



Oluwakemi Izomo

Mitigation and Adaptation Studies



Mitigation and Adaptation Studies



Class 16: Foresight: Understanding Uncertainty

Contents

- Uncertainty
- Foreseeability
- Decision Making and Foreseeability



“A good understanding of the climate system is essential to allow society to prepare for the future. Increasing populations, diminishing resources, changing weather patterns and extreme events in combination with water scarcity and changing crop yields will all put pressure on communities. The only sure thing is that the climate and weather in the coming years will continue to have a degree of uncertainty and surprise us.”

Nature Clim. Change, Editorial, 2013

Half full or half empty?

Glass of knowledge

WORKING WITH A CHANGING CLIMATE, NOT AGAINST IT

PROJECT REPORT

**Hydro-Meteorological Disaster Risk Reduction:
A Survey of Lessons Learned for Resilient Adaptation
to a Changing Climate**

Is Resilience the key?



[http://fcw.com/articles/2013/07/08/
exectech-operational-resilience.aspx](http://fcw.com/articles/2013/07/08/exectech-operational-resilience.aspx)

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SUPPORT STAFF:

Liz Wiig, Beau Driver, Mark Ferrara

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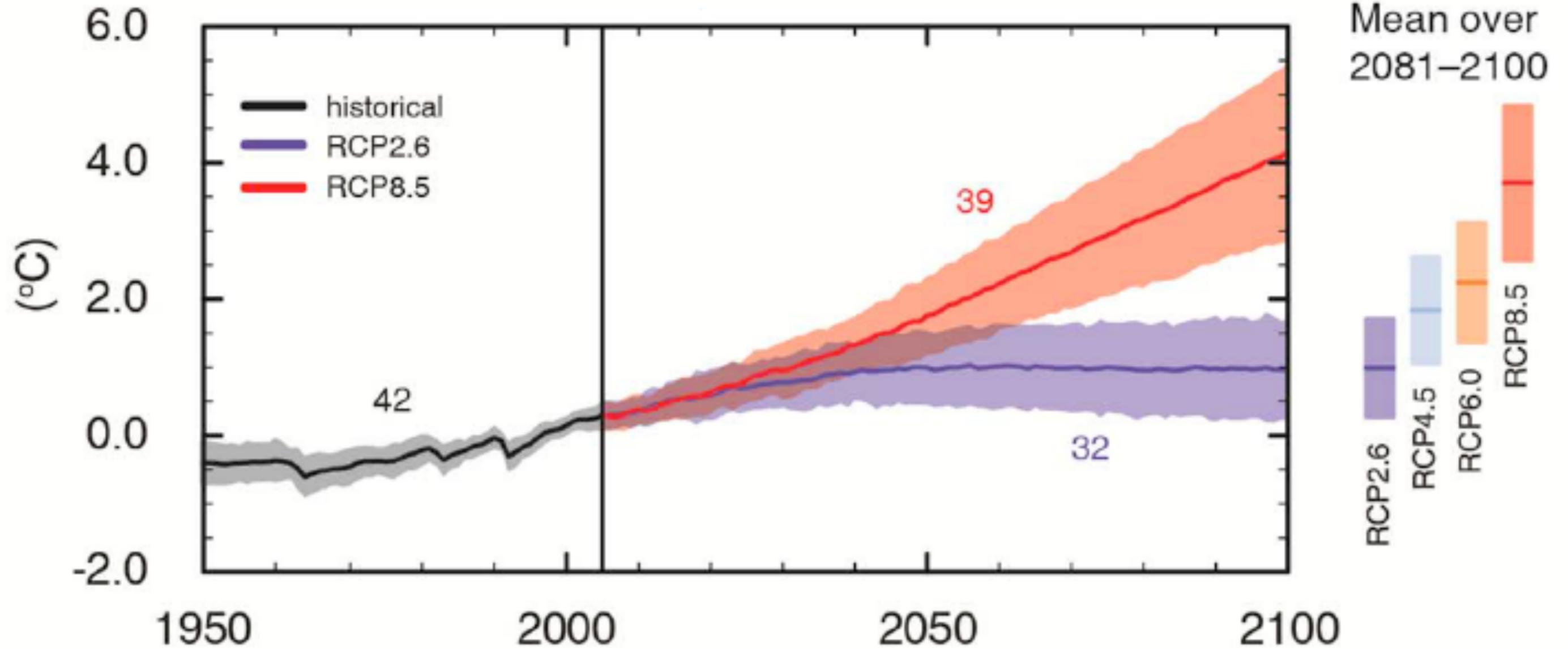


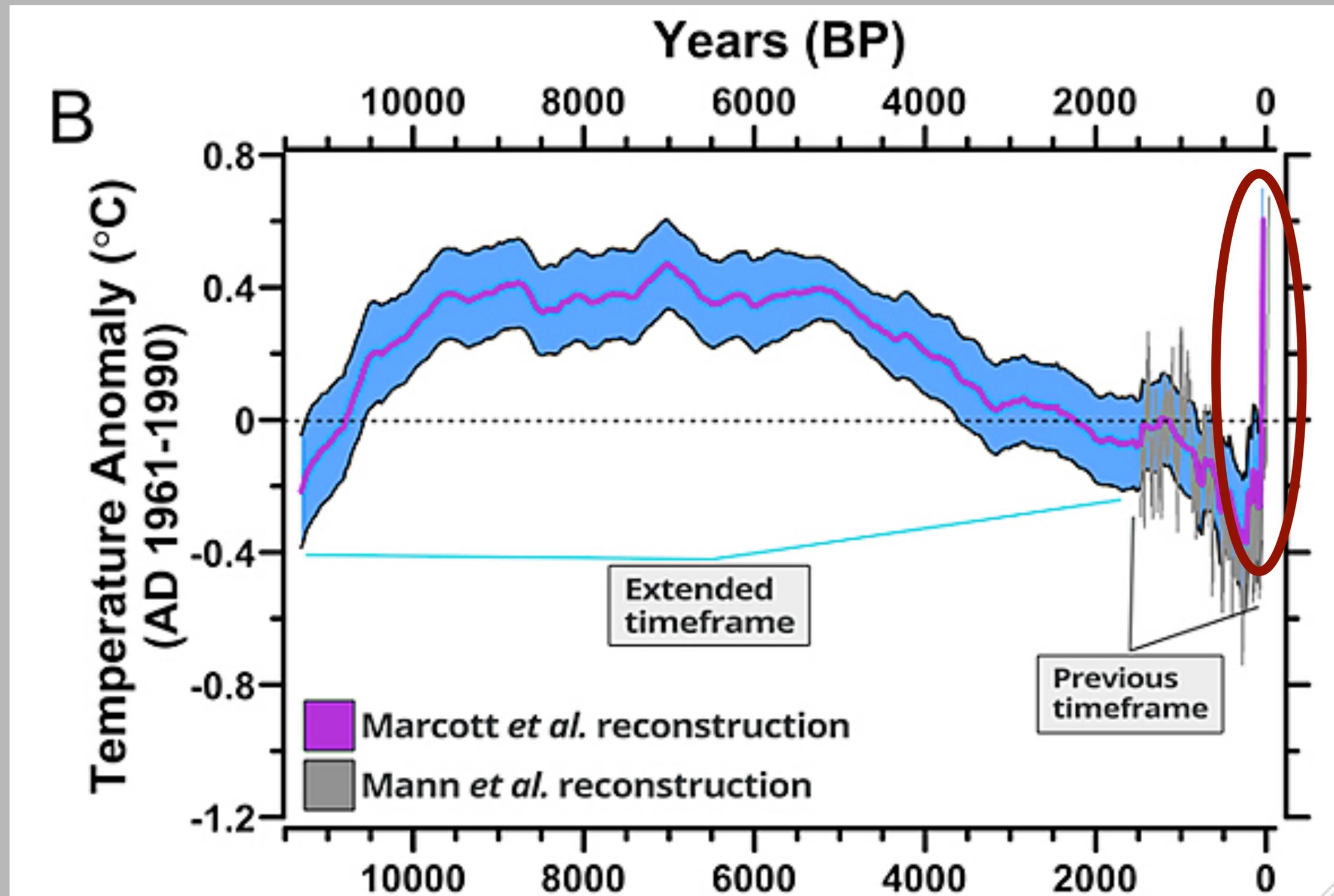
source: www.forbes.com

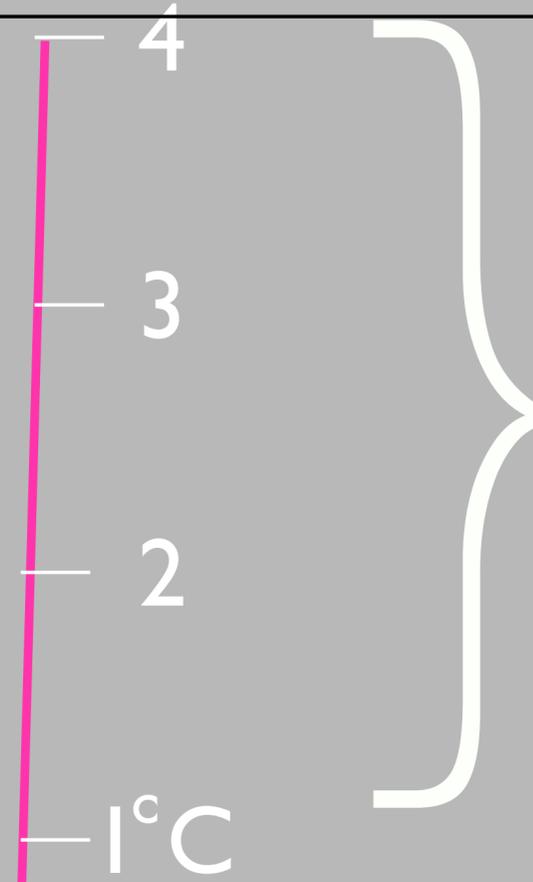
**Actions based on one's perceptions
of reality have real consequences.**

(a)

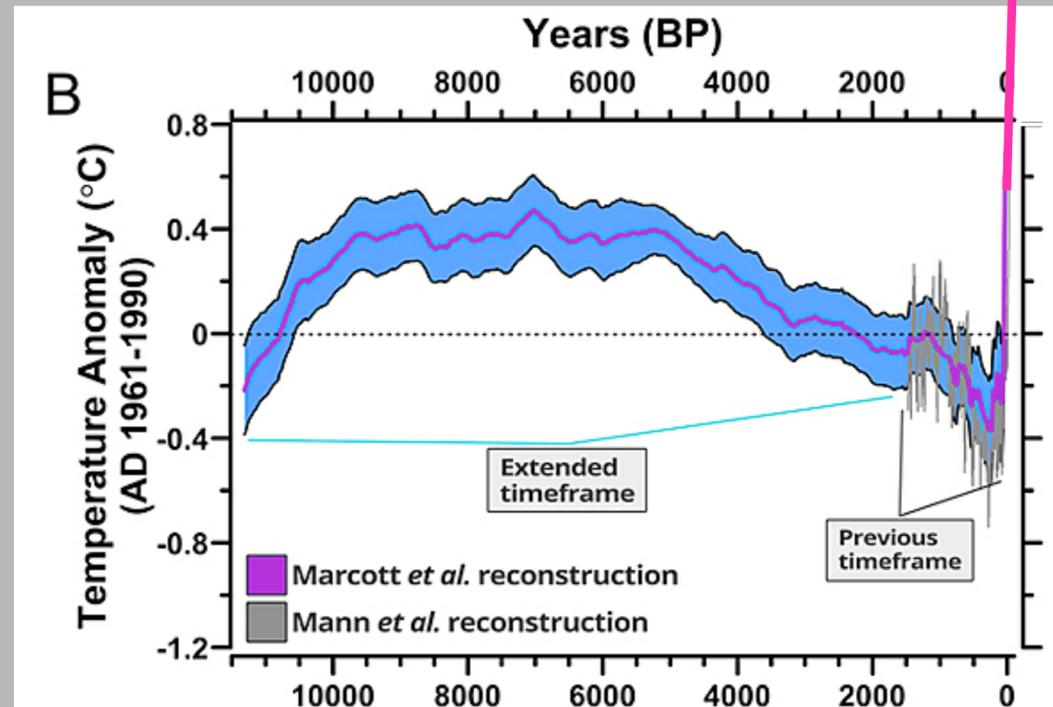
Global average surface temperature change







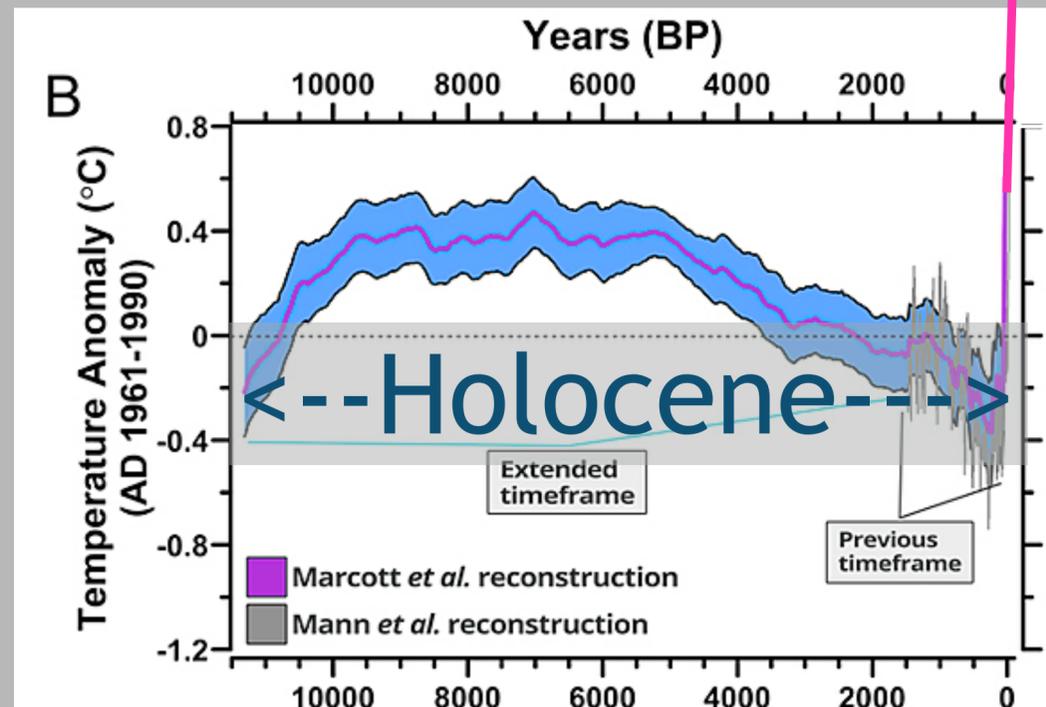
IPCC Assessment:
Very Likely by 2100



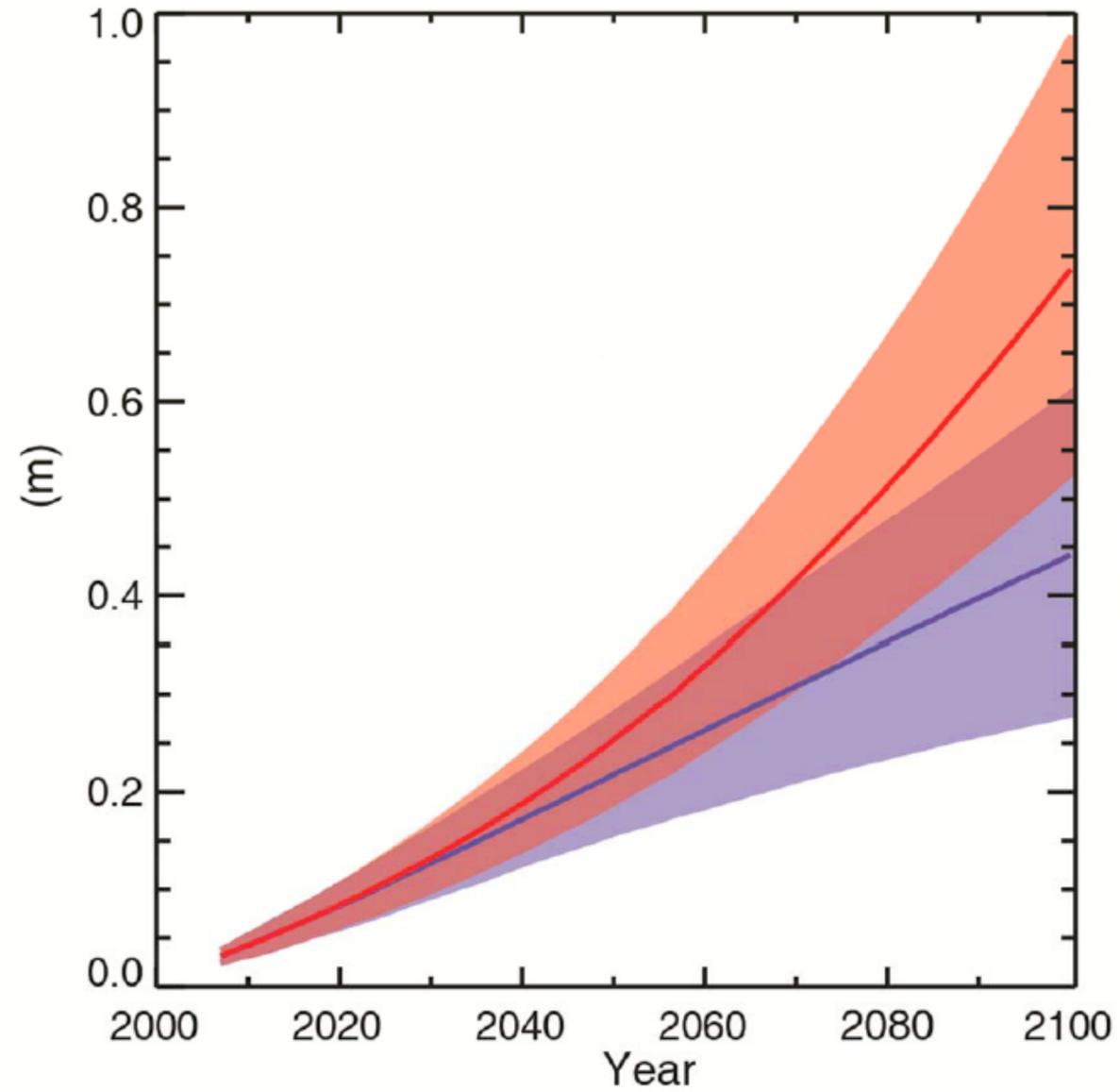
<-- Post-Holocene

IPCC Assessment:
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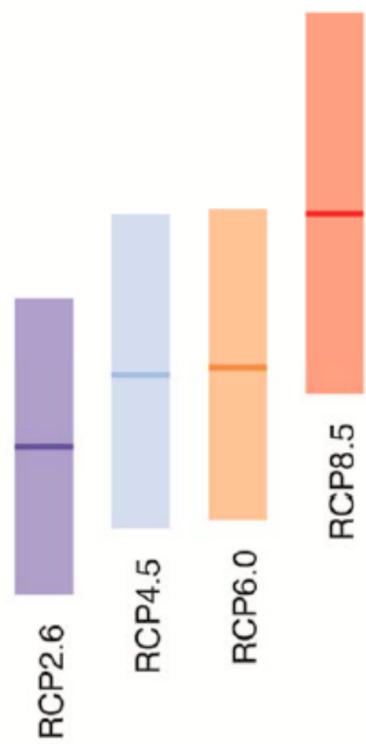
1°C



Global mean sea level rise

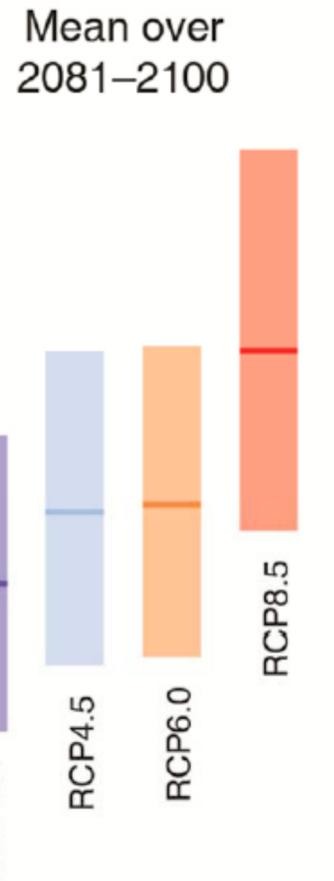
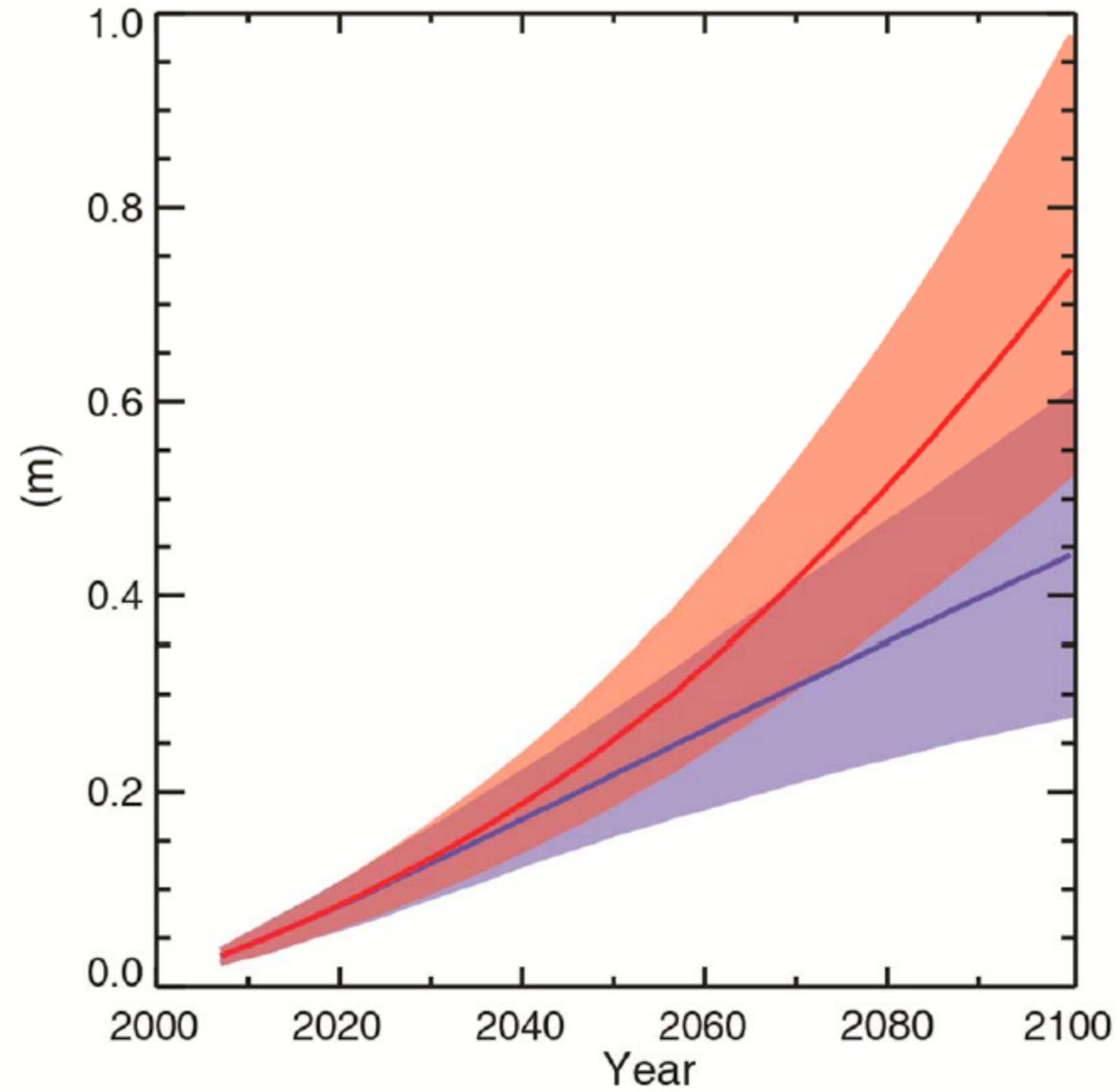


Mean over 2081–2100



IPCC, 2013

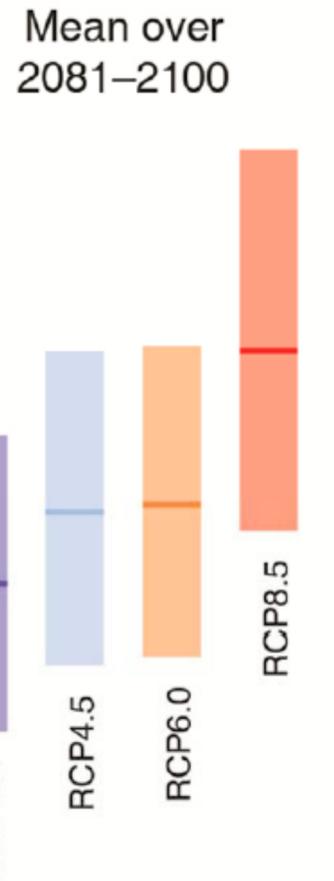
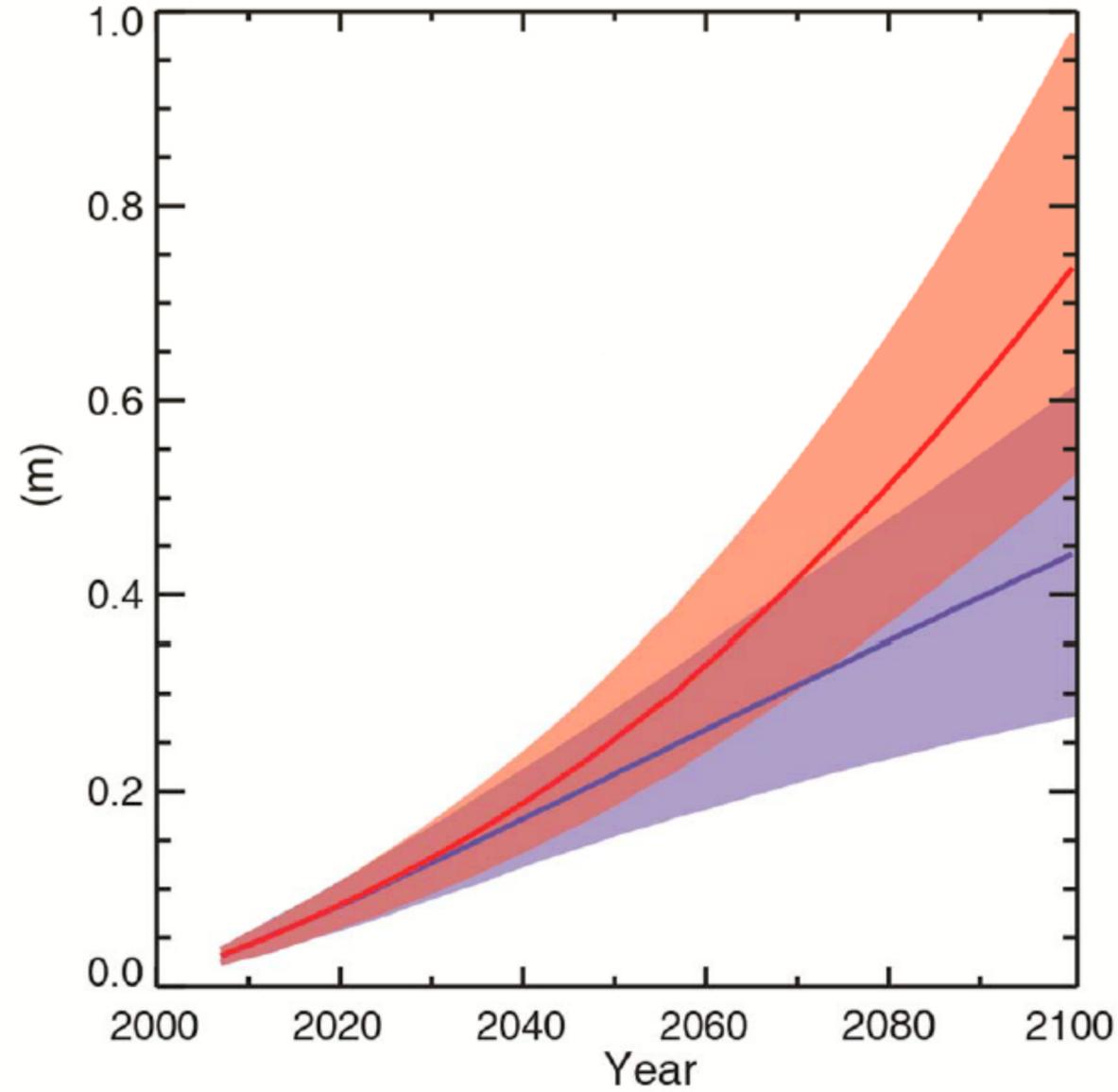
Global mean sea level rise



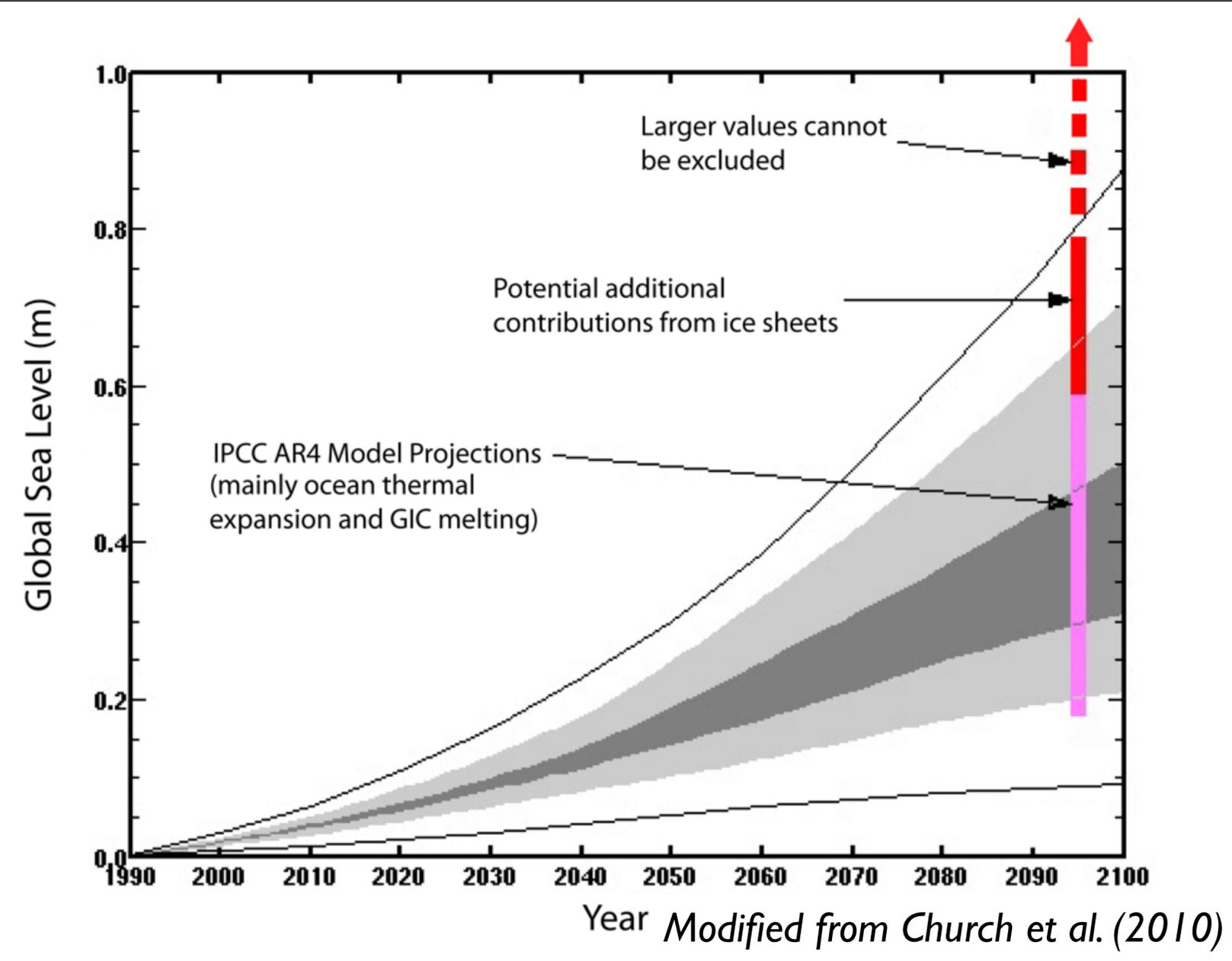
IPCC, 2013

Note: No accelerated contribution from Greenland and Antarctic ice sheets considered

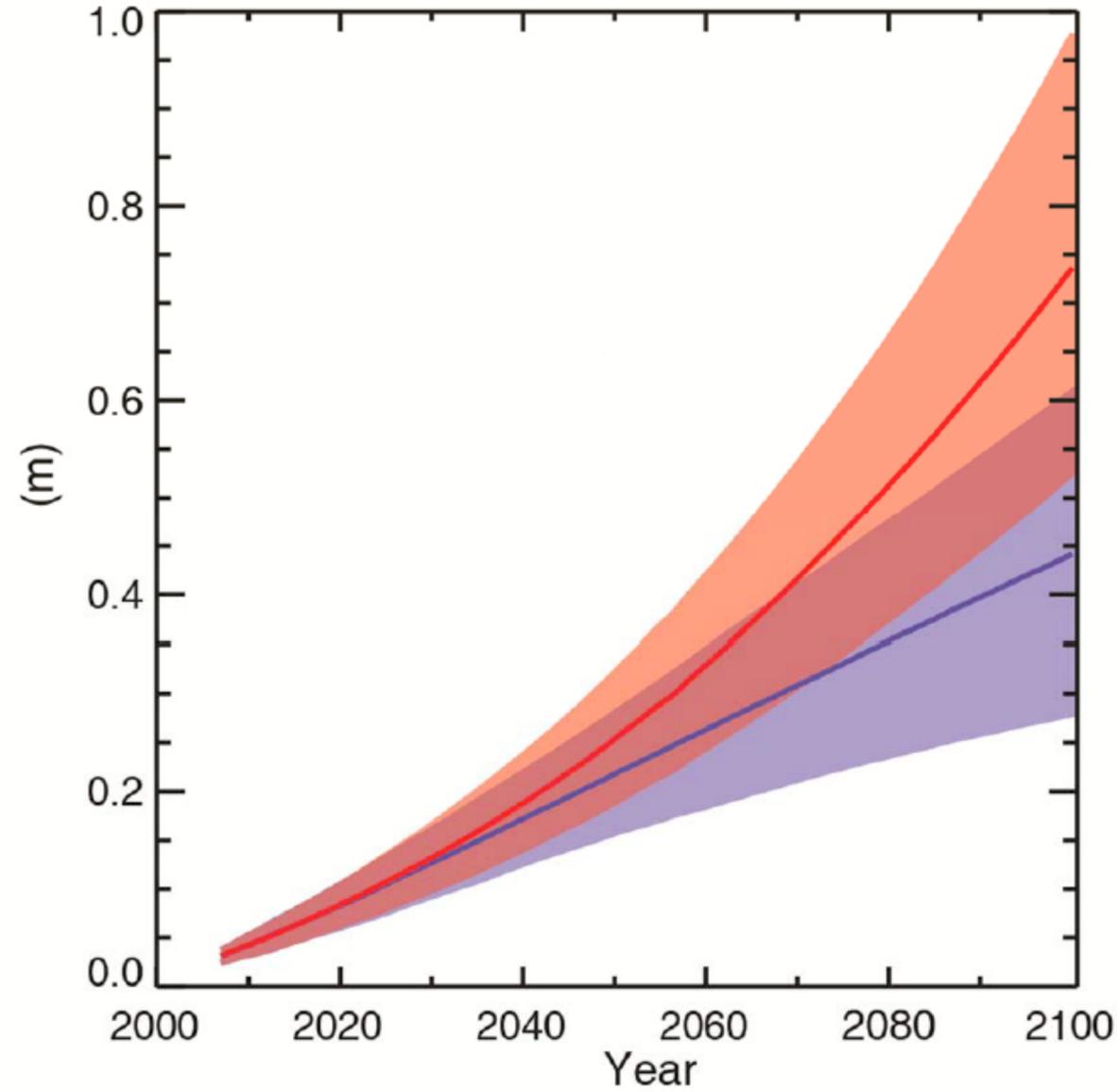
Global mean sea level rise



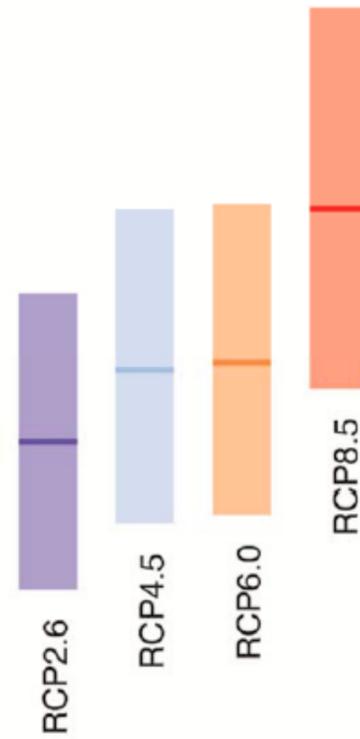
IPCC, 2013



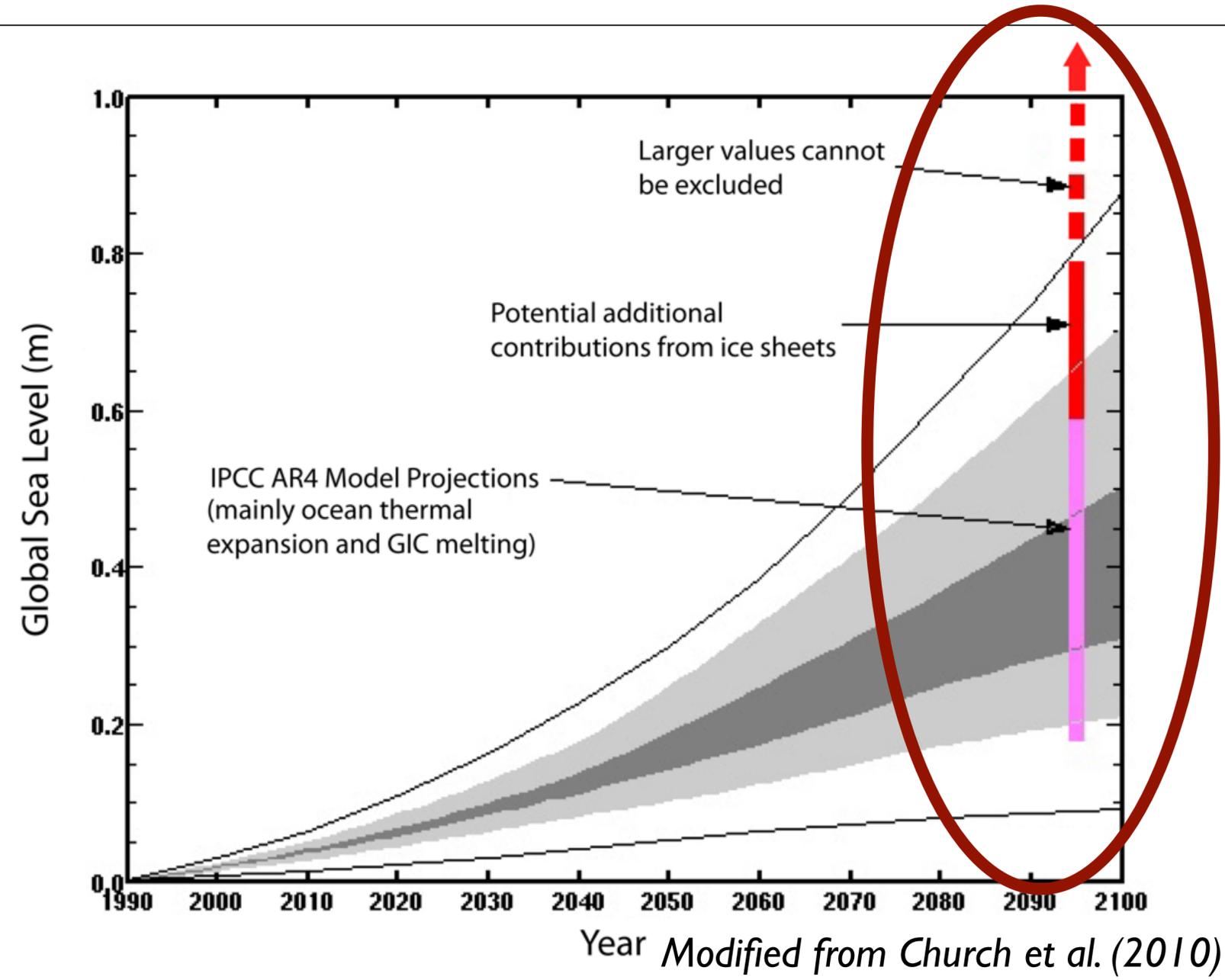
Global mean sea level rise



Mean over 2081–2100



IPCC, 2013



Aleatoric uncertainties: statistical uncertainties
Epistemic uncertainties: systemic uncertainties,
including knowledge gaps

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HOME SEARCH

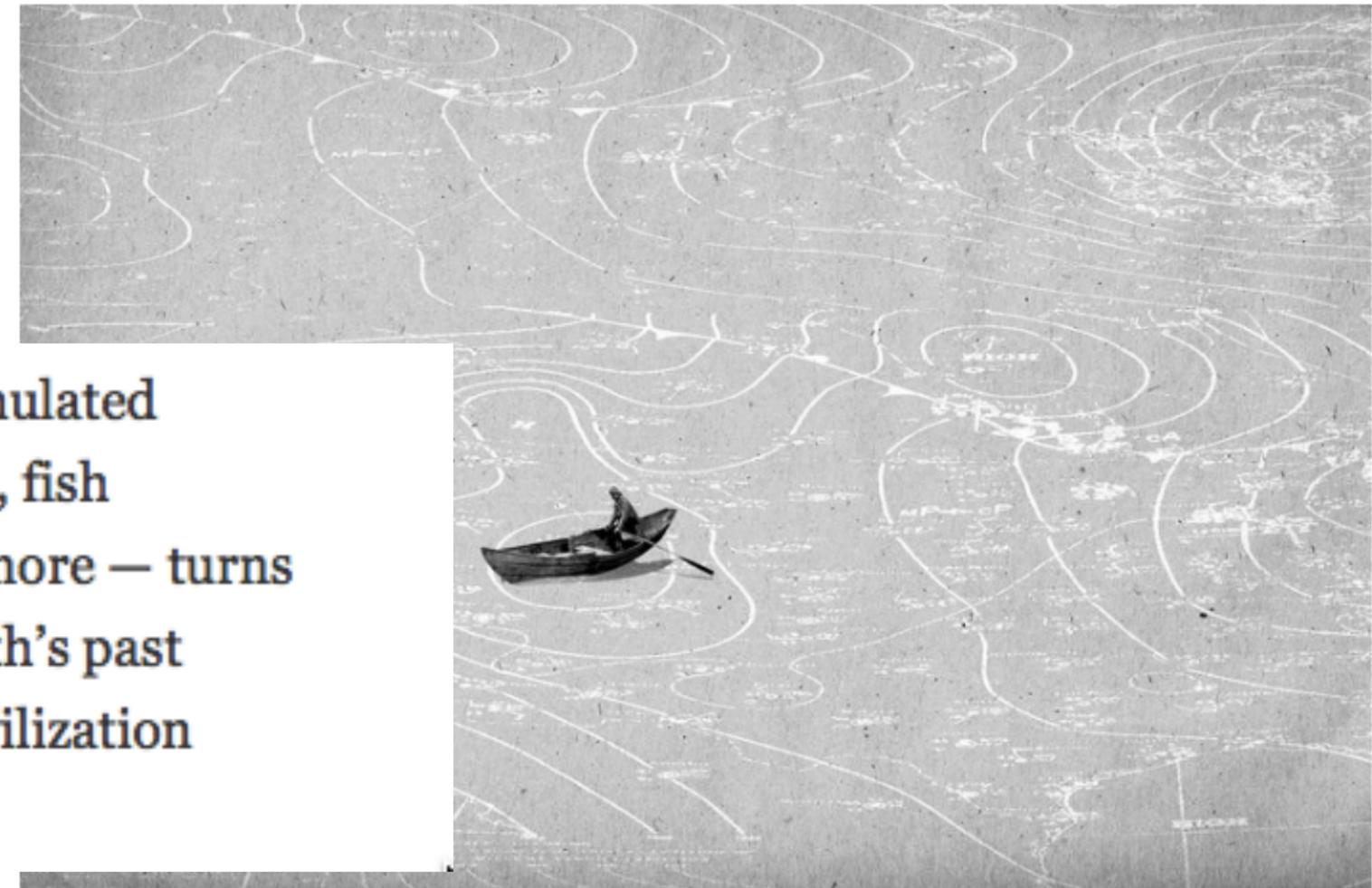
The New York Times

The Opinion Pages | OP-ED CONTRIBUTOR

A New Dark Age Looms

By WILLIAM B. GAIL APRIL 19, 2016

Boulder, Colo. — **IMAGINE** a future in which humanity's accumulated wisdom about Earth — our vast experience with weather trends, fish spawning and migration patterns, plant pollination and much more — turns increasingly obsolete. As each decade passes, knowledge of Earth's past becomes progressively less effective as a guide to the future. Civilization enters a dark age in its practical understanding of our planet.



Decision making in times of homeostasis:

- based on predictions with some level of uncertainty
- focus is on what we don't know

Decision Making and Foresight

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Mikey Glantz:

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Decision Making Under
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by:

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Our knowledge



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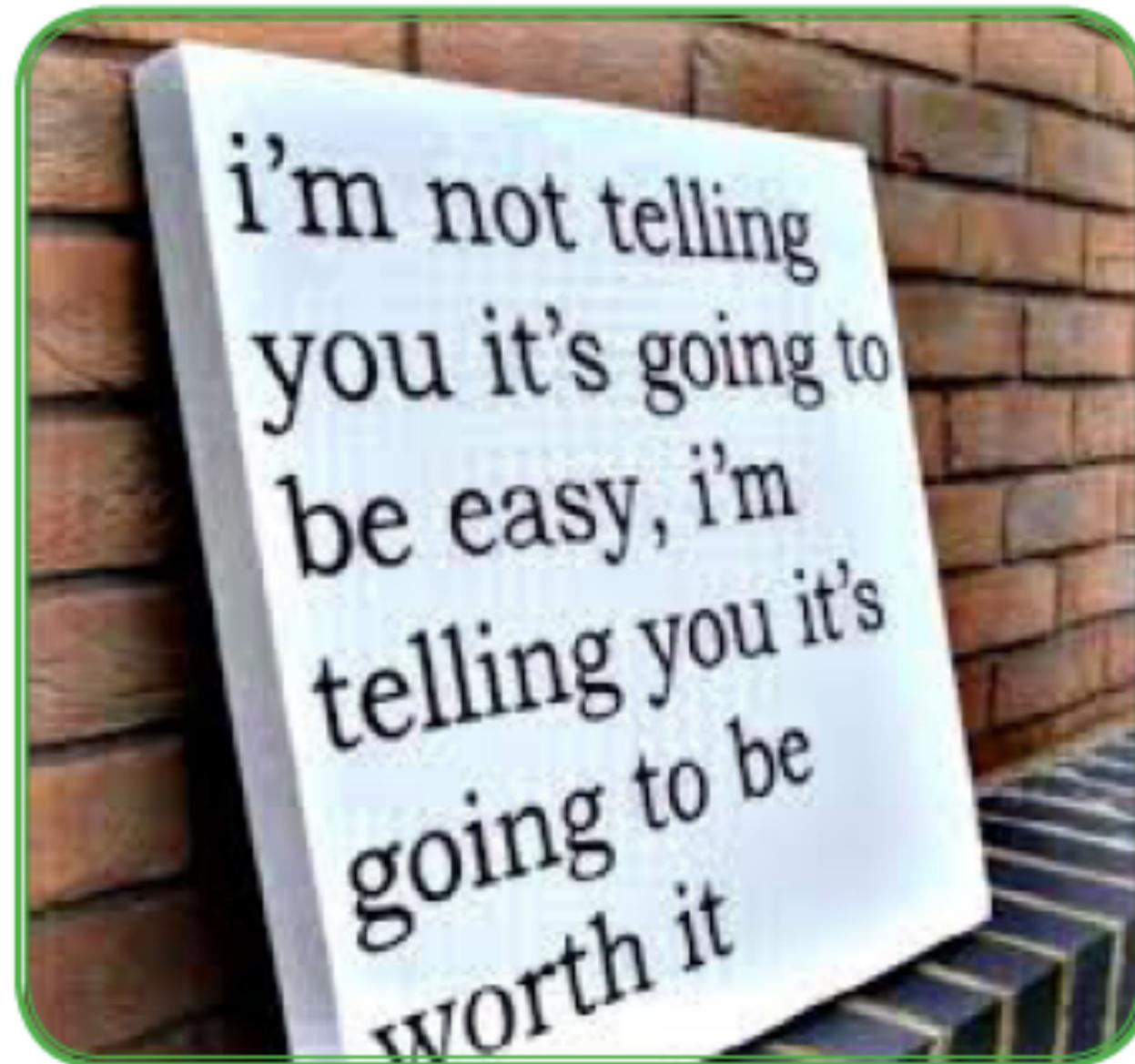
Task: Developing Foresight

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In his law dictionary, Gifis (1991, 195–196) writes that “Foreseeability encompasses not only that which the defendant foresaw, but that which the defendant ought to have foreseen.”

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Lessons Learned

recognize mistakes

observe what works

document them

share them

Source: www.uowblogs.com

LESSONS LEARNED
recognize mistakes
observe what works
document them
share them

Source: www.uowblogs.com

ABOUT LESSONS LEARNED

Why:

Philosopher Santana was noted as having said, “Those who do not learn from history are doomed to repeat it.” There are now variations on this theme, uttered by famous as well as the not so famous individuals, but the core message remains: people must know history in order to learn from it. People around the globe, through trial and error, have forever been learning tactical and strategic responses to their local and regional hydro-meteorological hazards and disasters.

Much of what they have learned in their local environments could be of value to others facing similar hazards and disasters far away.

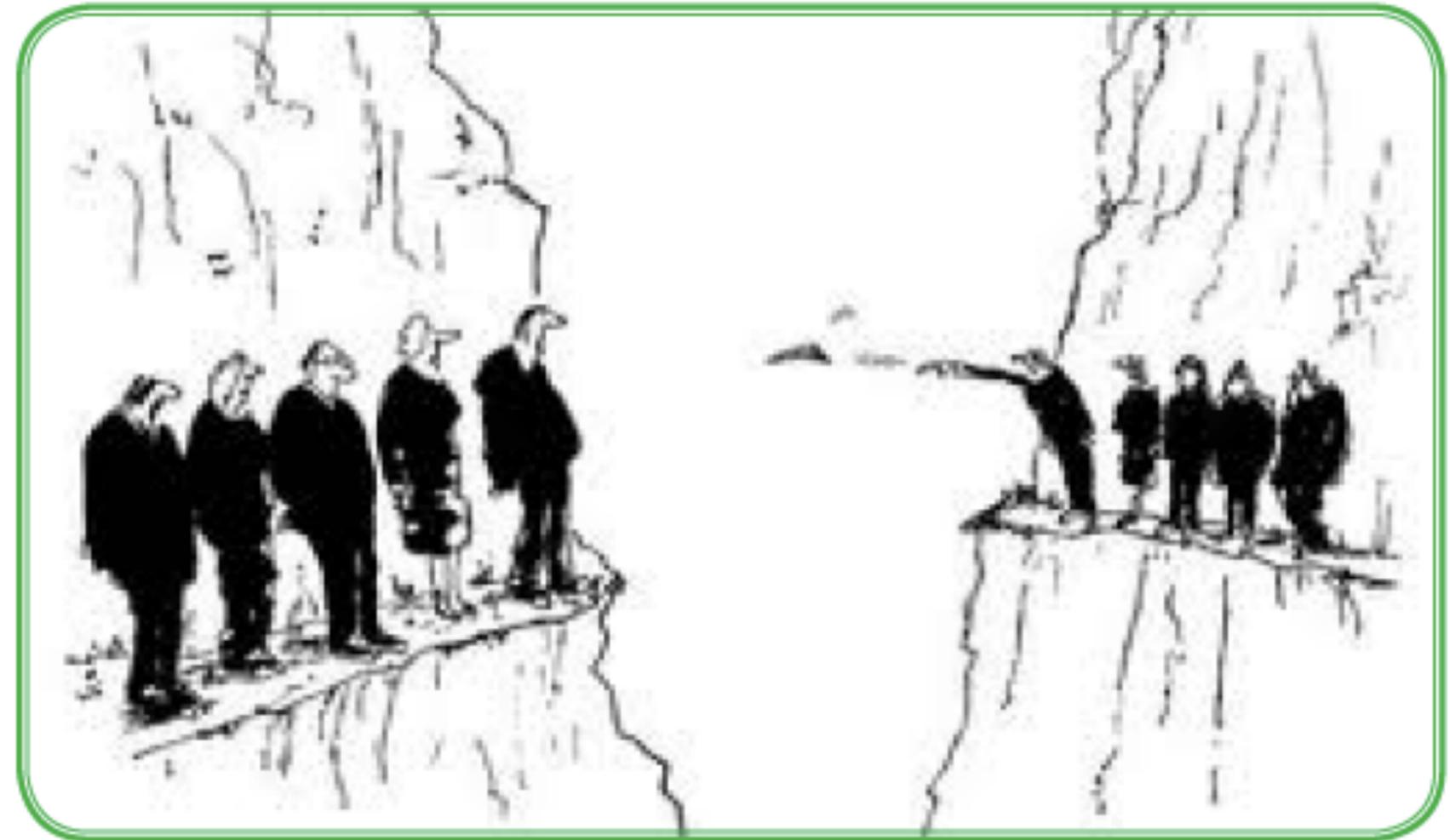


"The Suggestion Box is Full" ©Leo Posillico 2005



The Suggestion Box Is Full Leo Posillico

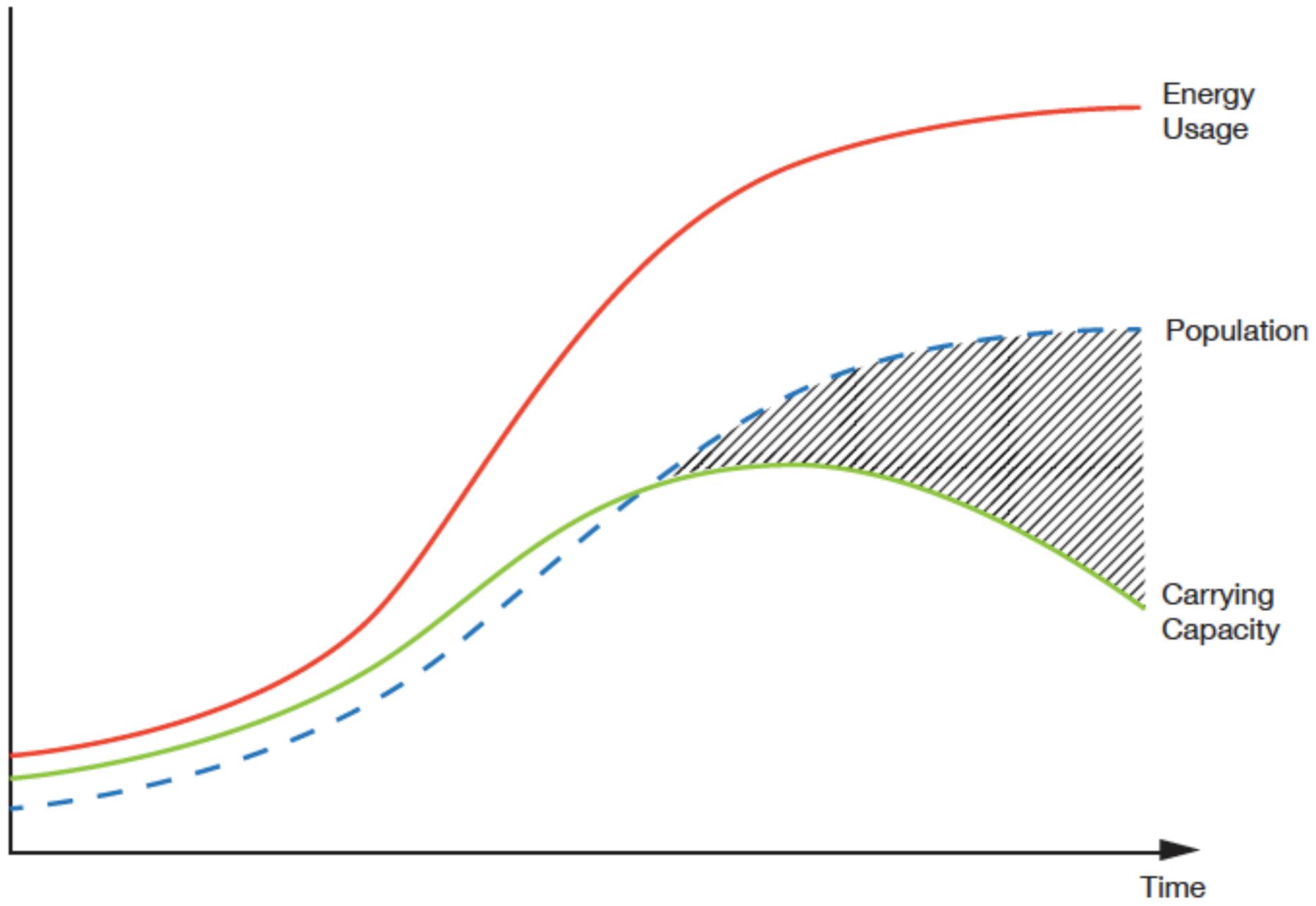
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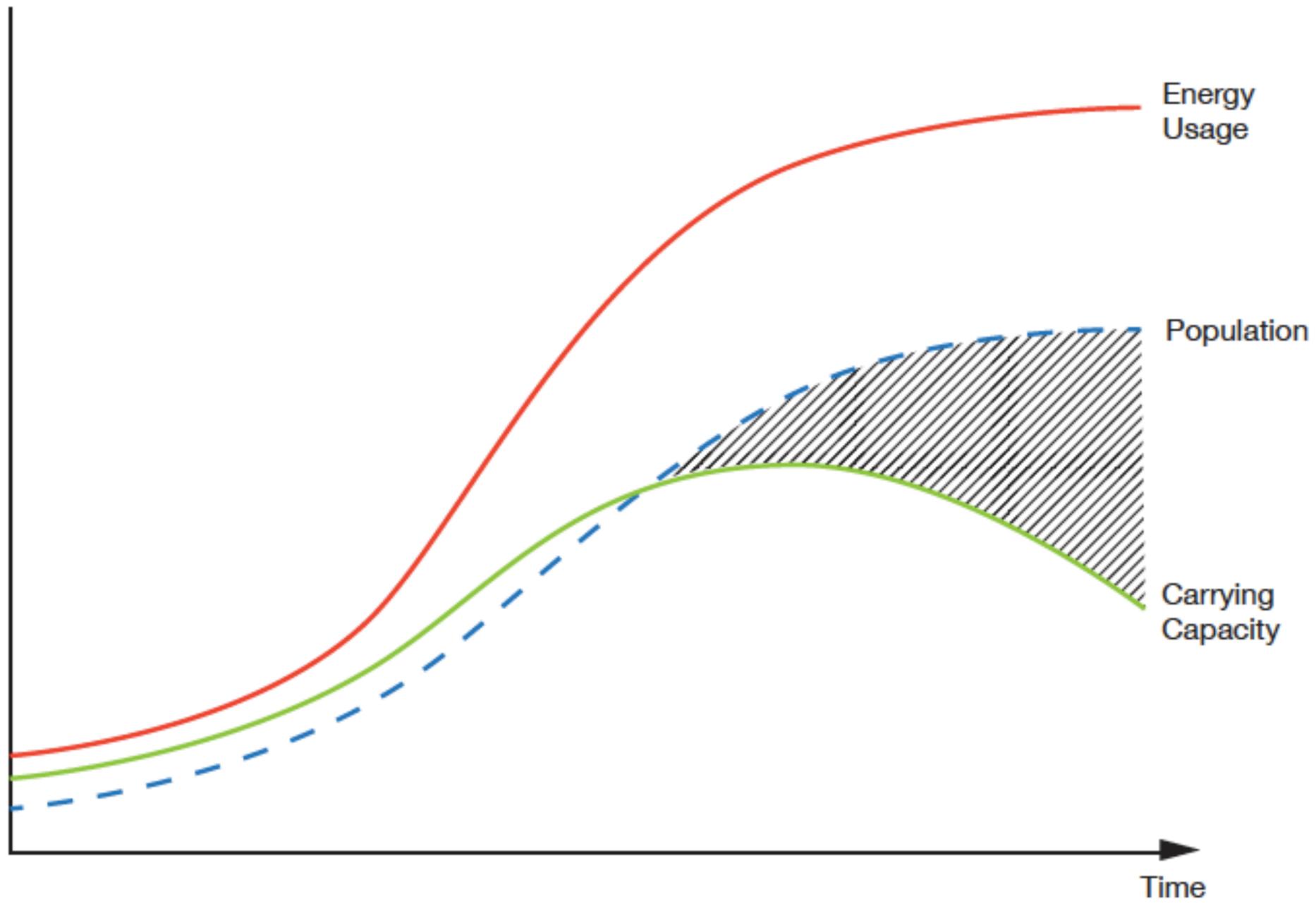
"Couldn't we communicate better if we built a bridge?"

<http://hahdang.blogspot.com>

Foreseeability: Population Growth



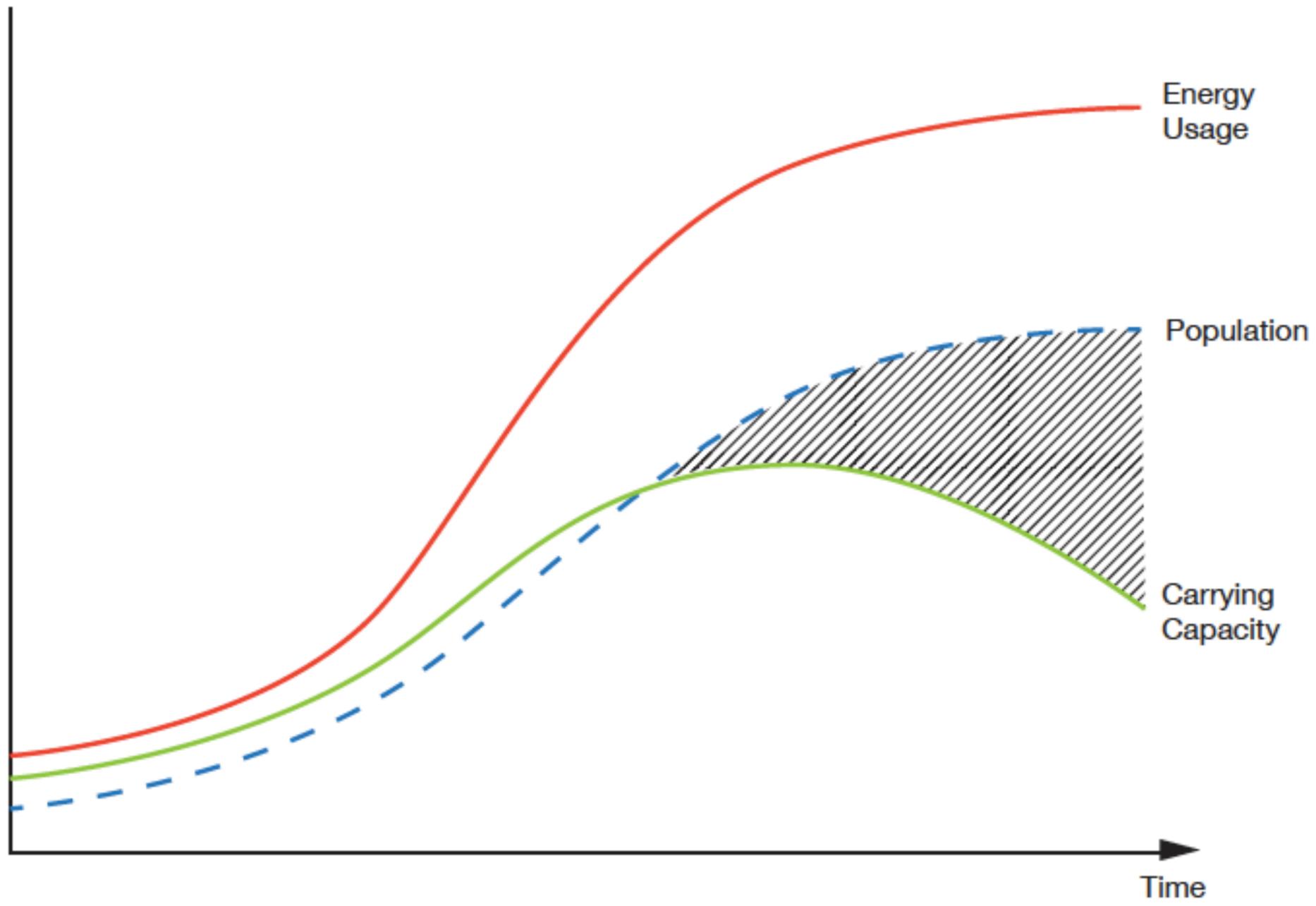
Foreseeability: Population Growth



Carrying Capacity = function of: Arable Land, Nitrogen, Phosphorous, Climate, Water, Biodiversity, Land Use, Energy, Degradation, Technology, ...

$$CC = f(A, N, P, C, W, B, L, E, D, T, \dots)$$

Foreseeability: Population Growth

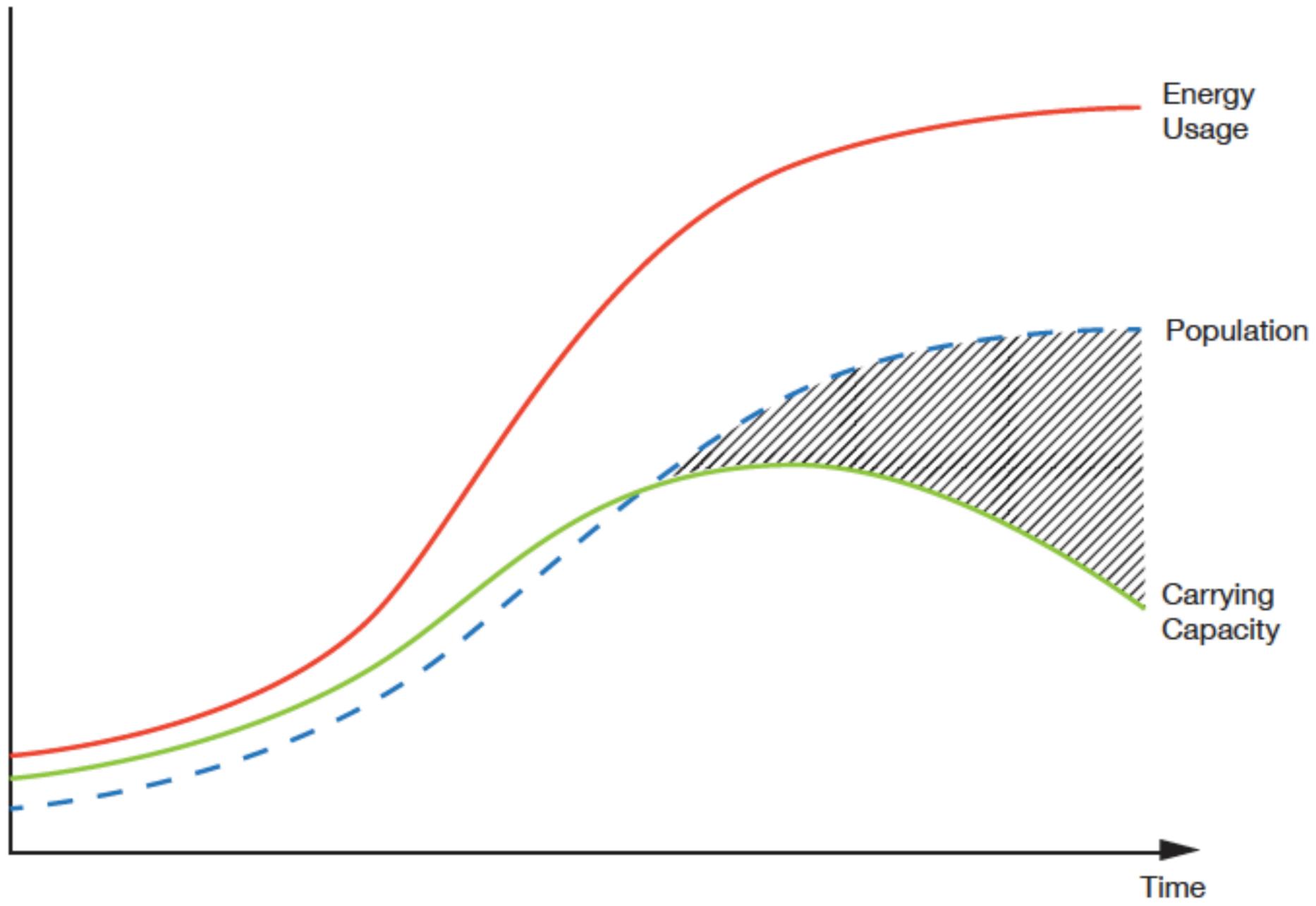


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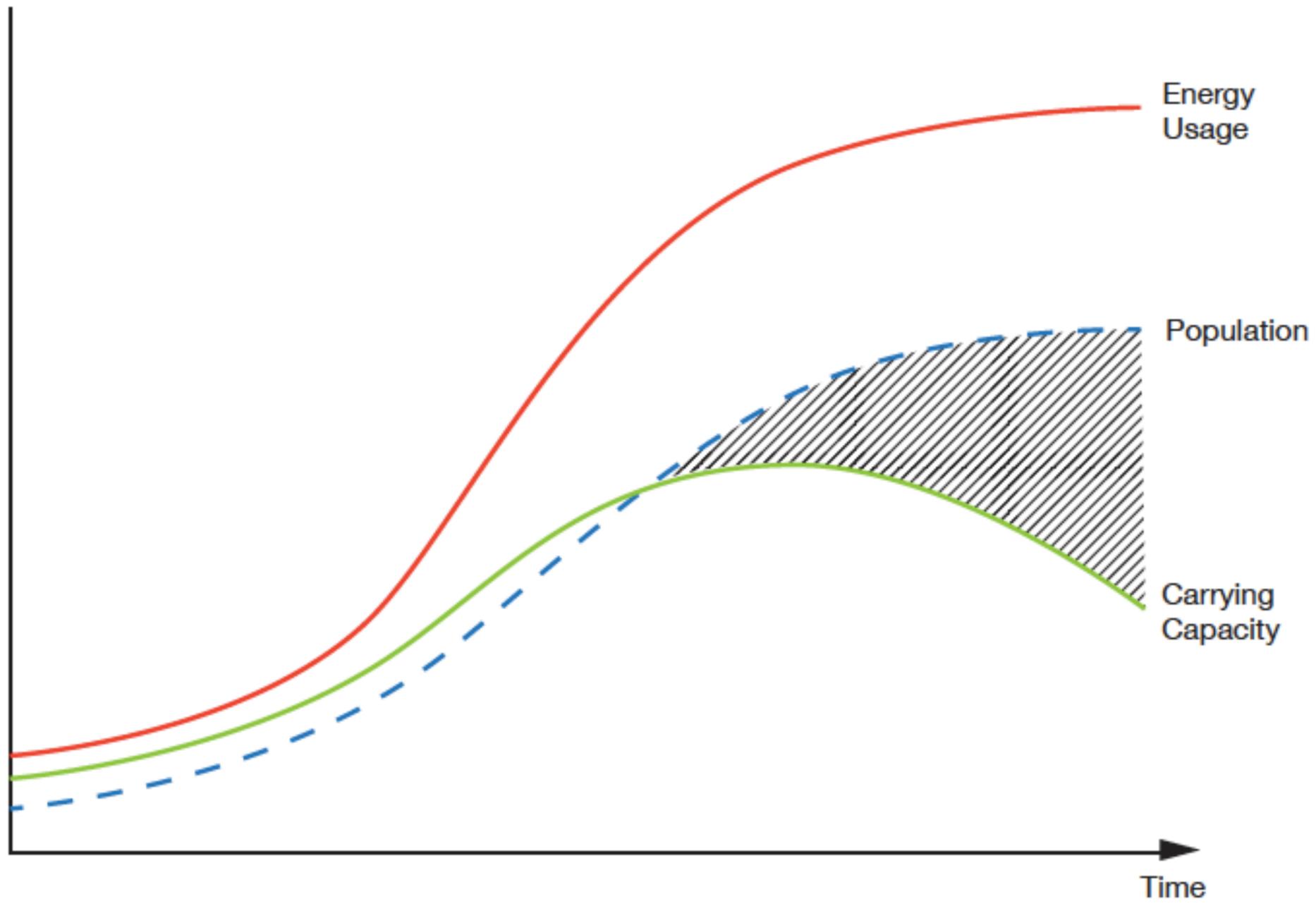
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$$W = f(C, L, E, D, \dots)$$

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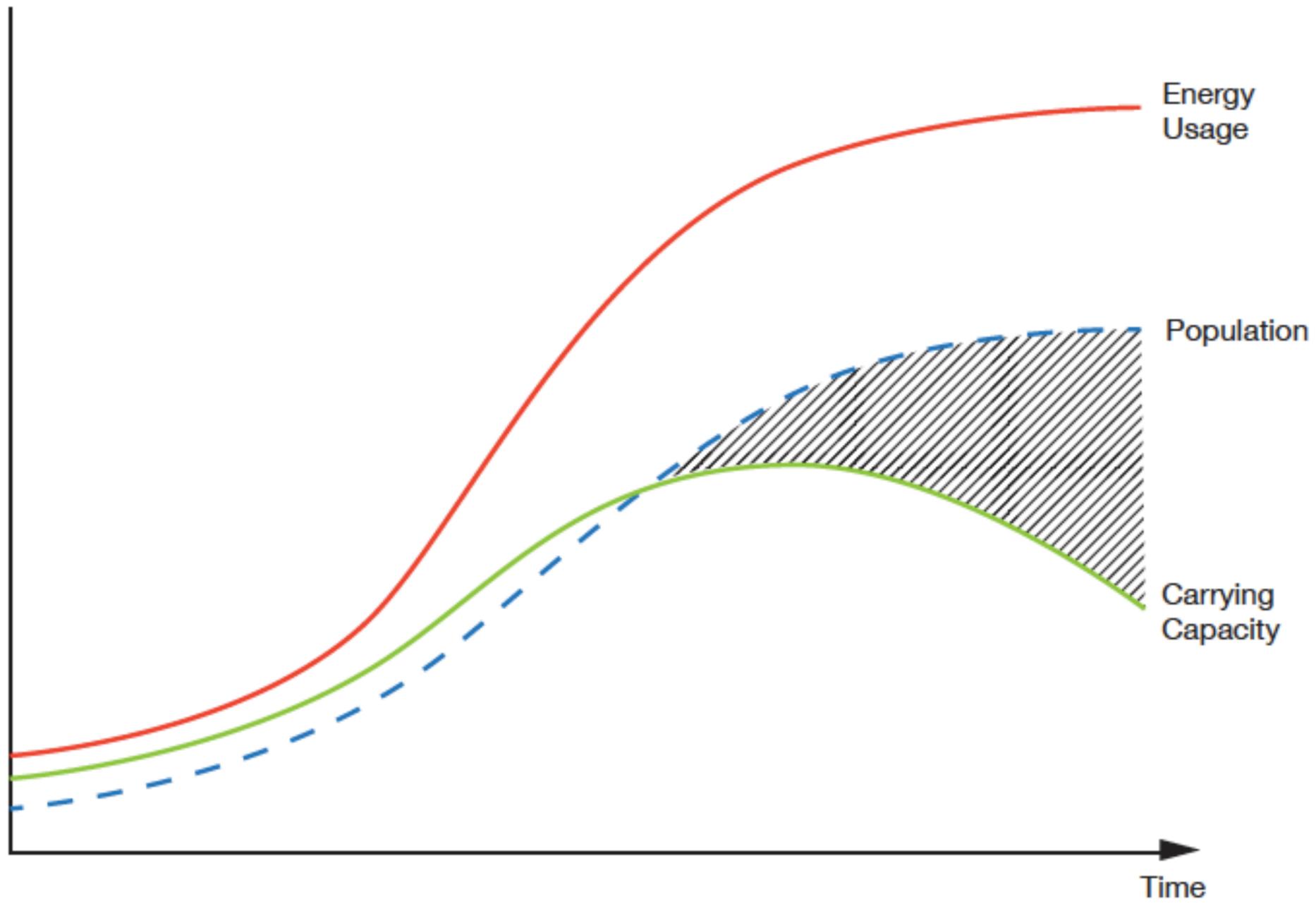
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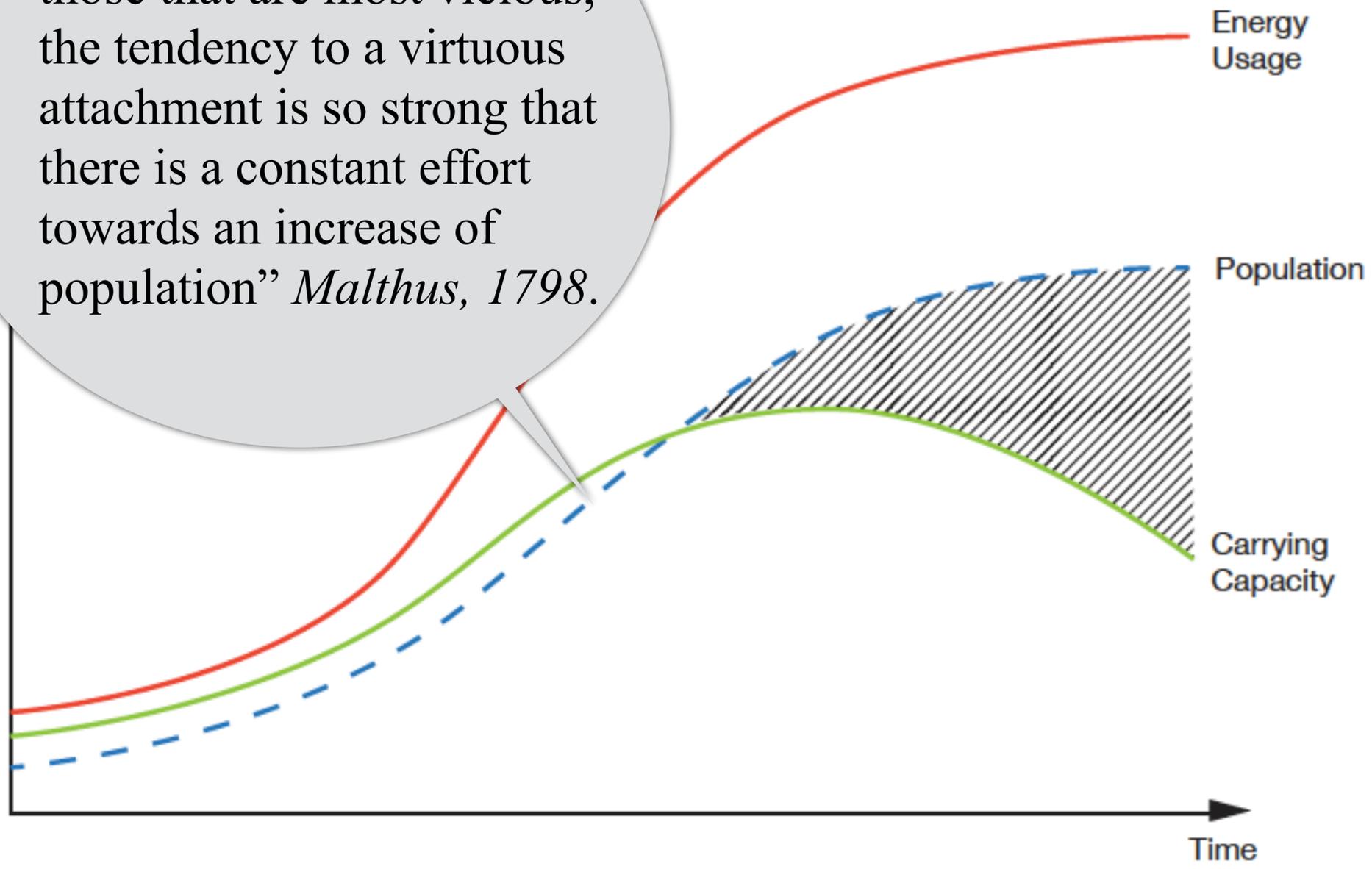
$$W = f(C, L, E, D, \dots)$$

$$N, P = f(E)$$

$$B = f(C, W, L, D, \dots)$$

Foreseeability: Population Growth

"Yet in all societies, even those that are most vicious, the tendency to a virtuous attachment is so strong that there is a constant effort towards an increase of population" *Malthus, 1798.*



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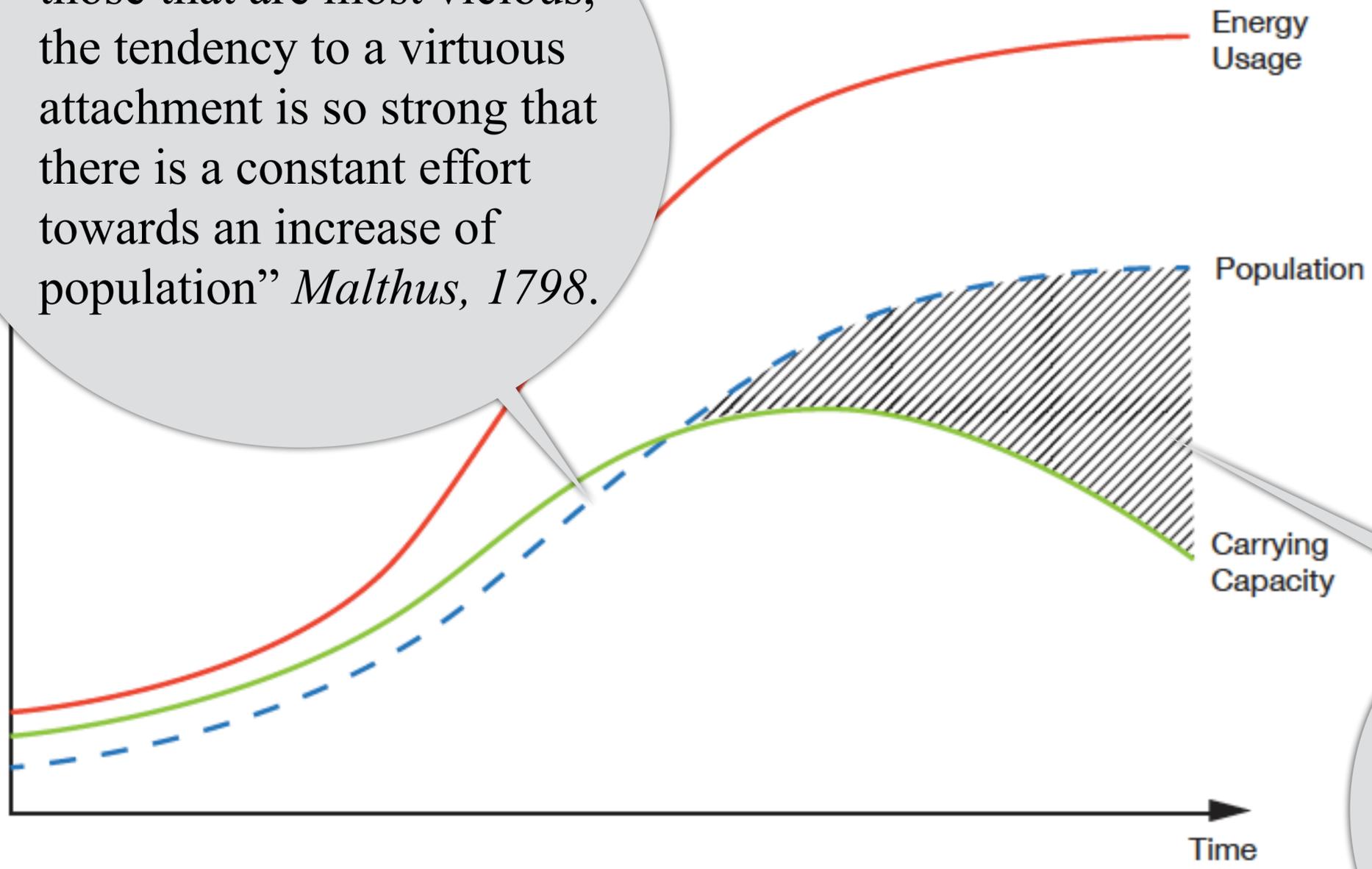
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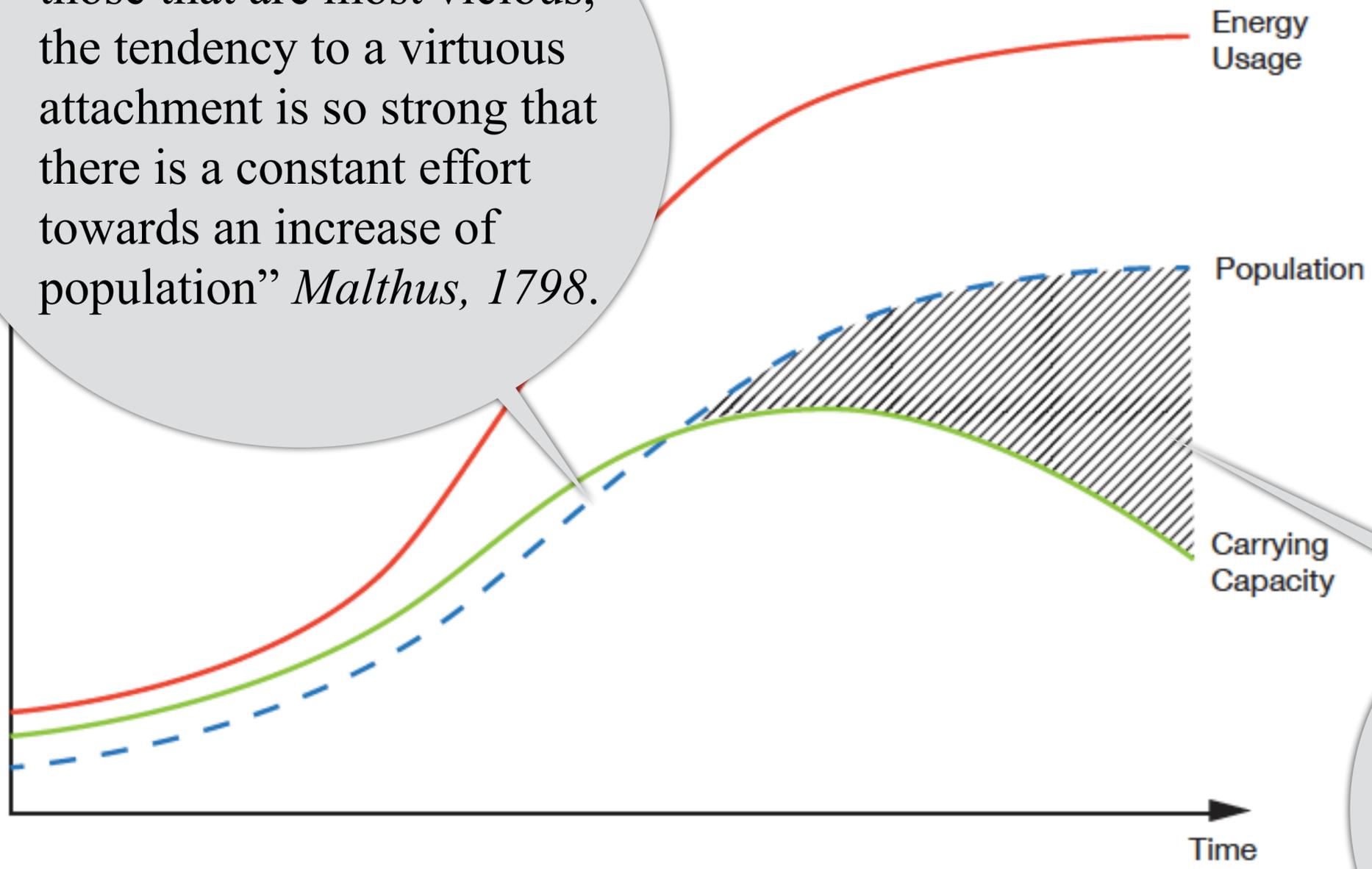
$$W = f(C, \dots)$$

"That the increase of population is necessarily limited by the means of subsistence, That population does invariably increase when the means of subsistence increase, and, That the superior power of population is repressed, and the actual population kept equal to the means of subsistence, **by misery and vice.**"

Malthus, 1798.

Foreseeability: Population Growth

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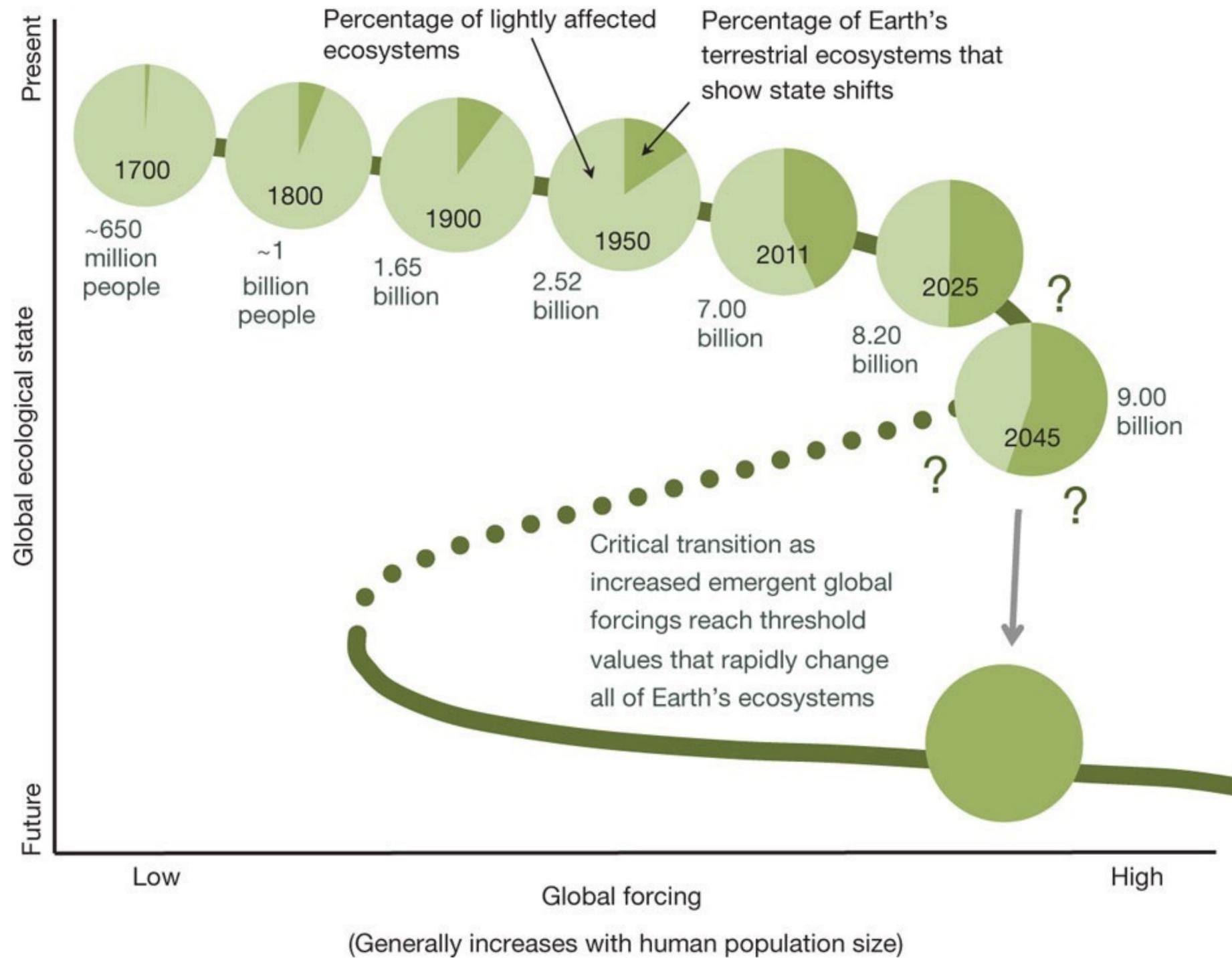
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Lovelock: Carrying Capacity will be down to 1 Billion in 2050

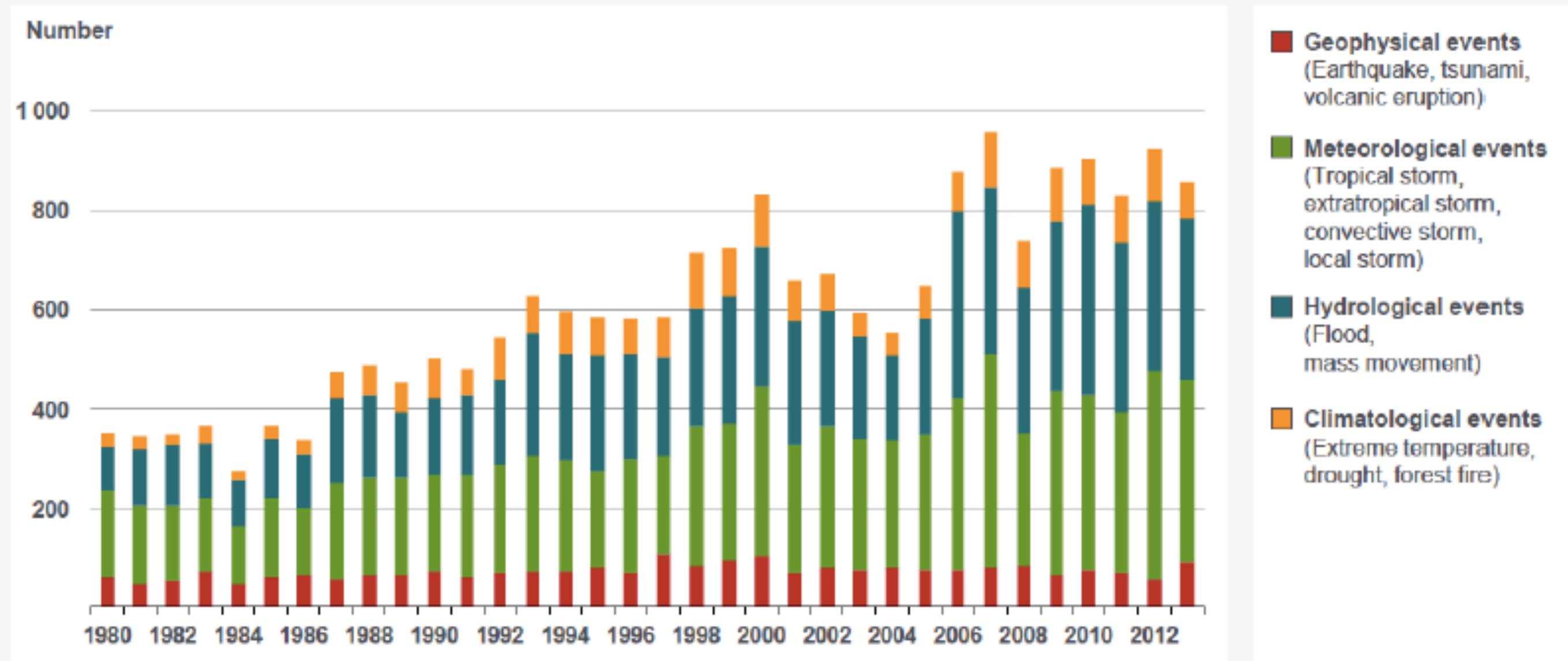
Foreseeability: Land use changes



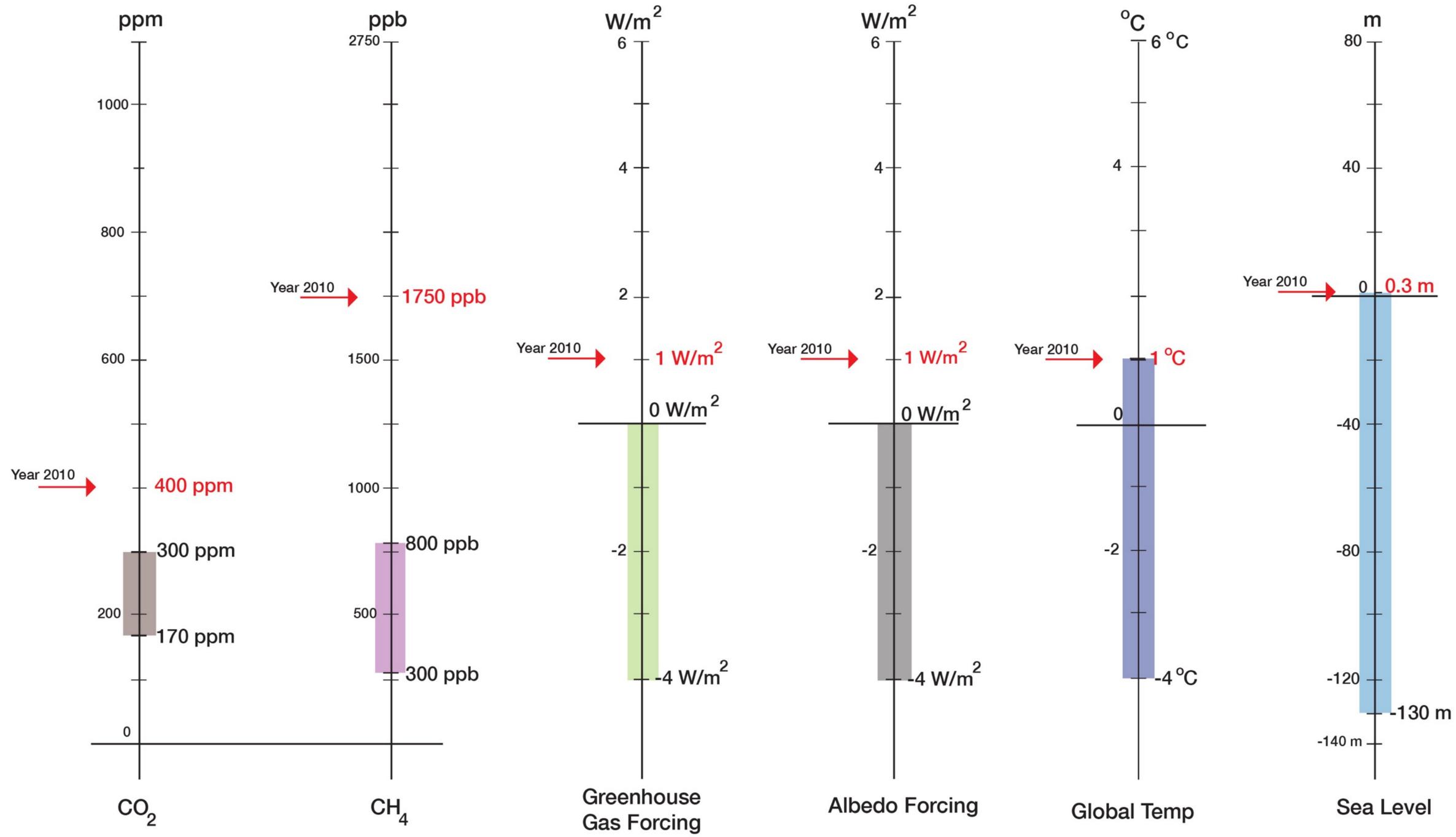
NatCatSERVICE

Loss events worldwide 1980 – 2013

Number of events



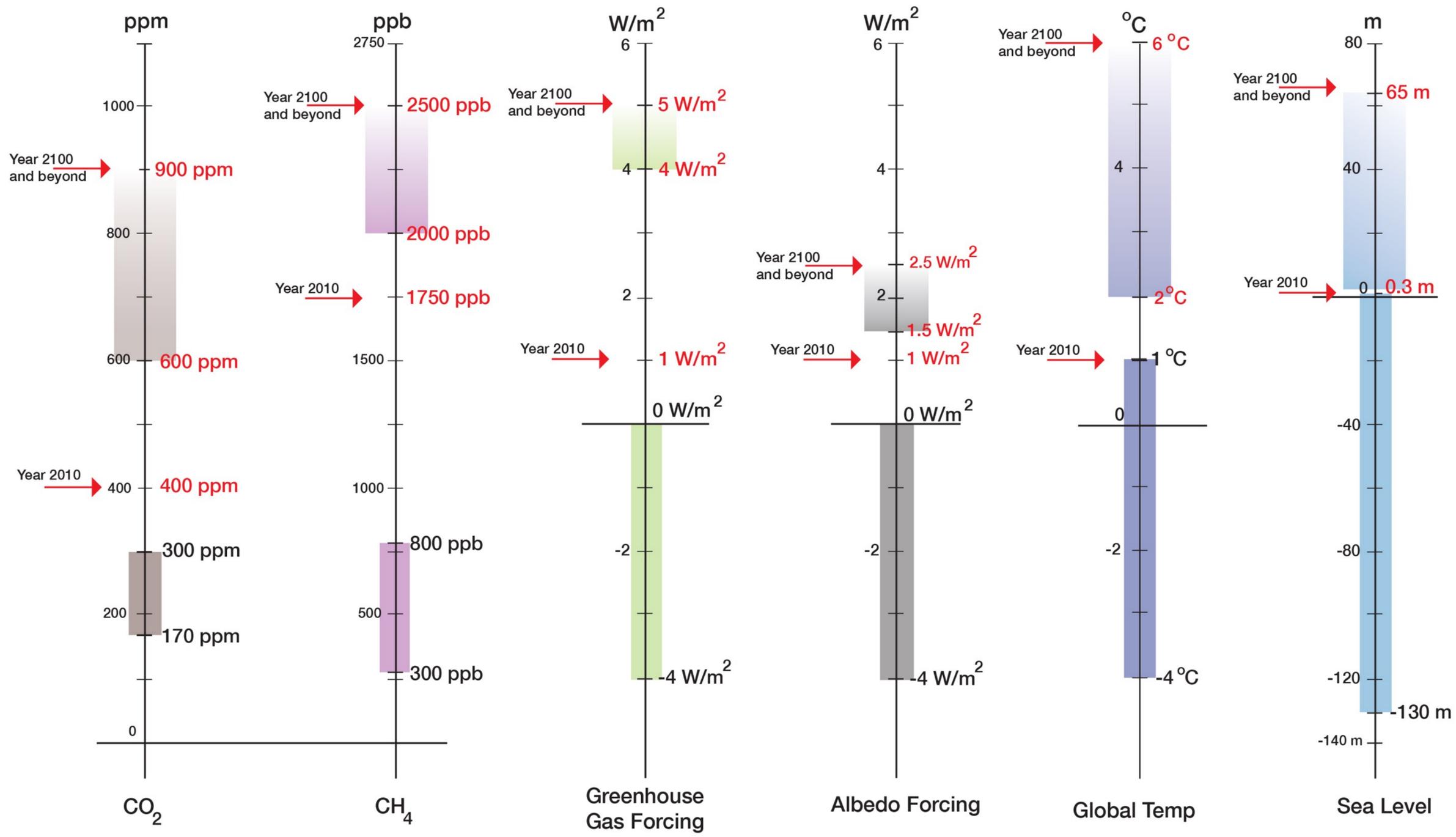
Foreseeability: Hazards and Disasters



“Current State”

“Normal Range”
(800,000 years)

Foreseeability: Hazards and Disasters



“Prognosis”

“Current State”

“Normal Range”
(800,000 years)



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RESEARCH PROGRAM ON
**Climate Change,
Agriculture and
Food Security**



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Foresight and Priority Setting

Food security, poverty reduction and sustainable natural resource management interventions need to be robust if they are to meet the challenges of a changing and uncertain climate. Ensuring their success, requires a strong *ex-ante* analytical capacity to diagnose points of vulnerability and intervention and the trade-offs between environmental and socioeconomic impacts.

Major components of CCAFS involve foresight studies, vulnerability assessment and *ex ante* impact assessment. These components have a strong capacity enhancement component ensuring that the methods are used outside and



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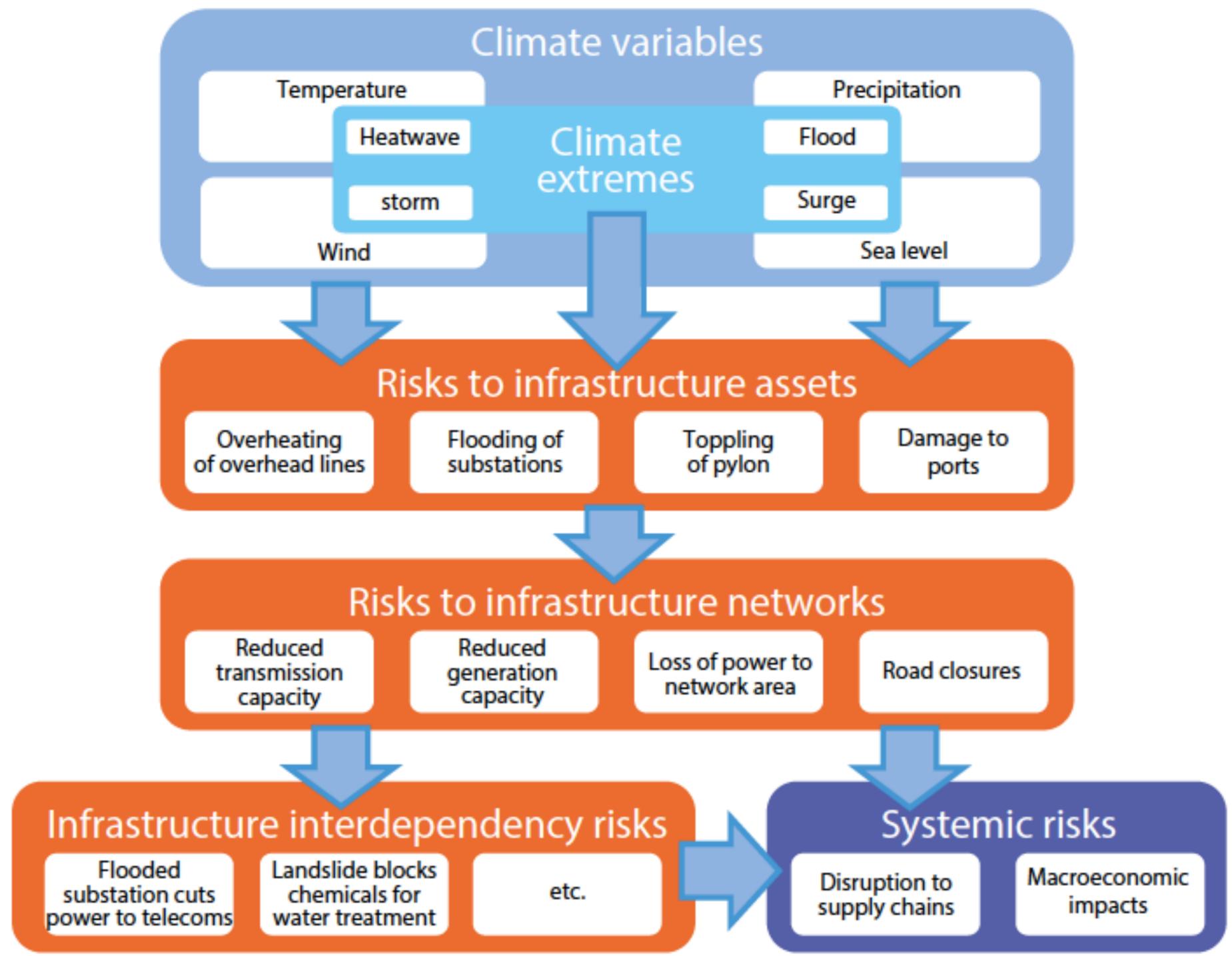
SA Innovation Summit - Accelerate-Innovate-Ignite!

SA Innovation Summit -



Foreseeability: Hazards and Disasters

Figure SR.A2: Example relationships between climate variables and infrastructure impacts



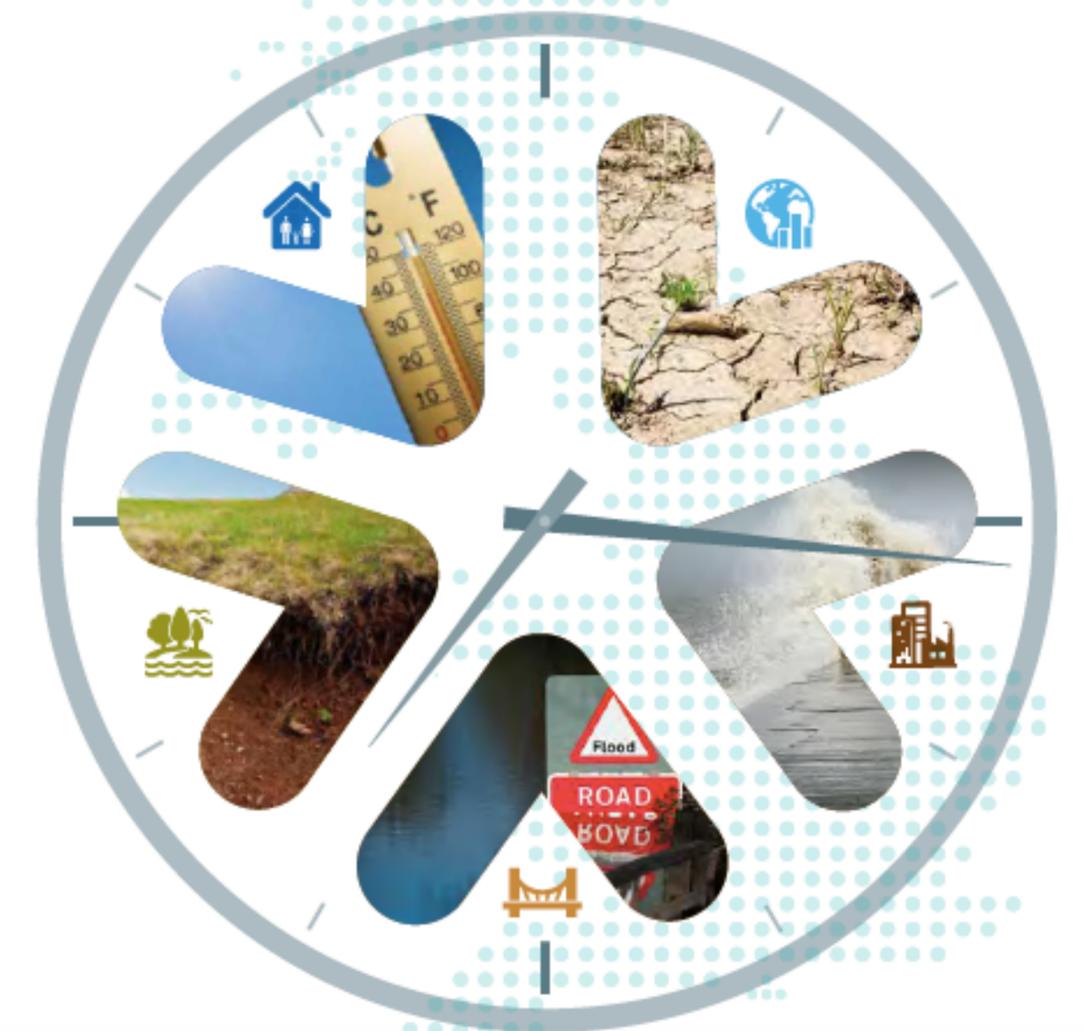
Source: CCRA2 Evidence report, Chapter 4.



UK 2017 Climate Change Risk Assessment

UK Climate Change Risk Assessment 2017

Synthesis report: priorities for the next five years



Foreseeability: Hazards and Disasters

Figure SR.1: Top six areas of inter-related climate change risks for the United Kingdom

<p>Flooding and coastal change risks to communities, businesses and infrastructure (Ch3, Ch4 Ch5, Ch6)</p>	<p>MORE ACTION NEEDED</p>
<p>Risks to health, well-being and productivity from high temperatures (Ch5, Ch6)</p>	
<p>Risk of shortages in the public water supply, and for agriculture, energy generation and industry (Ch3, Ch4, Ch5, Ch6)</p>	
<p>Risks to natural capital, including terrestrial, coastal, marine and freshwater ecosystems, soils and biodiversity (Ch3)</p>	
<p>Risks to domestic and international food production and trade (Ch3, Ch6, Ch7)</p>	
<p>New and emerging pests and diseases, and invasive non-native species, affecting people, plants and animals (Ch3, Ch5, Ch7)</p>	<p>RESEARCH PRIORITY</p>
<p>NOW -----> RISK MAGNITUDE -----> FUTURE LOW MEDIUM HIGH</p>	

Source: ASC synthesis of the main areas of risk and opportunity within the chapters of the Evidence Report.
Notes: Future magnitude is based on a combination of climate change and other drivers of risk (e.g. demographic change), taking account of how current adaptation policies and plans across the UK are likely to reduce risks.



UK 2017 | Climate Change Risk Assessment

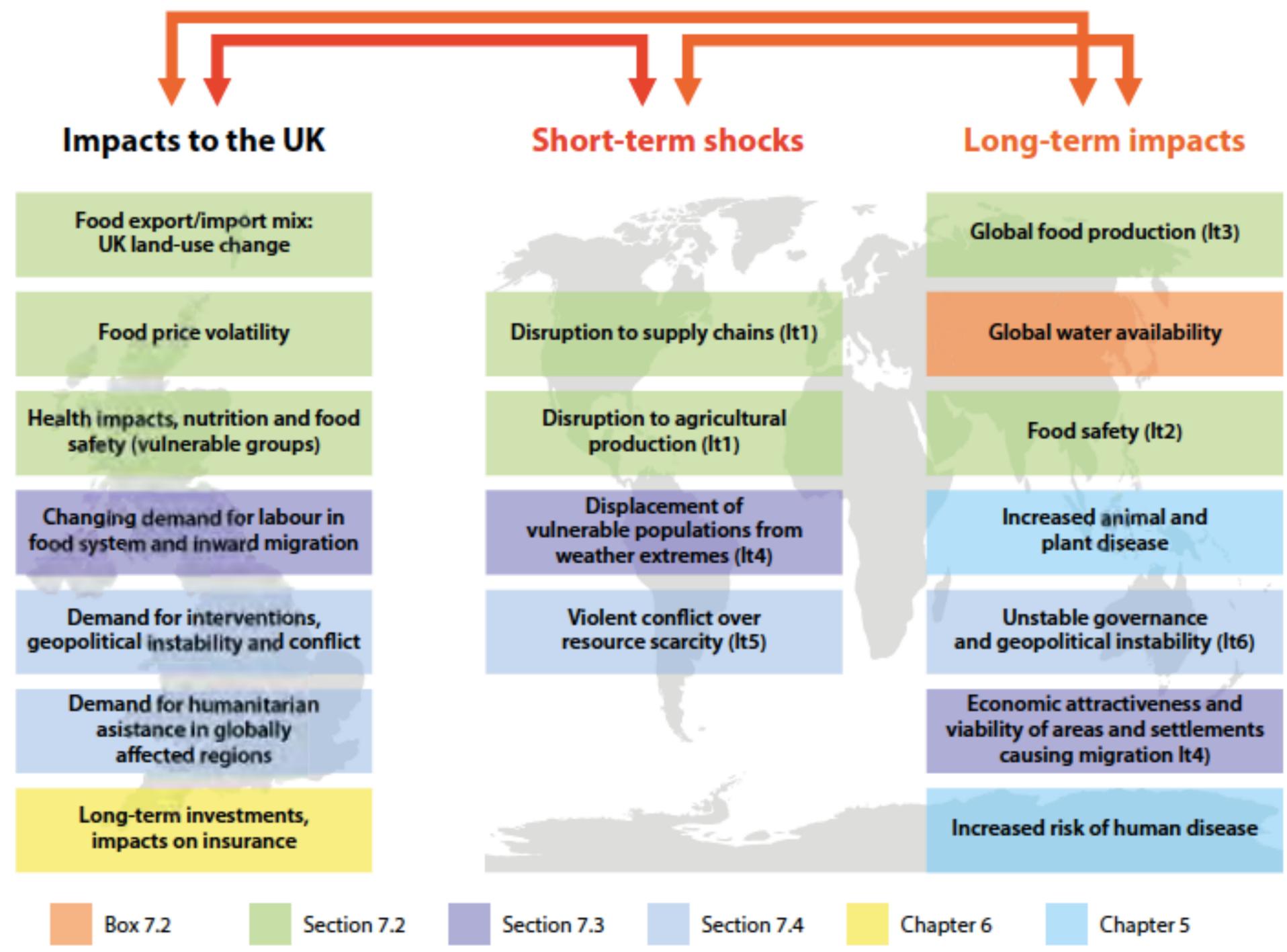
UK Climate Change Risk Assessment 2017

Synthesis report: priorities for the next five years



Foreseeability: Hazards and Disasters

Figure SR.A5: International dimensions of climate change risk



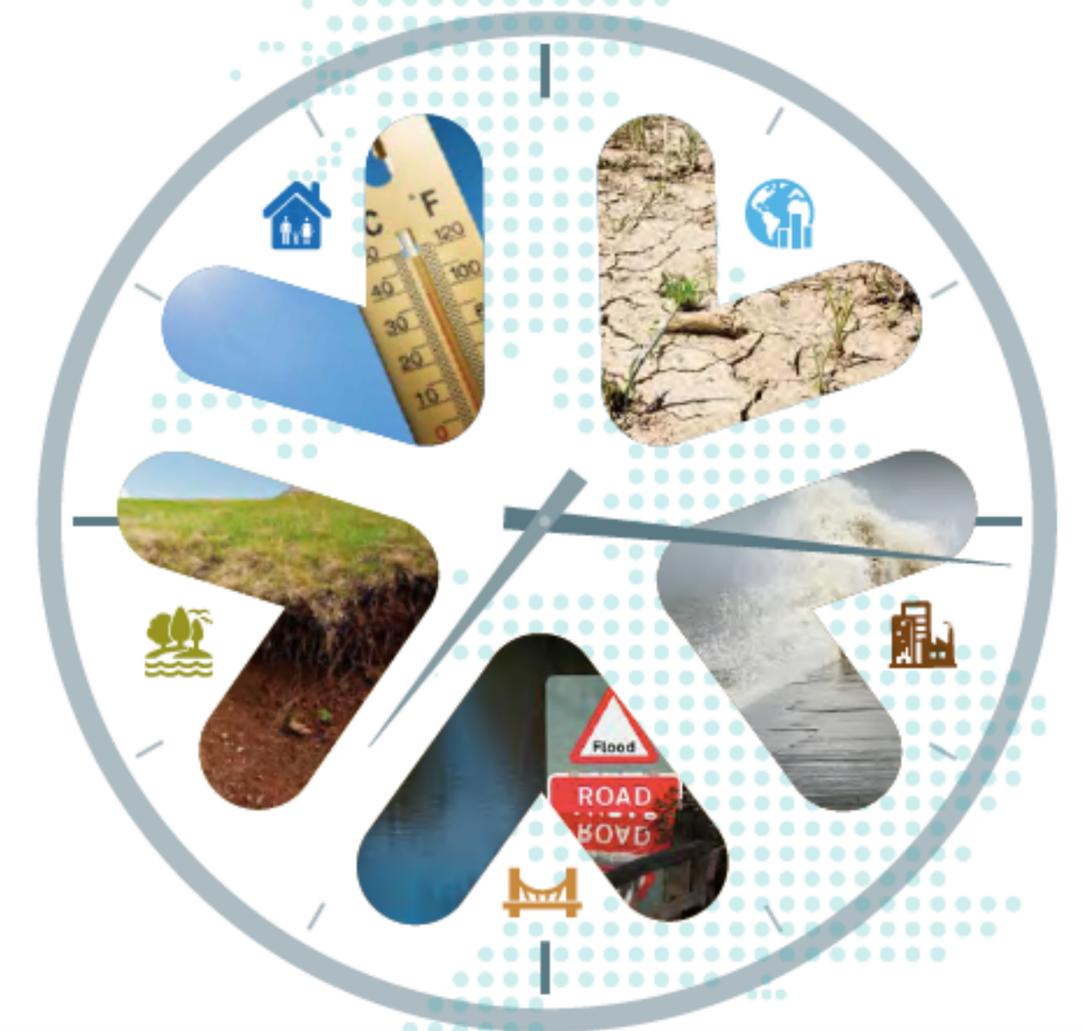
Source: CCRA2 Evidence Report, Chapter 7.



UK 2017 Climate Change Risk Assessment

UK Climate Change Risk Assessment 2017

Synthesis report: priorities for the next five years



Decision Making Under Uncertainty (DMUU):
Planning and preparing for a (somewhat) predictable future

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- understanding the vulnerabilities and comprehensively assessing the risks
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- having early warning (for extreme events and rapid impacts)

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How do we assess, and plan for, events that have never happened?

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- Determine the range of risks to be reduced based on these trajectories and vulnerabilities
- Adapt land use, building codes, protective measures accordingly

Decision Making Under Foreseeability (DMUF):

Anticipating and preparing for surprises, developing general resilience

Knowing the “worst case” and facilitating adaptation to unpredictable future:

- understanding the vulnerabilities and comprehensively assessing the risks
- including the worst cases (food, water, heat waves, droughts, storms, sicknesses, social unrest, wars, ...)
- having early warning (for extreme events and rapid impacts)

How do we assess, and plan for, events that have never happened?

Knowing the paradigms our decision making is based on ...

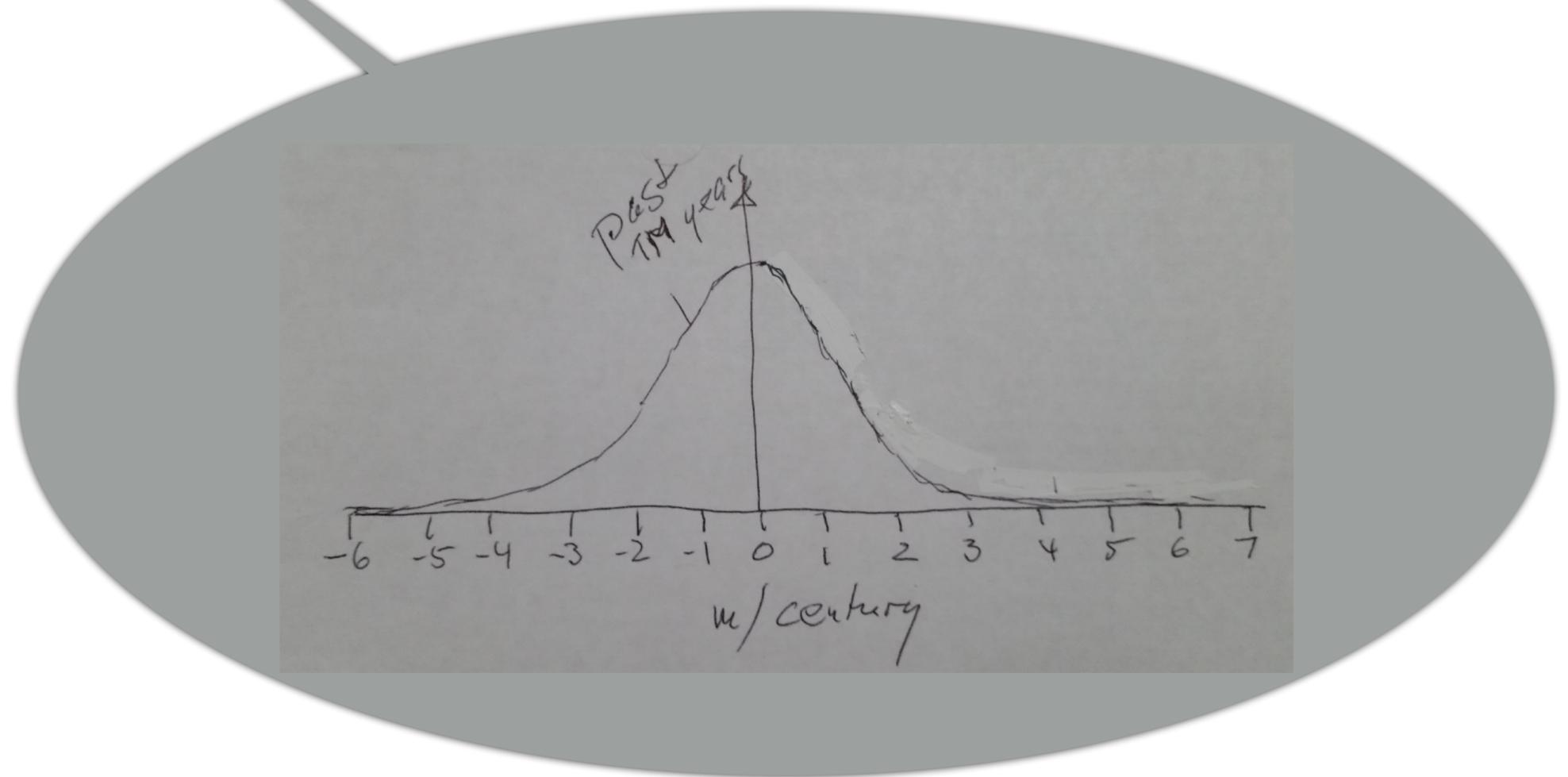
Decision Making Under Foreseeability (DMUF): *Having Foresight*

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Planning for any limited range of plausible LSL trajectories inherently ignores part of the “probability density function” (PDF) of future LSL.

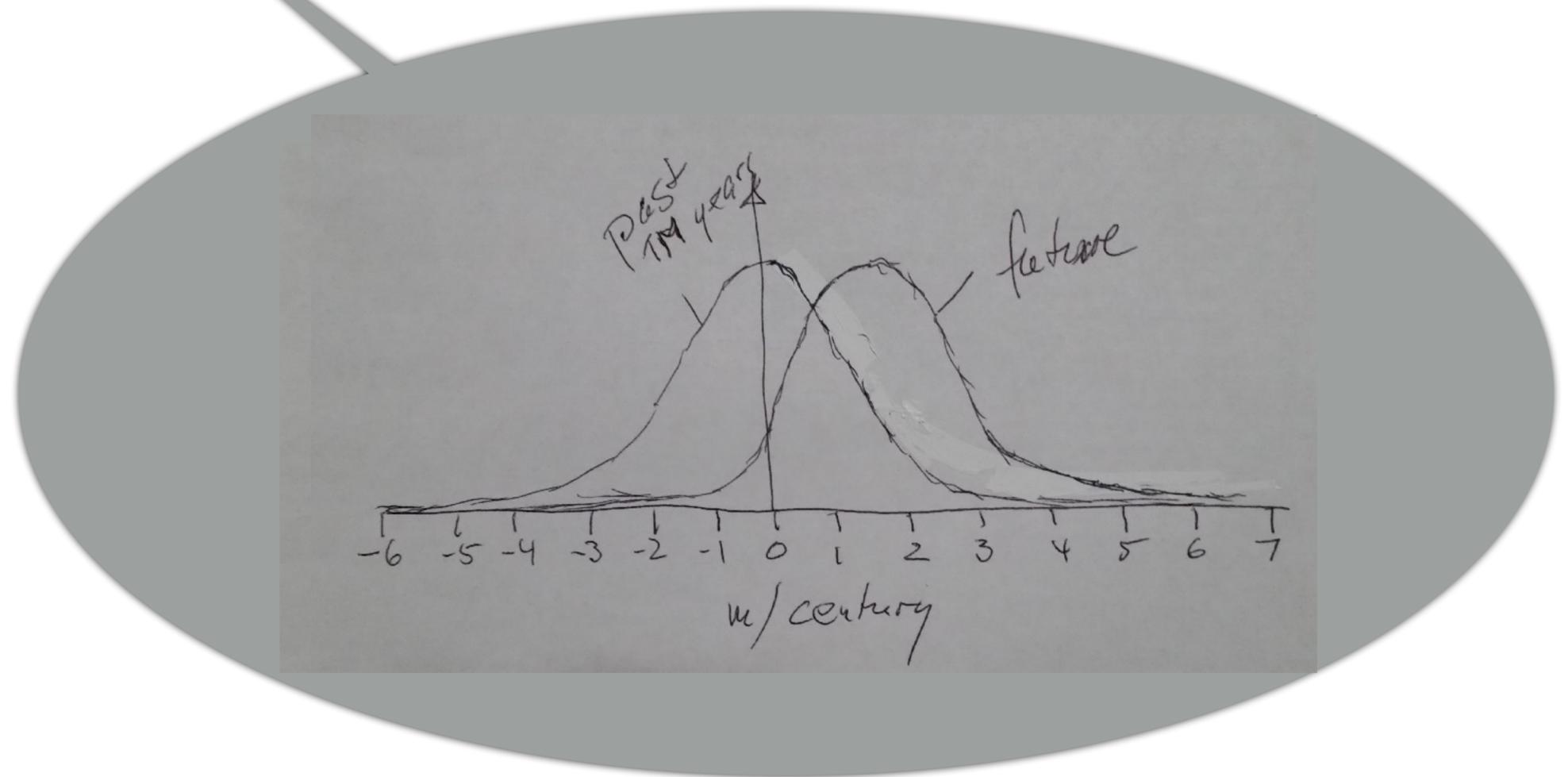
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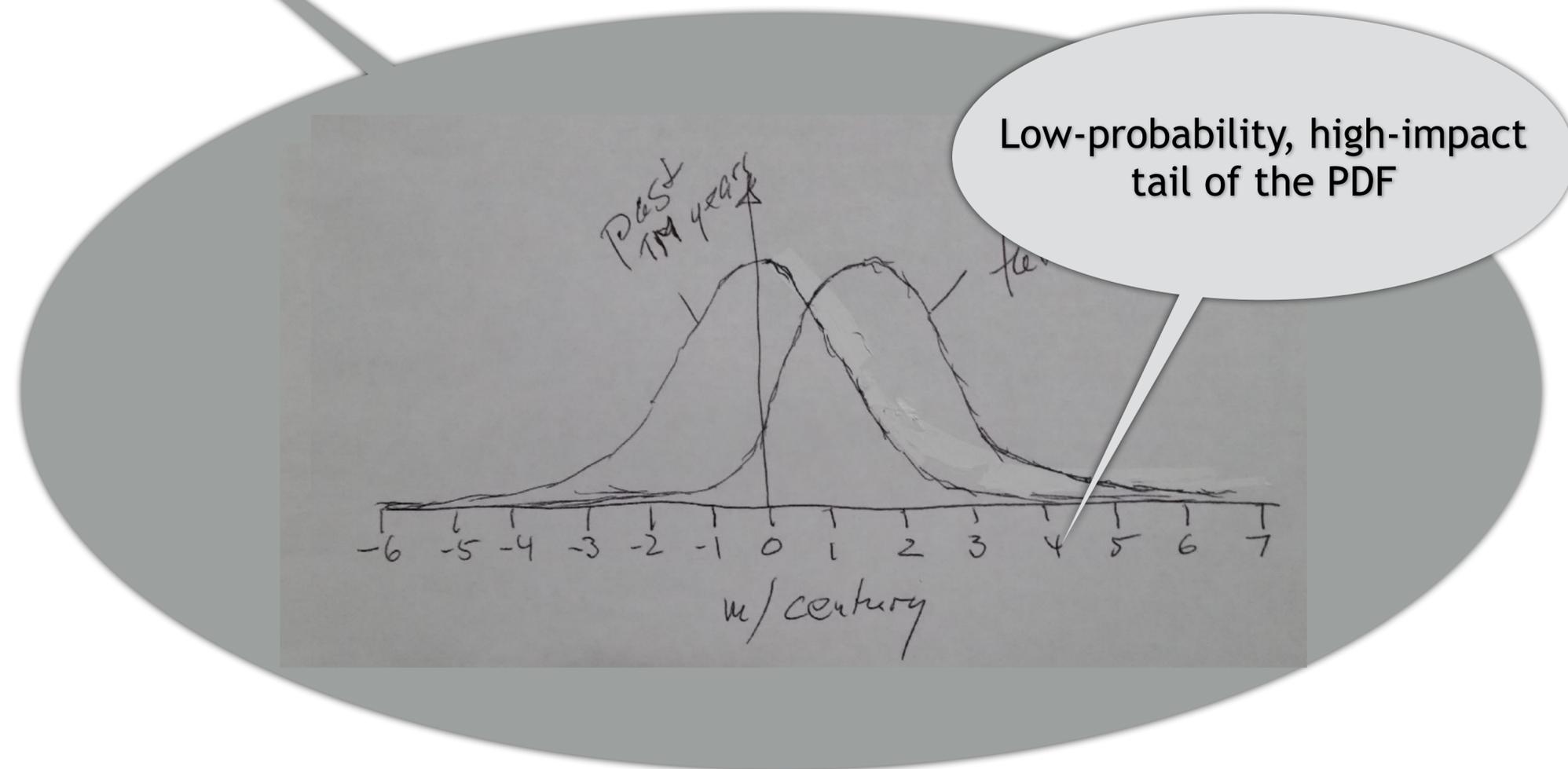
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How large is the risk associated with the part of the PDF not considered?
MOST LIKELY VERY LARGE, BUT WE DON'T HAVE A SOLID ASSESSMENT

How likely is it that LSL might by far outside the limited range considered?
WE CANNOT EXCLUDE THIS TO HAPPEN IN THE “Post-Holocene”

How likely would that turn into a low-probability, high-impact event?
MOST LIKELY, THIS WOULD BE A GLOBAL DISASTER

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Paradigm shift to overcome normalcy bias:
Instead of “Sea level is stable” (last 6,000 years)
assume “Sea level is variable!”



