TOPIC #16

THE IPCC FINDINGS

About the IPCC, the Projections, & Impacts

pp 87-92

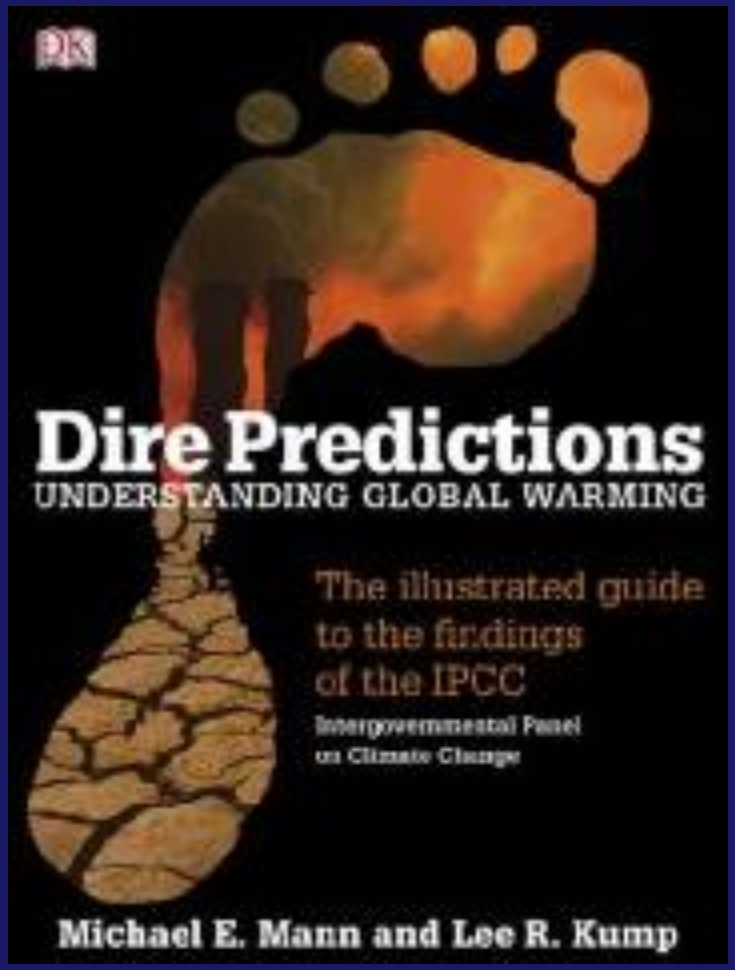
“Eden” by Gregory Kitterle

SGC Textbook cover

"A world civilization able to envision God and the afterlife, to embark on the colonization of space,

will surely find the way to save the integrity of this magnificent planet and the life it harbors because quite simply it's the right thing to do, and ennobling to our species.

~ E. O. Wilson
Eminent Scientist &
Radical Naturalist



"The Illustrated Guide to the findings of the IPCC"

The most comprehensive source of information on Global Climate Change -- the IPCC

WMO INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE UNEP

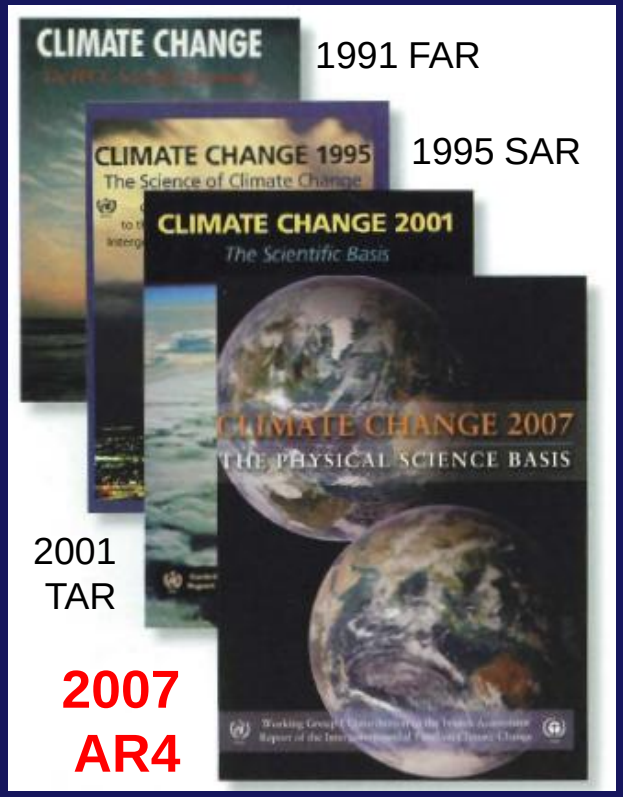
- Established by World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) in 1988 as an objective source of information for decision-makers, etc.

"to provide the world with a clear scientific view on the current state of climate change and its potential environmental and socio-economic consequences" (IPCC 2007)

- The IPCC does not conduct any research nor does it monitor climate related data or parameters.

Began with:

The "First Assessment Report" (FAR) in 1991



Most recent:

"Assessment Report 4" (AR4) in 2007

- Its role is **to assess on a comprehensive, objective, open and transparent basis** the latest **scientific**, **technical** and **socio-economic** literature produced worldwide relevant to the understanding of:
  - the **risk** of human induced climate change
  - its **observed and projected impacts** and
  - options for **adaptation and mitigation.**

http://www.ipcc.ch/publications_and_data/publications_and_data_reports.htm#1

- The **IPCC** is a **scientific body**

- **Thousands of scientists** from all over the world contribute to the work of the IPCC on a voluntary basis.

- **PEER REVIEW** is an essential part of the IPCC process, to ensure an objective and complete assessment of current information.

- **Differing viewpoints** existing within the scientific community are reflected in the IPCC reports.

AR4 (IPCC 2007)

• **The IPCC is an intergovernmental body,** and it is open to all member countries of UN and WMO.

• Because of its scientific and intergovernmental nature, the IPCC embodies a **unique opportunity to provide rigorous and balanced scientific information to decision makers**.

• By endorsing the IPCC reports, **governments acknowledge the authority of their scientific content.**

• The work of the organization is **therefore policy-relevant and yet policy-neutral, never policy-prescriptive**.

AR4 (IPCC 2007)

Small, low income, vulnerable people & nations:
They are least responsible,
yet likely to be impacted the most!

The IPCC has three working groups and a Task Force:

Working Group I (WGI) assesses the scientific aspects of the climate system and climate change.

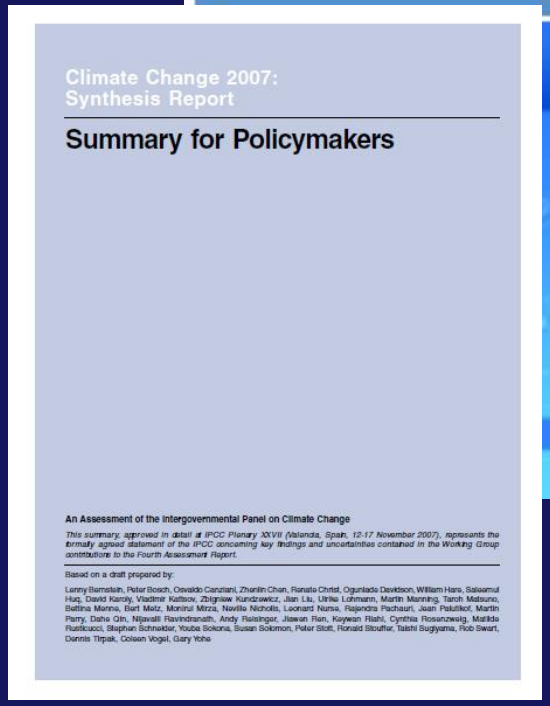
Working Group II (WGII) addresses the vulnerability of socio-economic and natural systems to climate change, negative and positive consequences of climate change, and options for adapting to it.

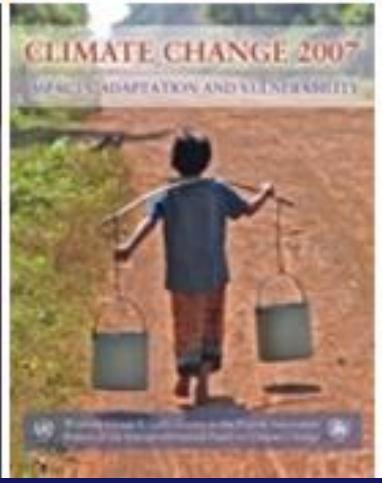
Working Group III (WGIII) assesses options for limiting greenhouse gas emissions and otherwise mitigating climate change

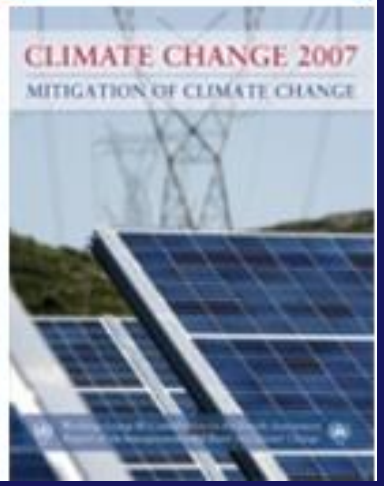
The Task Force on National Greenhouse Gas Inventories oversees the National Greenhouse Gas Inventories Program

The **Fourth Assessment Report (AR4)** was released in 2007, and it consists of four volumes: the three IPCC Working Groups (WGs) Reports and a Synthesis Report (SYR)

The AR4 Synthesis Report	WG I The Physical Science Basis	WG II Impacts, Adaptation and Vulnerability	WG III Mitigation of Climate Change



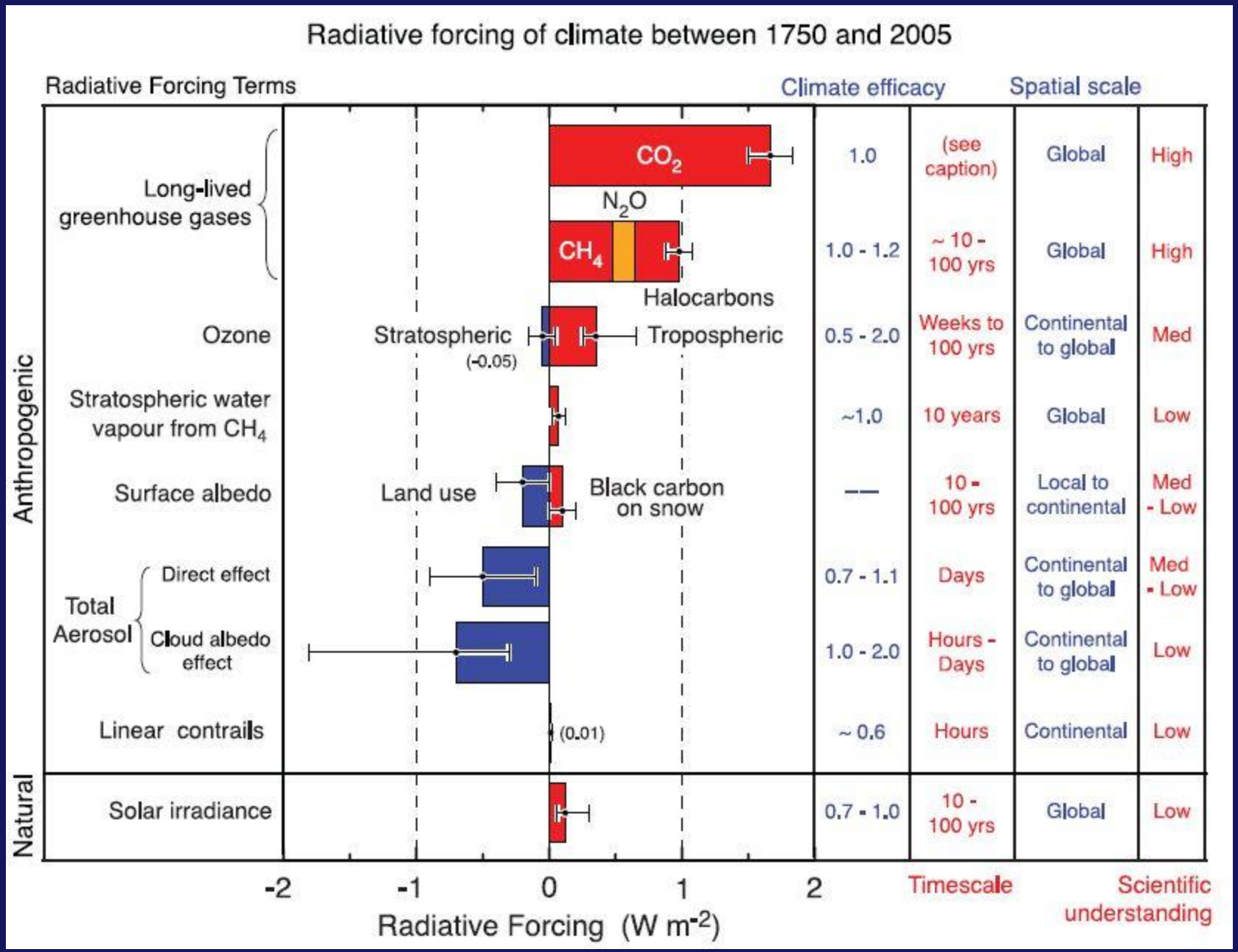




http://www.ipcc.ch/

Estimates of confidence in the report's results / conclusions:

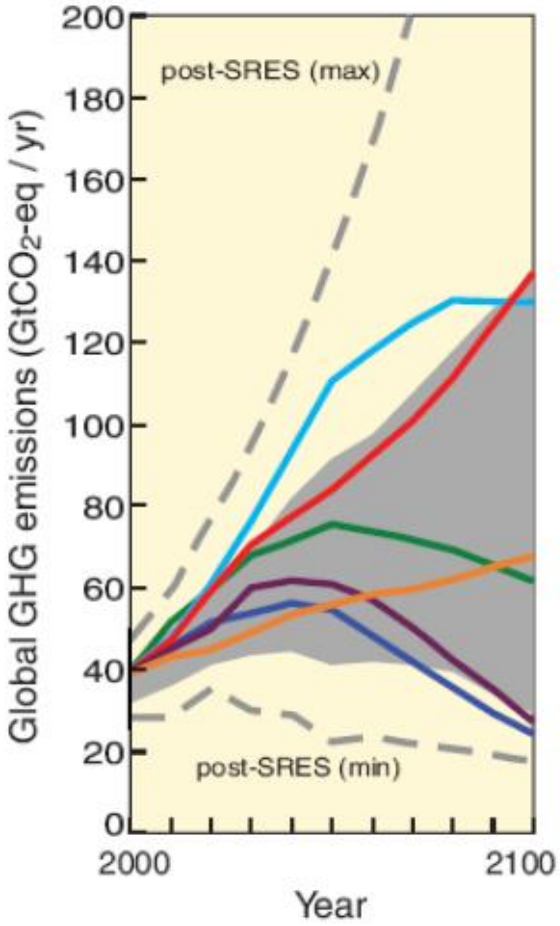
- **virtually certain** (greater than 99% chance that a result is true)
- **very likely** (90-99% chance);
- **likely** (66-90% chance);
- **medium likelihood** (33-66% chance);
- **unlikely** (10-33% chance);
- **very unlikely** (1-10% chance);
- **exceptionally unlikely** (less than 1%) chance).

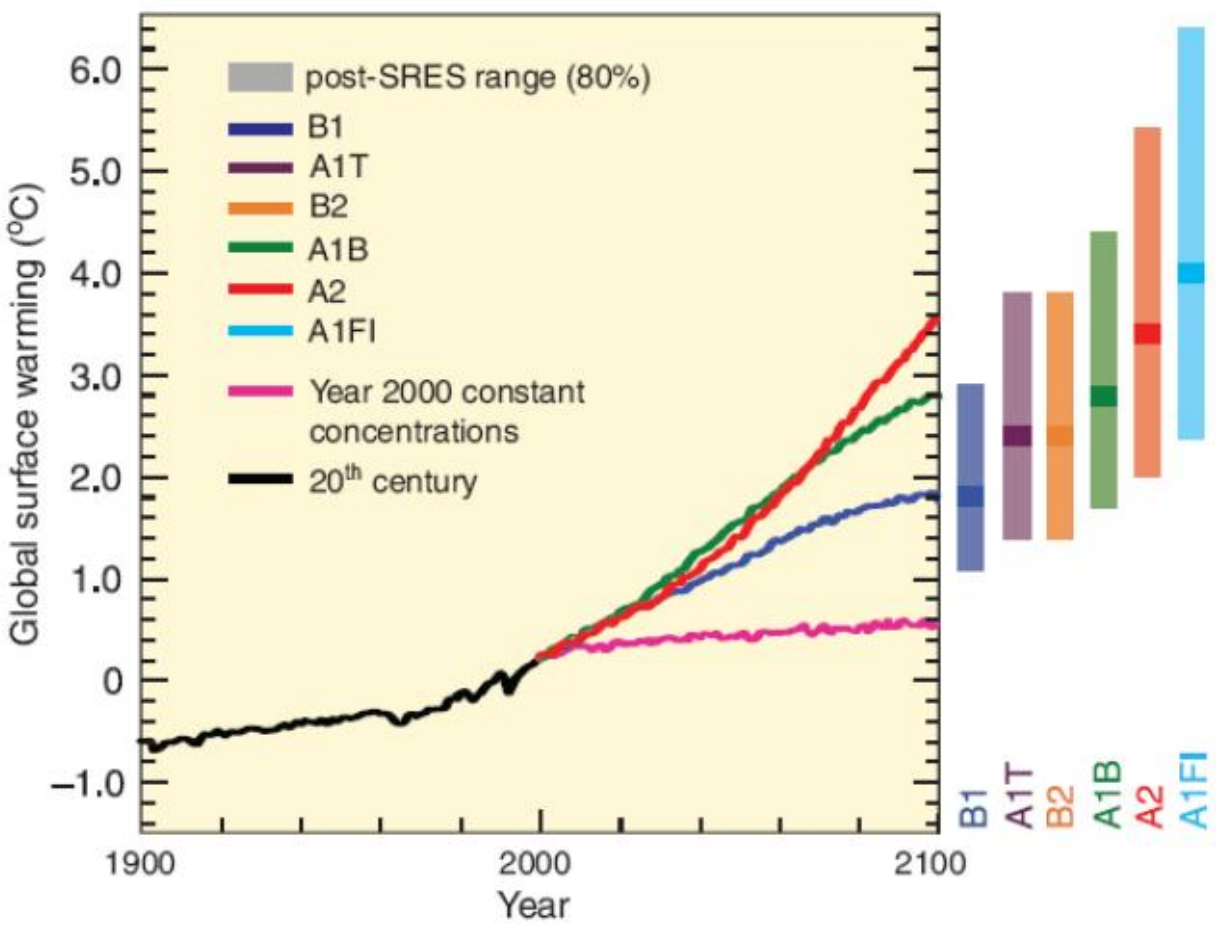


SOURCE: IPCC 2007 WG-1 Synthesis Report Summary for Policymakers

IPCC 2007:
Projected Climate Change for Different Scenarios of GHG Emissions

Scenarios for GHG emissions from 2000 to 2100 (in the absence of additional climate policies) and projections of surface temperatures

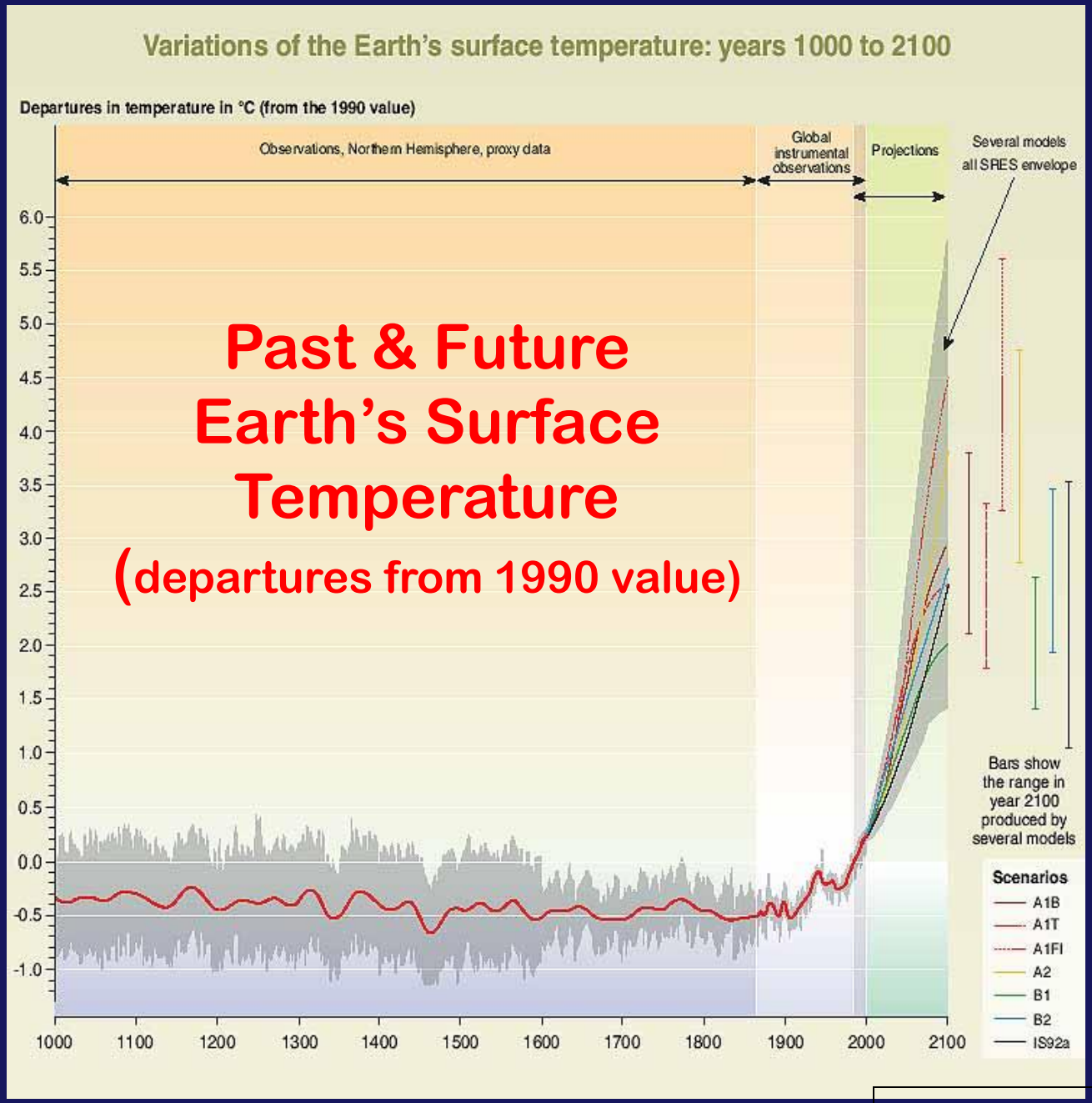




"Hockey Stick" approach introduced in:

2001 IPCC THIRD ASSESSMENT REPORT

GLOBAL SURFACE TEMPERA-TURE CHANGE (° C) (compared to 1990 value)



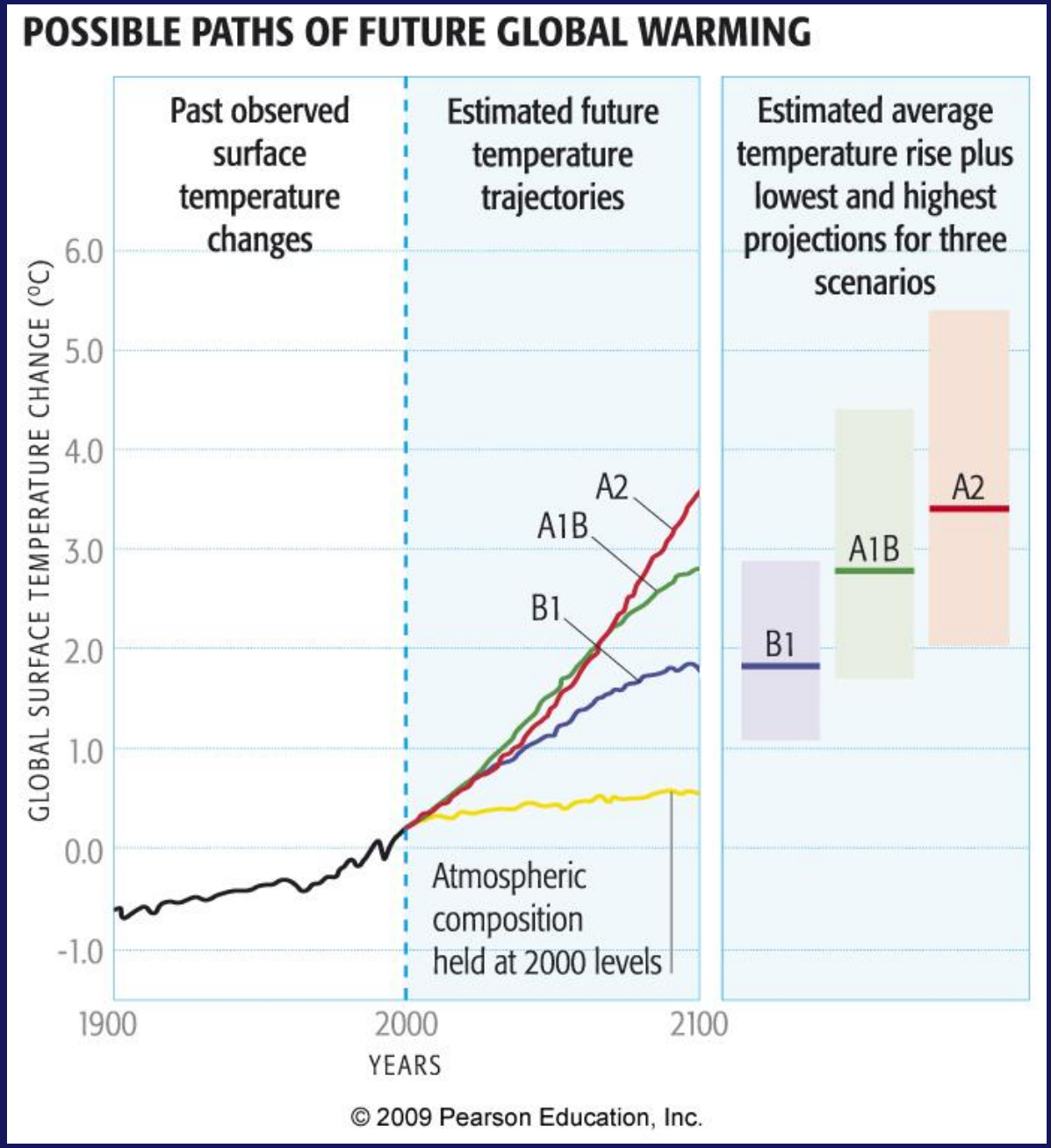
Self test 7

Updated version in AR4:

2007 IPCC FOURTH ASSESSMENT REPORT

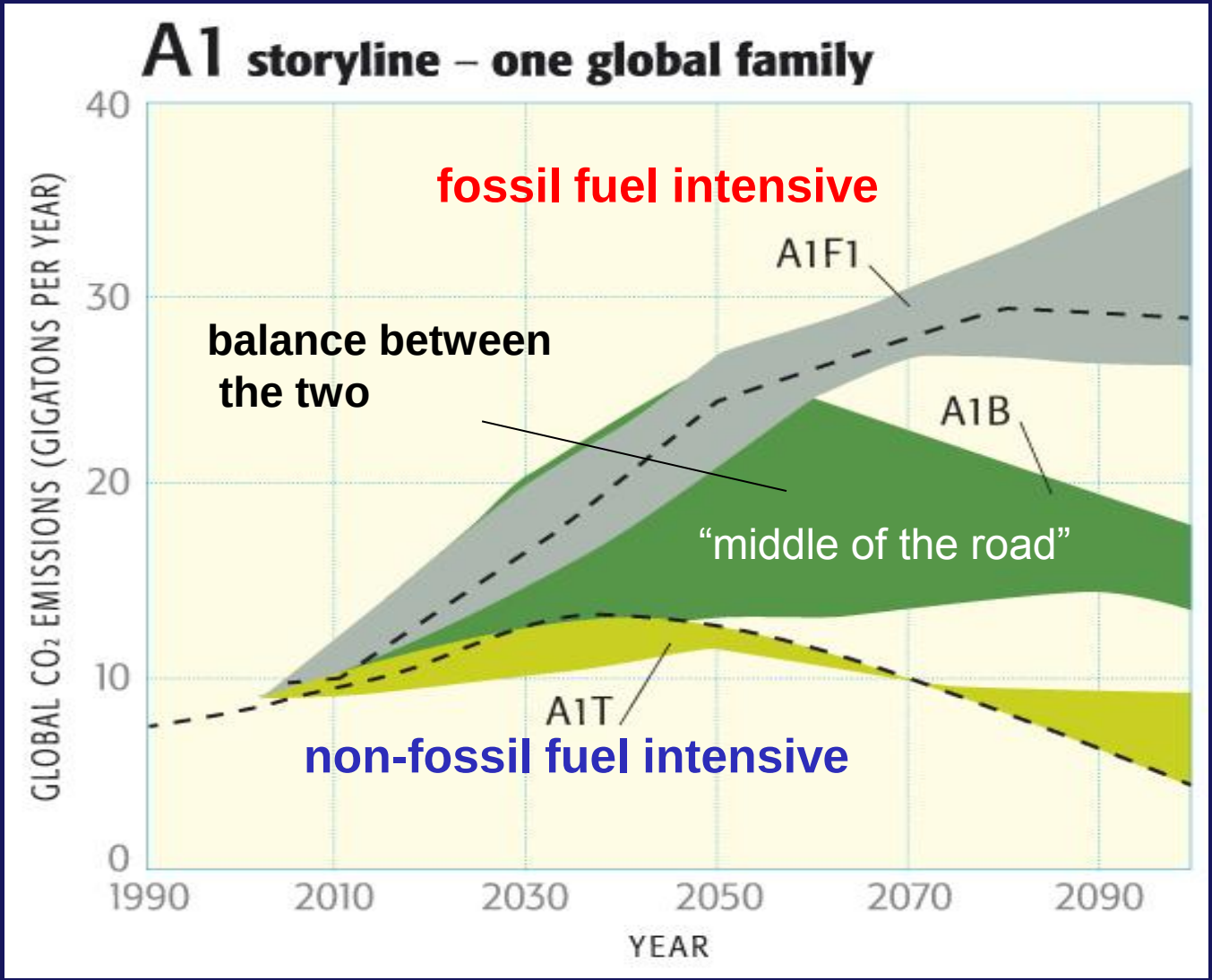
GLOBAL SURFACE TEMPERA-TURE CHANGE (° C)

Compared to 1980-1999 period



From *Dire Predictions* (p 20)

Possible CO_2 emissions scenarios, or "storylines"

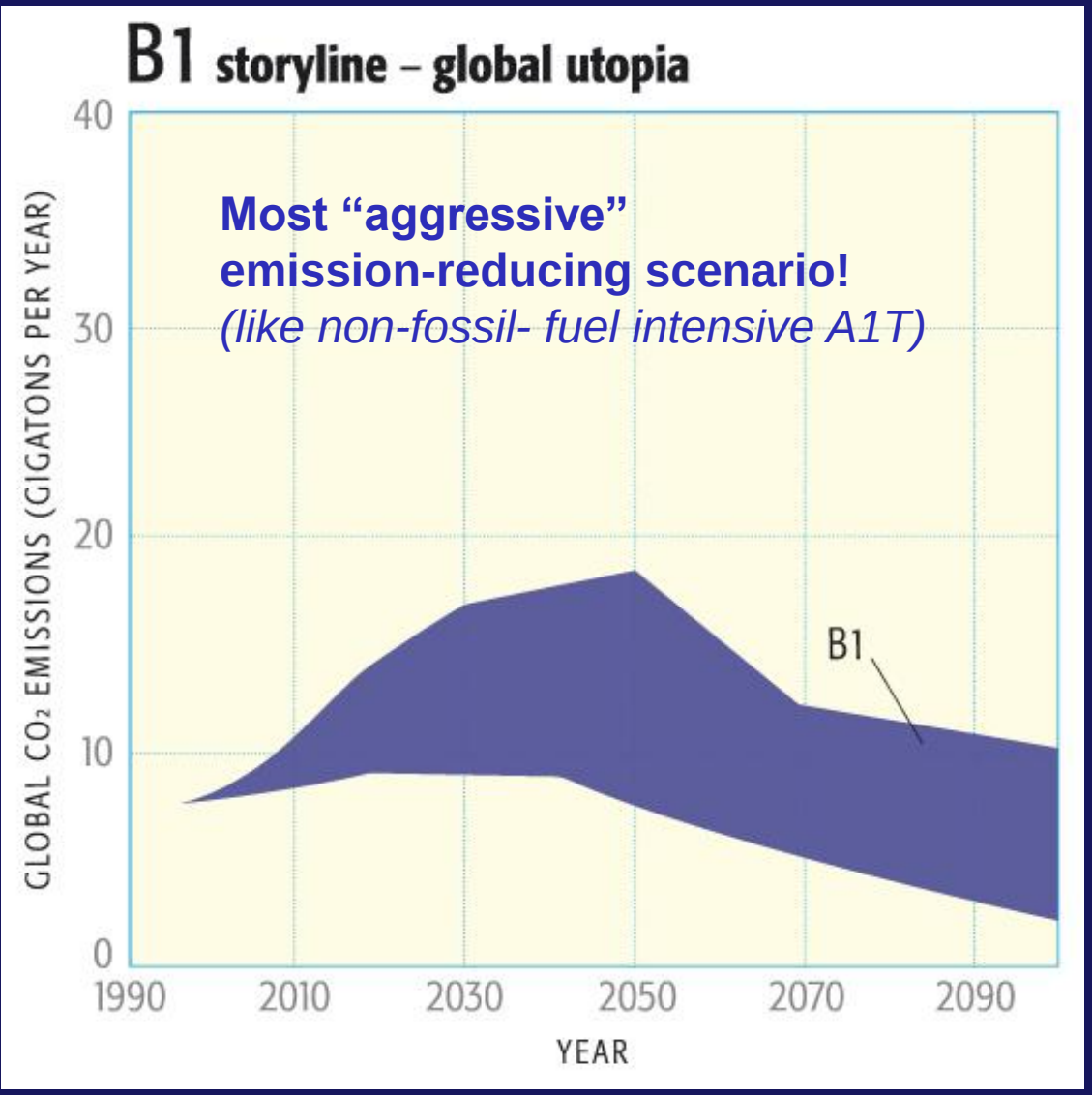


If these things happened . . .

- Regional income differences reduced
- Rapid economic growth
- Peak population in mid 21st century, then declining
- Rapid intro of new more efficient technology

From *Dire Predictions* (p 86)

POSSIBLE CO_2 EMISSIONS SENARIOS FOR THE FUTURE

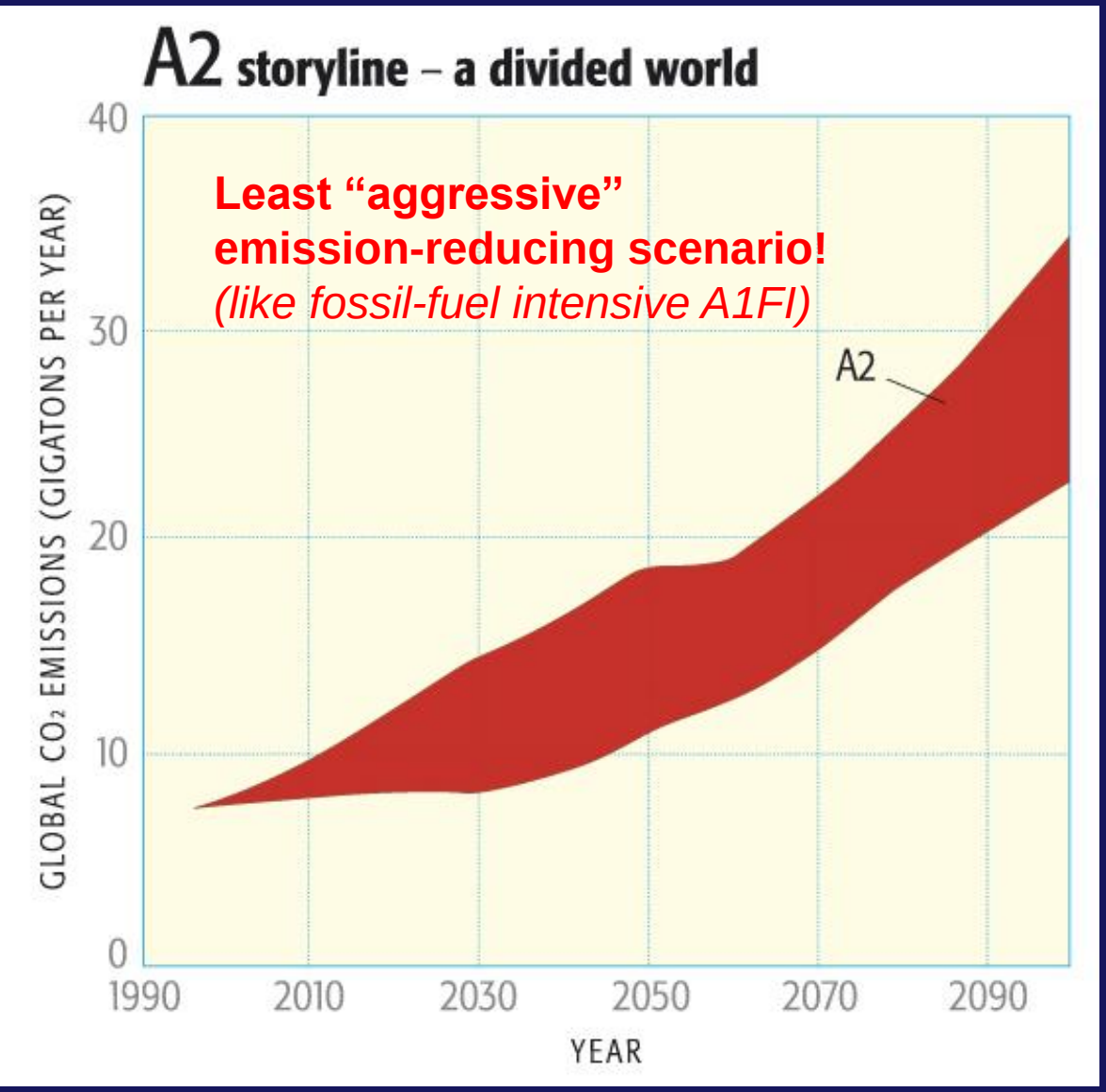


If these things happened . . .

- Emphasis on GLOBAL solutions to sustainability & environmental protection
- Rapid change to information & service economy
- Peak population in mid-21st century, then declining
- Less intense demand for materials
- Intro of clean and efficient energy technologies

From *Dire Predictions* (p 87)

POSSIBLE CO_2 EMISSIONS SENARIOS FOR THE FUTURE

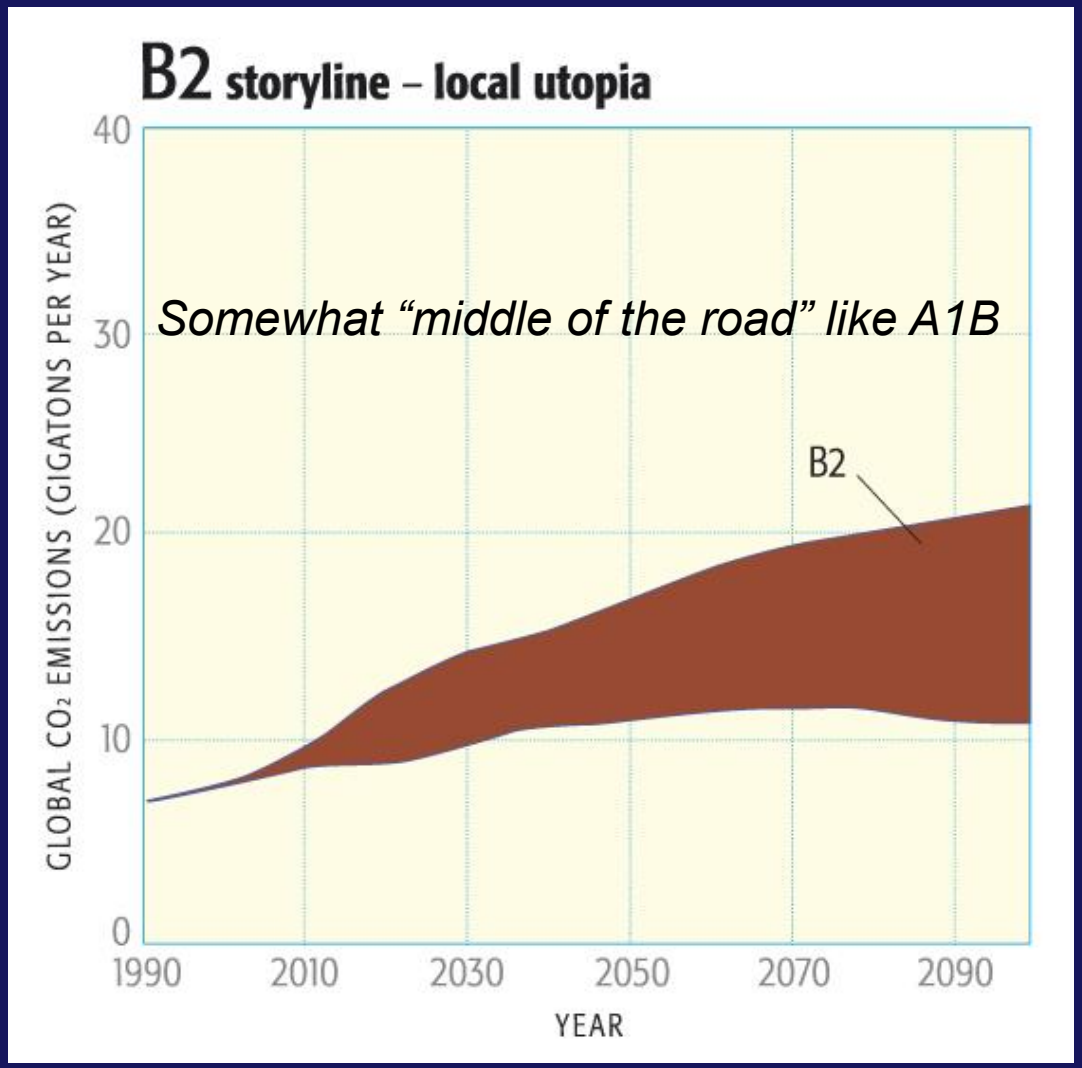


If these things happened . . .

- Emphasis on national identities and local/regional (not global) solutions to environmental protection and social equity
- Slow economic growth
- Continuously increasing world population
- Slow technological advancement

From *Dire Predictions* (p 86)

POSSIBLE CO_2 EMISSIONS SENARIOS FOR THE FUTURE



If these things happened . . .

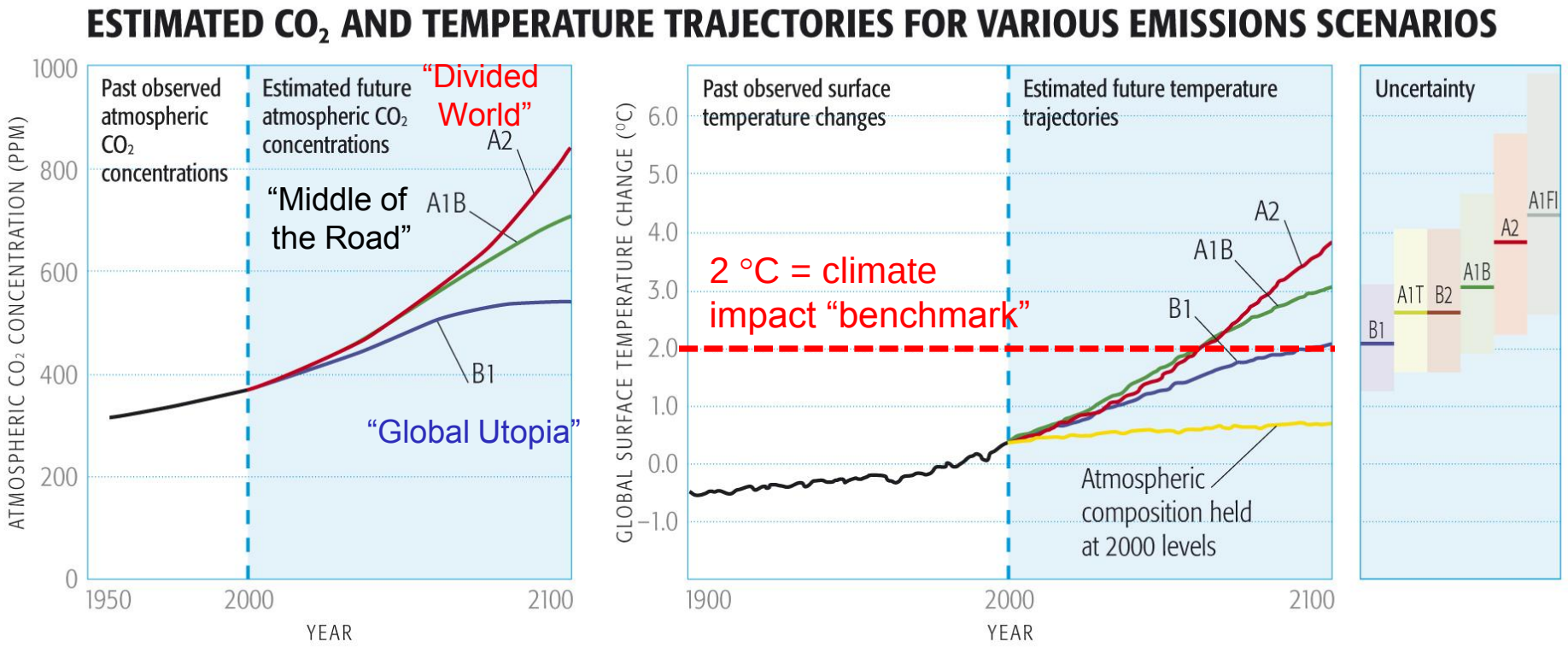
- Emphasis on local and regional (not global) solutions to environmental protection & social equity
- Intermediate economic development
- Continuously increasing world population (but slower than A2)
- Slower development of new energy technologies than B1 and A1

From *Dire Predictions* (p 87)

RANGE OF POSSIBLE TRAJECTORIES FOR FUTURE CLIMATE CHANGE

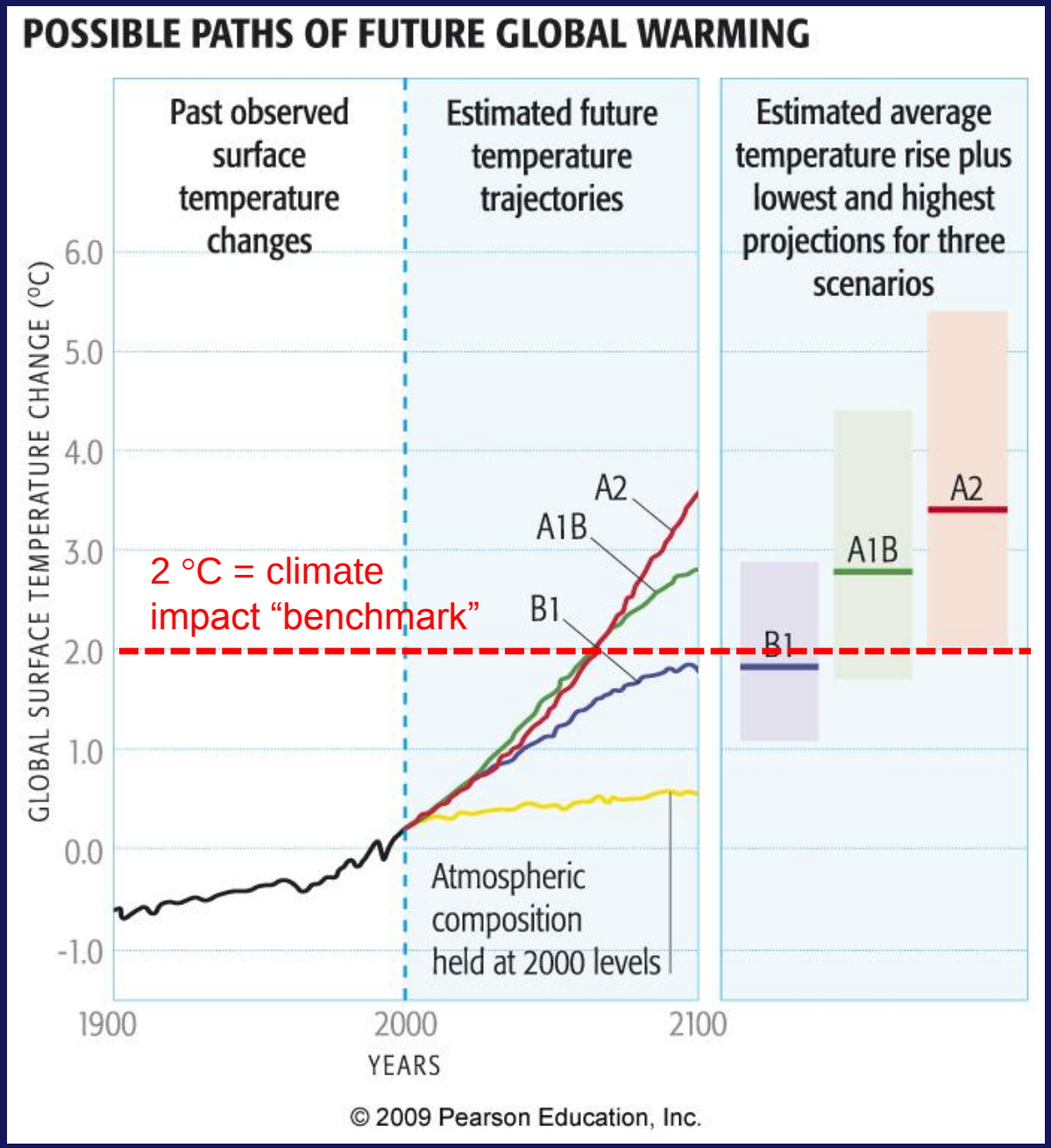
Spread of results due to:

(a) which future emission scenario used
(b) variations among different climate models



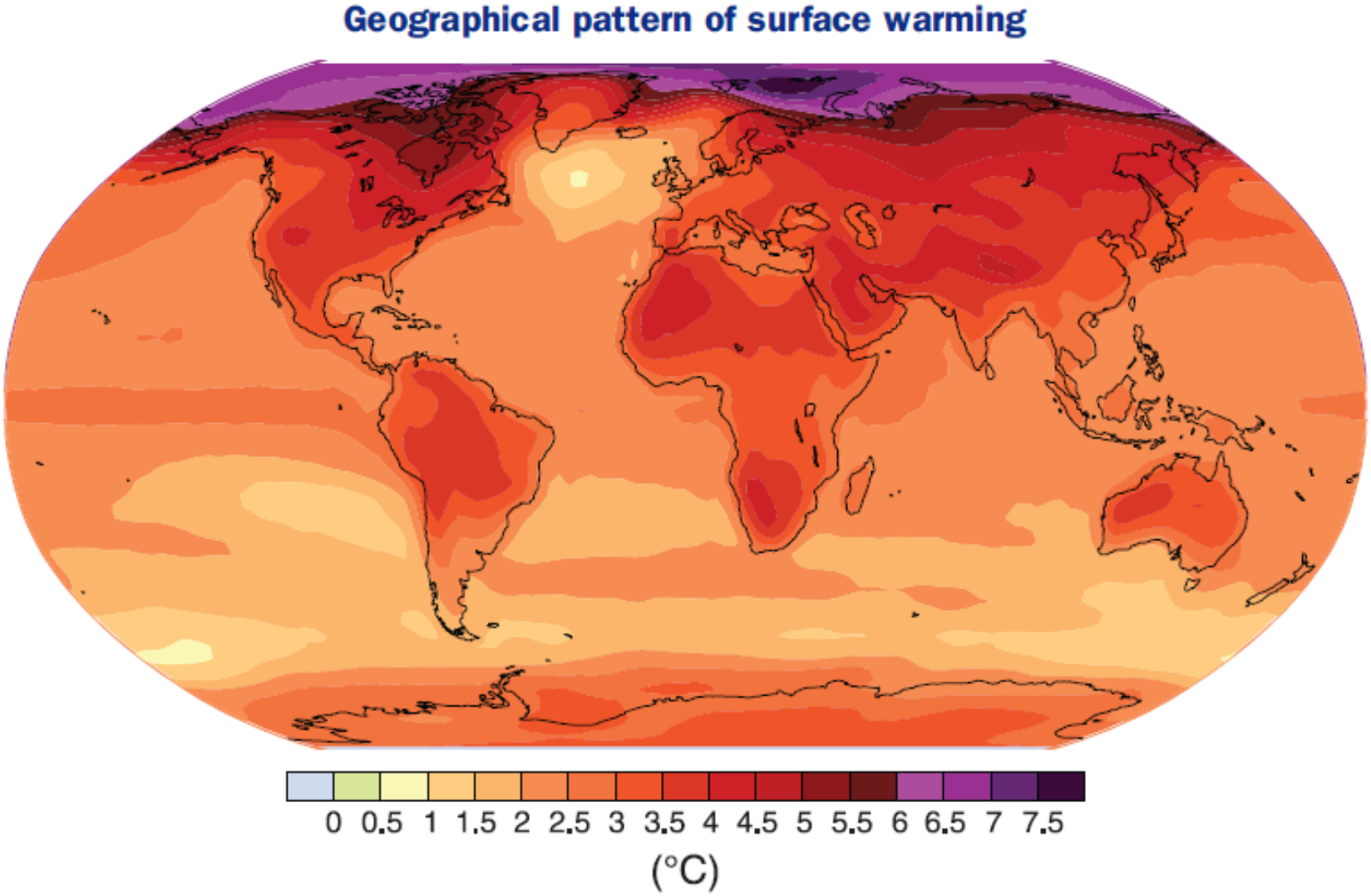
From *Dire Predictions* (p 88)

GLOBAL SURFACE TEMPERA-TURE CHANGE (° C)

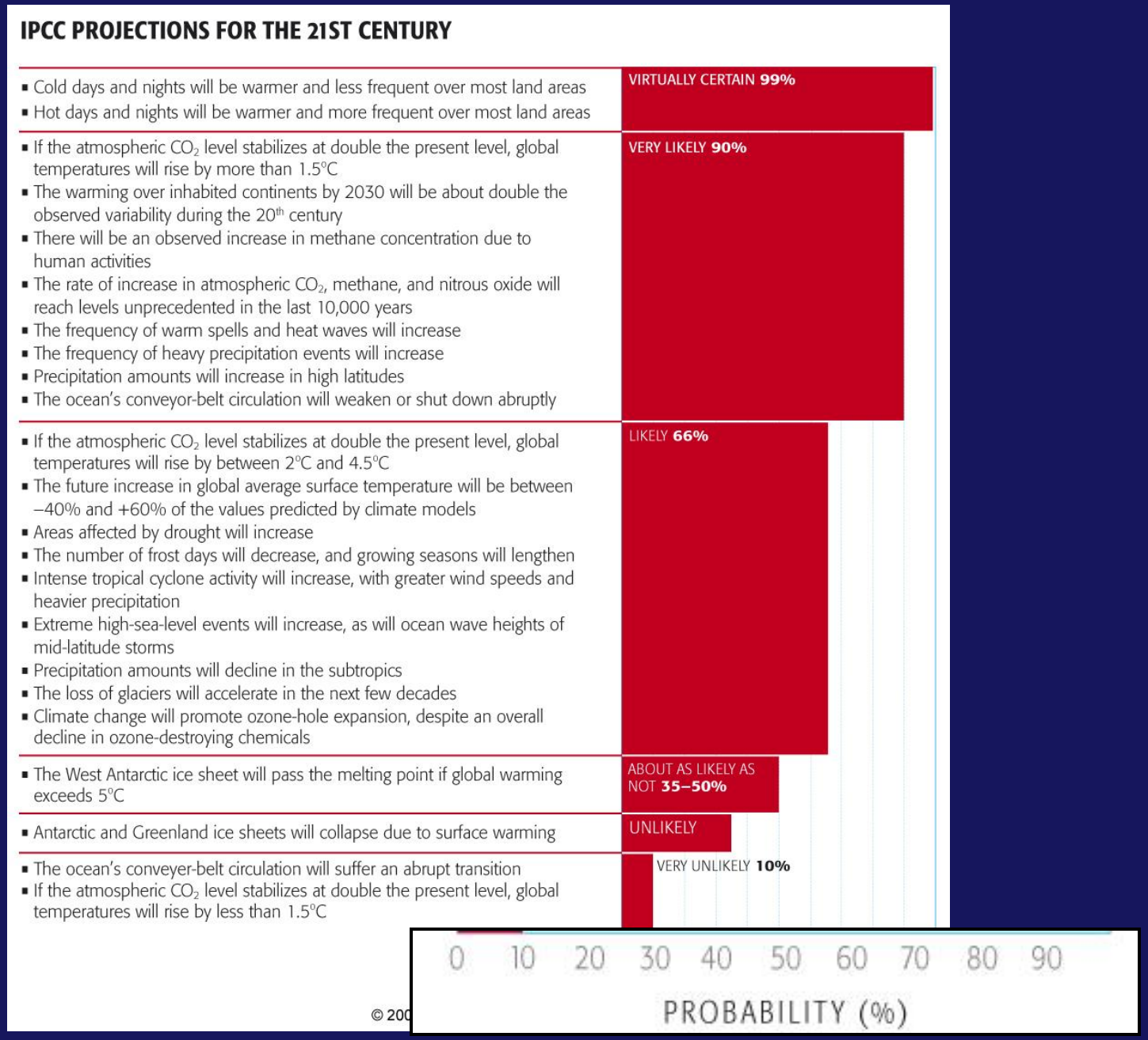


From *Dire Predictions* (p 20)

Projected Warming by Late 21st Century (2090-2099) based on the A1B "Middle of the Road" Scenario



IPCC PROJECTIONS FOR THE 21ST CENTURY

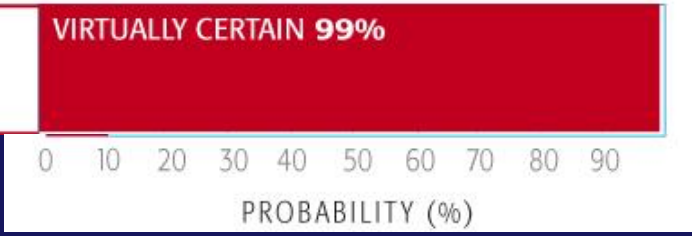


From *Dire Predictions* (p 21)

IPCC PROJECTIONS FOR THE 21ST CENTURY

VIRTUALLY CERTAIN 99%

- Cold days and nights will be warmer and less frequent over most land areas
- Hot days and nights will be warmer and more frequent over most land areas



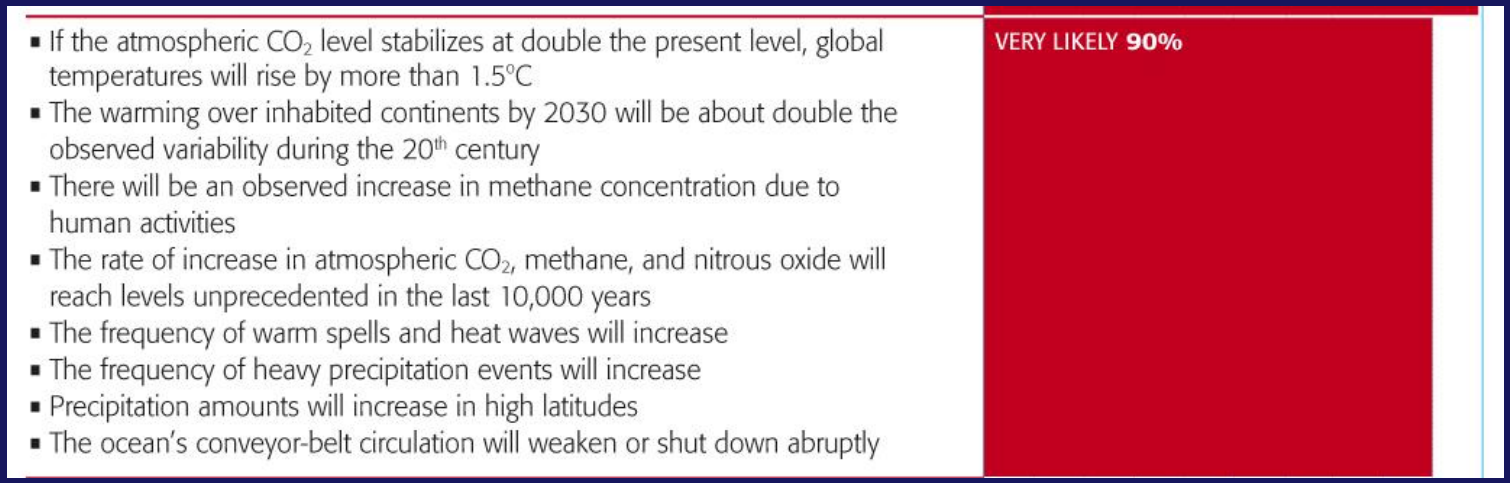
- **Over most land areas: COLD DAYS & NIGHTS will be WARMER; cold days & nights will be LESS FREQUENT**

- **Over most land areas: HOT DAYS & NIGHTS will be WARMER; hot days & nights will be MORE FREQUENT**

IPCC PROJECTIONS FOR THE 21ST CENTURY

VERY LIKELY 90%

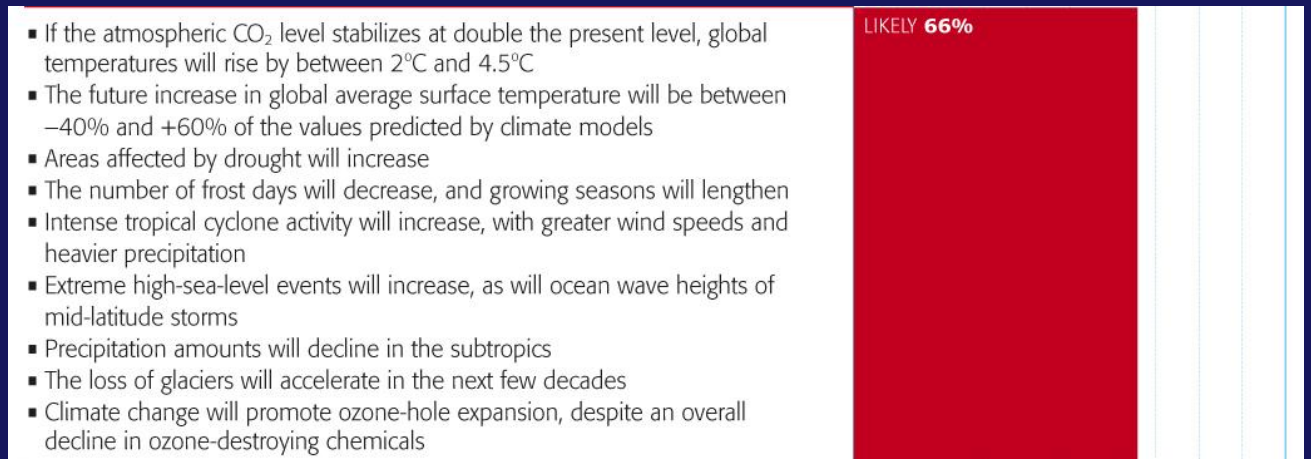
- **GLOBAL TEMPERATURES WILL RISE by > 1.5 °C (if CO_2 stabilizes at 2x)**
- **WARMING by 2030 will be DOUBLE the observed variability during 20th century**
- **RATE of increase of GHG's will be UNPRECEDENTED in 10,000 yrs**
- **Frequency of WARM SPELLS & HEAT WAVES will INCREASE**
- **Frequency of HEAVY PRECIPITATION EVENTS will INCREASE**
- **Ocean's conveyor-belt circulation will WEAKEN OR SHUT DOWN abruptly**



IPCC PROJECTIONS FOR THE 21ST CENTURY

LIKELY 66%

- **GLOBAL TEMPERATURES WILL RISE : 2 - 4.5 °C (if CO_2 stabilizes at 2x)**
- **Areas affected by DROUGHT will increase**
- **# of FROST DAYS will DECREASE; GROWING SEASON LENGTHEN**
- **INTENSE Tropical Cyclone Activity will INCREASE – wind, heavy rain**
- **Extreme HIGH SEA LEVEL events will increase, wave heights**
- **SUBTROPICS (that's us!): PRECIPITATION DECLINE**
- **GLACIER LOSS accelerates**
- **Stratospheric cooling ➔ ozone hole persistence; even WITH ban of CFC's**



IPCC PROJECTIONS FOR THE 21ST CENTURY

AS LIKELY AS NOT 35 - 50%

- **W. ANTARCTIC ICE SHEET MELTING (if Temp > 5° C)**

▪ The West Antarctic ice sheet will pass the melting point if global warming exceeds 5°C	ABOUT AS LIKELY AS NOT **35–50%**

UNLIKELY 35%

- **ANTARCTIC & GREENLAND ICE SHEETS COLLAPSE**

▪ Antarctic and Greenland ice sheets will collapse due to surface warming	UNLIKELY

VERY UNLIKELY10%

- Ocean's **CONVERYOR BELT CIRCULATION** – abrupt transition

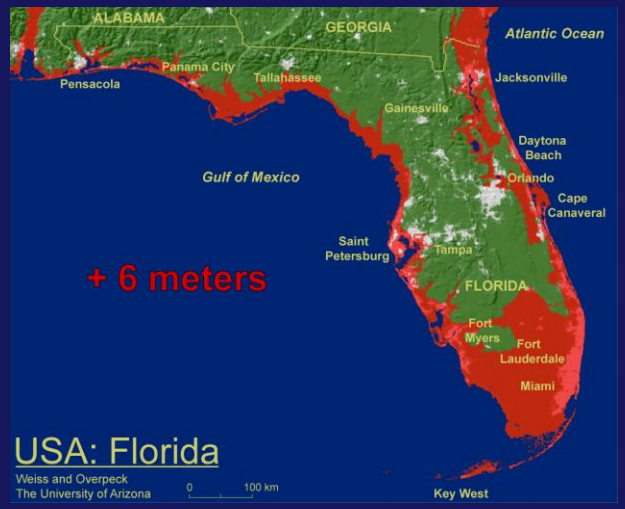
- **GLOBAL TEMPERATURES will rise by LESS than 1.5° C (if CO_2 stabilizes at 2x)**

▪ The ocean's conveyer-belt circulation will suffer an abrupt transition ▪ If the atmospheric CO_2 level stabilizes at double the present level, global temperatures will rise by less than 1.5°C	VERY UNLIKELY **10%**

SEA LEVEL RISE

Table SPM.1. Projected global average surface warming and sea level rise at the end of the 21st century. {Table 3.1}

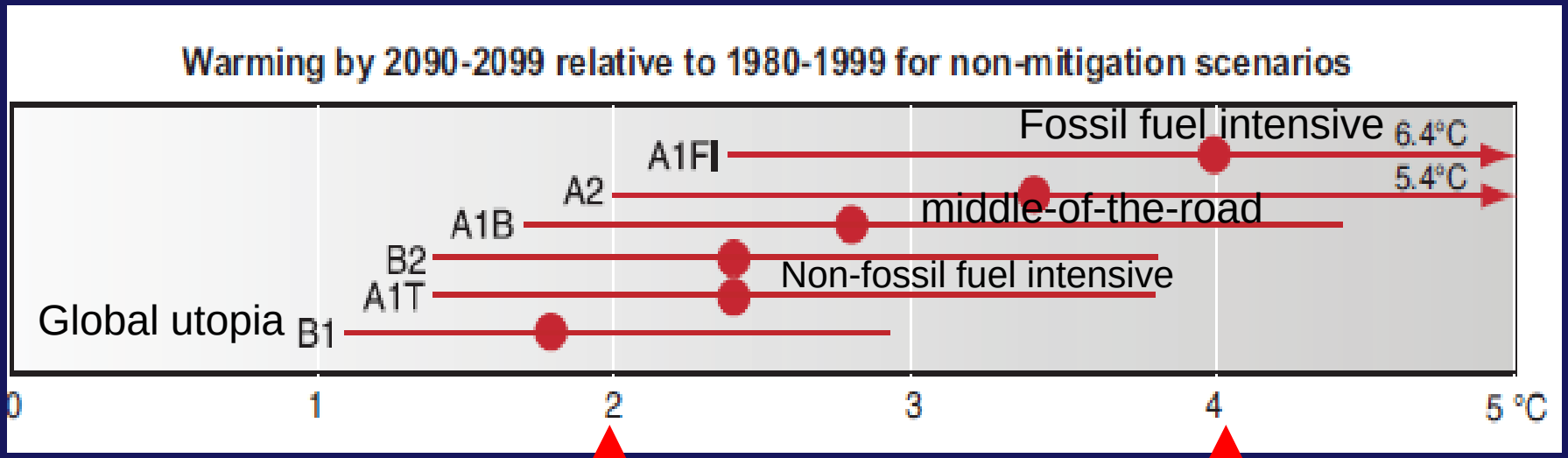
Case	Temperature change (°C at 2090-2099 relative to 1980-1999) [a, d]		Sea level rise (m at 2090-2099 relative to 1980-1999)
	Best estimate	*Likely* range	Model-based range excluding future rapid dynamical changes in ice flow
Constant year 2000 concentrations[b]	0.6	0.3 – 0.9	Not available
B1 scenario	1.8	1.1 – 2.9	0.18 – 0.38
A1T scenario	2.4	1.4 – 3.8	0.20 – 0.45
B2 scenario	2.4	1.4 – 3.8	0.20 – 0.43
A1B scenario	2.8	1.7 – 4.4	0.21 – 0.48
A2 scenario	3.4	2.0 – 5.4	0.23 – 0.51
A1FI scenario	4.0	2.4 – 6.4	0.26 – 0.59



http://www.geo.arizona.edu/dgesl/research/other/climate_change_and_sea_level/sea_level_rise/sea_level_rise_old.htm#images

IMPACTS

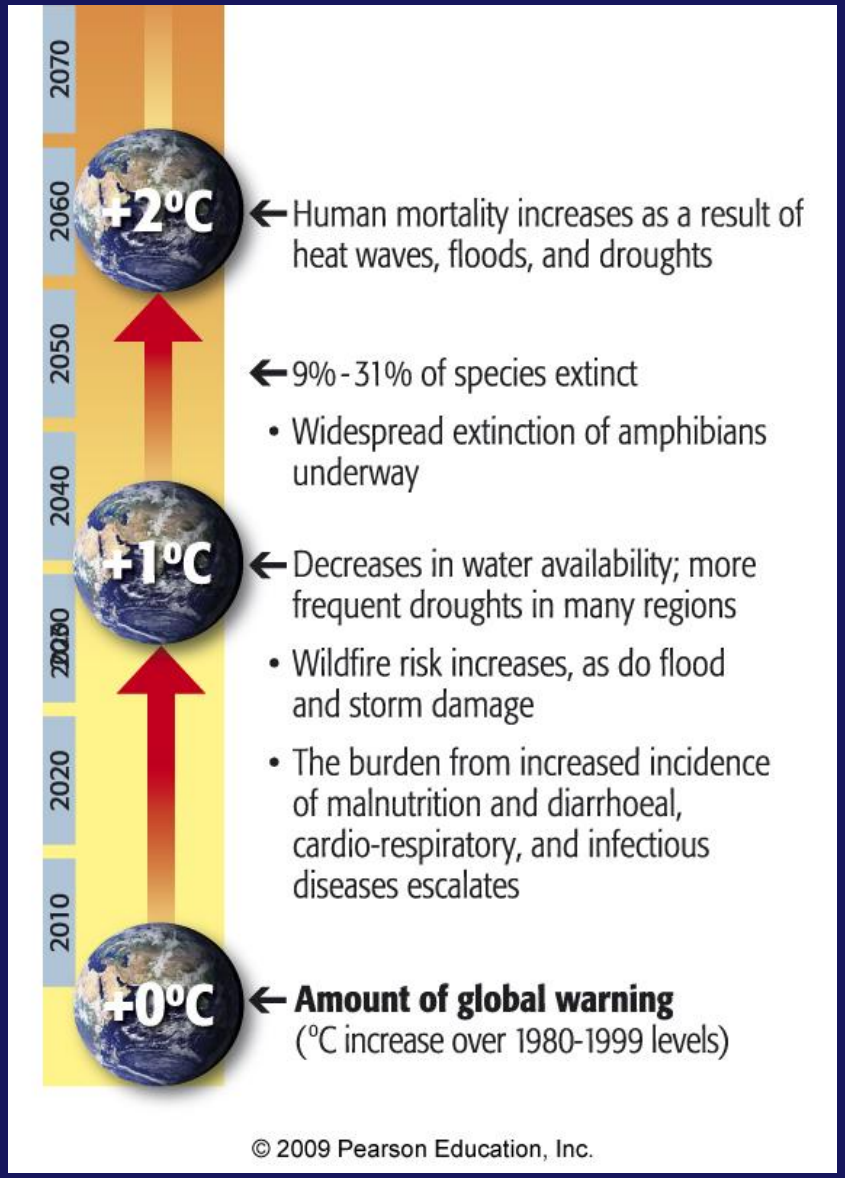
an introduction . . .

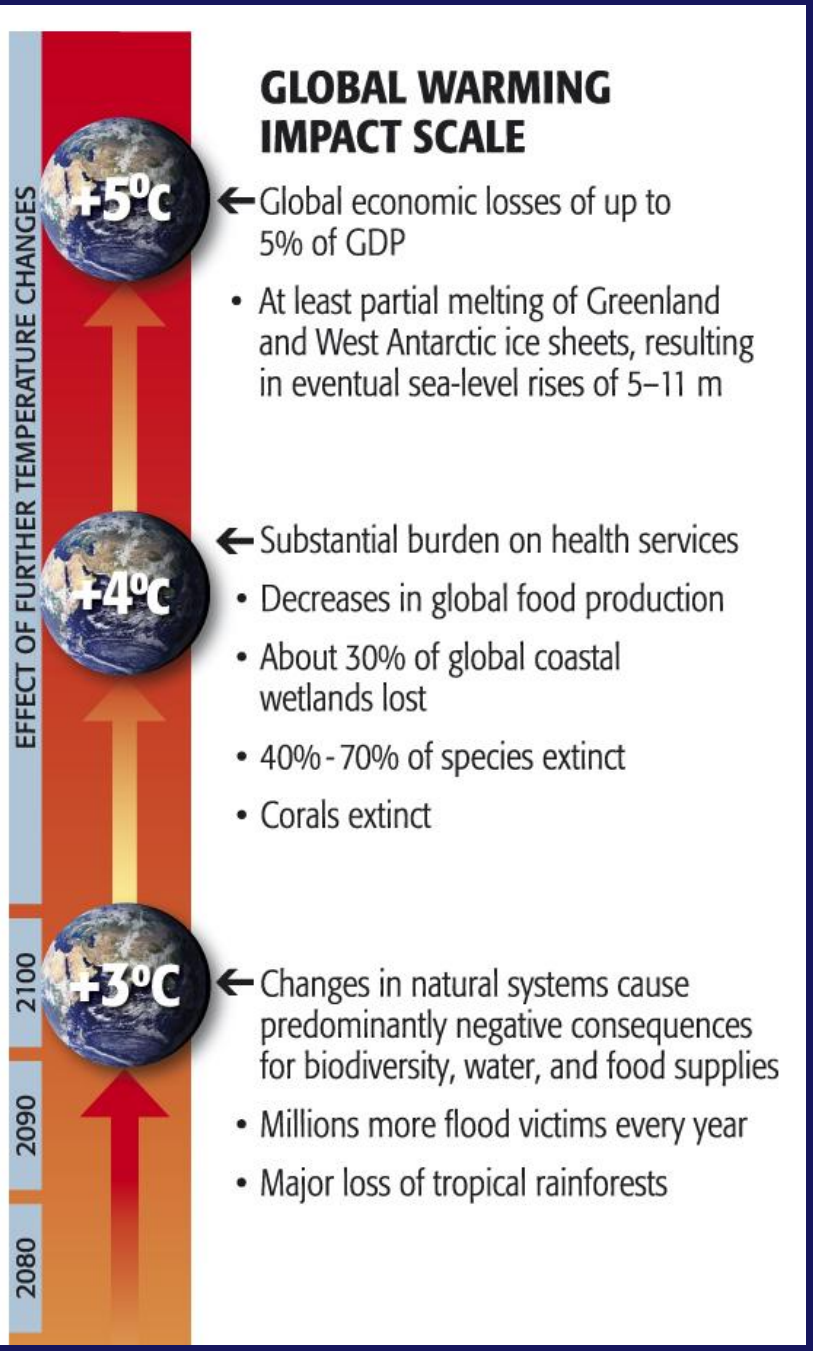


CO_2 increasing so fast that it may be difficult to stay BELOW 450 ppm (2° C warming)

Latest science suggests that hitting 4° C warming is far more likely than originally thought !

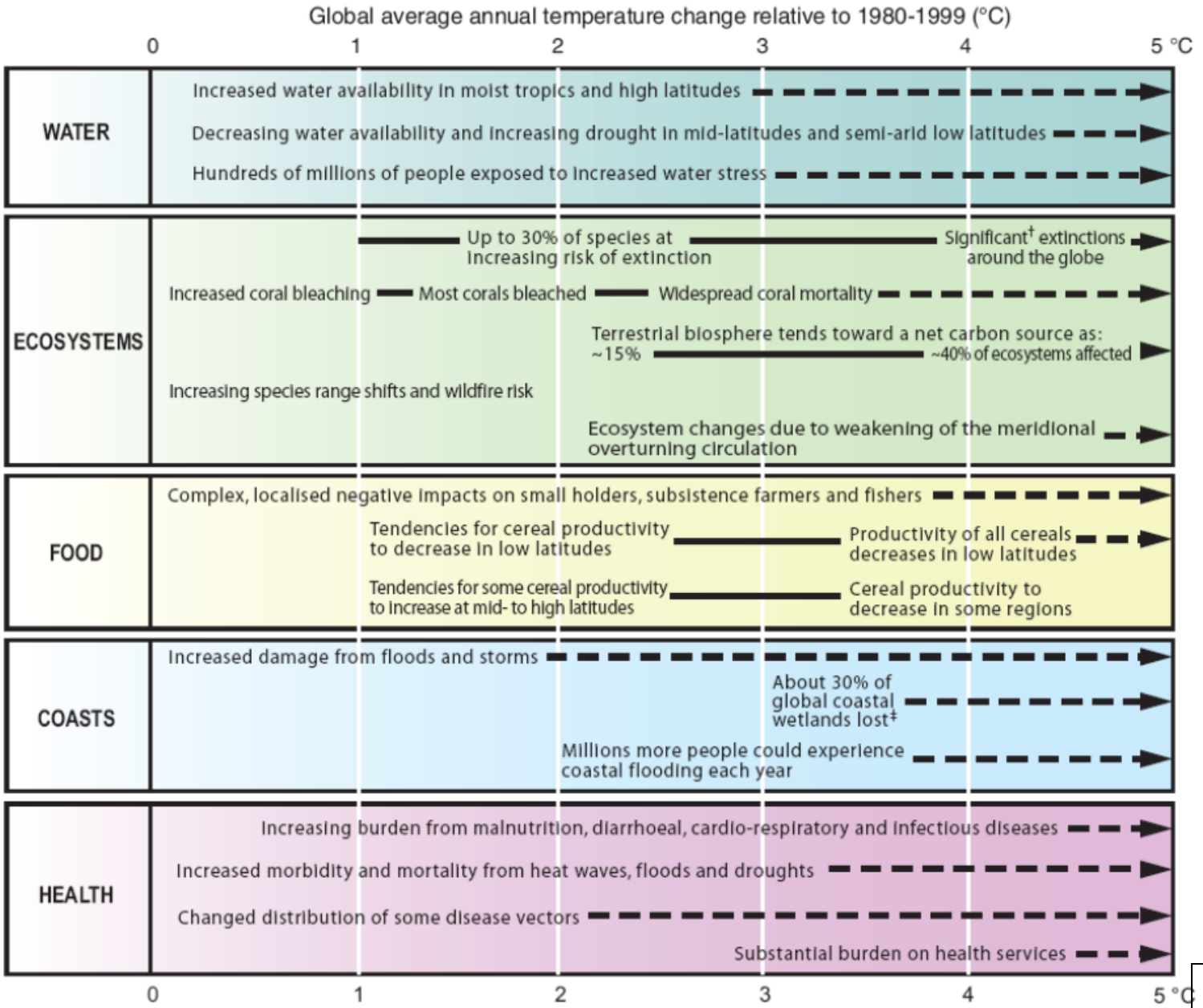
GLOBAL WARMING IMPACT SCALE





From *Dire Predictions* (p 108)

Examples of impacts associated with global average temperature change
(Impacts will vary by extent of adaptation, rate of temperature change and socio-economic pathway)



† Significant is defined here as more than 40%. ‡ Based on average rate of sea level rise of 4.2mm/year from 2000 to 2080.

GETTING READY FOR OUR LAST CLASS:

I-4 Global Warming Debate Preparation
(last assignment)

THE QUESTION:

Should the United States take aggressive and immediate action to slow global warming?

(e.g. sign the International Climate Treaty, reduce or tax GHG emissions, etc. etc.)

So what do we do about it???

NEXT: SOLUTIONS & CHOICES

POLICIES & POSSIBLE ACTIONS TO SLOW GLOBAL WARMING . . .


Happy
Thanksgiving