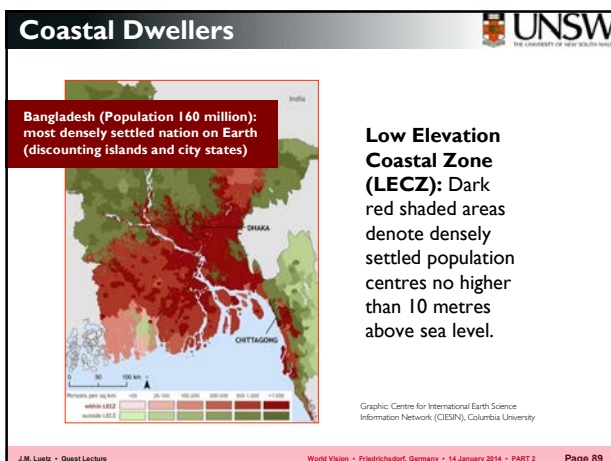
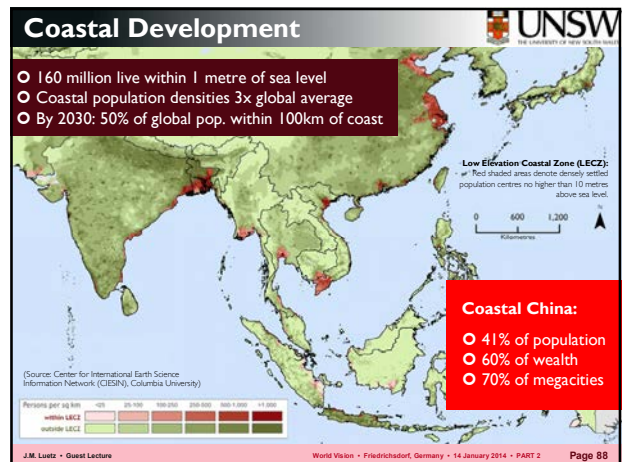
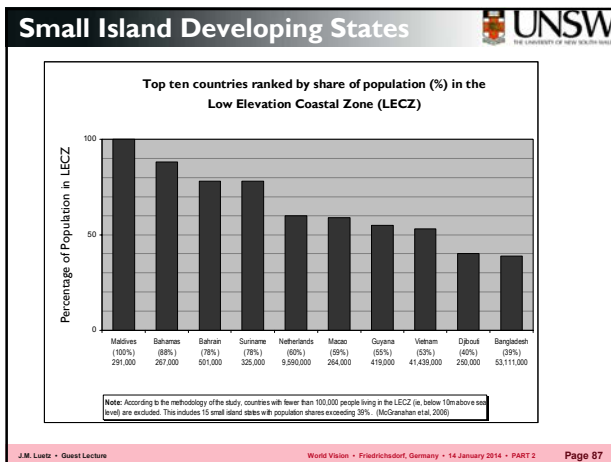
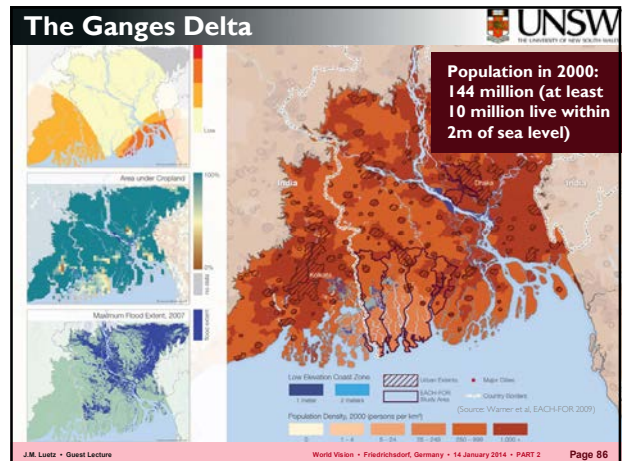
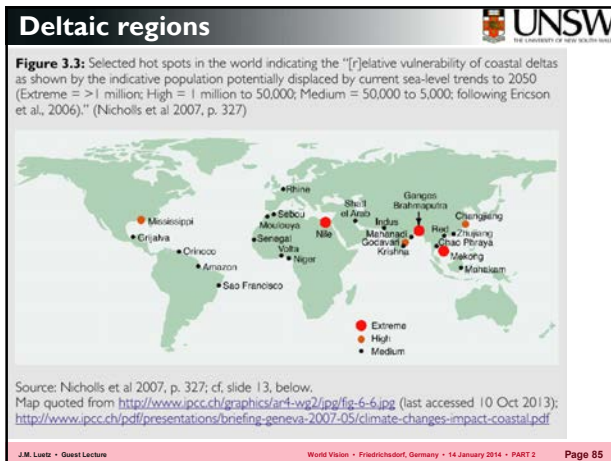
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### Abandoned houses


Photo: Johannes Luetz

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**H.J. Schellnhuber CBE** 



“ When we talk about a one metre rise in global sea level we are also talking about 500 million people who are going to have to look for new homes. So far we don't have any instruments to manage this. ”

*(Professor Hans Joachim Schellnhuber CBE, Director Potsdam Institute for Climate Impact Research, Chairman German Advisory Council on Global Change WBGU, Senior Advisor to the German Government, 2008)*

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**James Hansen** 




“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)*

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**Pilot study** 

How should such forced migration be managed?

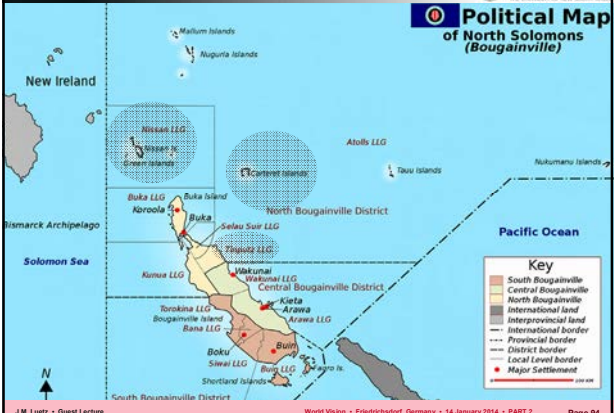


*(Photo Johannes Luetz)*

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**Pilot study** 

**Political Map of North Solomons (Bougainville)**




**Key**

- South Bougainville
- Central Bougainville
- North Bougainville
- International land
- Interprovincial land
- International border
- Provincial border
- District border
- Local Level border
- Major Settlement

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**Award winning documentary** 




There once was an island (trailer feature documentary)

<http://youtu.be/M7akwGUtGDw>

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**PhD pilot study objective** 



- Semi-structured interviews
- Trial data generation
- Observe issues raised
- Focus questionnaire



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### Small Island States





**Huene, Tulun Atoll**

Ursula Rakova, Carteret Islander and Director of Tulele Peisa NGO, Papua New Guinea Photo: Pip Starr


**Ursula Rakova:** "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."

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### Tulun Atoll



**Carteret Atoll, Papua New Guinea**



Carteret Islander and Director of Tulele Peisa NGO, Papua New Guinea Photo: Pip Starr

**Ursula Rakova:** "Storm surges regularly overtop our islands – then the sea and low-lying land become 'level.' Resettlement is underway. It is so sad to leave."

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### Huene Island, Tulun Atoll



Photo: Johannes Luetz

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### Origin Community





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### Destination Community



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### Small Island States



**Island of Buka**



Photo: Johannes Luetz

**ISLAND ADAPTATION THROUGH SEA WALLS?**

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### Small Island States



Carteret Atoll

Photo: Pip Starr



Show field research video footage:

File PNG I:  
18:00 (1 min) – Han Island  
19:20 (15sec) – drowning trees  
22:45 (45sec) – coconut, land lost  
26:00 (30sec) – flooded sea walls

## ISLAND ADAPTATION THROUGH SEA WALLS?

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### Tulun Atoll



<http://www.vimeo.com/4177527>

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### The President's Dilemma



<http://youtu.be/nZLWqa5irog>

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### Tulun Atoll



Circling Han Island in “banana boat” – coconut tree stump, evidence of sea level rise and diminishing island size ...


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### Multiplier Effects



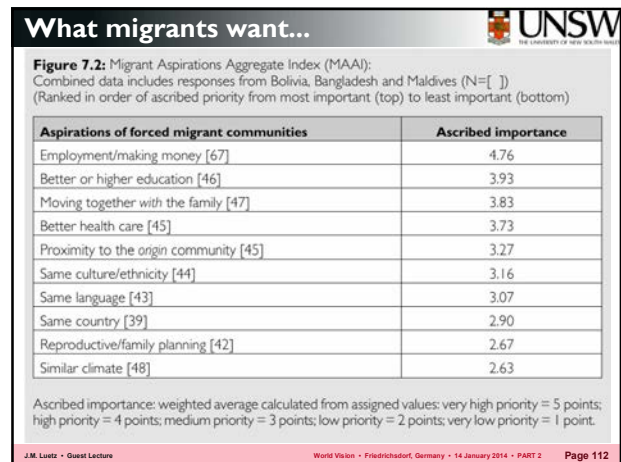
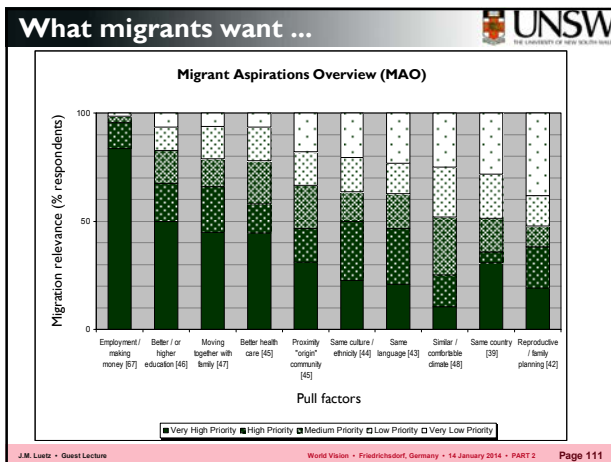
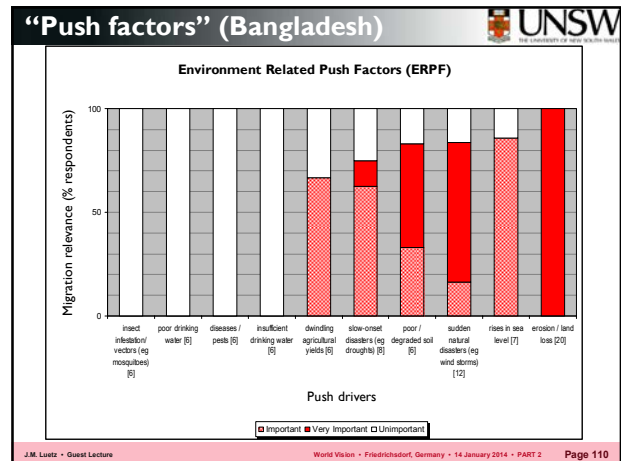
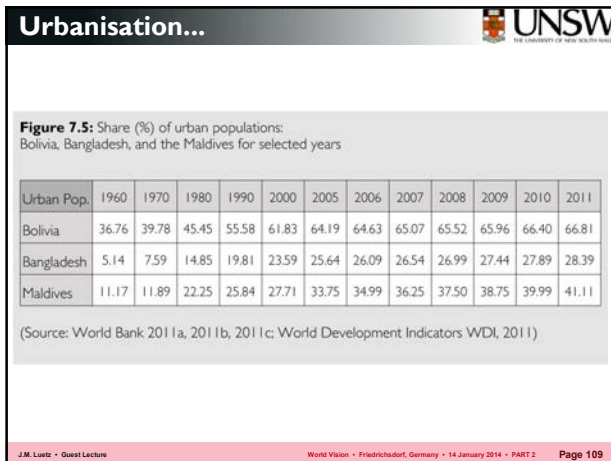
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### Case study locations



- Papua New Guinea (pilot study)
- Bolivia
- Bangladesh
- India
- Maldives
- Philippines

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### Policy recommendations

- Create and safeguard livelihoods *before* these are compromised beyond reasonable hopes of recovery
- Plan macro-managed migrations wherever there is reasonable doubt that communities can persist in perpetuity in situ, and importantly, *before* environmental or climatic changes overwhelm communal coping capacities, trigger ad hoc evacuations, impede benign migration scenarios, or create unnecessary duress for migrants and/or hosts.
- Prepare rural migrants for urban realities *before* these are encountered
- Conserve natural and forest resources *before* they irreversibly disappear (along with their diverse protective ecosystem services)
- Equip migrants to know their rights *before* these are transgressed
- Appraise financial and social costs of migration *before* these are incurred
- Protect host and guest communities from unfamiliar diseases *before* these are contracted
- Foster ethnocultural equity *before* transmigration forecloses options for harmonious integration and multicultural or multicomunal coexistence

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### Policy recommendations

- Invest in free and compulsory education for all *before* options are foreclosed and the hopes of a whole generation eclipsed (along with promising options for in situ and ex situ adaptation to climate change)
- Coordinate migration and mainstream services *before* slum conditions deteriorate beyond all reasonable prospects for human displacement with dignity, and importantly, *before* conditions degenerate beyond all hopes for remediation
- Meet the aspirational ambitions of migrants through upscaling of services in pre-selected future-proof locations *before* urbanisation commences, continues or even accelerates into environmentally fragile or unsustainable locations
- Implement awareness campaigns and community integration initiatives *before* unnecessary conflict and social problems evolve
- Establish a stronger state presence and more accountable government institutions in urban slums *before* parallel structures develop or expand in "state-absent" areas (eg, mastaans or "musclemen" controlling local level availability of rental space, land, amenities, etc and exacting exorbitant fees for the same); guarantee rights fulfilment through law enforcement with consequences
- Anticipate labour market requirements and create jobs *before* labour supplies supersede labour demands

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**Q&A** 

**Thank You!**  
PhD Sponsors:

**PhD Supervisors:**  
A/ Prof John Merson,  
Director Blue Mountains World Heritage Institute  
A/Prof Eileen Pittaway,  
Director Centre for Refugee Research

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**Contacts** 



**DR JOHANNES M LUETZ**  
90484740  
Institute of Environmental Studies  
UNSW AUSTRALIA  
(UNIVERSITY OF NEW SOUTH WALES)  
UNSW SYDNEY NSW 2052 AUSTRALIA  
T: +61 (0) 9385 4003  
M: +61 (0) 412 355 736  
F: +61 (0) 9563 5015  
E: [luetzj@unsw.edu.au](mailto:luetzj@unsw.edu.au)  
W: [www.ies.unsw.edu.au](http://www.ies.unsw.edu.au)

<http://planetprepare-videos.blogspot.com.au/>  
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