

Climate Change Mitigation and Adaptation

UNSW • ENVS1011 • 26 April 2013

Guest Lecture

Photo: Ermin Gutenberger / iStockphoto

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Intro: Research Background



PLANET **PREPARE**

2008 World Vision Preparedness Study

- rotect Development
- **R** esearch Priorities
 - 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

Ρ

Ε



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



Island of Torotsian, Papua New Guinea

Photo: Johannes Luetz



Island of Torotsian, Papua New Guinea





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





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. From a size of 6,400km² in the 1960s, Bhola is now only half its original size."

(General Secretary Equity & Justice Working Group)



Fajumuddin, Bhola, Bangladesh: (Photo: Johannes Luetz



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

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

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.



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)



Examples of adaptation which will be elaborated in next week's guest lecture on "Climate change induced migration".

(These slides are "teasers/tasters" only)

Bridge to "nowhere" (2011)





Google





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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)

Dhaka (2011)



Show field research video footage:

File name "Bangladesh 5": 46:00 (1min) – Dhaka tenants, settlements 59:00 (20sec) – Bhola CECIS (6km@61mir

59:00 (30sec) – Bhola-CEGIS (6km@61min) 00:00 (3min) – INDIA 1: erosion/ accretion Md. Faruk, migrant from Bhola Island interviewed at Dhaka slum

Photo:







I. What is climate change mitigation?(Discuss)

Mitigation



66 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.



I. What is climate change adaptation?(Discuss)

Adaptation



66 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. 99

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



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



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 very same (climate) "coin".

Plus: implementing them costs (and saves) money.



⁶⁶ 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 policydriven attempts to reduce emissions.

> –James Lovelock, 2009; p. 75: The Vanishing Face of Gaia



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





(Source: ppt Stephen H. Schneider)

Weather *≠* Climate



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



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

Weather *≠* Climate





(Source: ppt Stephen H. Schneider)

Weather *≠* Climate



"Hundreds Gather to Protest Global Warming"

(Source: ppt Stephen H. Schneider)



Global temperature change 1980-2009



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Global average temperature 1850-2009



One-Way Warming



Global warming cannot be reversed due to the long life-time of CO_2 in the atmosphere. This is because CO_2 cannot be extracted from the atmosphere in massive amounts.

CO₂ Concentrations





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).

CO₂ Context





Stopping Distance





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



⁶⁶ 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

Longevity of CO₂



Slow decay of fossil fuel CO₂ emissions



The fraction of CO_2 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.

(Hansen, J, 2007, Atmos. Chem. Phys. 7, 2287-2312).
Longevity of CO₂

6



Boeing 767-300

144

It Jet Fuel Burned = 3.157t CO₂ Emissions

(Photo: Adrian Pingstone)

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Longevity of CO₂



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

Per-capita emissions for Canada trip in 2010: 1.4t CO₂ (2110: 460kg, 3010: 260kg)

* 2.7 (Radiative Forcing Index, RFI) = ~ 3.8t CO₂

Historical Emissions



"Granny Maria" – 1958

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Historical Emissions



Lloyd Alexander, 1958

40% of total emissions from granny's 1st car still airborne today (~ 5,200 kg CO₂) as "historical emissions"

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Historical Emissions



Cumulative CO₂ Emissions 1850-2006

Rank	Country	Mt CO ₂ e	% of World Total
Ι	United States of America	333,747.8	29.00%
2	European Union (27)	305,750. I	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%
Тор 10	Cumulative Total	928,886	80.71%

CAIT, World Resources Institute

CAIT GHG data are derived from CDIAC, EDGAR, EIA, EPA, Houghton, IEA, and WB.



Reconstructed, observed and future warming projections



Four degrees or more?





Available resources:

Audio filesPresentation files

Conference

12-14 July 2011, Melbourne

FOUR DEGREES OR MORE? AUSTRALIA IN A HOT WORLD

www.fourdegrees2011.com.au

Copenhagen implemented





com.au/presentations/ presentation available: Base d on: Rogelj et al., Nature, 2010 Source: Meinshausen 2011, http://www.fourdegrees20





Bad News



Global warming cannot be reversed due to the long life-time of CO_2 in the atmosphere. This is because CO_2 cannot be extracted from the atmosphere in massive amounts.

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_2 released

into the atmosphere since industrialisation.

The Challenge



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

Zero Emissions? Zero Regrets!

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



"Great Transformation"



WBĠU

Mitigation

World in Transition: Social Contract for Sustainability

Flagship Report 2011

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

Summary for Policy-Makers

World in Transition A Social Contract for Sustainability



Bill McKibben, 2012





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 \rightarrow (threshold considered "dangerous" climate change) The Second Number: 565 Gigatons \rightarrow (fossil fuels remaining in 2°C cumulative budget) The Third Number: 2,795 Gigatons \rightarrow (remaining in the ground, ready for exploitation)

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

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.

Adaptation



66 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.

Adaptation Critical



Climate Adaptation Masterclass



Friday 20 May 2011, Queensland Museum, Brisbane

The entries of

The event area to build Australian understanding and expectly by providing researchers and becape-makes with the latest international travery on dimate charge adaptation. The workerspi of Networks of the words leading climate change adaptation threas and practitioners.

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Available resources:

Audio files Presentation files

Masterclass

20 May 2011, Brisbane

FROM THEORY TO IMPLEMENTATION

http://www.nccarf.edu.au/content/masterclass-climateadaptation-theory-implementation



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



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.



Which are some climate change mitigation and adaptation opportunities?

(Discuss)







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

http://youtu.be/EXZtzsR3OBk





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

What is the difference between CT and ETS?





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)



- I. Multicausality issues impossible to untangle
- 2. Different values, priorities, capabilities, awareness
- 3. Risk aversion risk accommodation?
- 4. Uneven distribution of impacts
- 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"



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.)



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/gLBE5QAYXp8

Battle of Ideologies

Shares of liberals and conservatives in each global warming



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Source

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

Sewror: Based on Table 20 in Edward Maibach, Connie Roser-Renouf and Anthony Leiserowitz, Global Warming: Six Americas' 2009

Note: 'Moderates' are not shown

Doubt





http://climaterealityproject.org/video/doubters/ http://youtu.be/YhDacrIIaSA

Doubt









http://www.merchantsofdoubt.org/

http://www.arts.unsw.edu.au/newsand-events/public-lecture-withnaomi-oreskes-645.html





(Source: ppt Stephen H. Schneider)





(Source: ppt Stephen H. Schneider)









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)



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."

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



Longevity of CO₂ Environmental Degradation Accelerating CO₂ Emissions Declining CO₂ Removal **Escalating Temperatures Rogue Weather** Sea Level Rise **Historical Emissions** Inertia of the Climate System

Population Pressures

Capable Remedy



 \Box ongevity of CO₂ **E** nvironmental Degradation A ccelerating CO_2 Emissions \mathbf{D} eclining CO₂ Removal **E** scalating Temperatures **R** ogue Weather **S** ea Level Rise H istorical Emissions nertia of the Climate System **P** opulation Pressures

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

Canada presentation available at: http://luetz.com/docs/leaders hip-wanted_slides.pdf





Sustainability – time, space, species

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



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)



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