

Factoring climate change

Implications for pandemic preparedness

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Agenda

- ▶ ENVforum in brief
- ▶ Introduction
- ▶ Climate change characteristics
- ▶ Main factors
- ▶ The connection between climate change and health
- ▶ Conclusions



Asia-Europe Environment Forum

- ▶ Established in 2003 as an initiative of ASEF
- ▶ Partners: ASEF, HSF, IGES, UNEP

It serves as:

- ▶ A multi-stakeholder forum between the two regions;
- ▶ a recognised reference point for Asia and Europe consensus on sustainable development;
- ▶ an interface between government and civil society for policy recommendations;
- ▶ an Asia-Europe network on sustainable development; and,
- ▶ a contributor to the agenda of the ASEM Environment Ministerial and other Asia-Europe Meeting (ASEM) fora.



Main activities of ENVforum

2010

- ▶ A Green Future: Asia and Europe Growing Sustainably international conference

2011 - 2012

- ▶ Environmental policy scanning
- ▶ Scenario building
- ▶ Environmental policies best practices
- ▶ Environmental strategies



Climate change: definitions

- ▶ the most general definition of *climate change* is a change in the statistical properties of the climate system when considered over periods of decades or longer, regardless of cause.
- ▶ the term is also used to refer to climate change caused by human activity;
- ▶ i.e. UN Framework Convention on Climate Change 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."
- ▶ climate change is also synonymous with global warming.



Intergovernmental Panel on Climate Change (IPCC)

- ▶ scientific intergovernmental body
- ▶ tasked with evaluating the risk of climate change caused by human activity
- ▶ established in 1988 by the WMO and the UNEP
- ▶ publishes special reports on topics relevant to the implementation of the UNFCCC
- ▶ Widely regarded by stakeholders as the authority on climate change response.



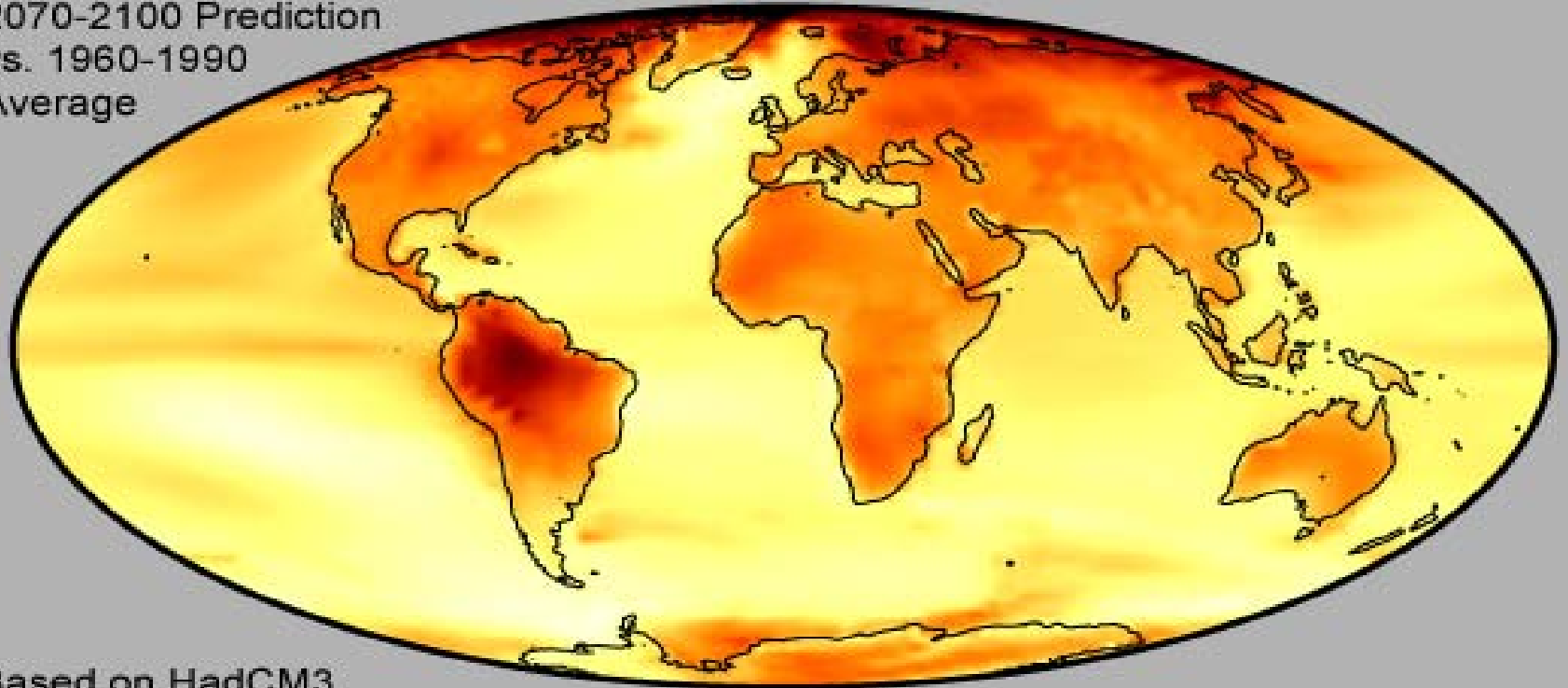
Scenarios of climate change

The four SRES scenario families^{[36][37][38]} of the *Fourth Assessment Report* vs. associated changes in global-mean temperature until 2100

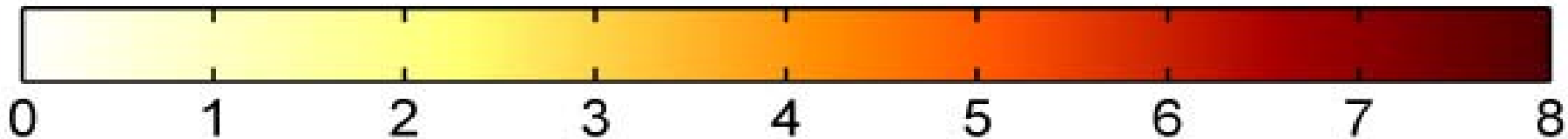
| | | |
|---|---|--|
| AR4 (http://ipcc-wg1.ucar.edu/wg1/wg1-report.html) | more economic focus | more environmental focus |
| Globalisation (homogeneous world) | A1 rapid economic growth (groups: A1T/A1B /A1F1) 1.4 – 6.4 °C | B1 global environmental sustainability 1.1 – 2.9 °C |
| Regionalisation (heterogeneous world) | A2 regionally oriented economic development 2.0 – 5.4 °C | B2 local environmental sustainability 1.4 – 3.8 °C |

Global Warming Predictions

2070-2100 Prediction
vs. 1960-1990
Average



Based on HadCM3



Temperature Increase ($^{\circ}\text{C}$)

The geographic distribution of surface warming during the 21st century calculated by the [HadCM3](#) climate model if a business as usual scenario is assumed for economic growth and greenhouse gas emissions. In this figure, the globally averaged warming corresponds to 3.0 $^{\circ}\text{C}$ (5.4 $^{\circ}\text{F}$).

Climate change causing factors

- ▶ solar radiation,
- ▶ deviations in the Earth's orbit,
- ▶ mountain-building
- ▶ continental drift
- ▶ changes in greenhouse gas concentrations.

Some parts of the climate system, such as the oceans and ice caps, respond slowly in reaction to climate forcing because of their large mass. Therefore, the climate system can take centuries or longer to fully respond to new external forcings.



Key factors

- ▶ Most of the temperature increases since the mid-20th century is due to corresponding increases human greenhouse gas concentrations.
- ▶ Anthropogenic warming and the rise of sea levels would continue for centuries even if greenhouse gas concentrations stabilise
- ▶ World temperatures could rise by 1.1 - 6.4 °C (2.0 - 11.5 °F) till 2100:
 - ▶ The sea level will probably rise by 18 to 59 cm.
 - ▶ >90% of more frequent warm spells, heat waves, and heavy rainfall
 - ▶ >66% of increase in droughts, tropical cyclones, and extreme high tides.

Key findings

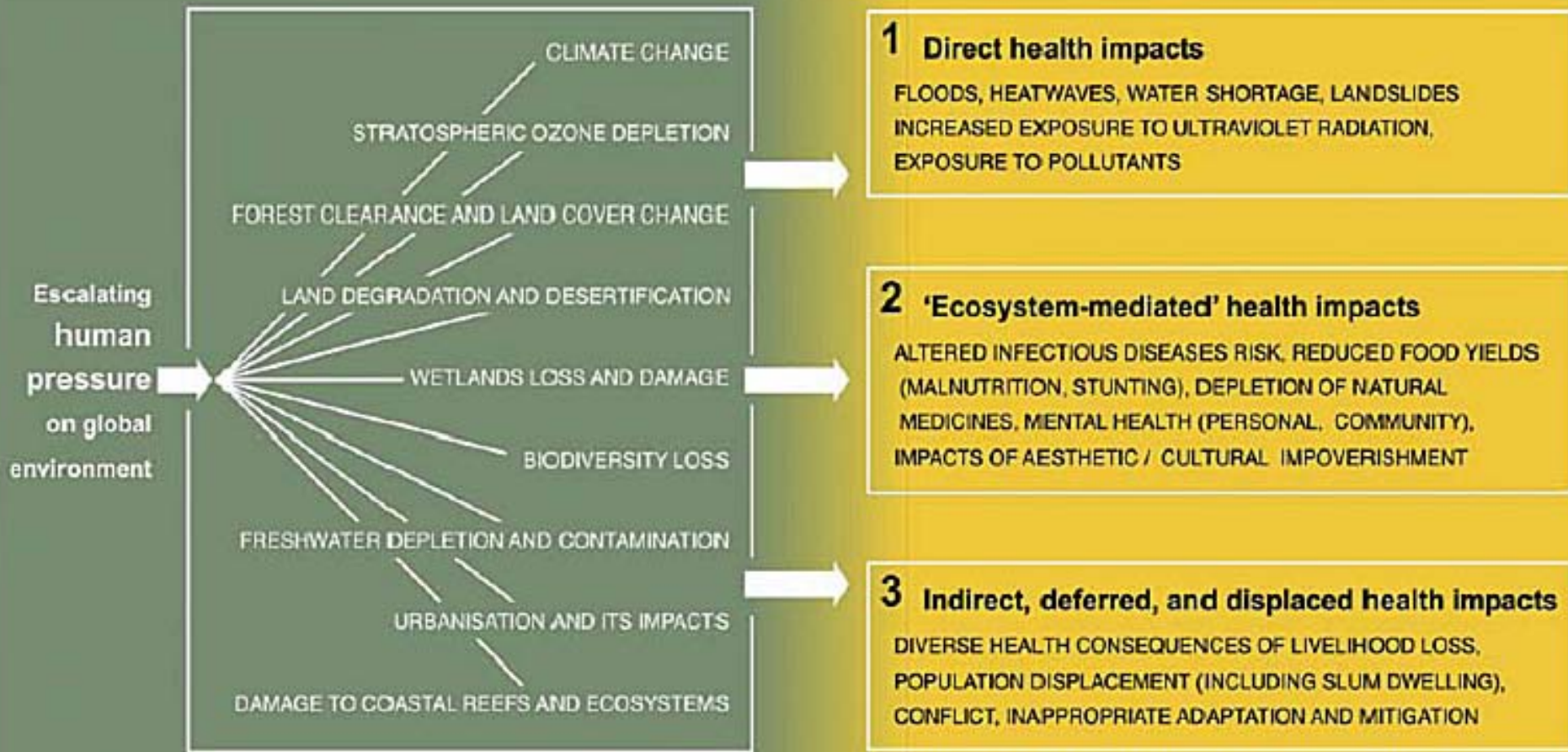
- ▶ Past and future anthropogenic CO₂ emissions will contribute to warming and sea level rise for more than a millennium
- ▶ Global atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased as a result of human activities since 1750 and now exceed pre-industrial values over the past 650,000 years.

Controversies on IPCC report

- ▶ **IPCC was forced to admit it made a mistake by claiming the Himalayan glaciers could melt by 2035.**
- ▶ It made the assertion two years ago, saying it was based on detailed research into global warming, but has now conceded it was an error and the claim would be reviewed

Examples of health impact

ecosystem impairment → health impacts



Climate change vs. health

- ▶ Climate change is not creating many new or unknown health threats, but it will increase certain interactions between environment and human health with stronger and more pronounced effects than currently seen.

Climate change vs. health

Climate change is expected to have impacts on the epidemiology of many diseases and health conditions.

- ▶ The assessment is based on reports from WHO and IPCC8.
- ▶ Source: *Accompanying document to the WHITE PAPER: Adapting to climate change: Towards a European framework for action Human, Animal and Plant Health Impacts of Climate Change*

Factoring climate change

Climate change will affect human health:

- ▶ directly - in relation to the physiological effects of heat and cold
- ▶ indirectly through:
 - ▶ altered human behaviours (e.g. forced migration, more time spent outdoors),
 - ▶ the increased transmission of food
 - ▶ vector borne diseases
 - ▶ other effects of climate change, such as flooding.



Possible climate change influence on health

- ▶ **Illnesses and deaths** associated with temperature
- ▶ **Food borne diseases** (e.g. increase of Salmonella cases in Europe)
- ▶ **Vector borne diseases** (changes in infectious disease transmission by vectors such as mosquitoes and ticks, as a result of changes in their geographic range, seasons of activity and population size; i.e. potential increase of malaria risk in parts of Europe, tick population increase due to milder winters, sand flies spread)



Possible climate change influence on health

- ▶ **Water borne diseases** (mobilising of pathogens or extensive water contamination from sewage pipes, reductions in summer water flows may increase the bacterial and chemical contamination. Higher temperatures may cause harmful algal blooms. The scarcity of water for hygiene practices i.e. hand washing, can cause infectious diseases outbreaks)
- ▶ **Ultraviolet radiation** (the incidence of skin cancers, including malignant melanoma and cataracts)
- ▶ **Mental diseases** (i.e. psychological effects that follow disasters, especially in high risk groups like children)



Effects on biodiversity

- ▶ **Vulnerable groups** (elderly suffering from heat waves)
- ▶ **Increased migration** due to climate change
- ▶ **Increased need for humanitarian aid**
- ▶ **Air quality** (i.e. increase in respiratory diseases and mortality, ozone concentration, allergic disorders)
- ▶ **Animal health**
- ▶ **Plant health** (vegetation cycle disorders, new pests, expansion of existing ones, reduction of forest i.e. tundra due to ice melting)



Fresh storms threaten landslide rescue effort in north-west China



Source: <http://www.bbc.co.uk/news/world/>

14 million Pakistanis affected by flood



Source: <http://www.bbc.co.uk/news/world-south-asia-10924923>

New 'superbug' found in UK hospitals

The bacteria which make an enzyme called NDM-1 travelled back with NHS patients who had gone abroad to countries like India and Pakistan for treatments such as cosmetic surgery.

NDM-1 can exist inside different bacteria, like E.coli, and it makes them resistant to one of the most powerful groups of antibiotics – carbapenems. Although there have only been about 50 cases identified in the UK so far, scientists fear it will go global.

Source: <http://www.bbc.co.uk/news/health-10925411>



Impact of climate change on ecology of avian influenza

Climate change would almost certainly:

- ▶ alter bird migration
- ▶ influence the AI virus transmission cycle and
- ▶ directly affect virus survival outside the host.

AI virus circulation in water bird populations will continue with endless adaptation and evolution.

In domestic poultry, too little is known about the direct effect of environmental factors on highly pathogenic avian influenza transmission and persistence to allow inference about the possible effect of climate change.

Source: Movements of birds and avian influenza from Asia into Alaska. *Winker K, McCracken KG, Gibson DD, Pruett CL, Meier R, Huettmann F, Wege M, Kulikova IV, Zhuravlev YN, Perdue ML, et al. Emerg Infect Dis. 2007 Apr; 13(4):547-52.*

Speculations

- ▶ The next flu pandemic is frozen in an Arctic glacier or Siberian lake, waiting for temperature rise to be set free
- ▶ Global warming stimulates virus mutation as well as possibility of host - switching



Conclusions

- ▶ There was no new disease related directly to climate change unidentified
- ▶ There is a possibility that new pandemics will arise from global warming and weather changes
- ▶ The warming effect and severe weather increases risks and the scope has not been fully identified yet

