Lomonosov Moscow State University
Business School

Global Limits of Economic Growth

Lomonosov Moscow State University,
Inter-Departmental Course, 2023-2024, Spring Fall

Course Reader:

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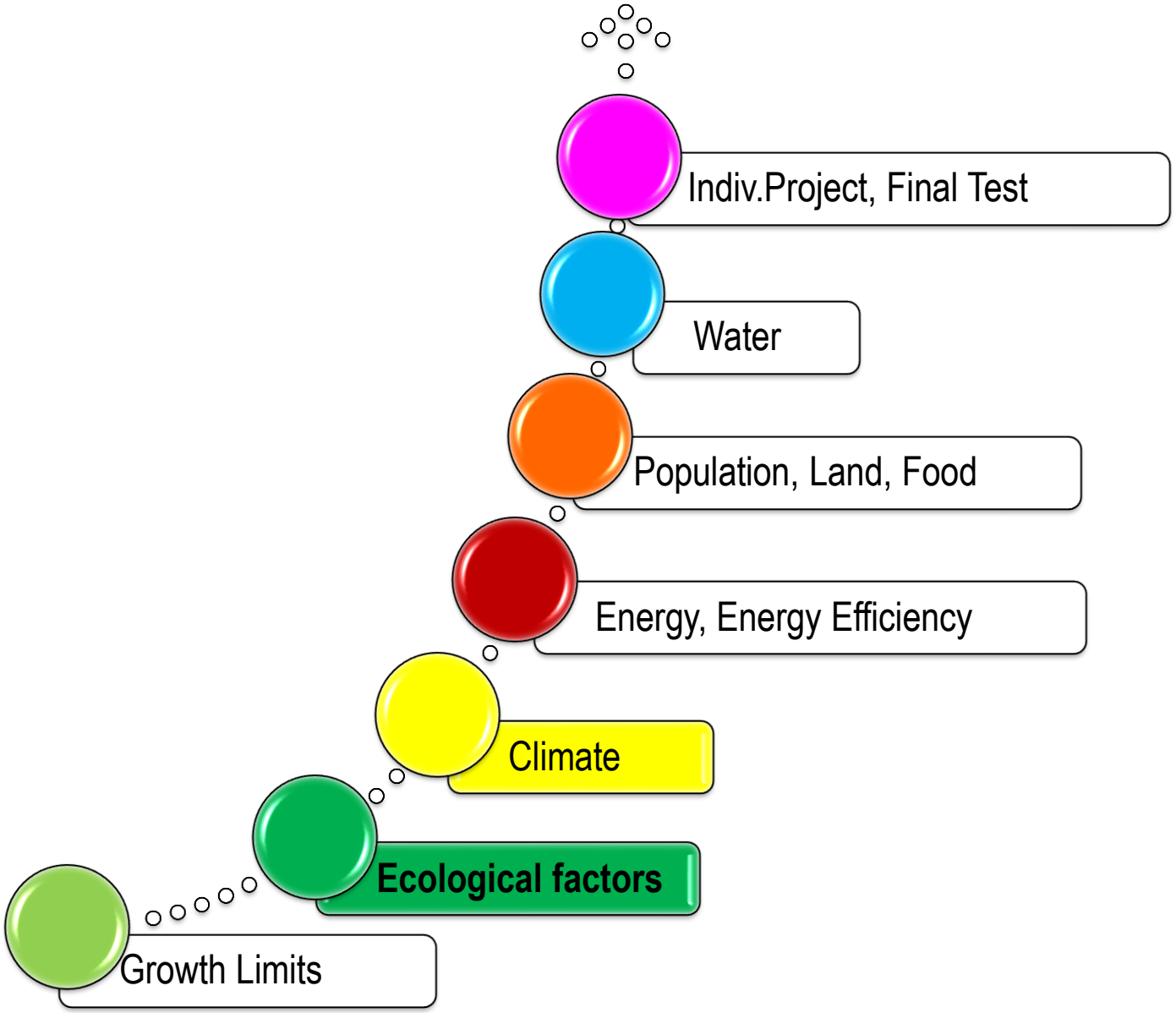
Course Route



Session 3
Global Climate Changes

Pre-Reading and Food-for-Thought Assignment

Global Limits of Economic Growth (GLOEG) - 2025

Lomonosov Moscow State University
Business School

Pre-Reading and Food-for-Thought Assignment before Session 3 (March, 5th)

CLIMATE CHANGE THEORY

1. Explore the **IPCC Special Report: Global Warming of 1.5C**:
   https://www.ipcc.ch/sr15/chapter/spm/
   Think about:
   What this document is about?
   What is the main idea of the document?

INTERNATIONAL CLIMATE DOCUMENTS

1. **Paris Agreement**: https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

2. Explore **UN Sustainable Development Goals** related to climate (SDG13 and SGD7):
   https://sdgs.un.org/goals

   Think about:
   How do the SDGs correlate between one another?
   How do ideas of Paris Agreement correlate with SGDs on climate?

CLIMATE CHANGE_HOW INDUSTRIES ARE ADAPTNG TO IT

1. Read the executive summary **"Climate Change in the European Alps", OECD.** (see the file)
   Pay attention to the adaptation measures of winter tourism industry to climate change.

Pre-Reading and Food-for-Thought Assignment

Climate Change in the European Alps: Adapting Winter Tourism and Natural Hazards Management. OECD (2007), Executive Summary, p.1-4.

Executive Summary

This report provides an assessment of the impacts of, and adaptation to, climate change in the areas of winter tourism and natural hazards management for the European Alps.[1] The implications of this assessment however extend beyond the European Alps. Insights into the costs of adaptation, the roles of the private sector and government agencies, and broader lessons on the synergies and trade-offs between climate change adaptation and other sectoral and development priorities are also likely to be relevant for other mountain systems which face similar climatic and contextual challenges, for example in North America, Australia and New Zealand. More generally, examining the case of the European Alps – where there is high adaptive capacity – can highlight examples of good adaptation practices and the role of financial mechanisms, as well as identify constraints and limits to adaptation. Such insights would be valuable not only for other developed country contexts, but for developing countries as well.

Our Ocean | Timelapse in Google Earth

Our Forests | Timelapse in Google Earth: https://www.youtube.com/watch?v=b4eLTYUcj7k

Our Cities | Timelapse in Google Earth: https://www.youtube.com/watch?v=v74_mf2usc0

Aims of Session 3. *Global Climate Changes*

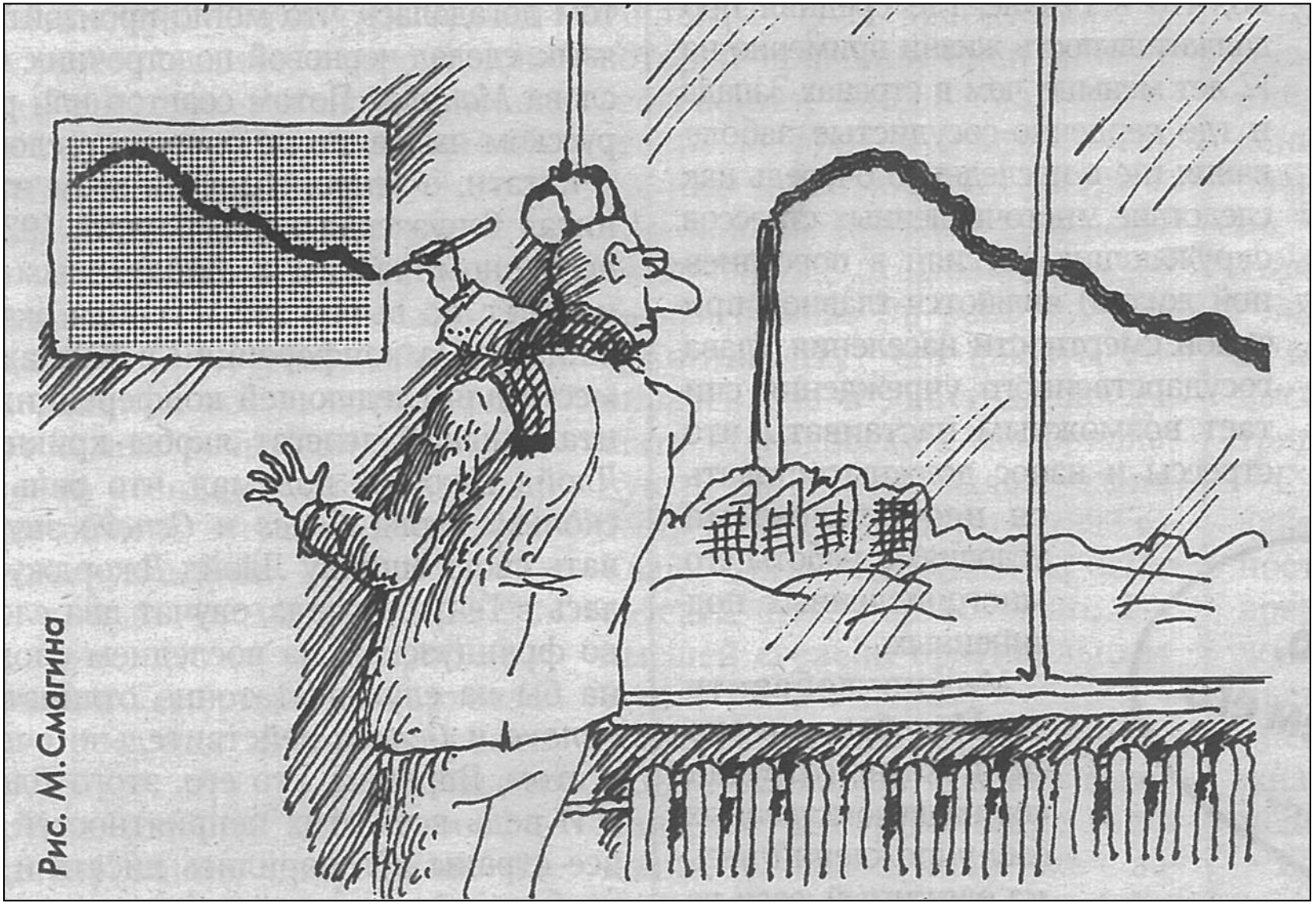
1. To understand and interpret correctly **climate change manifestations**
2. To understand climate change consequences

Plan of Session 3

SESSION 3

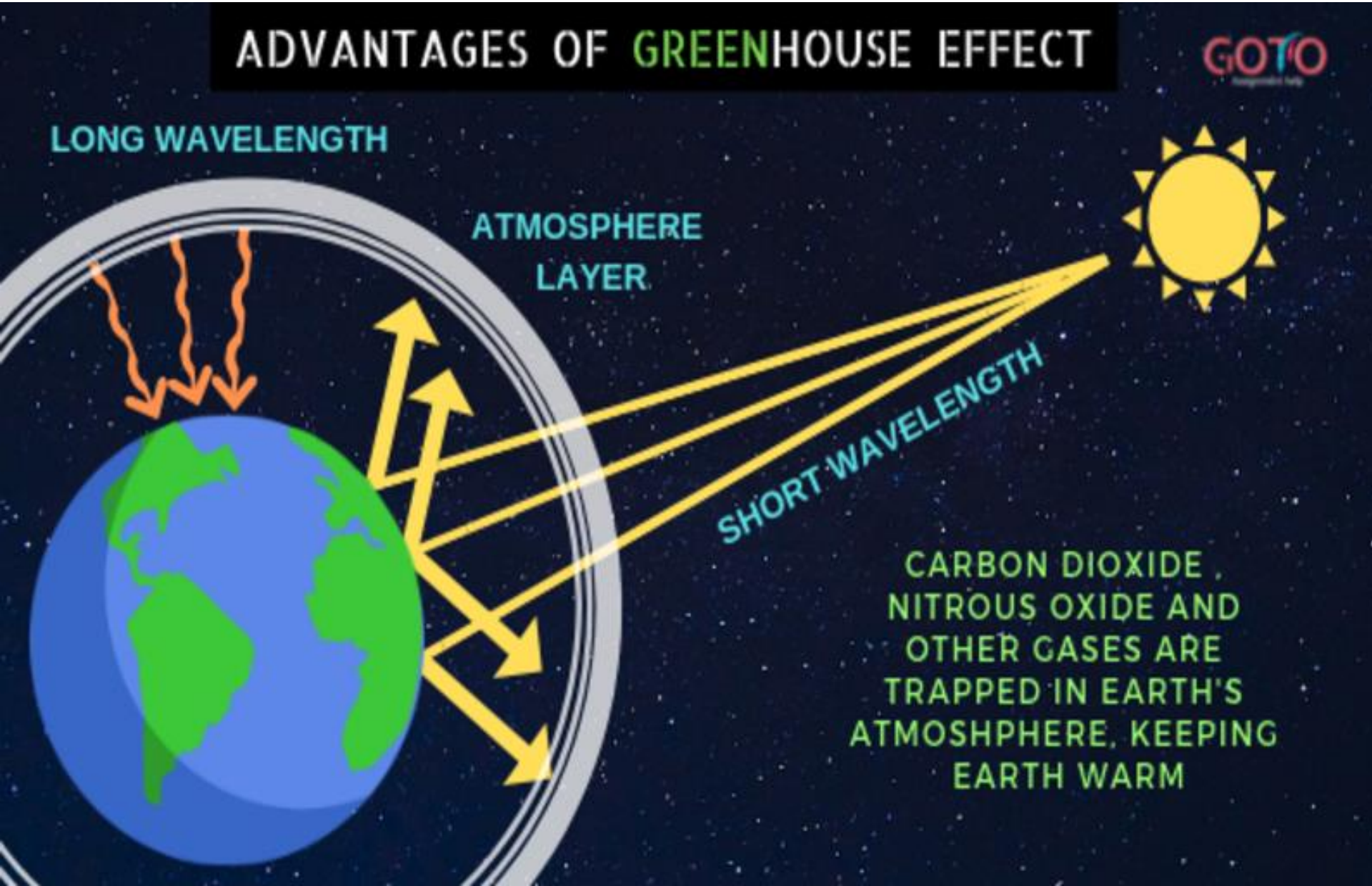
1. Climate Change Manifestations
   - Hockey-stick effect
   - Different views on global warming
   - Natural & Industrial Contribution to Global Warming
   - Climate Change consequences
   - Case: Climate Change in the European Alps

Global Warming Predictions



Source: Troitzkiy Variant, No.24, 2010

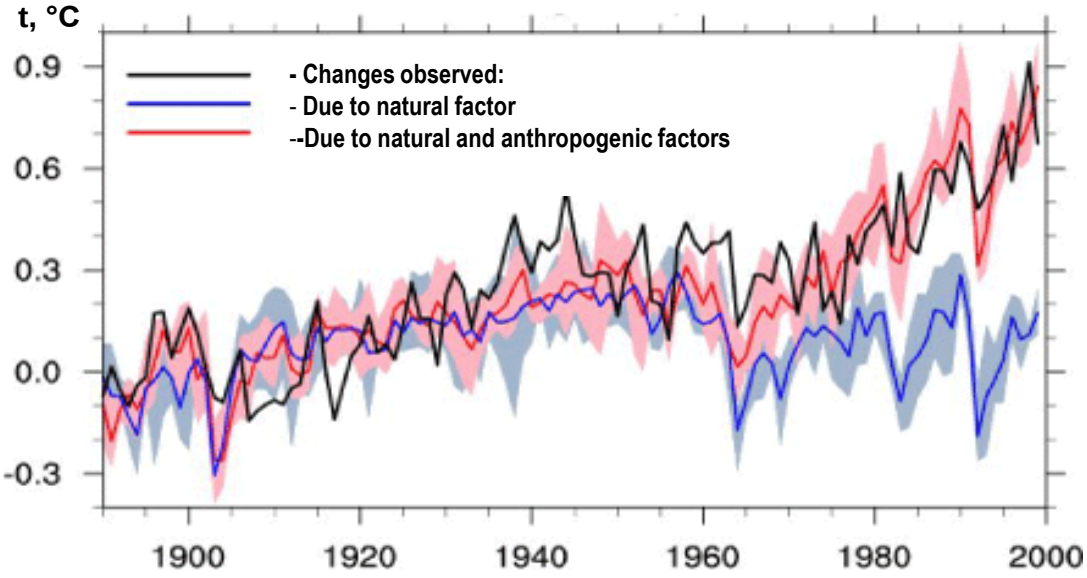
Positive side of the Greenhouse effect



Climate Change Manifestations

- Discussions have taken place since 1970-s
- From 2005 discussions pass to the level of G8
- The discussion continues about the ambiguous character of the global warming
- **Individual businesses and whole industries face the climate change consequences today**

Observed temperature rise cannot be explained only by natural factors

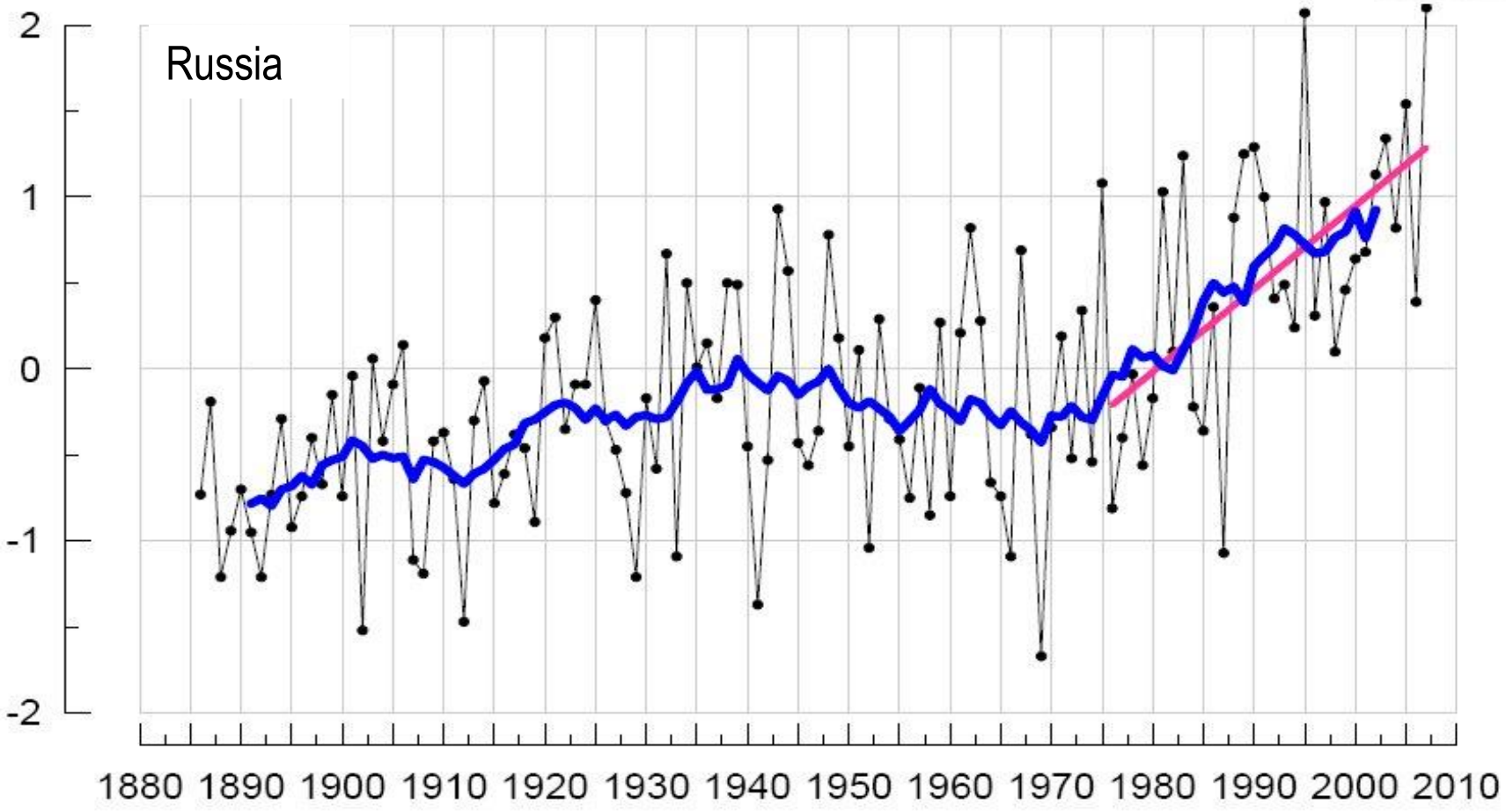


Source: IPCC

Climate change "deregulation" can cause different climate and natural changes

Growth of average annual temperature in Russia, ºC

(average levels of 1961-1990 taken as a zero)



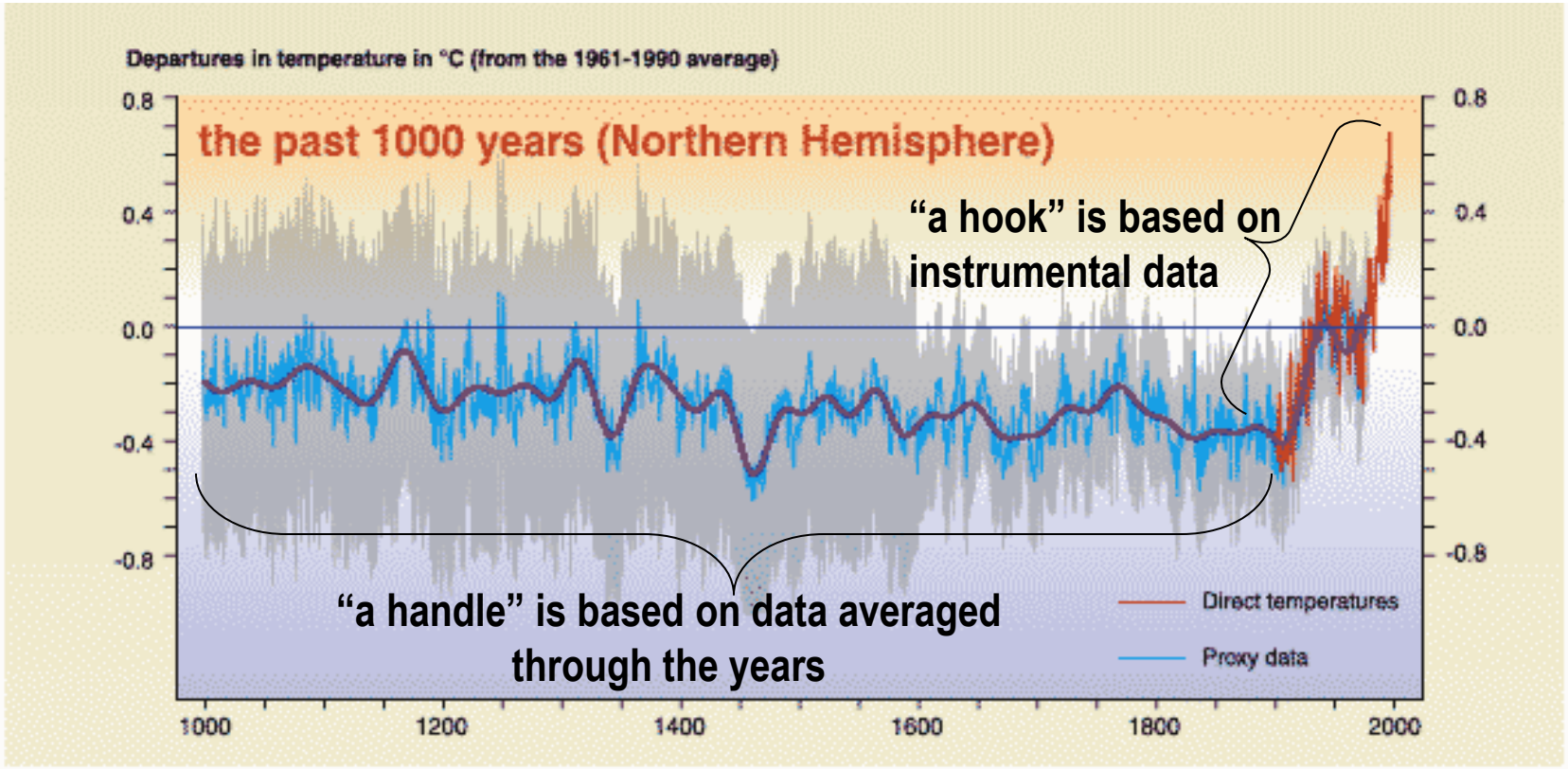
Source: WWF

IPCC Special Report: Global Warming of 1.5C

A.1. Human activities are estimated to have caused approximately 1.0°C of global warming [FN5] above pre-industrial levels, with a *likely* range of 0.8°C to 1.2°C. Global warming is *likely* to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate. (*high confidence*) (Figure SPM.1) {1.2}

- https://www.ipcc.ch/sr15/chapter/spm/

“Hockey-stick” effect



Источник: МГЭИК

The uncertainty of climate change models remains very high

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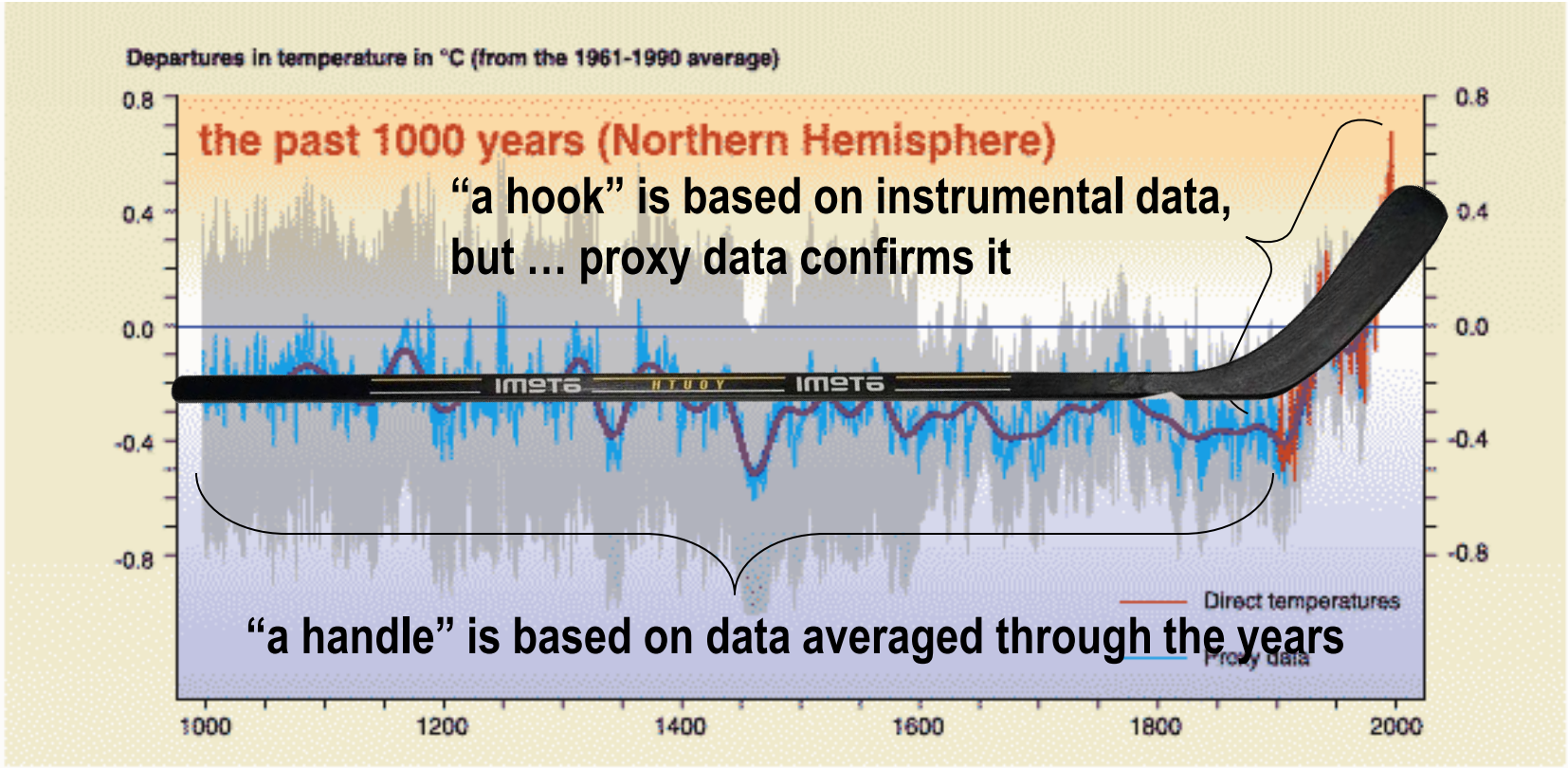
“Hockey-stick” effect



Источник: МГЭИК

The uncertainty of climate change models remains very high.

Different Views on Global Warming Origins

Alarmers and Mainstreamers

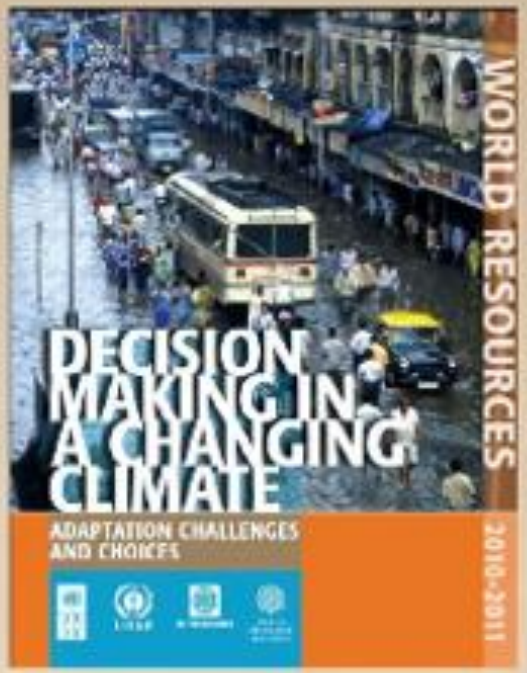
- Anthropogenic character is caused by human industrial activity (emissions of GHG)
- Alarmers are more eccentric: World Collaps Model!

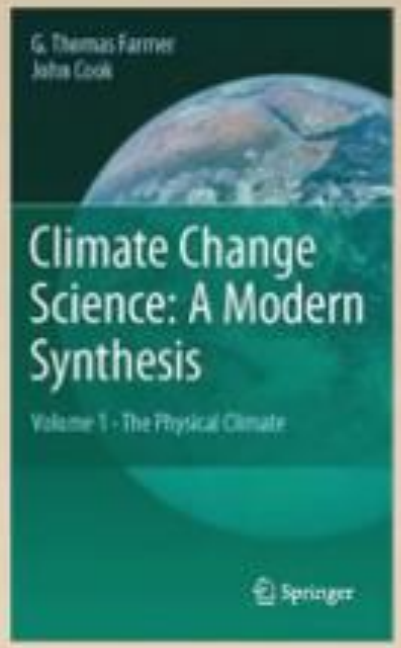
Sceptics

- Do recognize global warming effect, but doubt on the dominant component of humanity in it

Deniers

- Do not recognize the fact of global warming itself





http://www.skepticalscience.com/docs/Guide_to_Skepticism.pdf

http://www.skepticalscience.com/translation.php?lang=16

- http://www.unep.org/climatechange/mitigation/Default.aspx
- http://www.globalissues.org/issue/178/climate-change-and-global-warming
- http://climate.nasa.gov/causes
- http://www.worldclimatereport.com
- http://www.worldresourcesreport.org/wrr-2010-2011

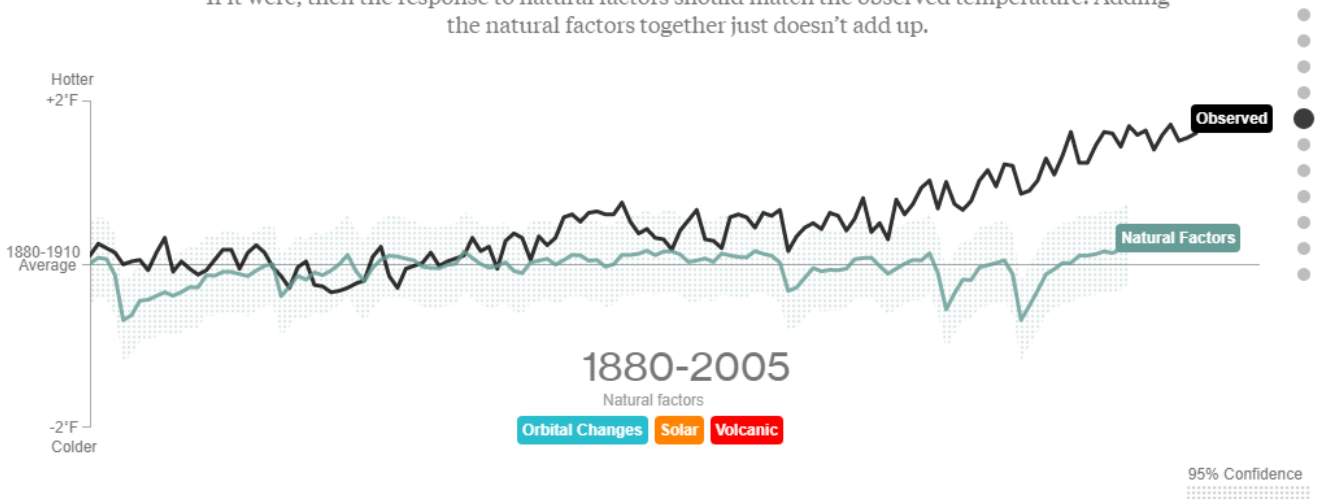
Natural & Industrial Contribution to Global Warming

- Around the world there are 28 or so research groups in more than a dozen countries who have written 61 climate models. Each takes a slightly different approach to the elements of the climate system, such as ice, oceans, or atmospheric chemistry.
- The computer model that generated the results for this graphic is called "ModelE2," and was created by **NASA's Goddard Institute for Space Studies (GISS)**

http://www.bloomberg.com/graphics/2015-whats-warming-the-world/

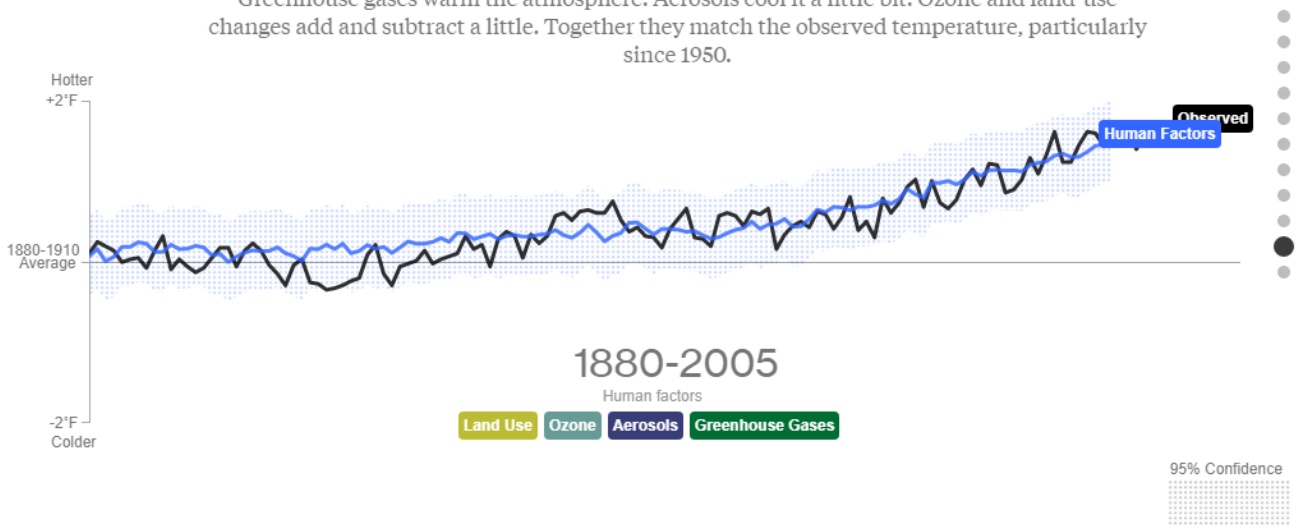
Is it All Three of These Things Combined?

If it were, then the response to natural factors should match the observed temperature. Adding the natural factors together just doesn't add up.



See for Yourself

Greenhouse gases warm the atmosphere. Aerosols cool it a little bit. Ozone and land-use changes add and subtract a little. Together they match the observed temperature, particularly since 1950.



GHG Emissions by sectors

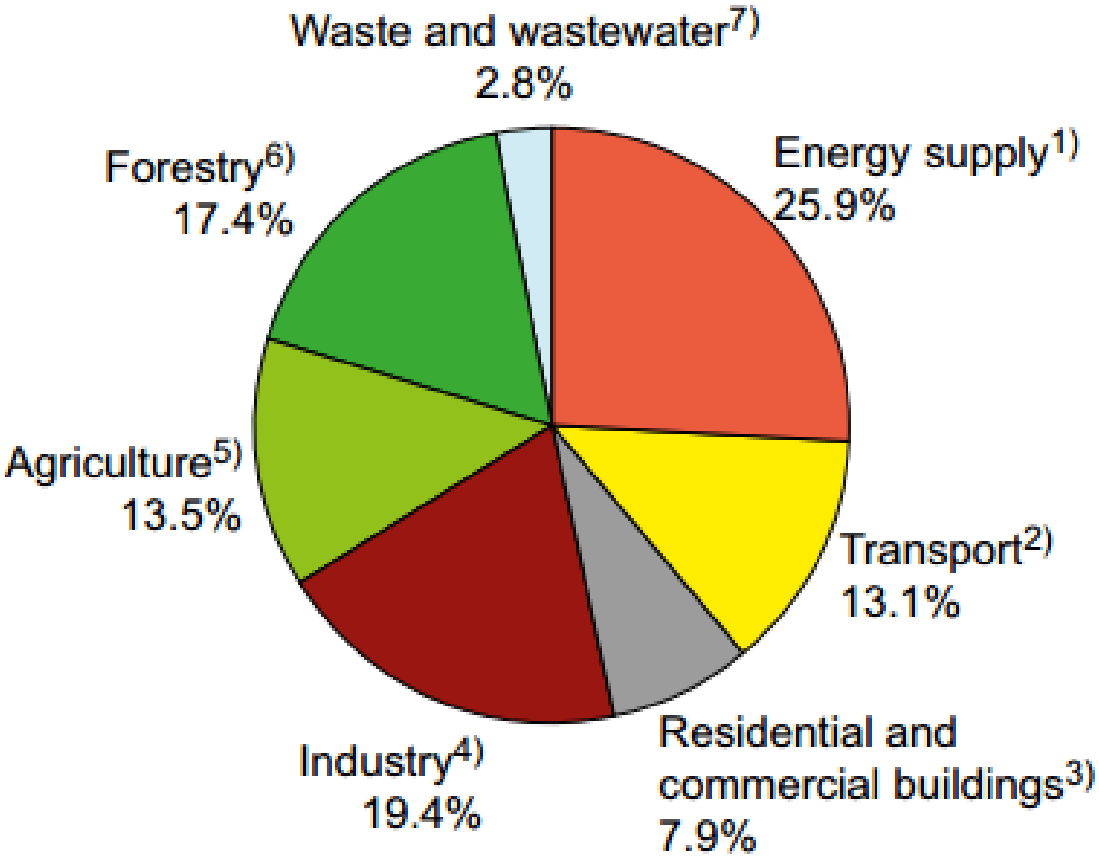
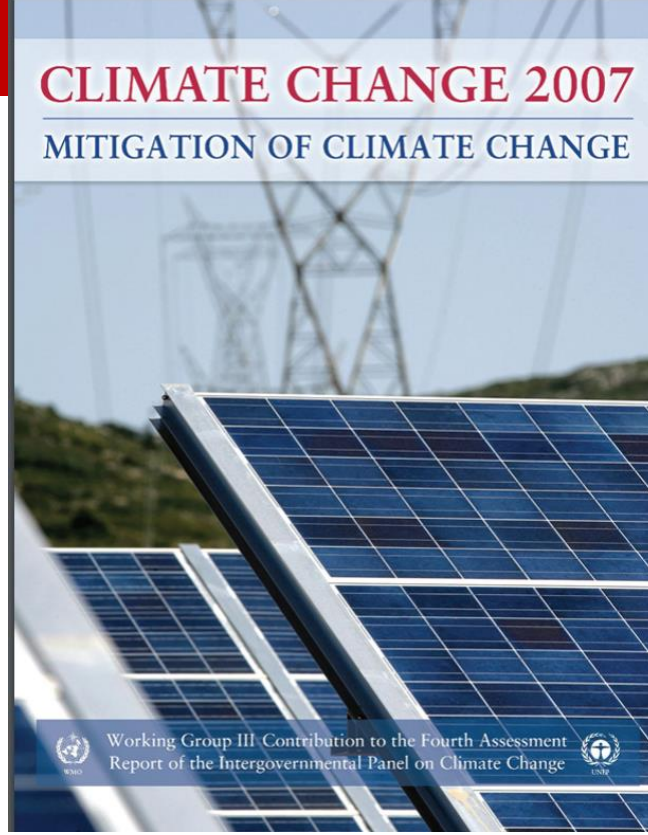


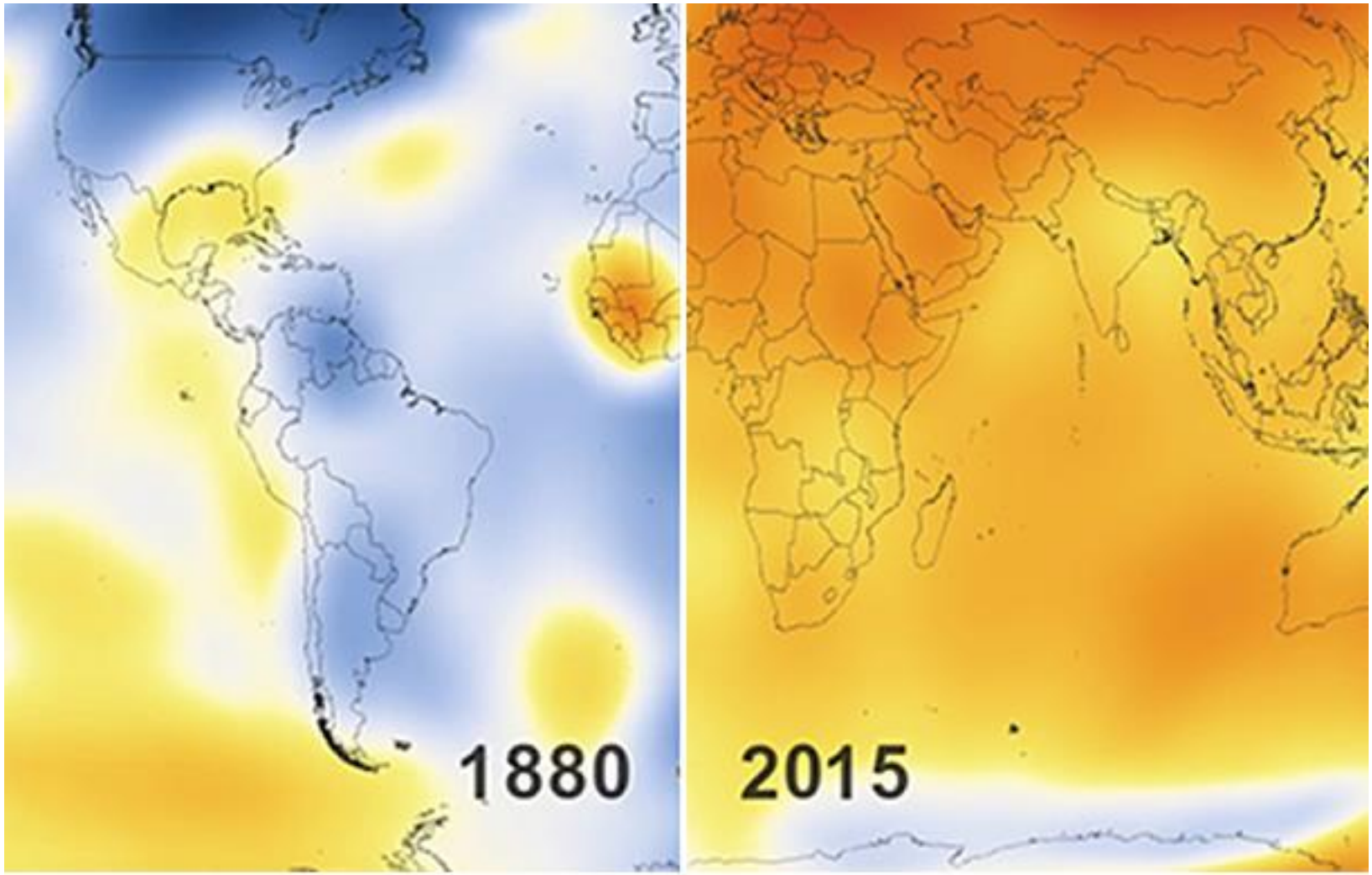
Figure TS.2b: *GHG emissions by sector in 2004 [Figure 1.3b].*



https://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4_wg3_full_report.pdf

100 years of global warming in less than a minute

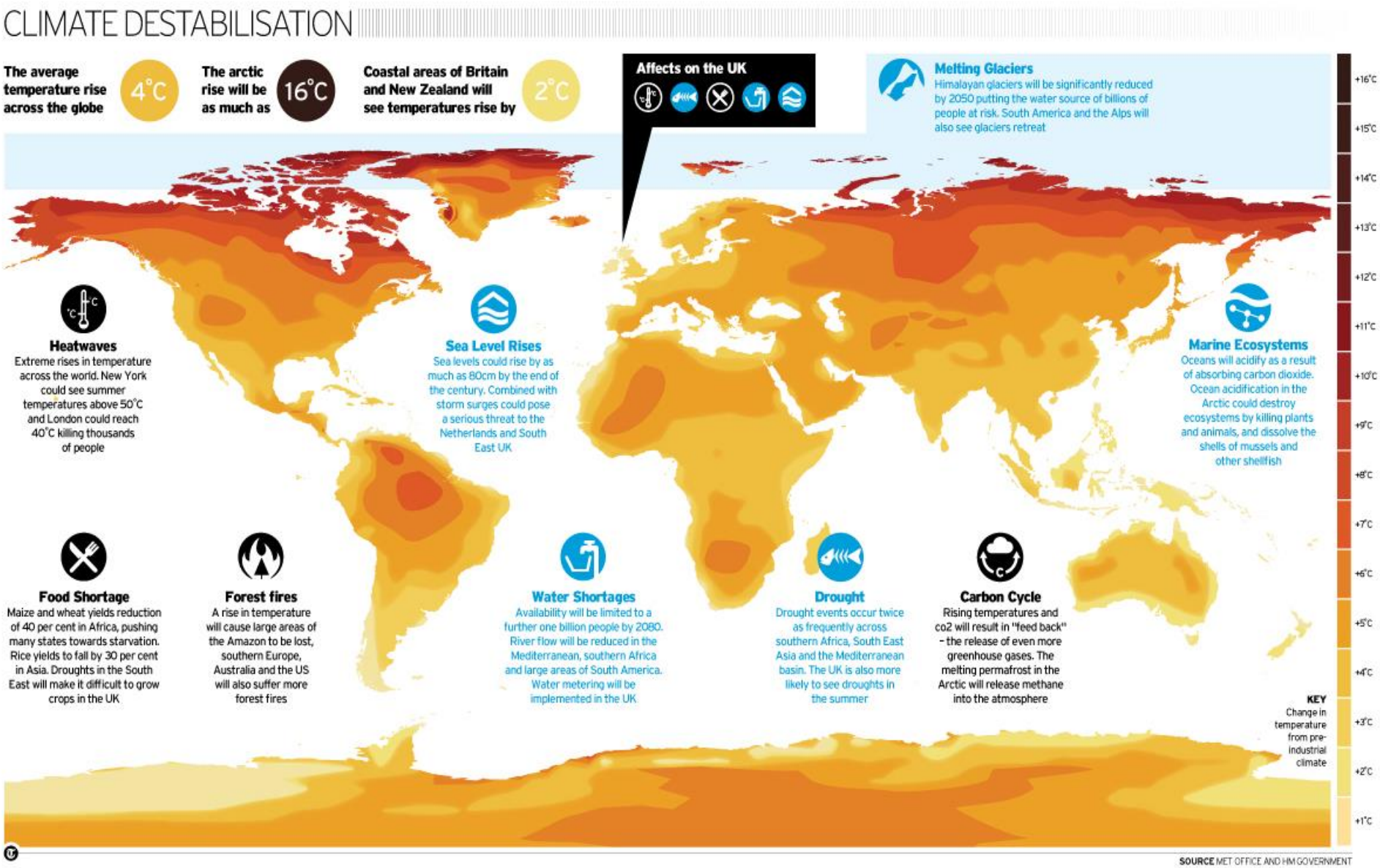
Nasa illustration of Earth's long-term warming trend between 1880 and 2015



It shows the changing temperatures over the last 100 or so years using a rolling five-year average.
The blue colours represent temperatures cooler than average, while hues of orange signify temperatures warmer than average.

http://www.telegraph.co.uk/news/earth/environment/globalwarming/12117449/Animation-100-years-of-global-warming-in-less-than-a-minute.html

Expected Consequences of Climate Change



Countries extremely dependent on Climate Changes

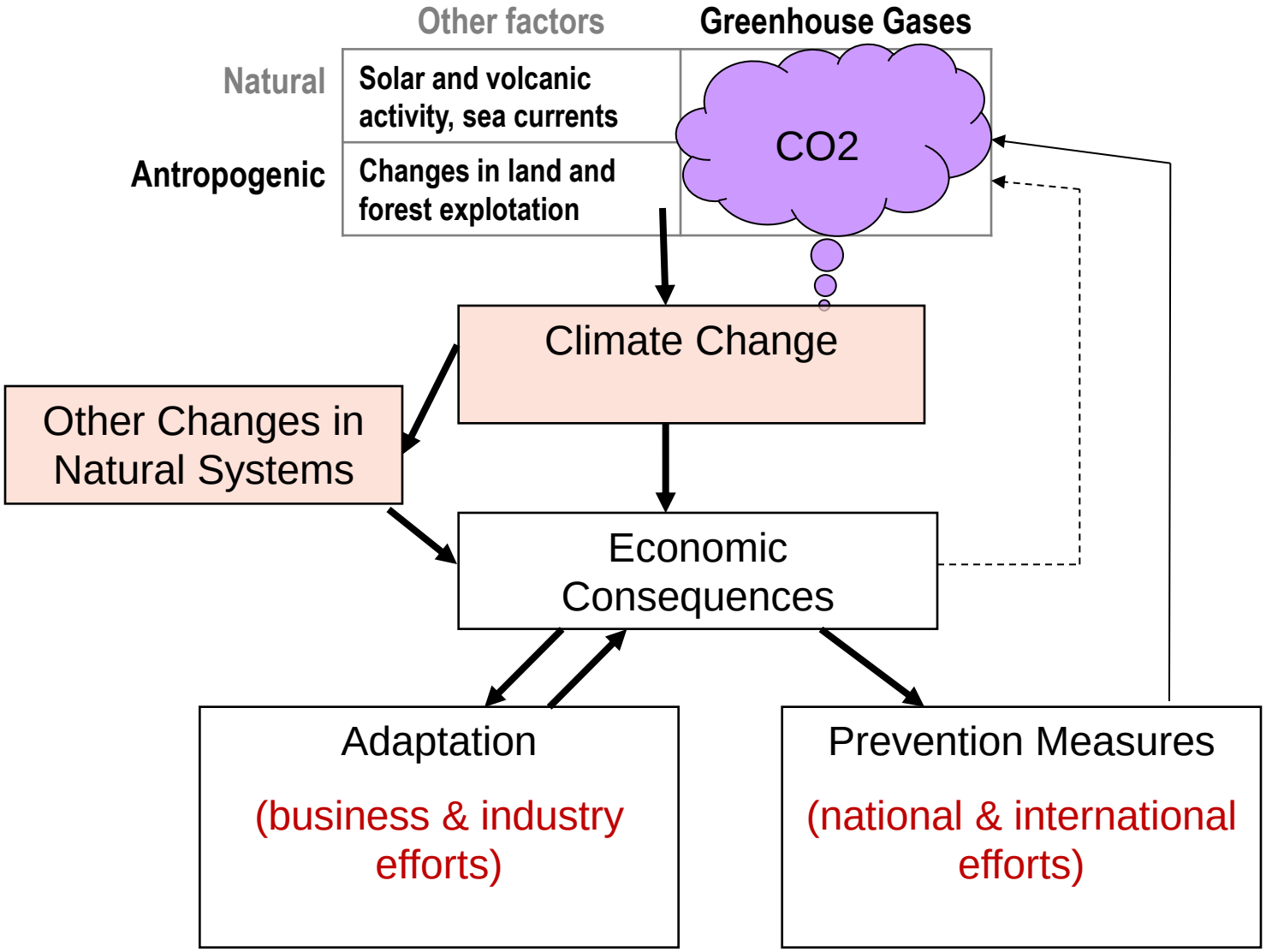
- These are poor countries from the developing world
- Their economy is usually strongly dependent on agriculture
- Their political situation usually is not stable
- Their costal areas suffer from flooding, their internal areas suffer from draught
  - Examples: Bangladesh, Chad, DR of Congo, Guinea-Bissau, CAR, Afghanistan, etc.

THE RIO DECLARATION ON ENVIRONMENT AND DEVELOPMENT (1992)

PRINCIPLE 15

- In order to protect the environment, **the precautionary approach** shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

Causes and Consequences of Climate Change




THE CLIMATE IS
CHANGING,
WHY AREN'T WE?

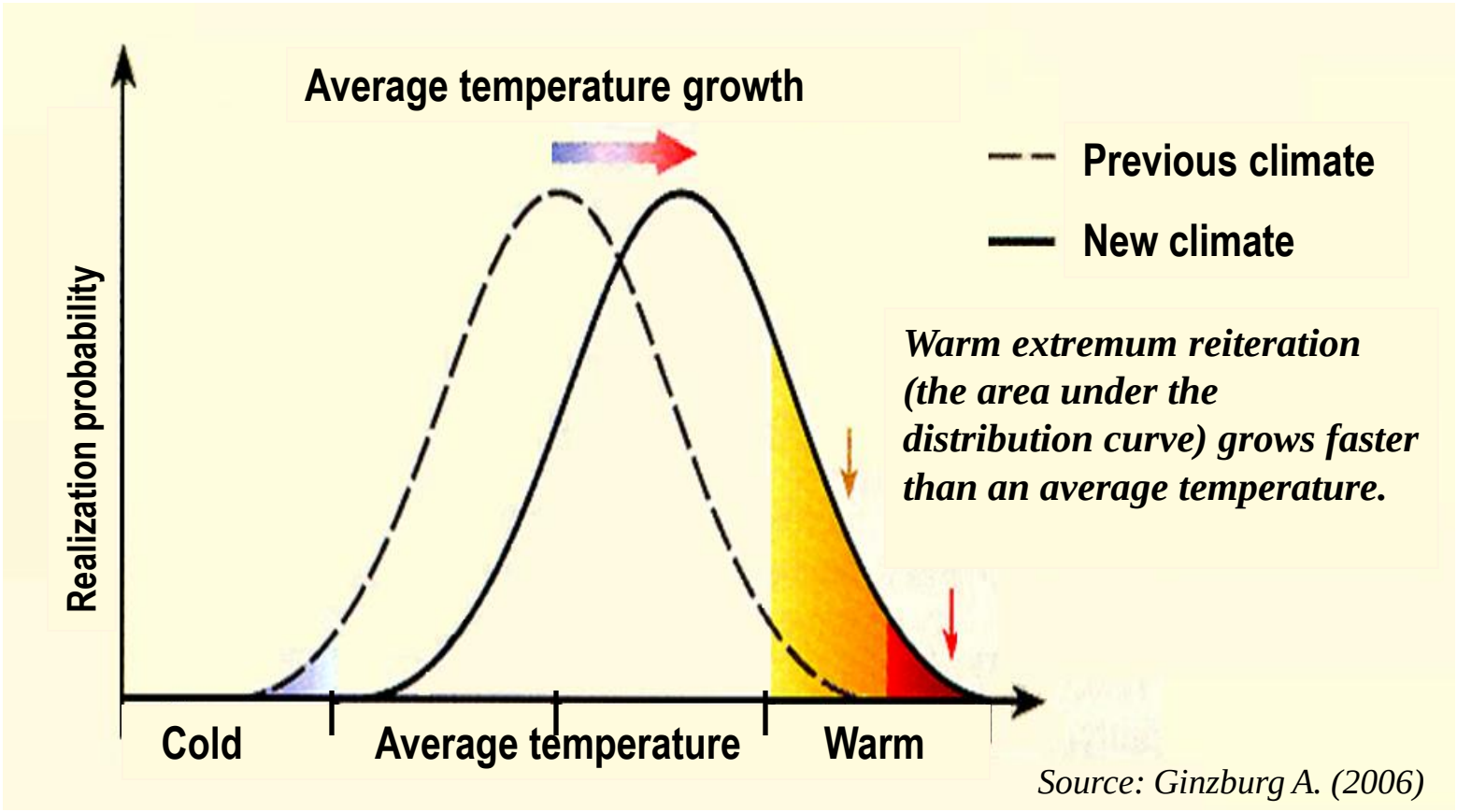

WORLD
ECONOMIC
FORUM
The Global Risks
Report 2024
19th Edition
INSIGHT REPORT

Expected Consequences of Climate Change

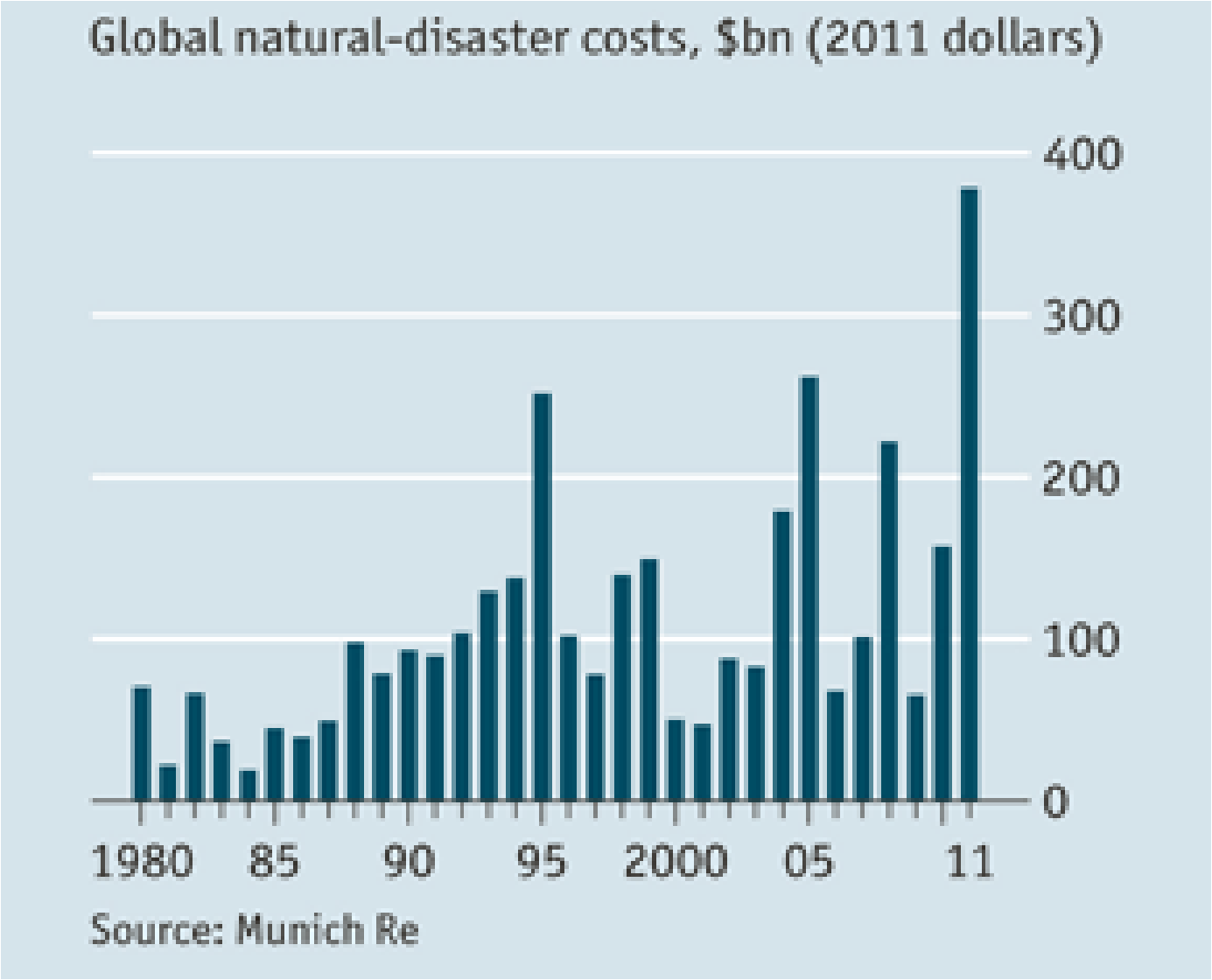
Changes	"Gradual" changes	⟹	"Extreme" changes (disasters)
1. Meteorological changes			
▪ Temperature	Average temperature growth		Heat waves, cold waves
▪ Moisture	Changes in atmospheric precipitation		Thunderstorms, hails, droughts
▪ Wind speed	Changes in wind speed		Hurricanes, snowstorms, dust storms
2. Affected geophysical processes			
▪ Lithosphere	Soil erosion		Earthquakes, volcanism, landslips
▪ Cryosphere	Glacier and permafrost receding		Avalanching
▪ Hydrosphere	Sea level rise, change in ocean currents		Floods, tsunami
▪ Biosphere	Size, structure, migration of populations		Epidemics

Growth of Extreme Changes

Small changes in average temperature can cause significant changes of extremum reiteration

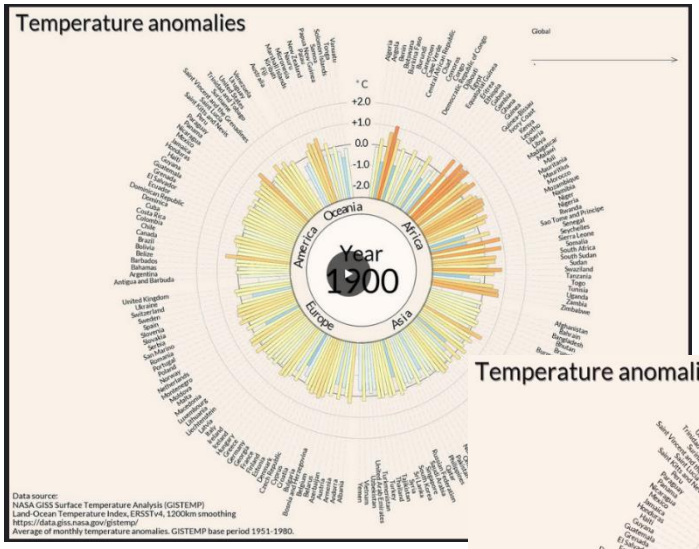


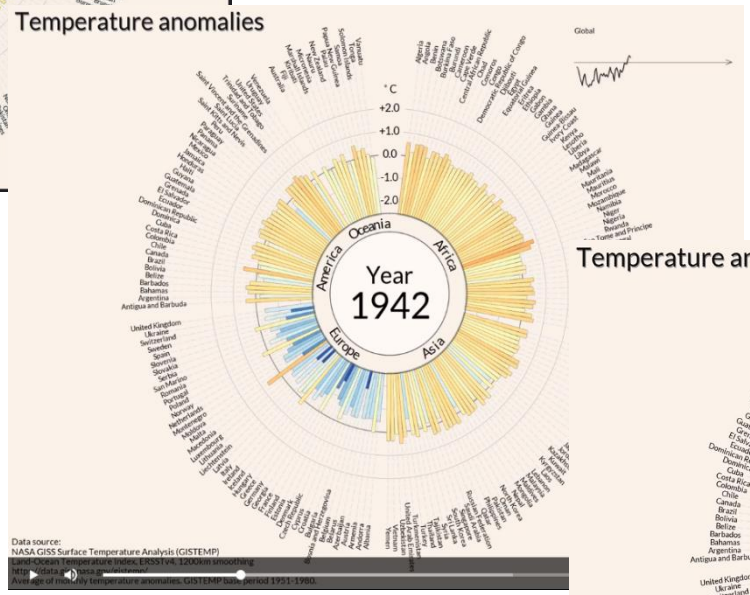
Global Natural-Disaster costs

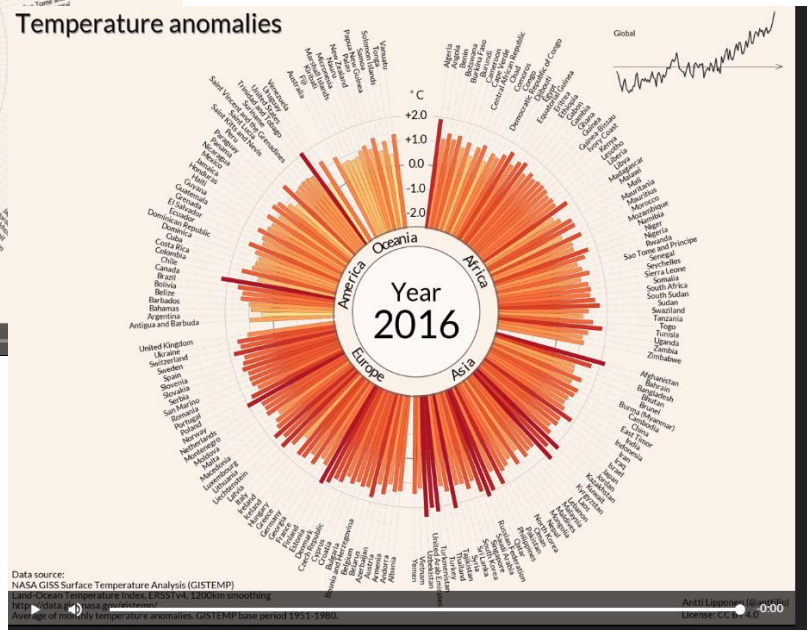


Why there is a trend of growing costs of disasters?

Temperature anomalies arranged by country 1900 - 2016







https://www.flickr.com/photos/150411108@N06/35471910724/

Recent Examples of Weather Extremes

June 2015	The hottest month in the history of temperature observing (since 1891)
2015	The hottest year in the history of temperature observing (since 1891)
2014	91 tropical cyclones
1981-2020	82 tropical cyclones on average per year

WARNING!

By 2050

- the sea level can arise by 5 meters
- there could be around 150 mln of “climate refugees”

Example: Winter Olympics in Danger

One week before Winter Olympic Games start Vancouver is missing snow…
Unseasonably warm, wet weather in the Vancouver area has been a worry for organizers some weeks before the great start. Cypress Mountain was closed to the public 2½ weeks earlier than planned to protect the snow. More than 300 dump trucks of snow have already been used to create courses, and straw and wood are being laid to create bases for the snow.
28.01.2010, Associated Press

In 1998, Nagano had major concerns about a lack of snow in the months before the games. Heavy snow forced organizers to cancel events and left spectators stranded.
28.01.2010, Associated Press

The 1964 Innsbruck Games also faced a lack of snow. The Austrian army rushed to the rescue, carving out 20,000 blocks of ice from the mountainside, which they transported to the luge and bobsled tracks. They also carried 1.4 million cubic feet of snow to the Alpine ski slopes.
28.01.2010, Associated Press

Sochi Winter Olympics

Total expenditures have grown many times more than it was planned initially

Enough snow?

Pre-Reading and Food-for-Thought Assignment

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Executive Summary

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Discussion Topic 1: Climate Change in the European Alps

Adaptation measures	Positive effect +++ ++ +	Existing limits
1		
2		
3		
4		
5		
6		