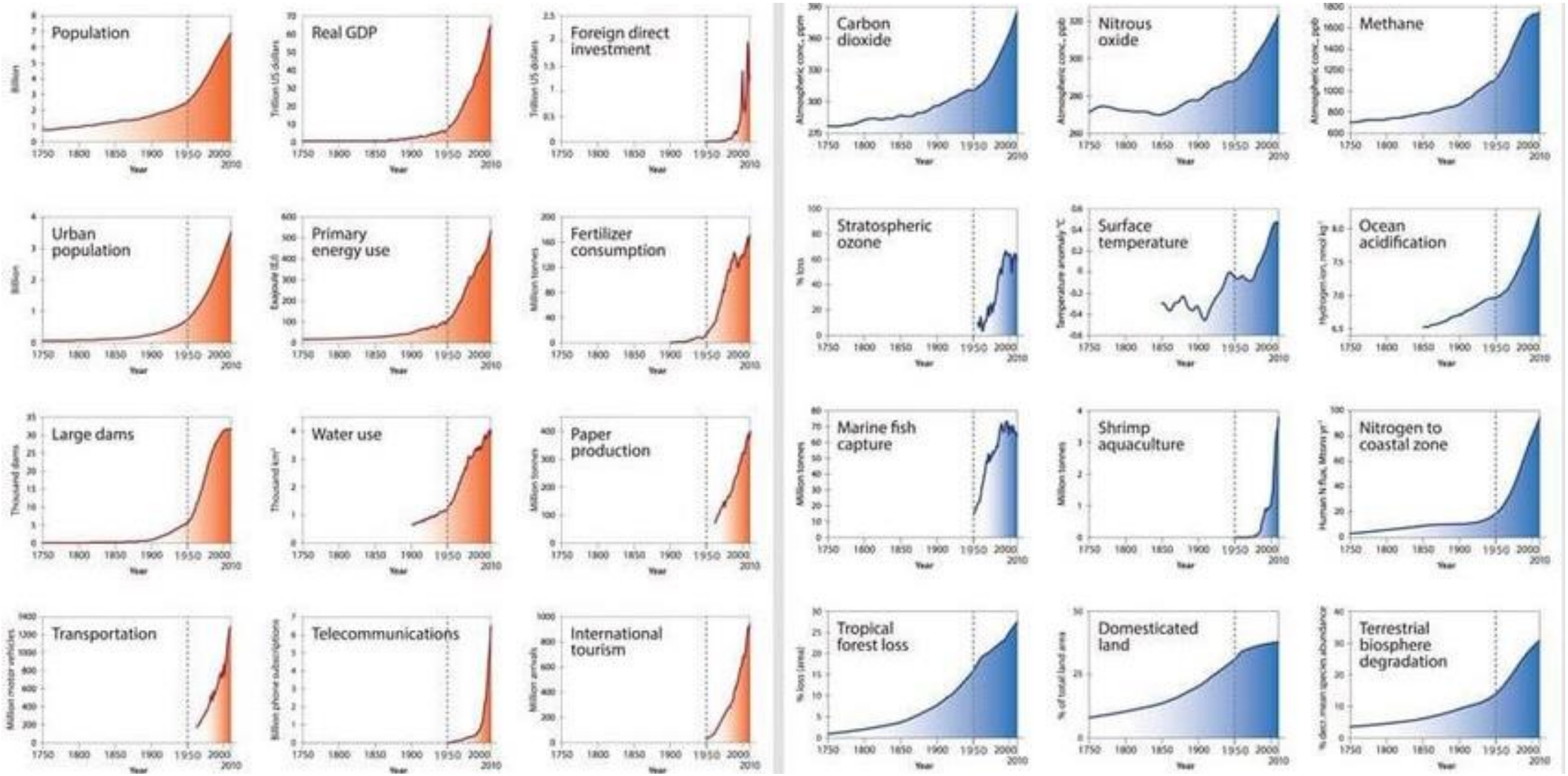
Economic Transformation in Capitalist Society

THE ECONOMY AND THE ANTHROPOCENE

WWW.ERIKCHEVRIER.CA

Live people eat dead mushrooms. Live mushrooms eat dead people.

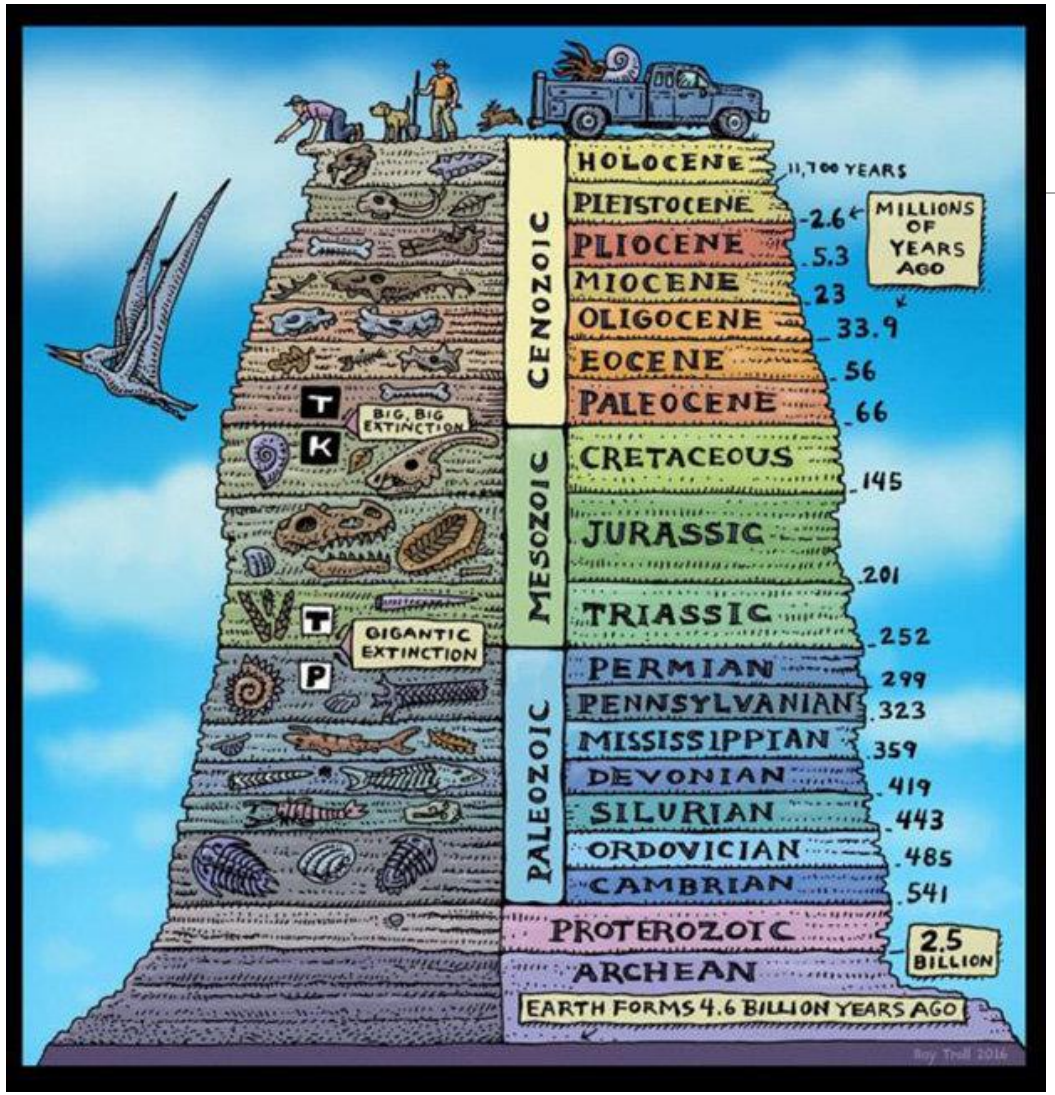

Population
Real GDP
Foreign direct investment
Urban population
Primary energy use
Fertilizer consumption
Large dams
Water use
Paper production
Transportation
Telecommunications
International tourism
Carbon dioxide
Nitrous oxide
Methane
Stratospheric ozone
Surface temperature
Ocean acidification
Marine fish capture
Shrimp aquaculture
Nitrogen to coastal zone
Tropical forest loss
Domesticated land
Terrestrial biosphere degradation
1750
1800
1850
1900
1950
2000
2010
Year

Are We in the Anthropocene Epoch?

The Anthropocene

(Angus, I. (2016) Facing the Anthropocene: Fossil Capitalism and the Crisis of the Earth System, Monthly Review Press)

- Human population has grown tenfold in three centuries
- Humans are in the process of exhausting fossil fuel reserves that were generated over several hundred millions of years ago
- Nearly 50% of the land surface has been transformed by human action
- Synthetic nitrogen is being used in massive amounts
- More than half the freshwater is being used directly and indirectly by humans
- CO_2 and CH_4 have increased substantially
- Costal and marine habitats have been dramatically altered, 50% of mangroves have been removed
- 22% of fisheries are overexploited and 44% more are at their limits
- Biodiversity is reducing drastically
- Rainforests are being destroyed at rapid rates
- Widespread dam building for energy



Younger

Older

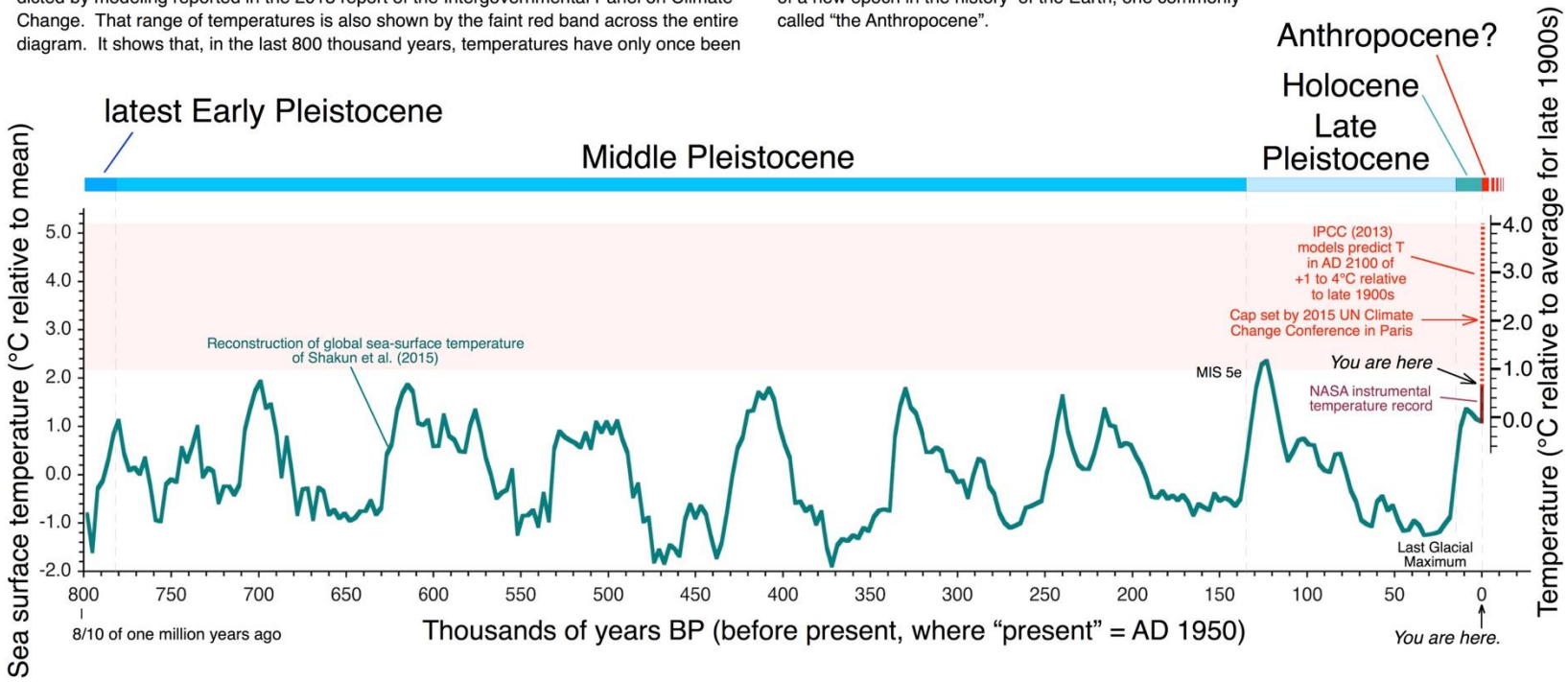
Eon	Era	Period	Epoch	
Phanerozoic	Cenozoic	Quaternary	Holocene	← Today
			Pleistocene	← 11.8 Ka
		Neogene	Pliocene	
			Miocene	
		Paleogene	Oligocene	
			Eocene	
			Paleocene	← 66 Ma
	Mesozoic	Cretaceous	~	
		Jurassic	~	
		Triassic	~	← 252 Ma
	Paleozoic	Permian	~	
		Carboniferous: Pennsylvanian	~	
		Carboniferous: Mississippian	~	
		Devonian	~	
		Silurian	~	
		Ordovician	~	
		Cambrian	~	← 541 Ma
Proterozoic	~	~	~	← 2.5 Ga
Archean	~	~	~	← 4.0 Ga
Hadean	~	~	~	← 4.54 Ga

Temperatures from the Middle Pleistocene to the future

The diagram below shows in green a reconstruction of sea-surface temperature made from multiple marine sediment sequences, using the Mg/Ca ratios in the calcite ($CaCO_3$) of fossil planktic foraminifera. The record is plotted relative to its mean because temperatures at lower latitude locations were greater than those at high-latitude locations, but all show the same pattern and thus can be "stacked" to give one record of relative temperature.

In the rightmost part of the diagram, in the part representing the last 150 years, a dark red solid curve shows average Earth-surface temperature as derived from multiple thermometer records. A dashed bright red line shows the range of temperatures predicted by modeling reported in the 2013 report of the Intergovernmental Panel on Climate Change. That range of temperatures is also shown by the faint red band across the entire diagram. It shows that, in the last 800 thousand years, temperatures have only once been as high as those expected by AD 2100. That one time was during the last interglacial, the Eemian or MIS 5e, when sea level was at least six meters higher than present.

Another FQS page shows the last 22 thousand years in more detail; it is called "Temperatures from the Last Glacial Maximum to the future". Like this one, it shows that the rate of temperature increase in the last 150 years and the temperatures expected in the coming century are strikingly unlike those of the Holocene and Pleistocene. The changes that have happened and are expected are so great that they merit great concern from a societal standpoint and, from a geological standpoint, merit recognition of a new epoch in the history of the Earth, one commonly called "the Anthropocene".



Sources, from left to right:

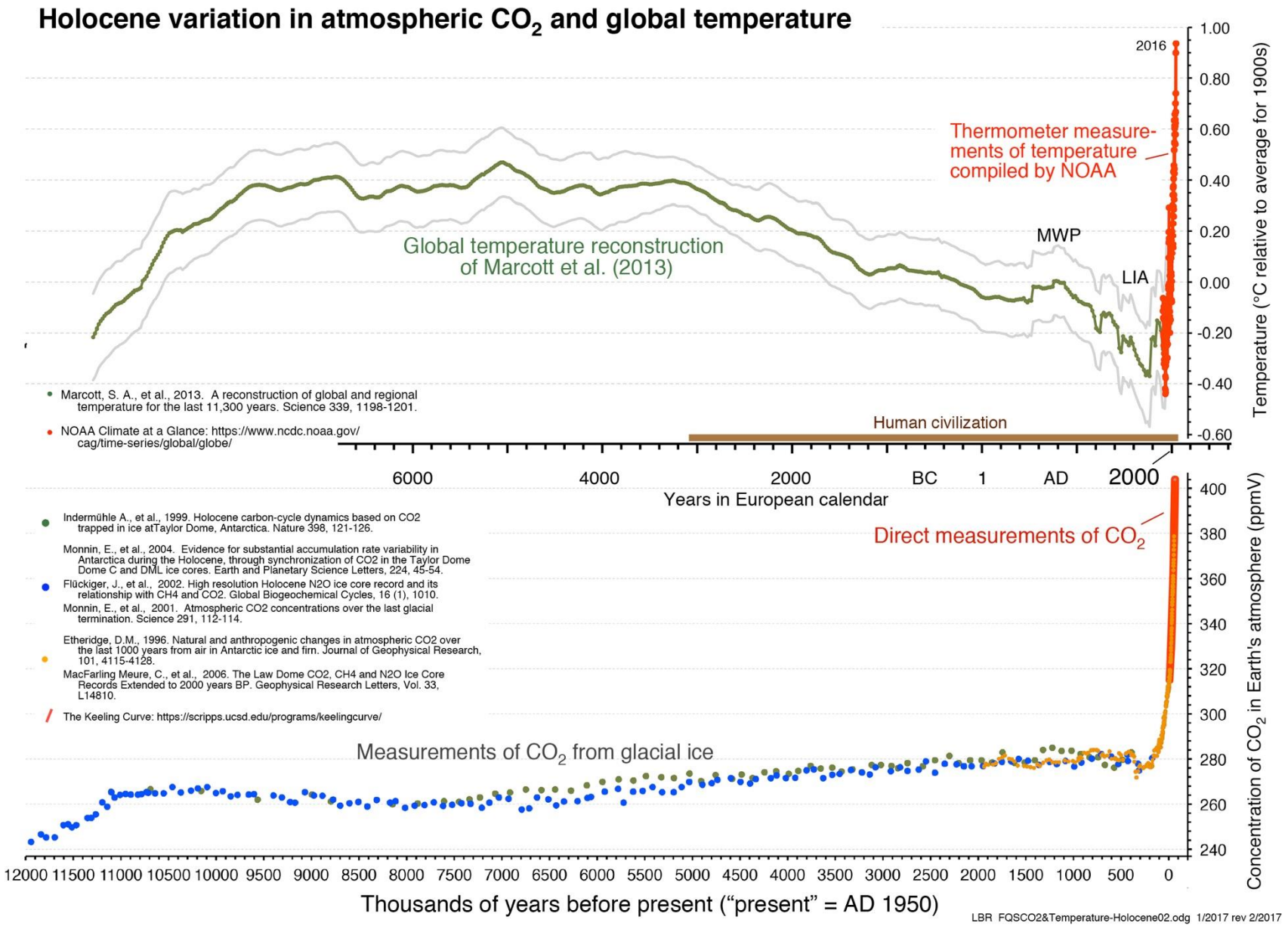
Shakun, J. D., Lea, D.W., Lisiecki, L.E., and Raymo, M.E., 2015, An 800-kyr record of global surface ocean $\delta^{18}O$ and implications for ice volume-temperature coupling. Earth and Planetary Science Letters 426, 58-68.

U.S. National Aeronautics and Space Administration (NASA) GISS Surface Temperature Analysis at data.giss.nasa.gov/gistemp/graphs_v3/ accessed 20 December 2015.

Intergovernmental Panel on Climate Change (IPCC), 2013. Summary for Policymakers. In: Stocker, T.F., Qin, D., Plattner, G.-K., Tignor, M., Allen, S.K., Boschung, J., Nauels, A., Xia, Y., Bex, V., Midgley, P.M. (Eds.), Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

LBR FQS800katoFutureTemps01.odg 12/2015

Railsback's *Fundamentals of Quaternary Science*

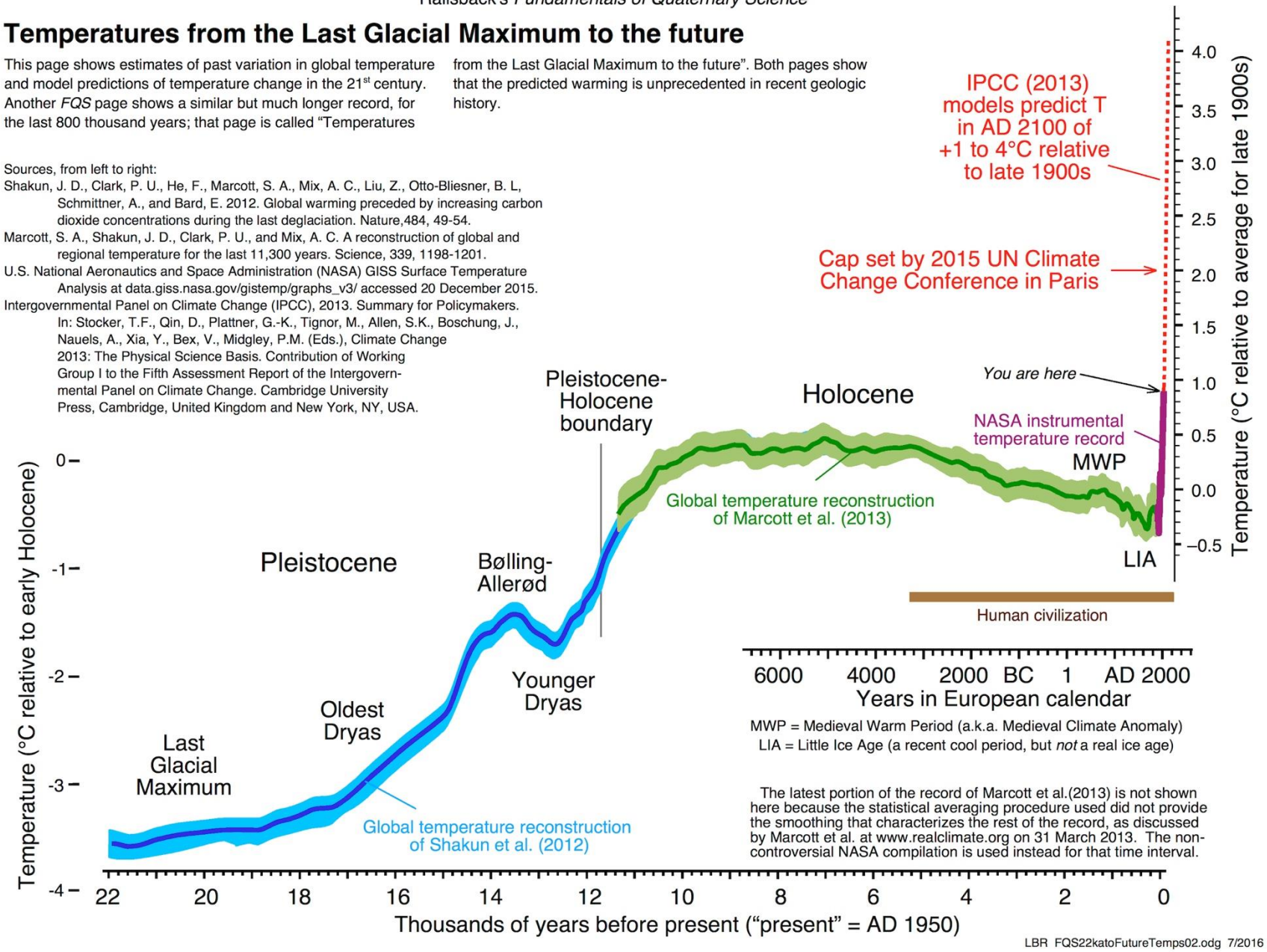


LBR FQSCO2&Temperature-Holocene02.odg 1/2017 rev 2/2017

Temperatures from the Last Glacial Maximum to the future

This page shows estimates of past variation in global temperature and model predictions of temperature change in the 21st century. Another *FQS* page shows a similar but much longer record, for the last 800 thousand years; that page is called "Temperatures from the Last Glacial Maximum to the future". Both pages show that the predicted warming is unprecedented in recent geologic history.

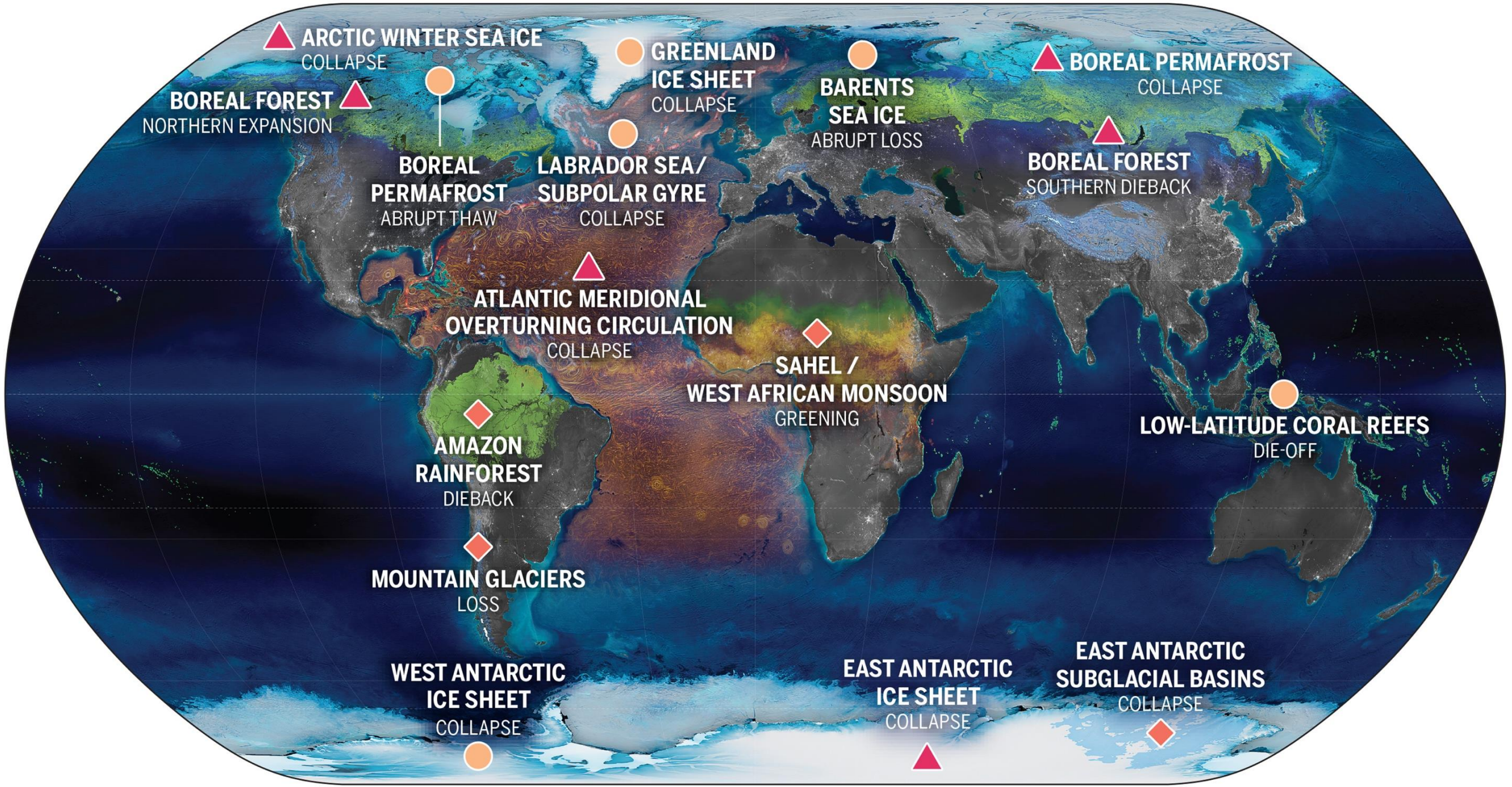
Sources, from left to right:
Shakun, J. D., Clark, P. U., He, F., Marcott, S. A., Mix, A. C., Liu, Z., Otto-Bliesner, B. L, Schmittner, A., and Bard, E. 2012. Global warming preceded by increasing carbon dioxide concentrations during the last deglaciation. Nature,484, 49-54.
Marcott, S. A., Shakun, J. D., Clark, P. U., and Mix, A. C. A reconstruction of global and regional temperature for the last 11,300 years. Science, 339, 1198-1201.
U.S. National Aeronautics and Space Administration (NASA) GISS Surface Temperature Analysis at data.giss.nasa.gov/gistemp/graphs_v3/ accessed 20 December 2015.
Intergovernmental Panel on Climate Change (IPCC), 2013. Summary for Policymakers. In: Stocker, T.F., Qin, D., Plattner, G.-K., Tignor, M., Allen, S.K., Boschung, J., Nauels, A., Xia, Y., Bex, V., Midgley, P.M. (Eds.), Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.



MWP = Medieval Warm Period (a.k.a. Medieval Climate Anomaly)
LIA = Little Ice Age (a recent cool period, but *not* a real ice age)

The latest portion of the record of Marcott et al.(2013) is not shown here because the statistical averaging procedure used did not provide the smoothing that characterizes the rest of the record, as discussed by Marcott et al. at www.realclimate.org on 31 March 2013. The non-controversial NASA compilation is used instead for that time interval.

LBR FQS22katoFutureTemps02.odg 7/2016

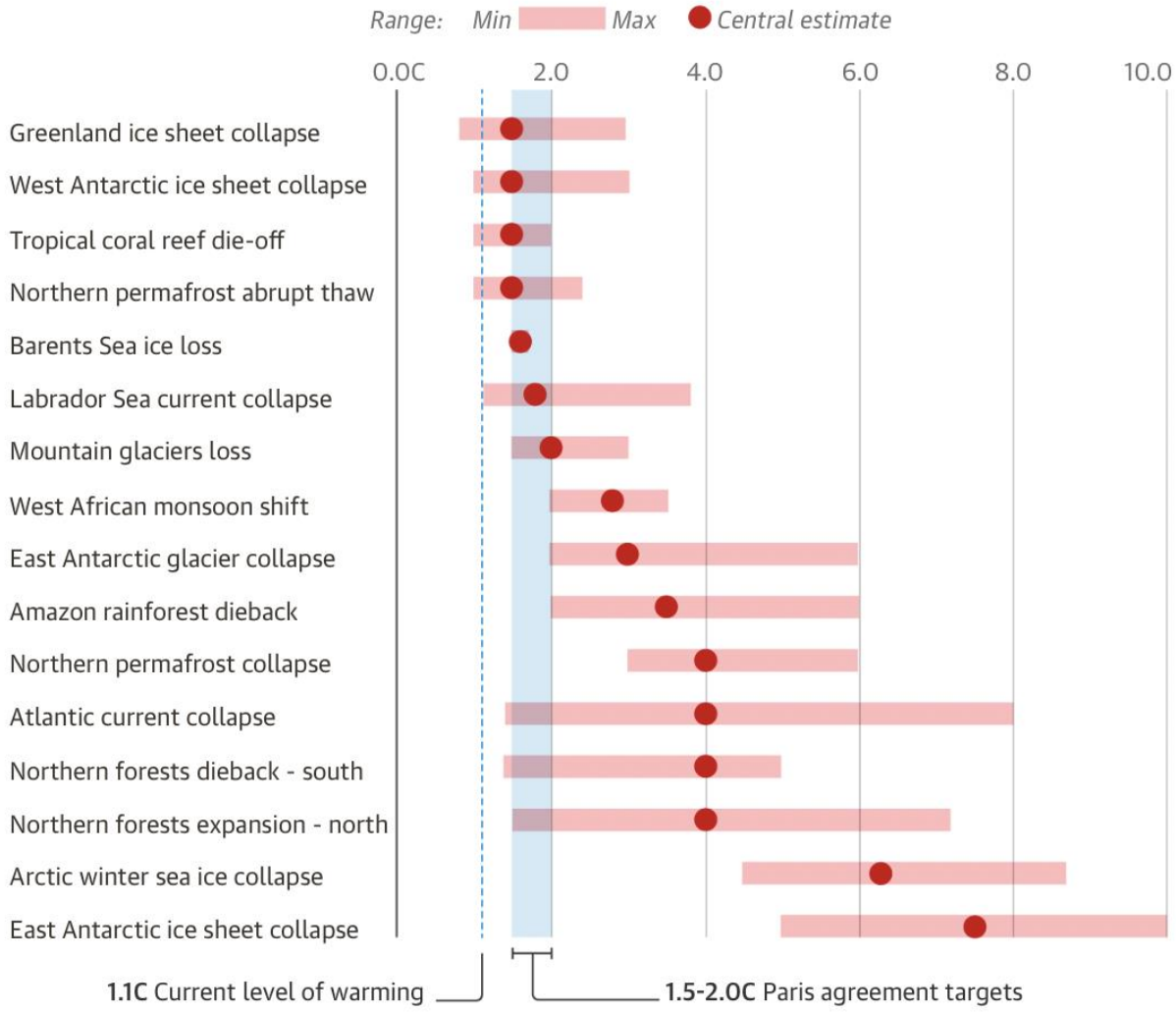


GLOBAL WARMING THRESHOLDS

<2°C 2–4°C ≥4°C

The risk of climate tipping points is rising rapidly as the world heats up

Estimated range of global heating needed to pass tipping point temperature



Guardian graphic. Source: Armstrong McKay et al, Science, 2022. Note: Current global heating temperature rise 1.1C Paris agreement targets 1.5-2.0C

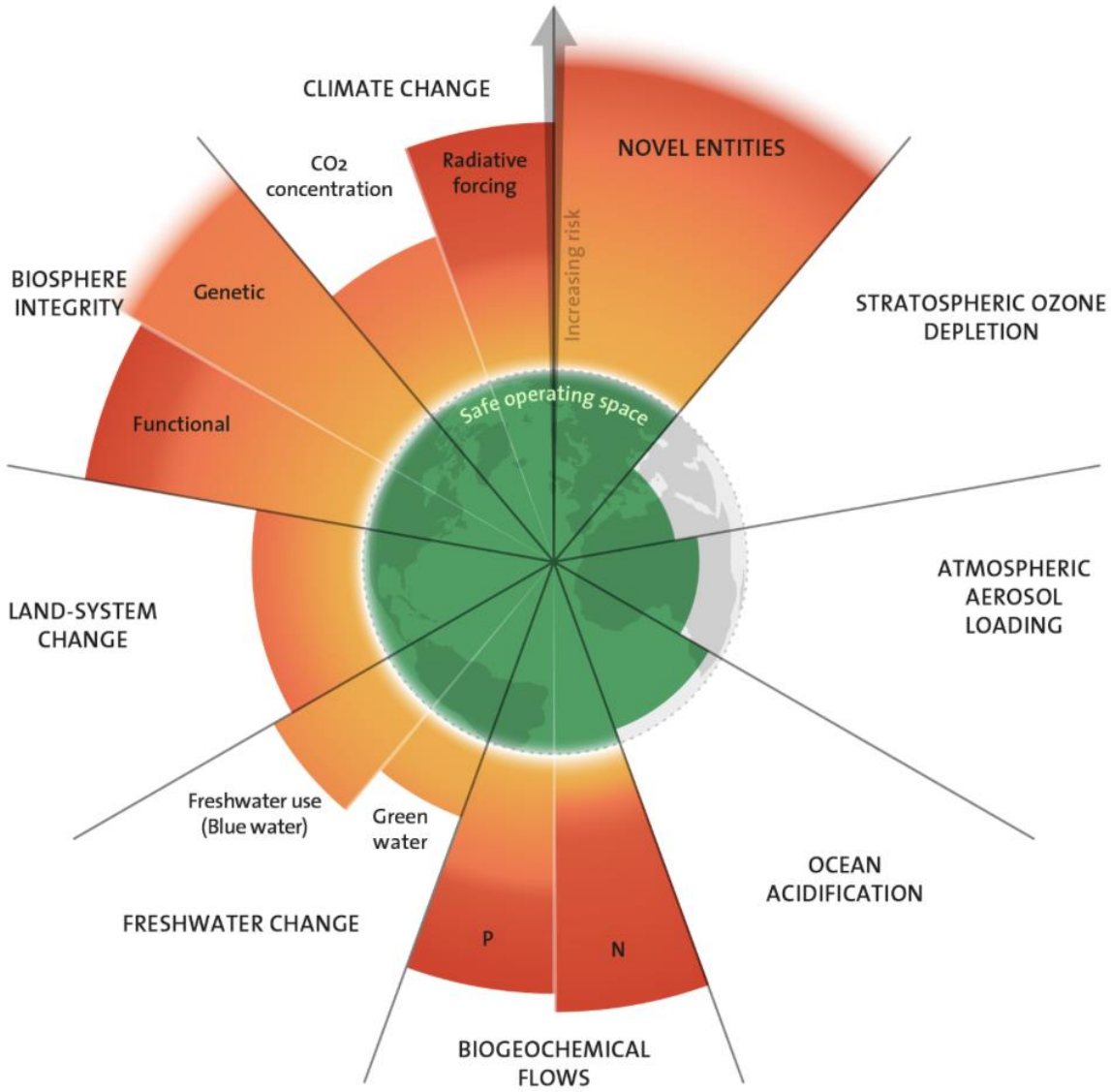
Planetary Limitations

What are the nine planetary limitations? Please describe one of the planetary limitations below?

Group 1 – What is biospheric integrity?
Group 2 – What is climate change?
Group 3 – What are novel entities?
Group 4 – What is stratospheric ozone depletion?
Group 5 – What is freshwater change?
Group 6 – What is ocean acidification?
Group 7 – What are biochemical flows?
Group 8 – What is land system change?
Group 9 – What is atmospheric aerosol loading?

- How are humans pushing the planet towards each of these limitations?
- How can we prevent surpassing these planetary limitations?
- How is your topic (below) connected with the other issues (also below)?
- Why is this topic important? What is the context (summarize introduction and discussion)?
- How did your other weekly reading relate to the discussion about planetary limitations?

Planetary Boundaries Website for More Information



The 2023 update to the Planetary boundaries. Licensed under CC BY-NC-ND 3.0. Credit: "Azote for Stockholm Resilience Centre, based on analysis in Richardson et al 2023". Download the illustration here.

Source

Reports About Rapid Ecological Change

IPCC Reports

Older Publications

Millennium Ecosystem Assessment

International Geosphere-Biosphere Program

Global Temperature Rise

Global Temperature Rise

Ice Sheets Melting

- Greenland Melting at Faster Rates

Artic Sea Ice Sheets Melting

Carbon Dioxide Production

Sea Level Rise

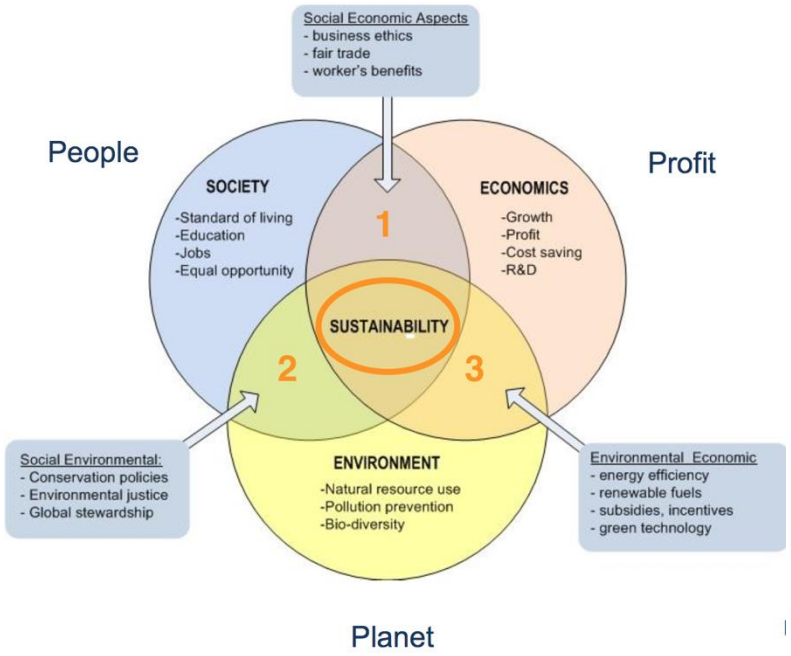
Ocean Heat

Discussion Question

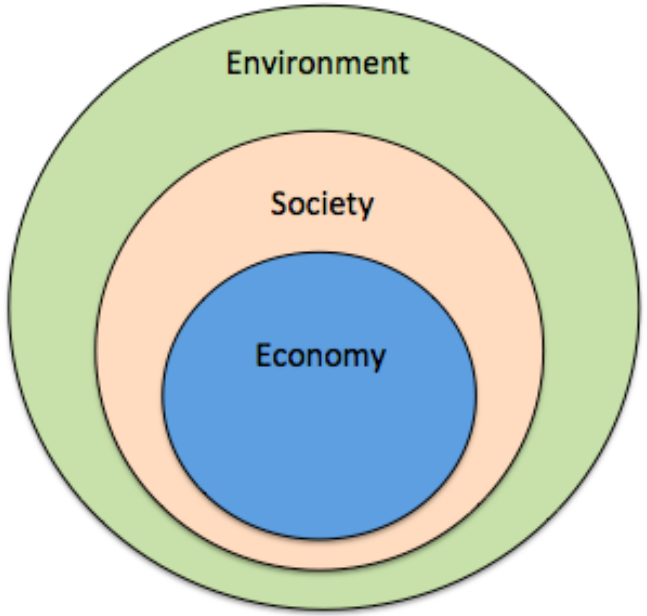
How can we develop political and economic systems that are part of the solution to ecological, social and economic issues?

From Sustainability to Food Sovereignty

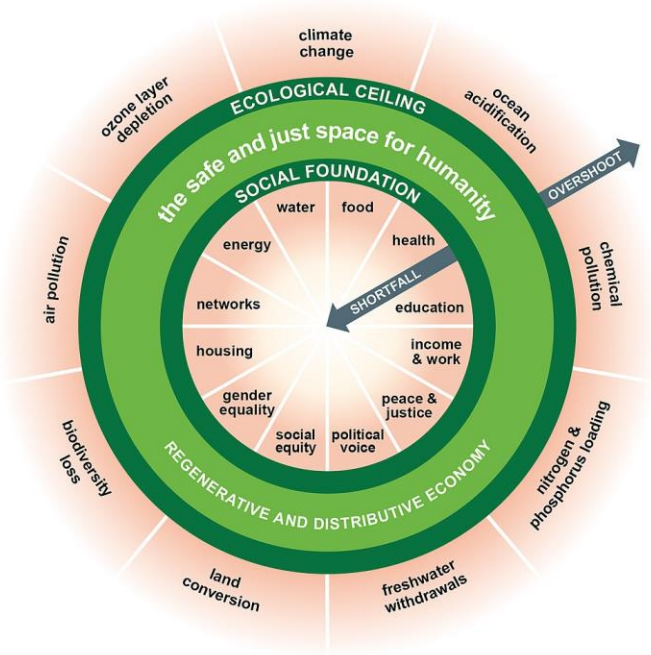
TRIPLE BOTTOM LINE



NESTED MODEL



Doughnut Model



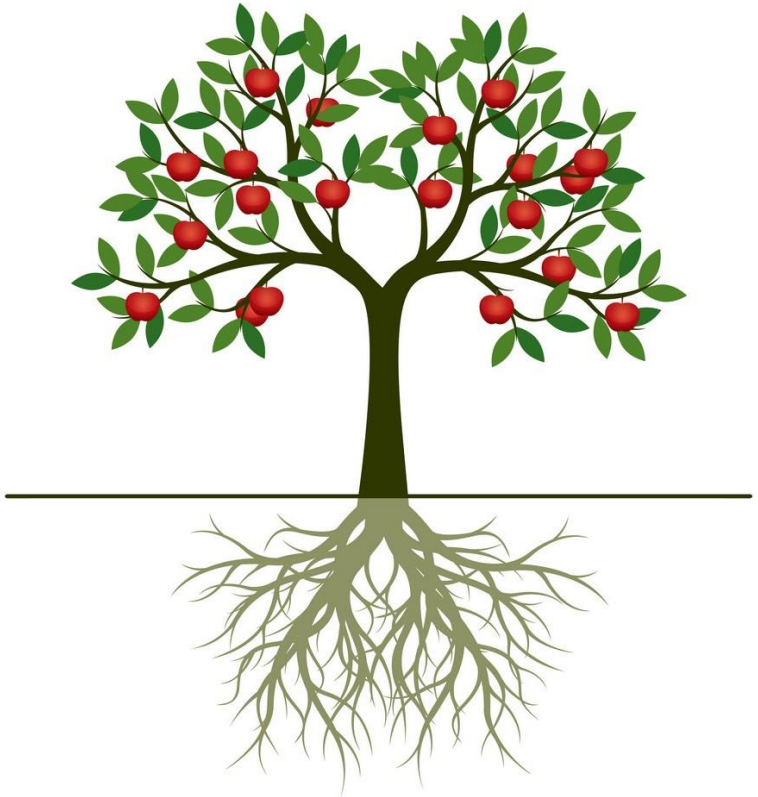
Is The Food System Broken?

Calls to “fix a broken food system” assume that the capitalist food system used to work well. This assumption ignores the food systems long, racialized history of mistreatment of people of colour. The food system is unjust and unsustainable, but it is not broken. It functions precisely as the capitalist food system has always worked, concentrating power in the hands of the privileged minority and passing off the social and environmental “externalities” disproportionately to racially stigmatized groups. (Holt-Gimenez, 2017, p. 160)

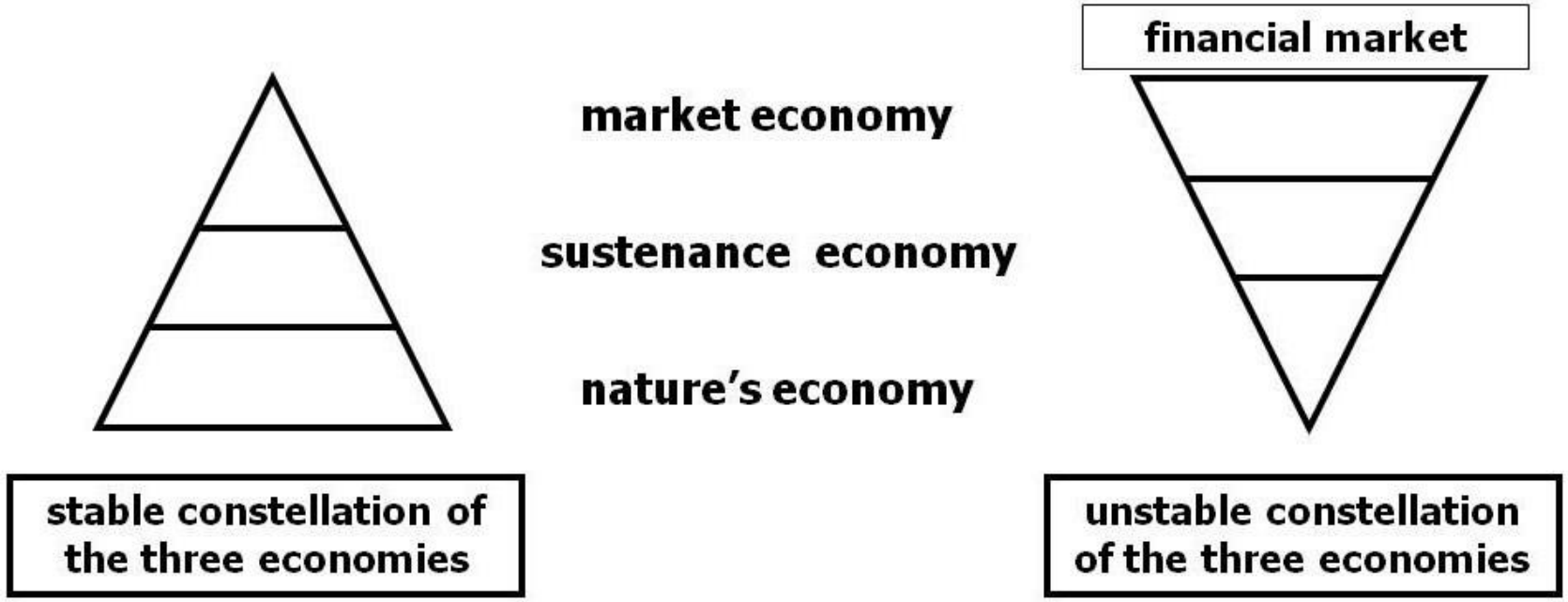
How we produce and consume determines how our society is organized, but how we organize socially and politically can also determine how we produce and consume. The implications of this are profound: our food systems are vessels of unmatched social and economic power and pivotal sites for systemic transformation. (Holt-Gimenez, 2017, p. 214)

Holt-Gimenez, E. (2017) A Foodie’s Guide to Capitalism: Understanding the Political Economy of What We Eat, Monthly Review Press, New York.

Problems – Symptoms – Root Causes



Living Economies – Vandana Shiva



Group Discussions

Group 1 – Capital
Group 2 – Value
Group 3 – Jevons's Hypothesis
Group 4 – Energy
Group 5 – Diverse economies
Group 6 – Social Reproduction
Group 7 – Food sovereignty
Group 8 – Metabolic Rift
Group 9 – Relative surplus value (vs absolute surplus value)
Group 10 – Strong vs weak-sustainability
Group 11 – Fictitious commodities (land, labour, money)

Questions

1 – Define each term
2 – How do these terms relate to planetary limits
3 – How can we understand these terms to mitigate against surpassing planetary limits?
4 – What is important about these terms in configuring a post-capitalist society?

Questions?

Thanks!