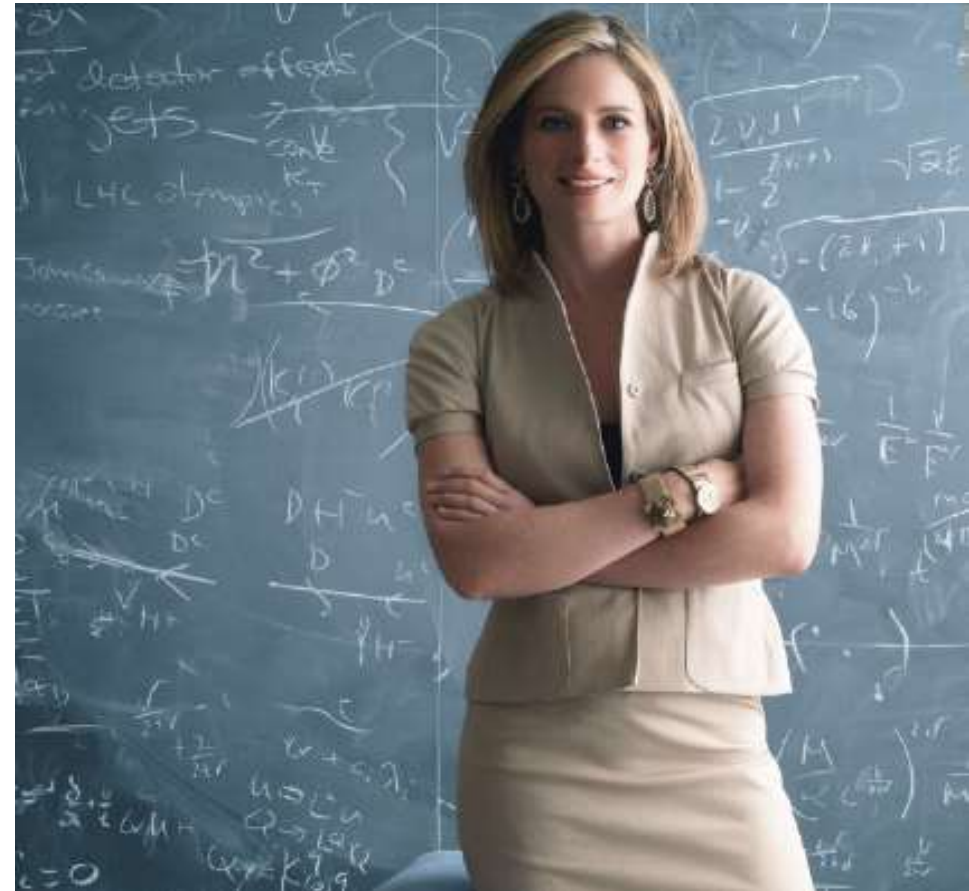
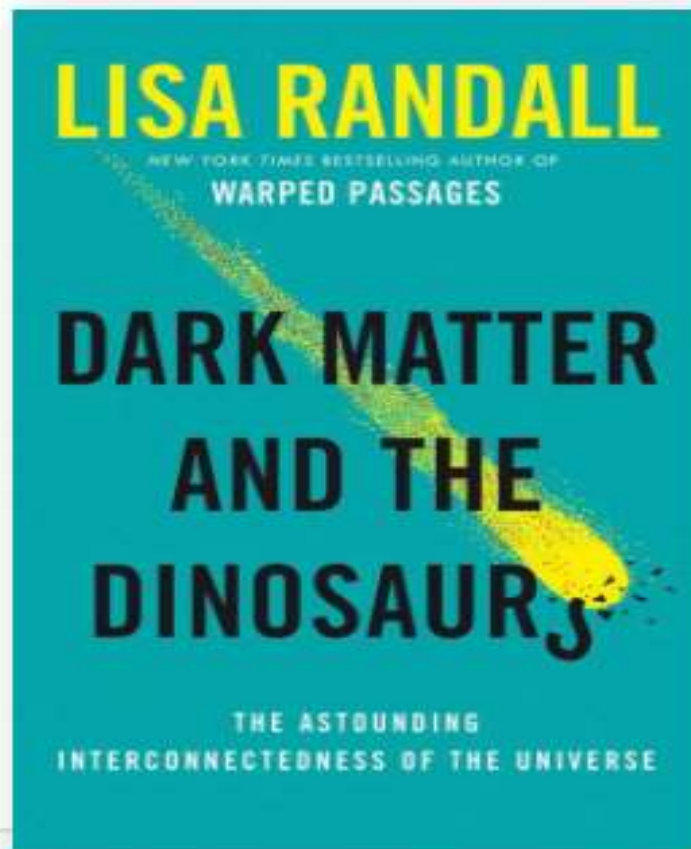




Living Within Limits

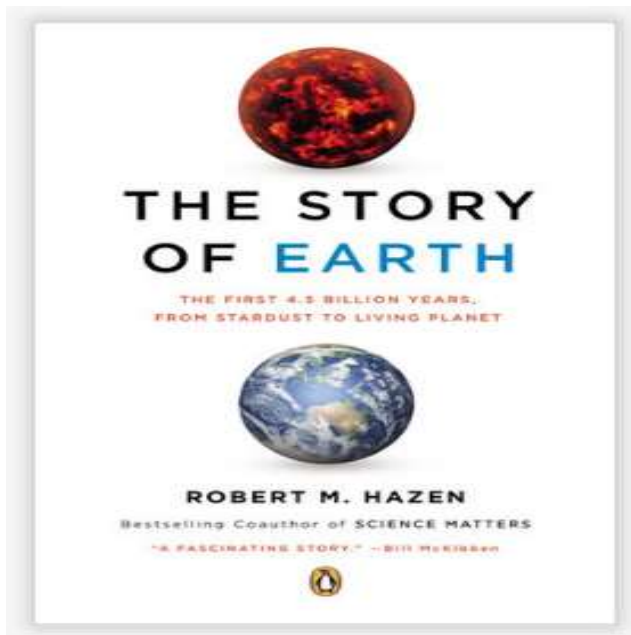
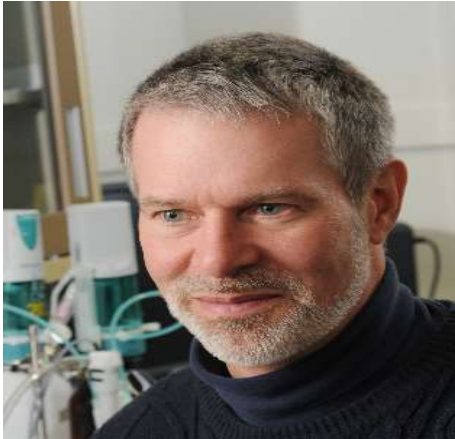
Gianfranco Bologna
Scientific Director WWF Italy



«Mi sta particolarmente a cuore la soddisfazione di aver compreso come i pezzi dell'Universo sono connessi in così tante e notevoli maniere. La lezione fondamentale, in sostanza, è che la fisica delle particelle elementari, la fisica del cosmo e la stessa biologia sono tutte correlate, non in un'accezione New Age, ma in modi sorprendenti che vale bene la pena comprendere.»

Evolution of **Minerals**

BY ROBERT M. HAZEN



- **«Viviamo in un solo minuscolo mondo all’interno di un cosmo che comprende cento miliardi di galassie, ciascuna formata da centinaia di miliardi di stelle [...] Le scale di grandezza dello spazio e del tempo sono tanto grandi da risultare inconcepibili.**
- **Tuttavia, un cosmo legato a leggi naturali che portano inevitabilmente, inesorabilmente, a un universo in grado di conoscere se stesso, come suggeriscono gli studi scientifici, è un cosmo straordinariamente ricco di significato.»**



C O S M O S :
SKETCH
OF A
PHYSICAL DESCRIPTION OF THE UNIVERSE.
BY
ALEXANDER VON HUMBOLDT.
VOL. II.

*Natura vero rerum vis atque majestas in omnibus momentis fide caret, si quis modo partes ejus
ac non totam complectatur animo.—PLIN. H. N. lib. vii. c. 1.*

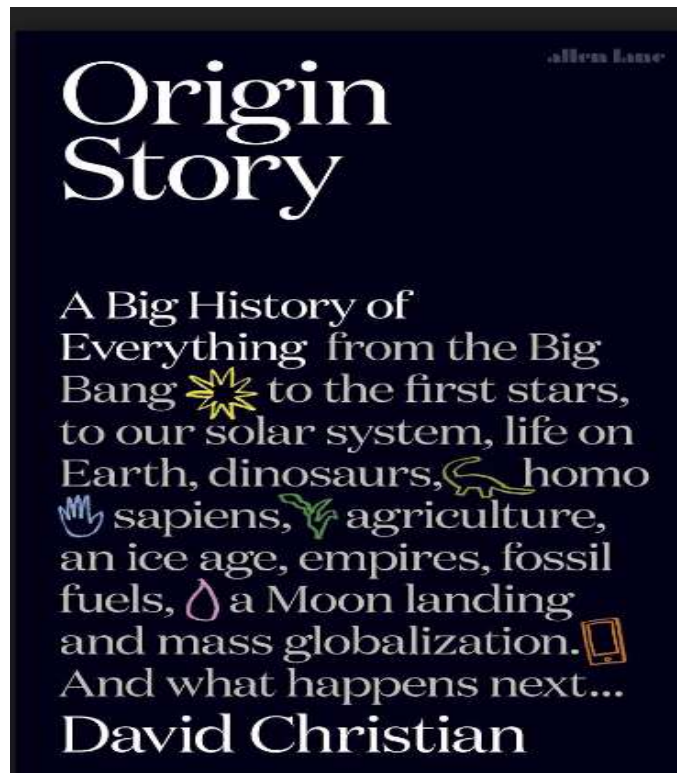
TRANSLATED UNDER THE SUPERINTENDENCE OF
LIEUT.-COL. EDWARD SABINE, R.A., FOR. SEC. R.S.

«..descrivere la natura in maniera tale da restituire il più possibile il piacere immediato della visione e al tempo stesso, sulla base dell'attuale stato della scienza, a una maggior comprensione dell'armonico nesso che governa l'agire delle forze naturali.»



Big History

- ***The attempt to understand, in a unified way, the history of Cosmos, Earth, Life and Humanity.***
- ***It is a course that covers history from the Big Bang through to the present in an interdisciplinary way.***
- ***The Big History Project “is dedicated to fostering a greater love and capacity for learning among students.”***







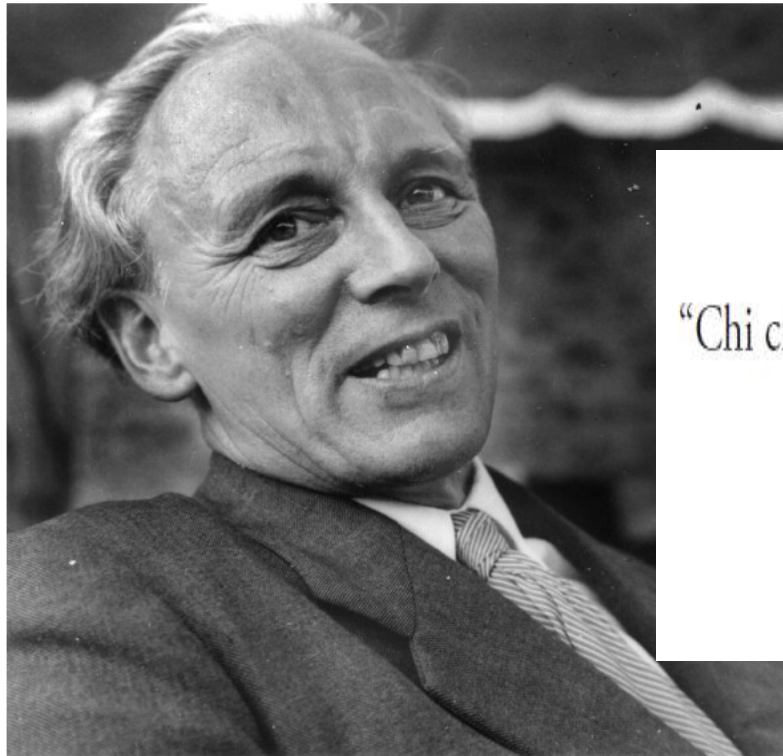
Jet Propulsion Laboratory
California Institute of Technology

CASSINI



The Economics of the Coming Spaceship Earth

By Kenneth E. Boulding, 1966



“Chi crede che la crescita esponenziale possa continuare all’infinito in un mondo finito è un folle oppure un economista.”

Kenneth Boulding, 1973¹

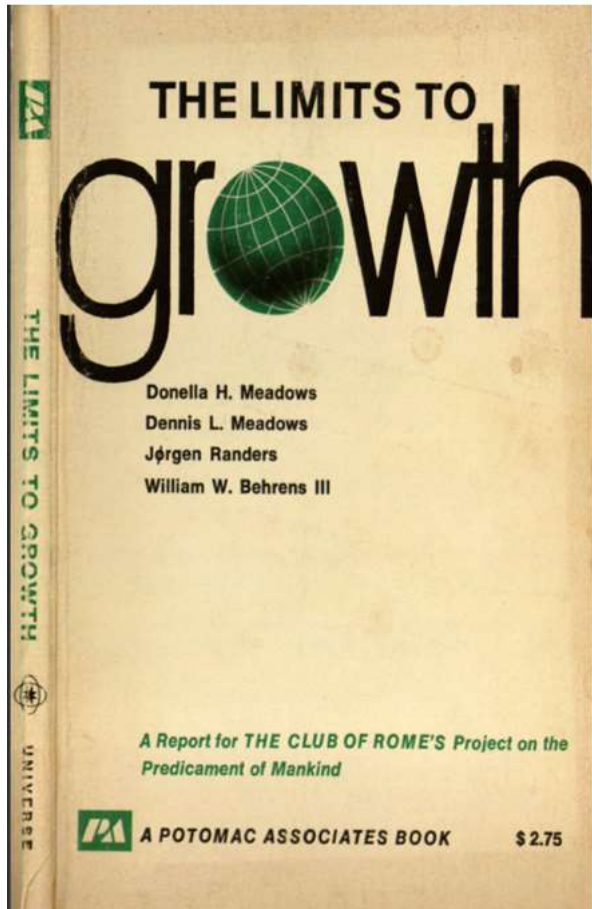
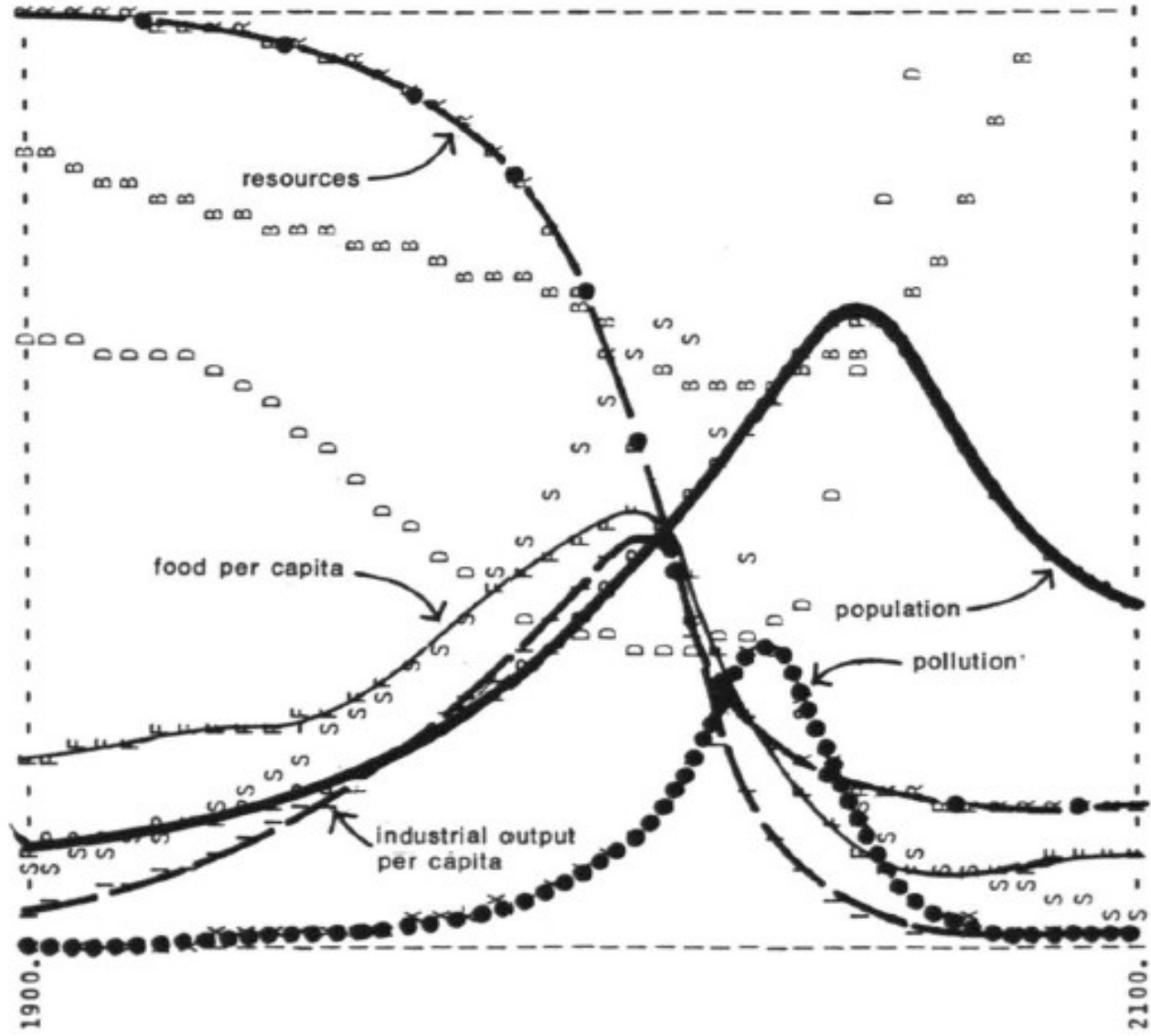
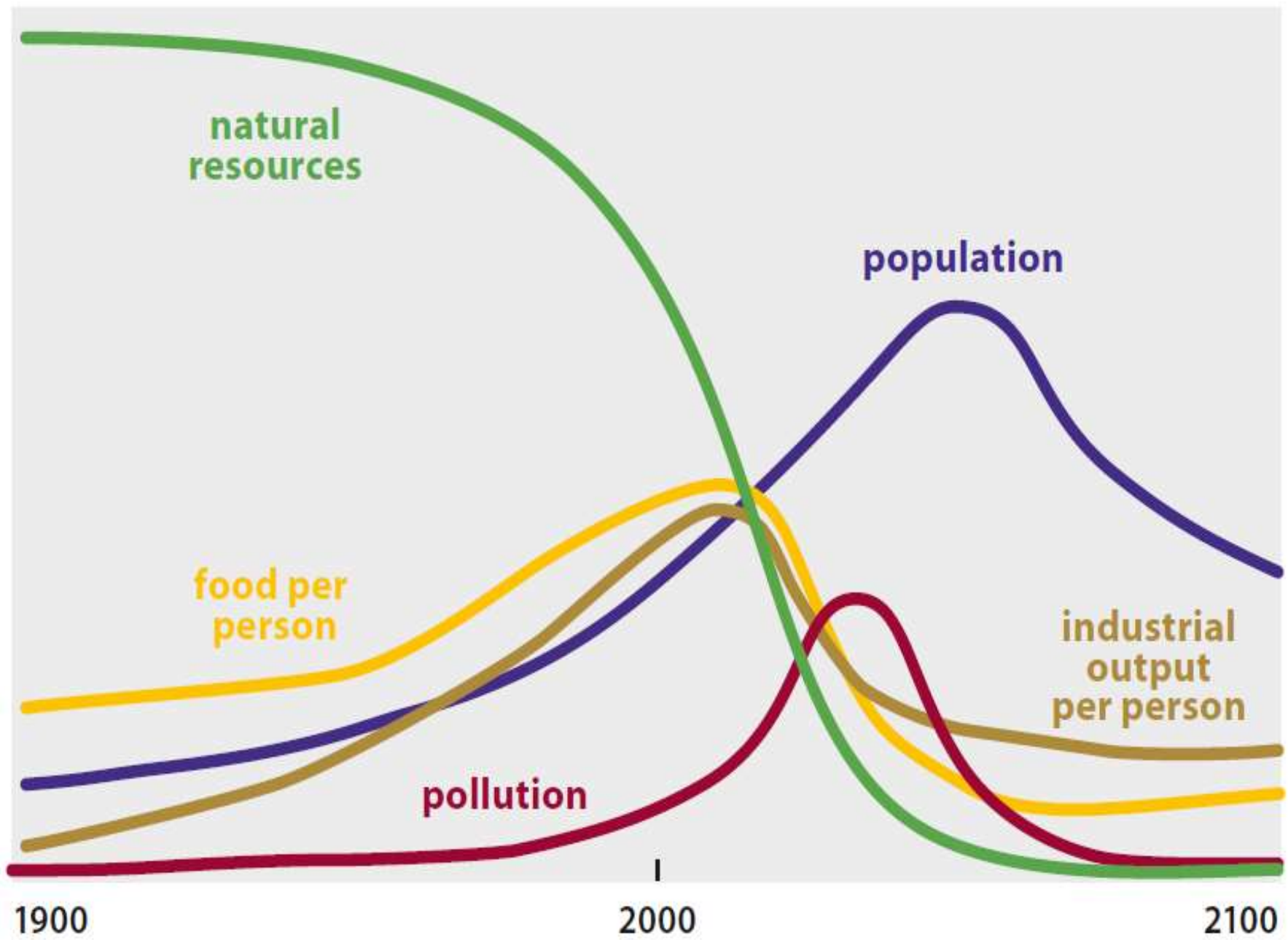


Figure 35 WORLD MODEL STANDARD RUN



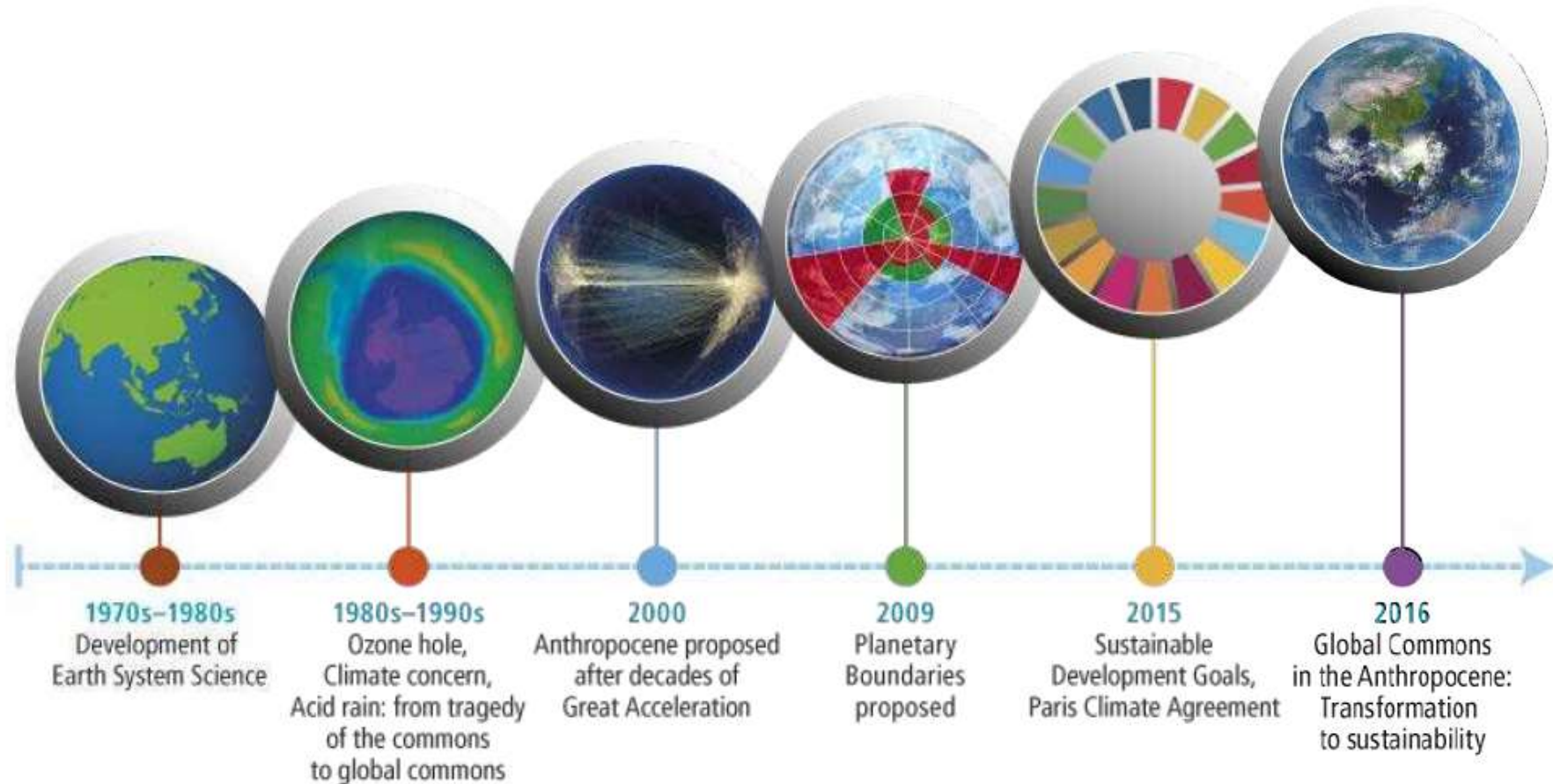


La grande sfida della sostenibilità

- ***Orientare la gestione del nostro mondo verso la sostenibilità costituisce una sfida senza precedenti per l'umanità.***
- ***Garantire agli attuali 7.5 miliardi di esseri umani (nel 2050 previsti 9.7 - variante media UN) disponibilità di energia, materie prime, cibo, acqua, case, infrastrutture, lavoro, equità, pace e giustizia, mantenendo i delicati equilibri dinamici della biosfera richiede capacità innovative, creative, anticipative che mai abbiamo sperimentato nella storia dell'umanità.***



Global Commons in the Anthropocene: World Development on a Stable and Resilient Planet



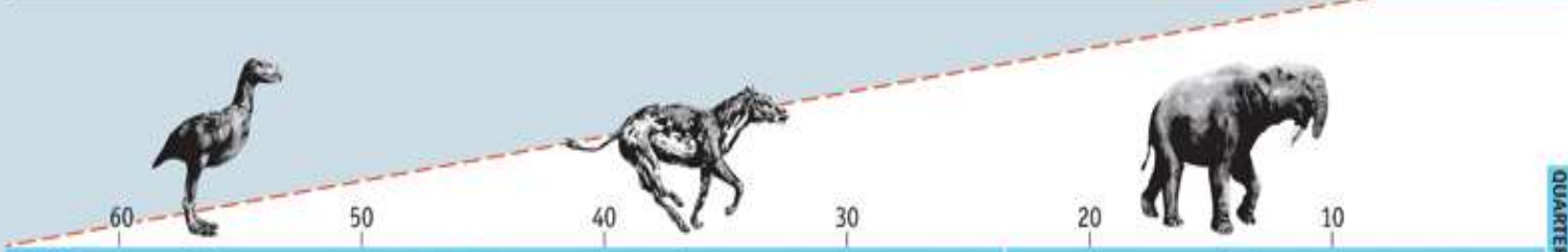
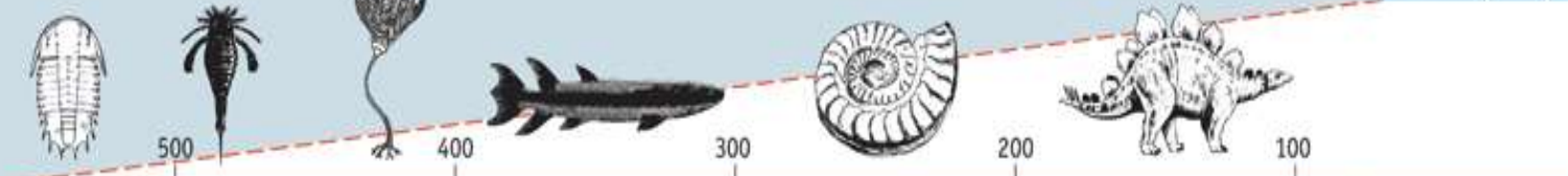
The Anthropocene:

A New Epoch of Geological Time?



Millions of years ago

4,500 4,000 3,500 3,000 2,500 2,000 1,500 1,000 500 0



Pleistocene
Holocene



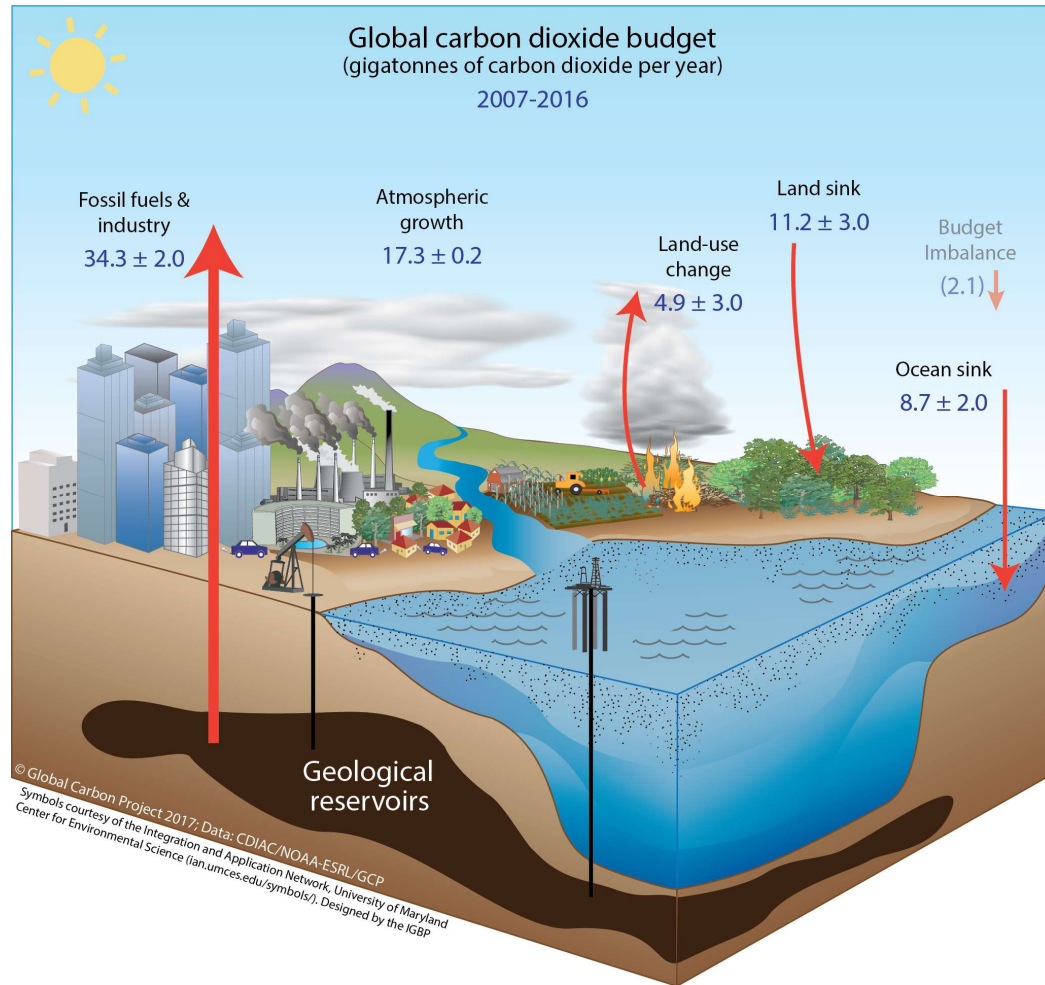
Anthropocene

the human epoch



Anthropogenic perturbation of the global carbon cycle

Perturbation of the global carbon cycle caused by anthropogenic activities, averaged globally for the decade 2007–2016 (GtCO₂/yr)



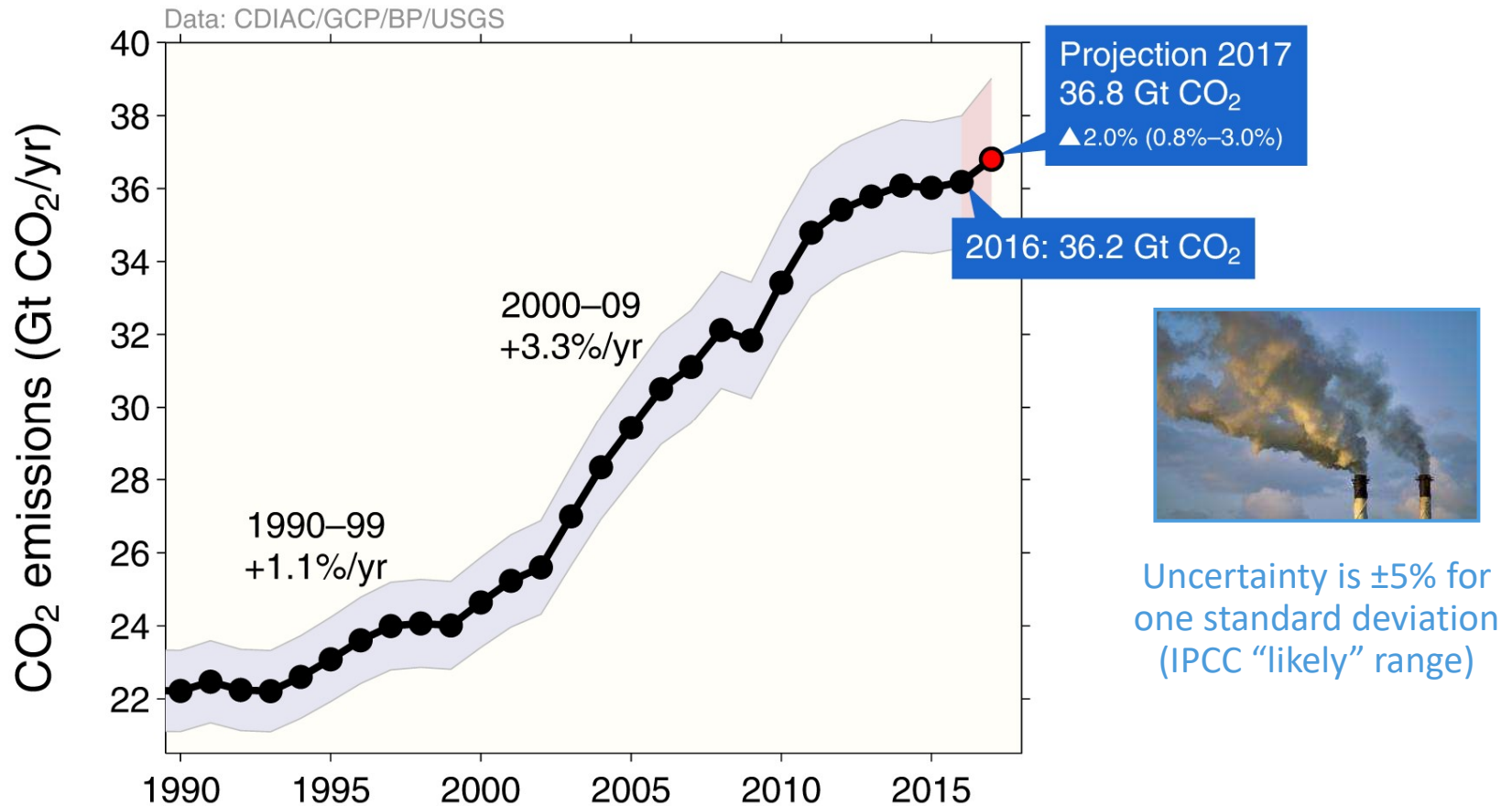
The budget imbalance is the difference between the estimated emissions and sinks.

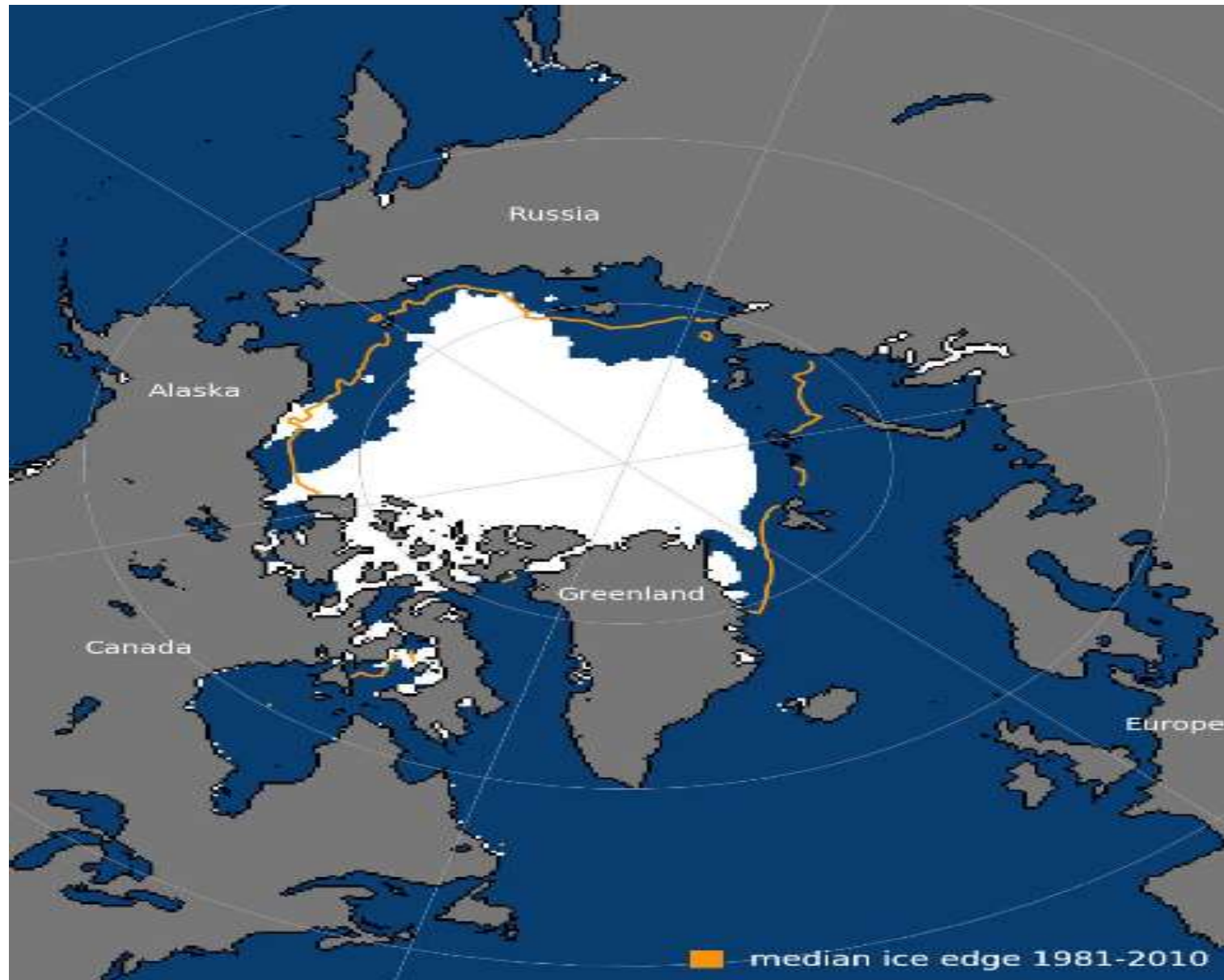
Source: [CDIAC](#); [NOAA-ESRL](#); [Le Quéré et al 2017](#); [Global Carbon Budget 2017](#)

Emissions from fossil fuel use and industry

Global emissions from fossil fuel and industry: 36.2 ± 2 GtCO₂ in 2016, 62% over 1990

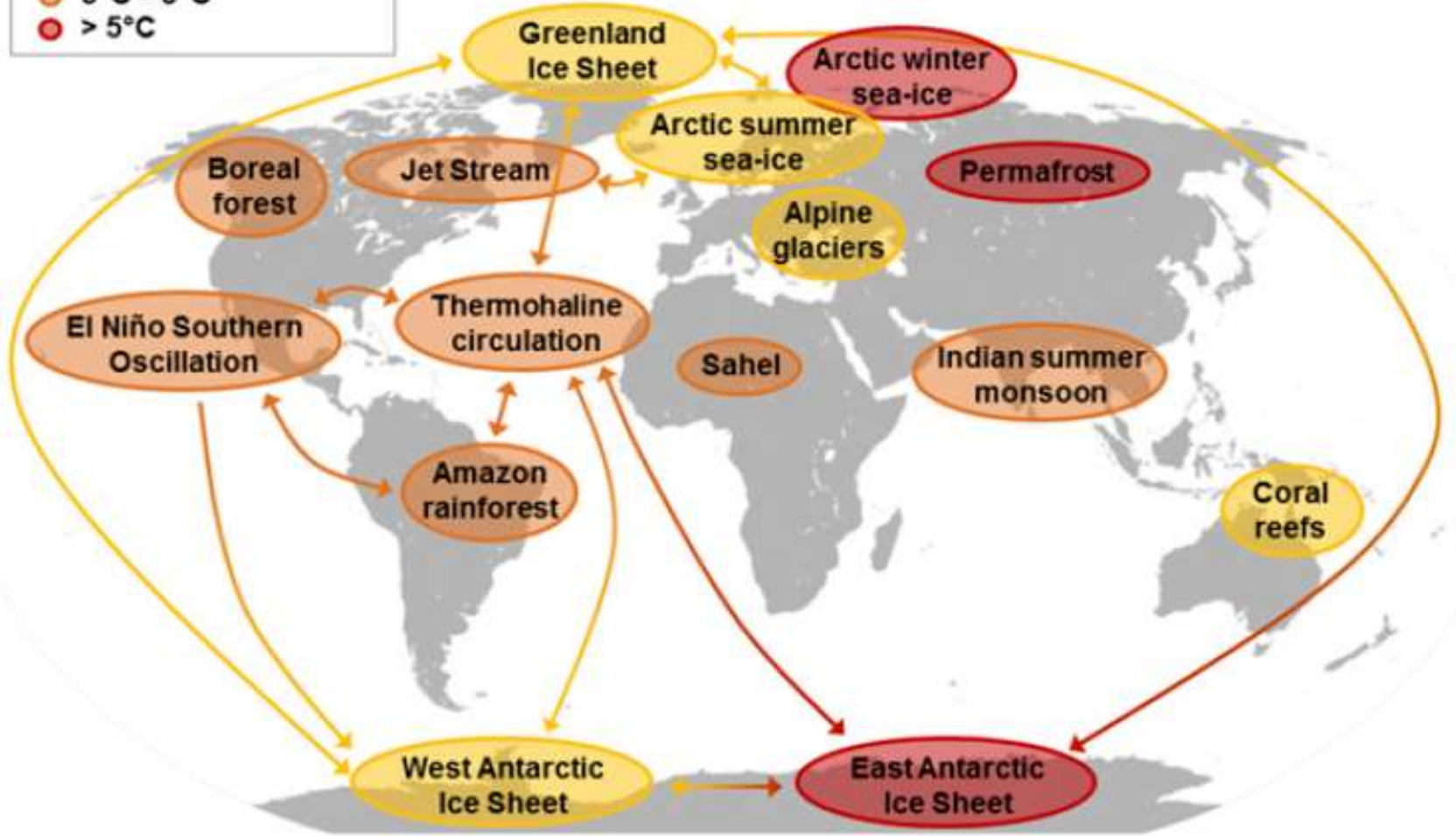
● Projection for 2017: 36.8 ± 2 GtCO₂, 2.0% higher than 2016



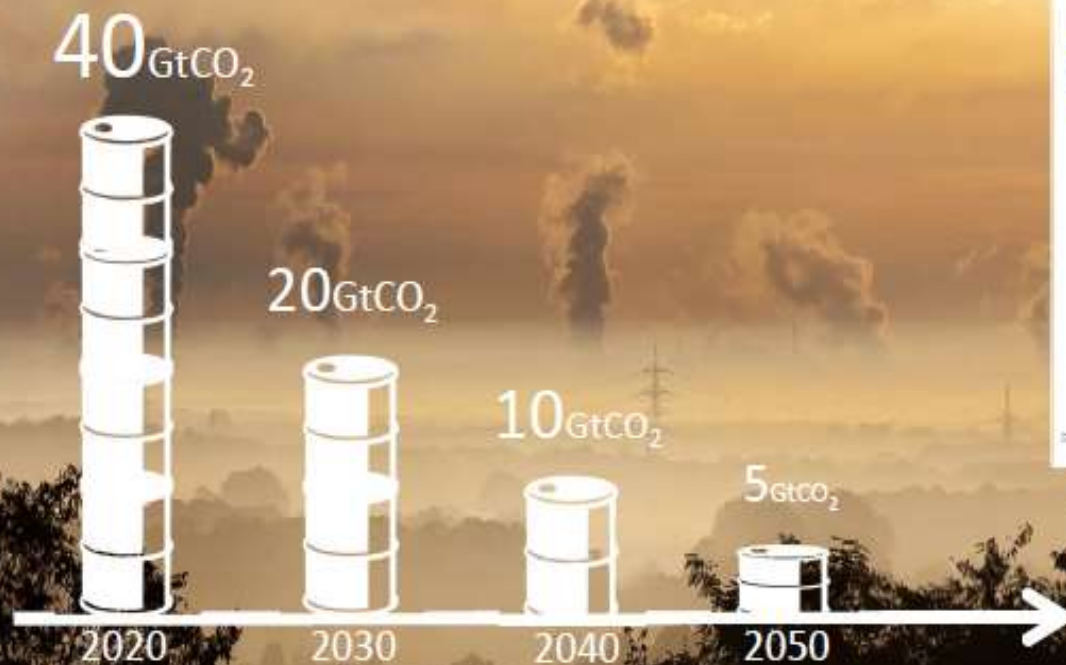


Tipping elements at risk:

- 1°C – 3°C
- 3°C – 5°C
- > 5°C



A Global Carbon Law Halving Emissions Every Decade



Equazione dell'impatto

$$I = P \times A \times T$$

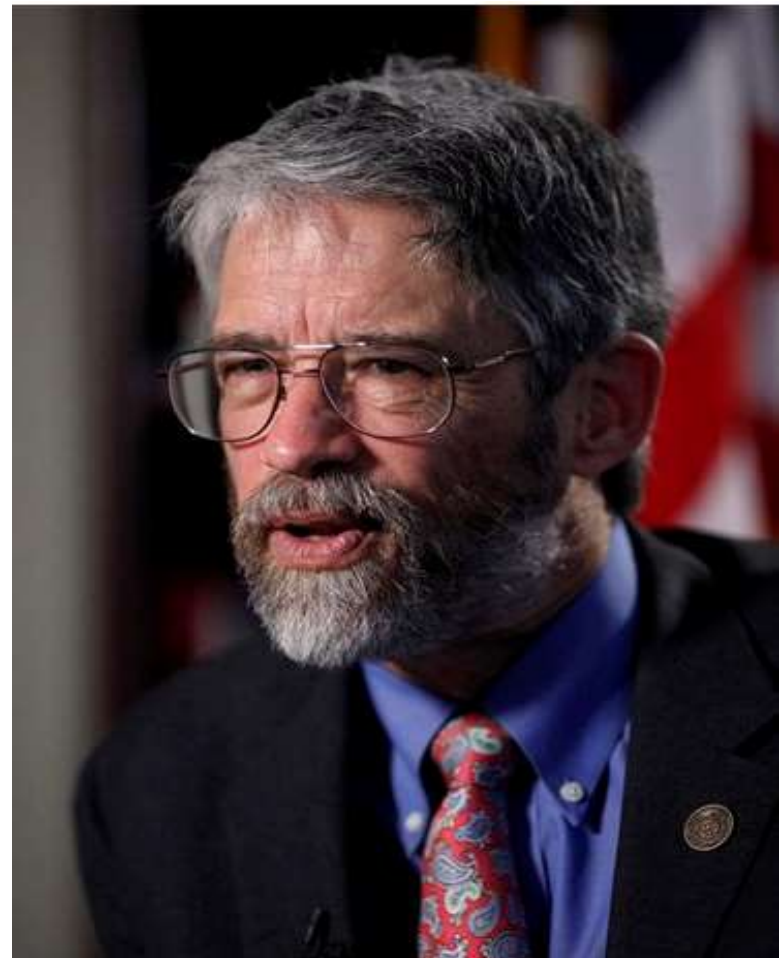
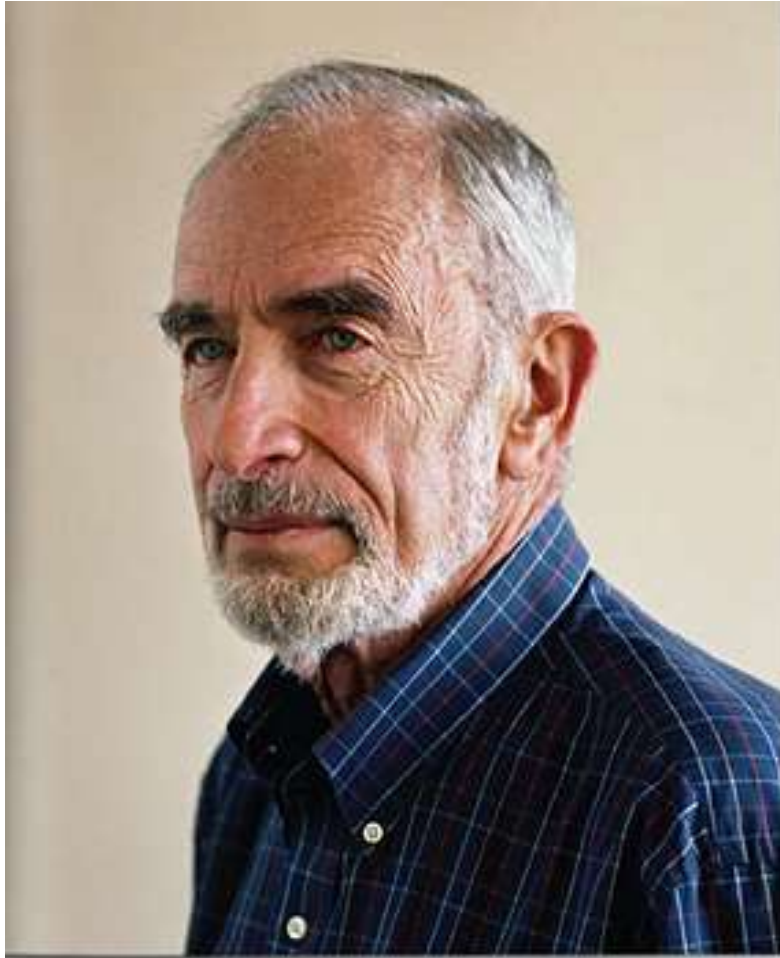
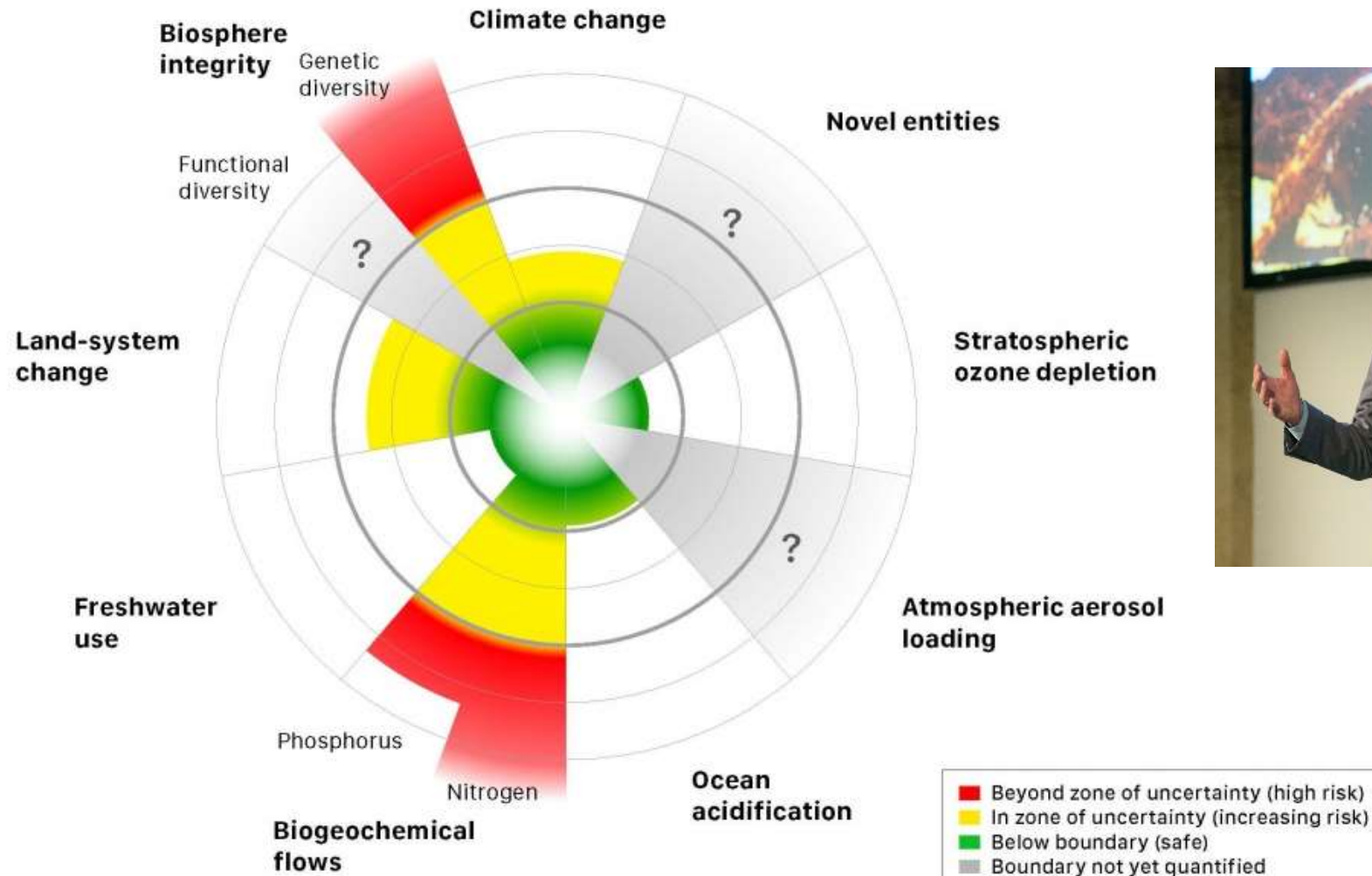


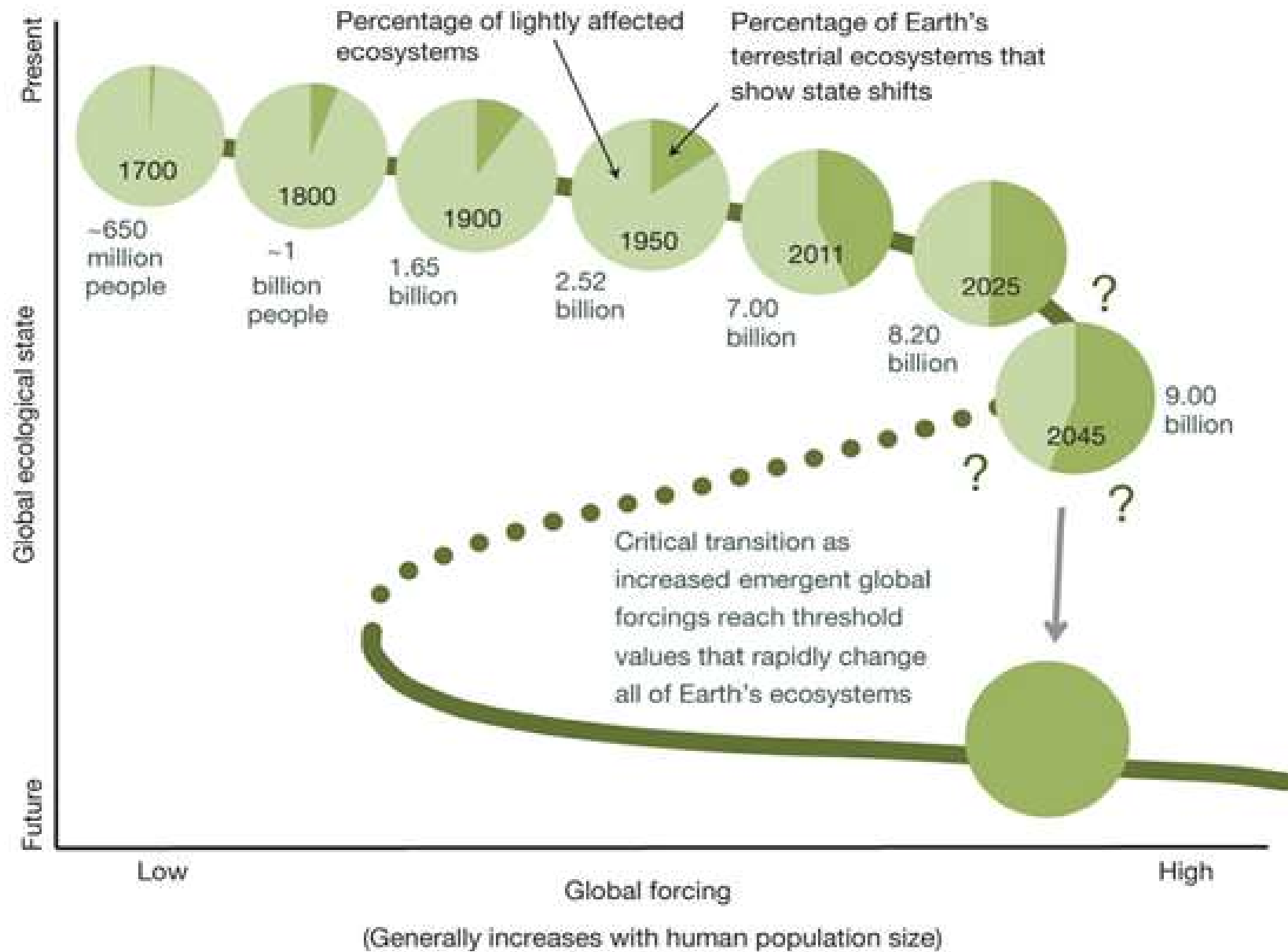
TABLE 1. POPULATION OF THE WORLD AND REGIONS, 2017, 2030, 2050 AND 2100,
ACCORDING TO THE MEDIUM-VARIANT PROJECTION

<i>Region</i>	<i>Population (millions)</i>			
	<i>2017</i>	<i>2030</i>	<i>2050</i>	<i>2100</i>
World	7 550	8 551	9 772	11 184
Africa	1 256	1 704	2 528	4 468
Asia	4 504	4 947	5 257	4 780
Europe.....	742	739	716	653
Latin America and the Caribbean	646	718	780	712
Northern America	361	395	435	499
Oceania	41	48	57	72

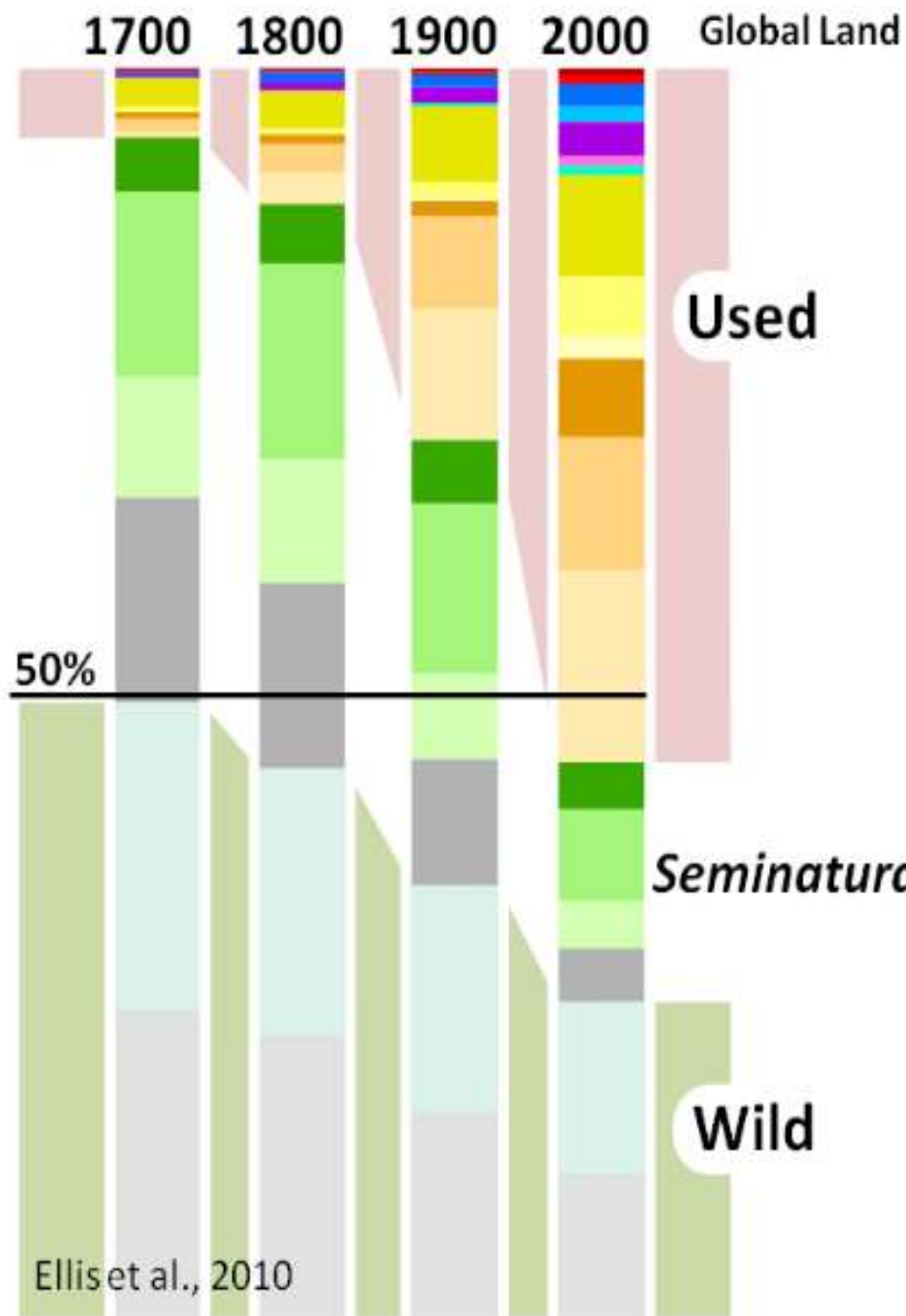
Source: United Nations, Department of Economic and Social Affairs, Population Division (2017).
World Population Prospects: The 2017 Revision. New York: United Nations.

Planetary Boundaries





A.D. Barnosky *et al.* *Nature* 486, 52–58 (2012) doi:10.1038/nature11018



Dense Settlements

- Urban
- Mixed settlements



Villages

- Rice
- Irrigated
- Rainfed
- Pastoral



Croplands

- Residential Irrigated
- Residential Rainfed
- Populated
- Remote



Rangelands

- Residential
- Populated
- Remote



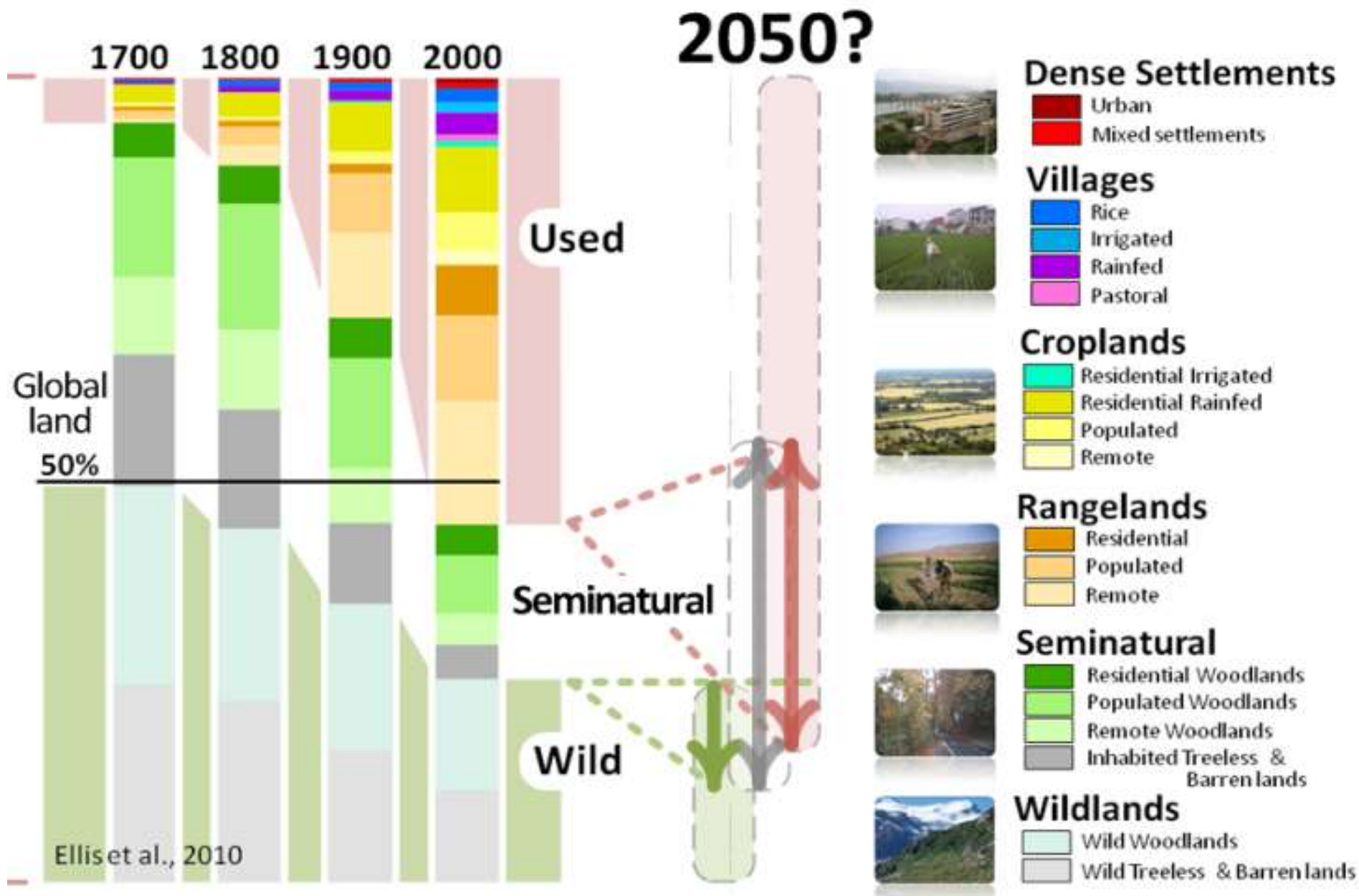
Seminatural

- Residential Woodlands
- Populated Woodlands
- Remote Woodlands
- Inhabited Treeless & Barren lands

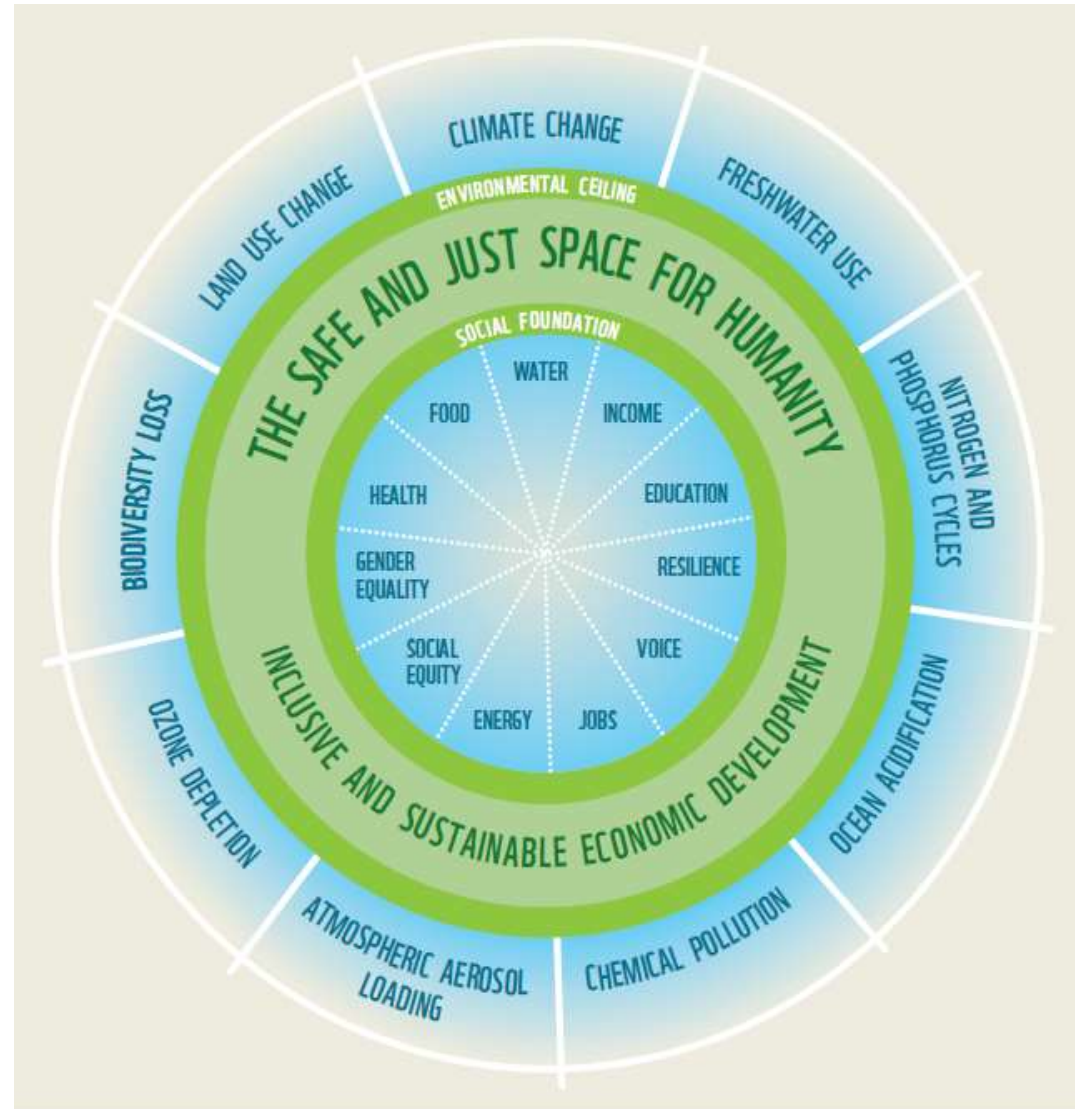


Wildlands





- Wild Woodlands
- Wild Treeless & Barren lands



Doughnut Economics



A good life for all within planetary boundaries

Daniel W. O'Neill ^{1*}, Andrew L. Fanning ¹, William F. Lamb ² and Julia K. Steinberger ¹

Humanity faces the challenge of how to achieve a high quality of life for over 7 billion people without destabilizing critical planetary processes. Using indicators designed to measure a 'safe and just' development space, we quantify the resource use associated with meeting basic human needs, and compare this to downscaled planetary boundaries for over 150 nations. We find that no country meets basic needs for its citizens at a globally sustainable level of resource use. Physical needs such as nutrition, sanitation, access to electricity and the elimination of extreme poverty could likely be met for all people without transgressing planetary boundaries. However, the universal achievement of more qualitative goals (for example, high life satisfaction) would require a level of resource use that is 2–6 times the sustainable level, based on current relationships. Strategies to improve physical and social provisioning systems, with a focus on sufficiency and equity, have the potential to move nations towards sustainability, but the challenge remains substantial.

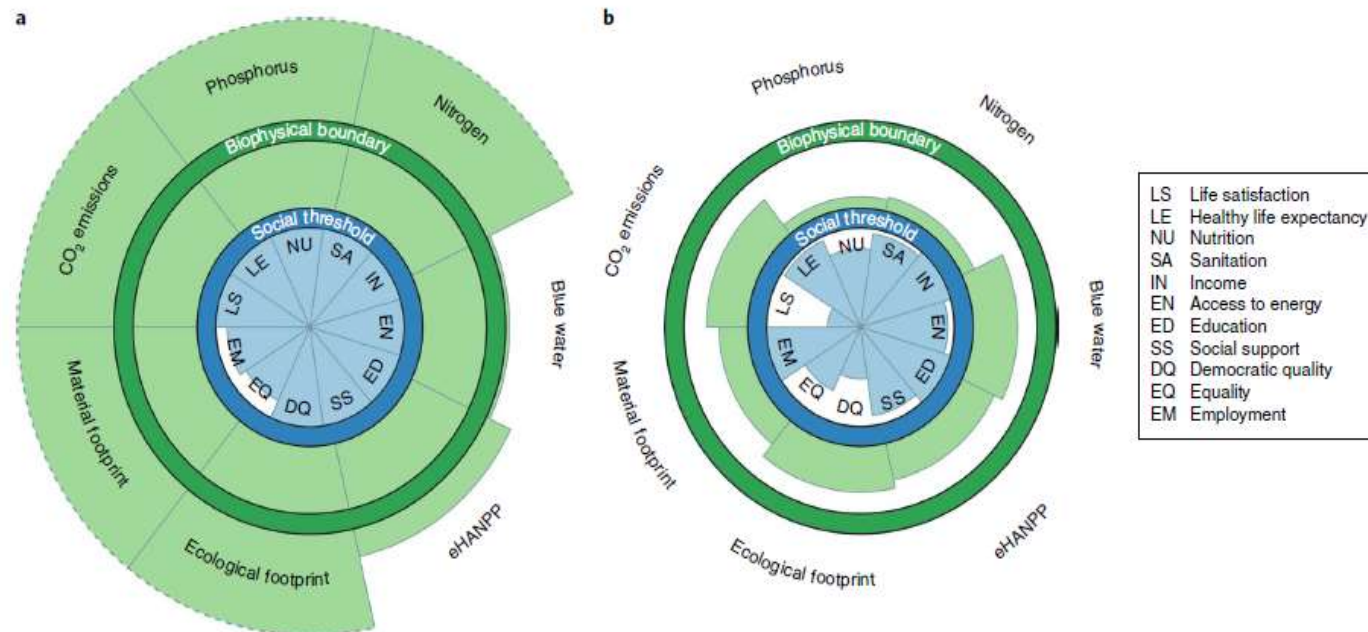
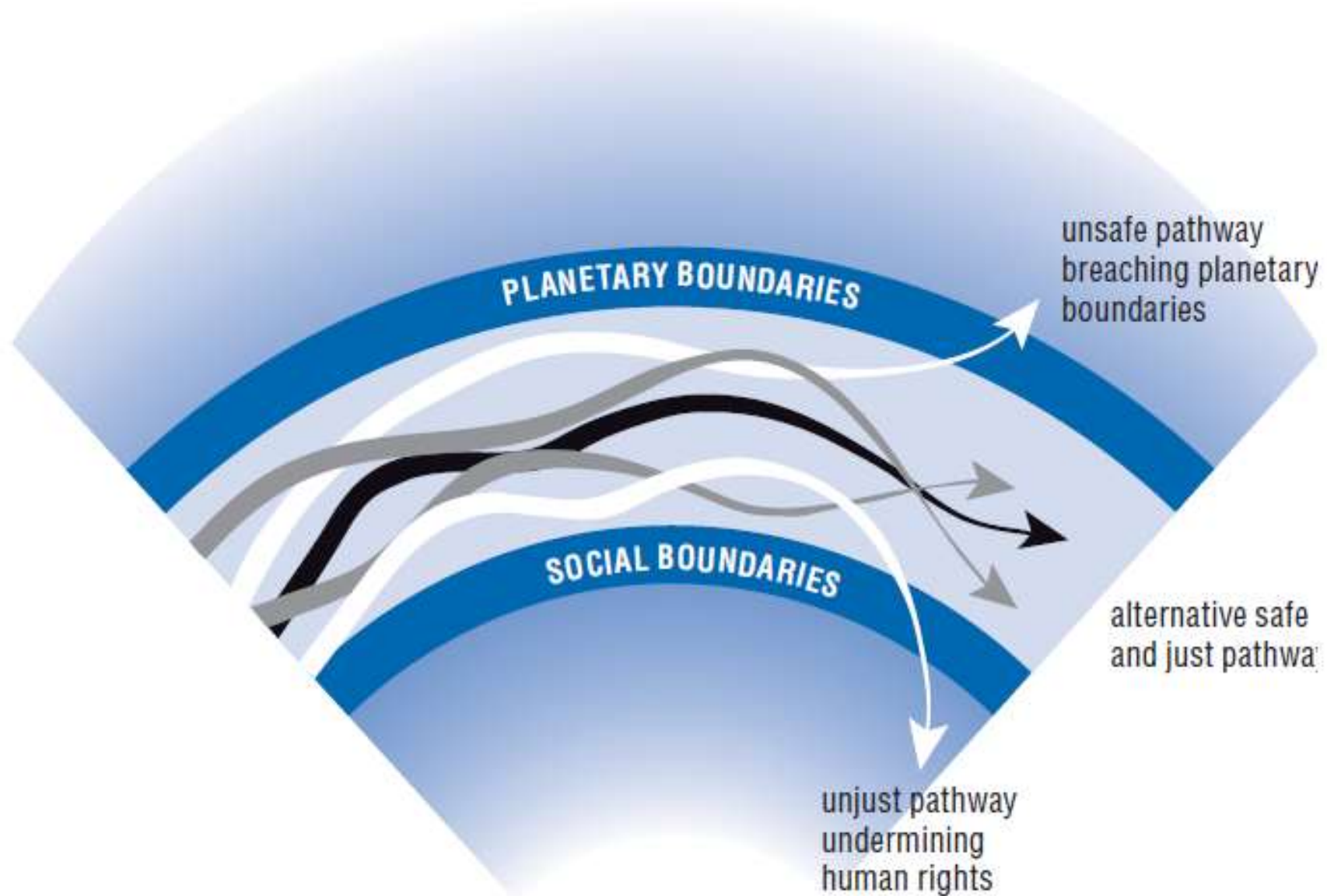
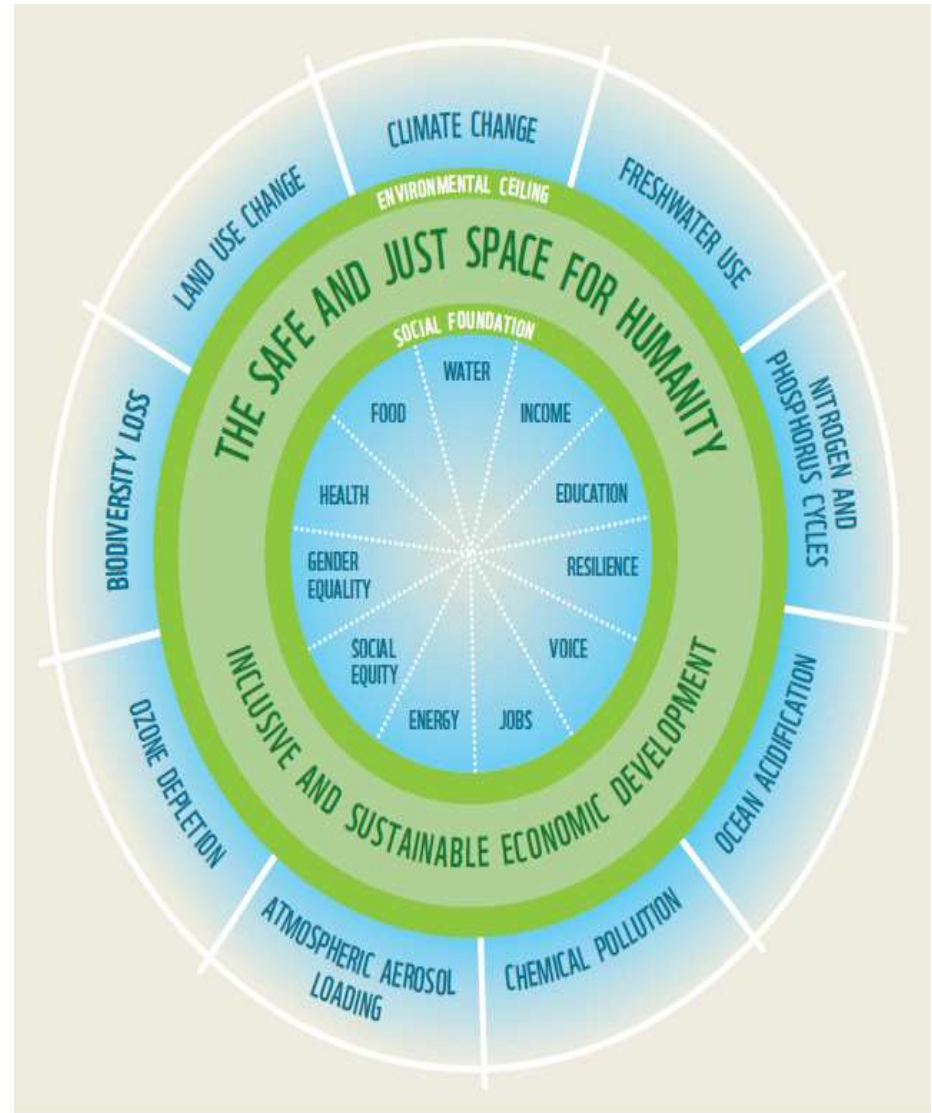




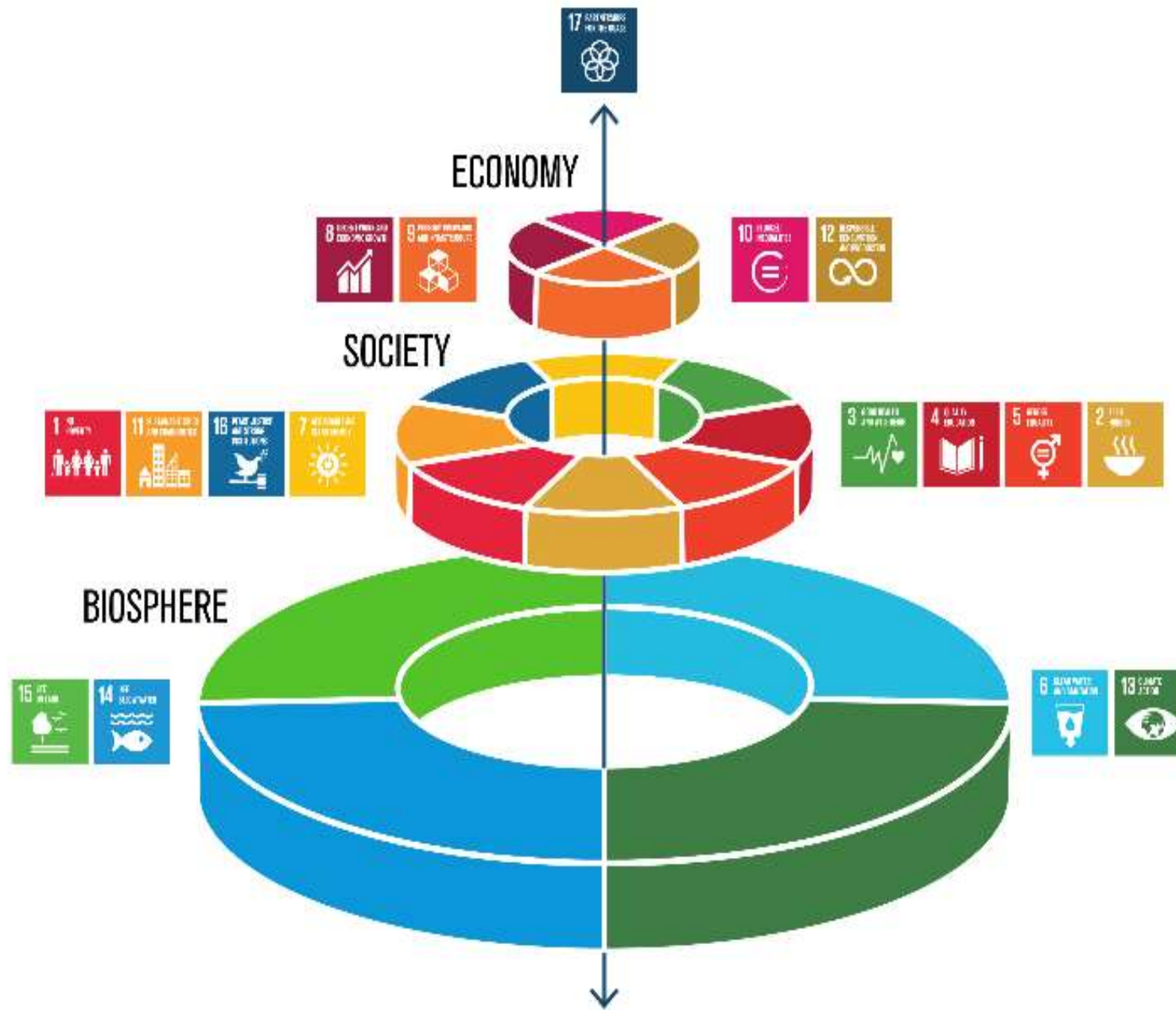
Figure 6.2. **Possibilities within the safe and just space**

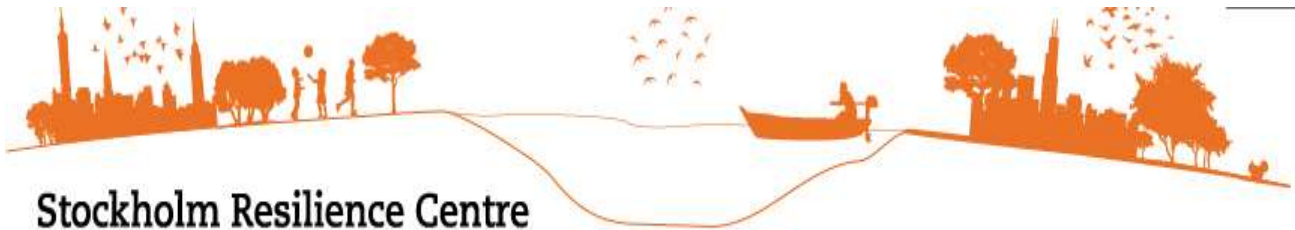




THE SDGS WILL OPERATE DURING 2016-2030



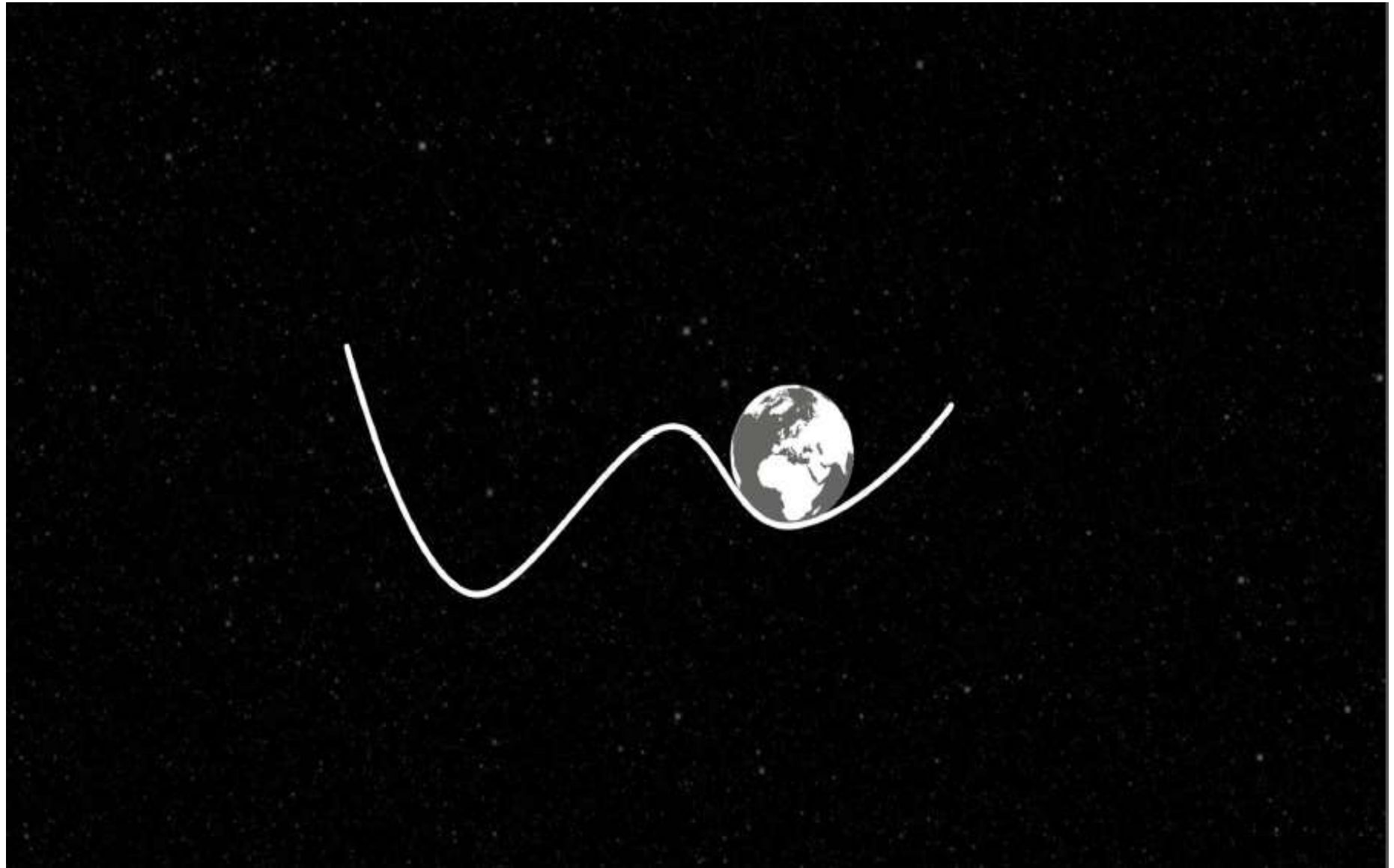


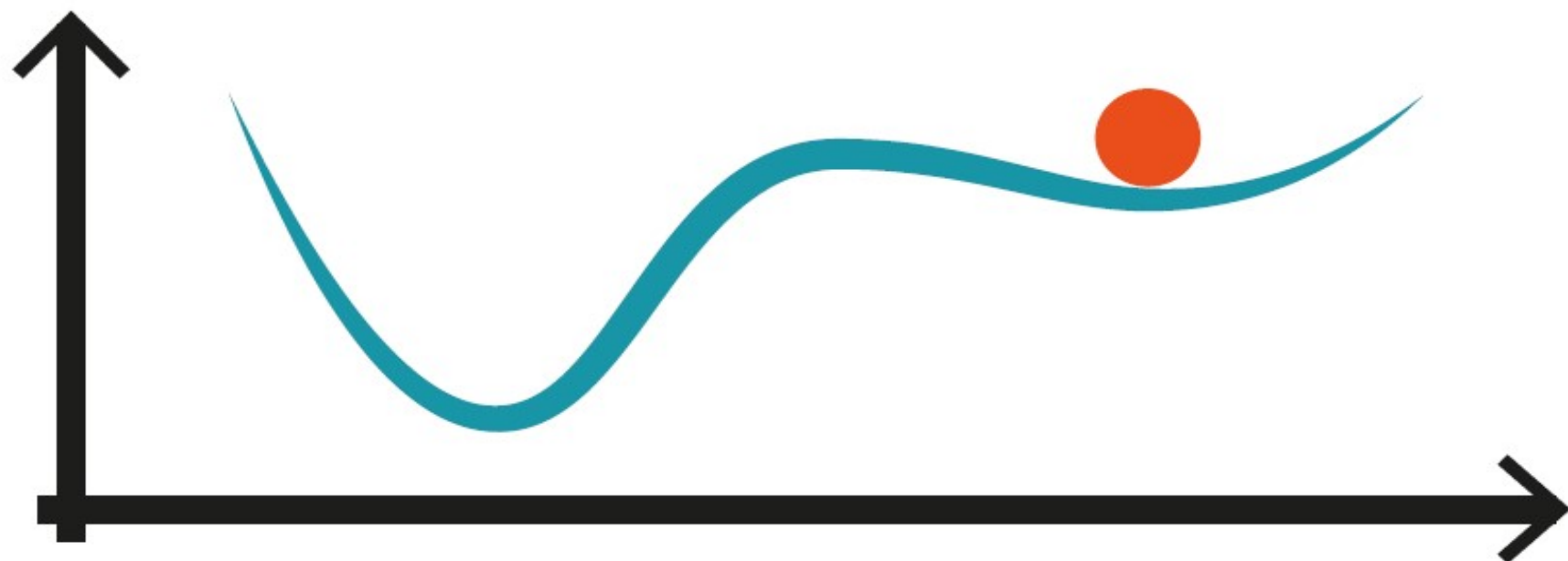
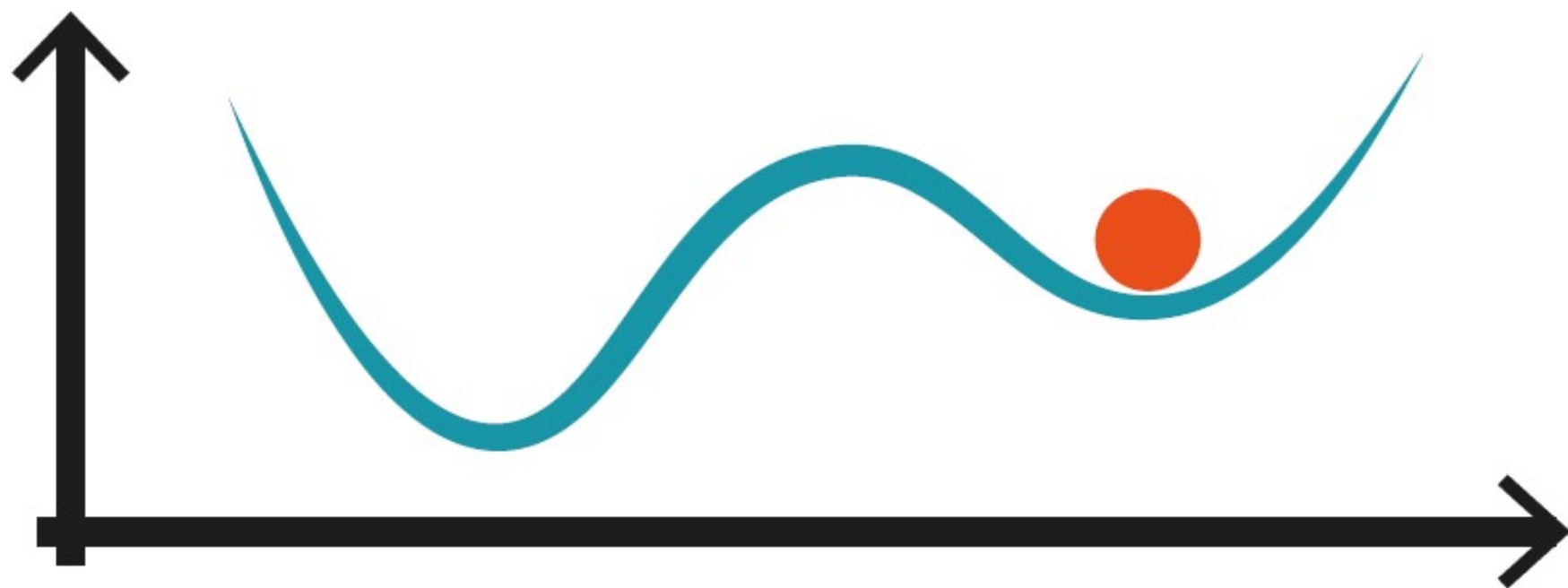


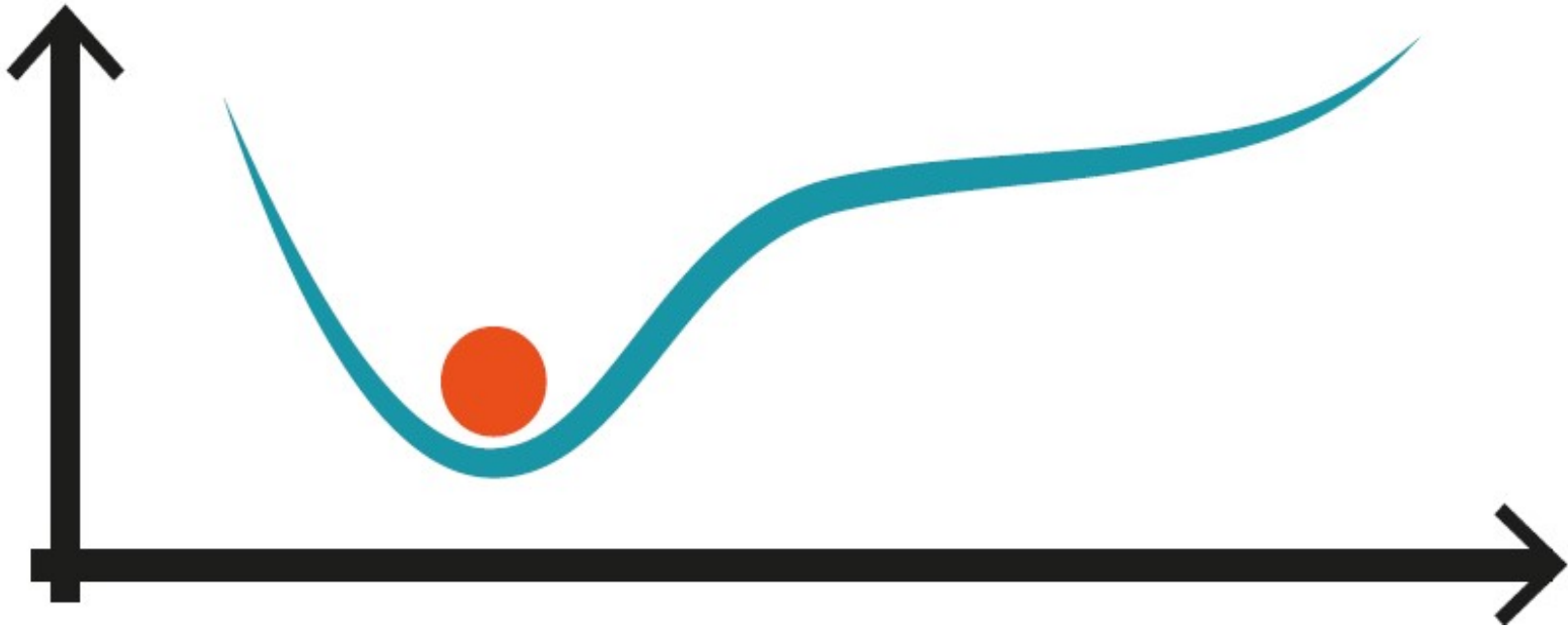
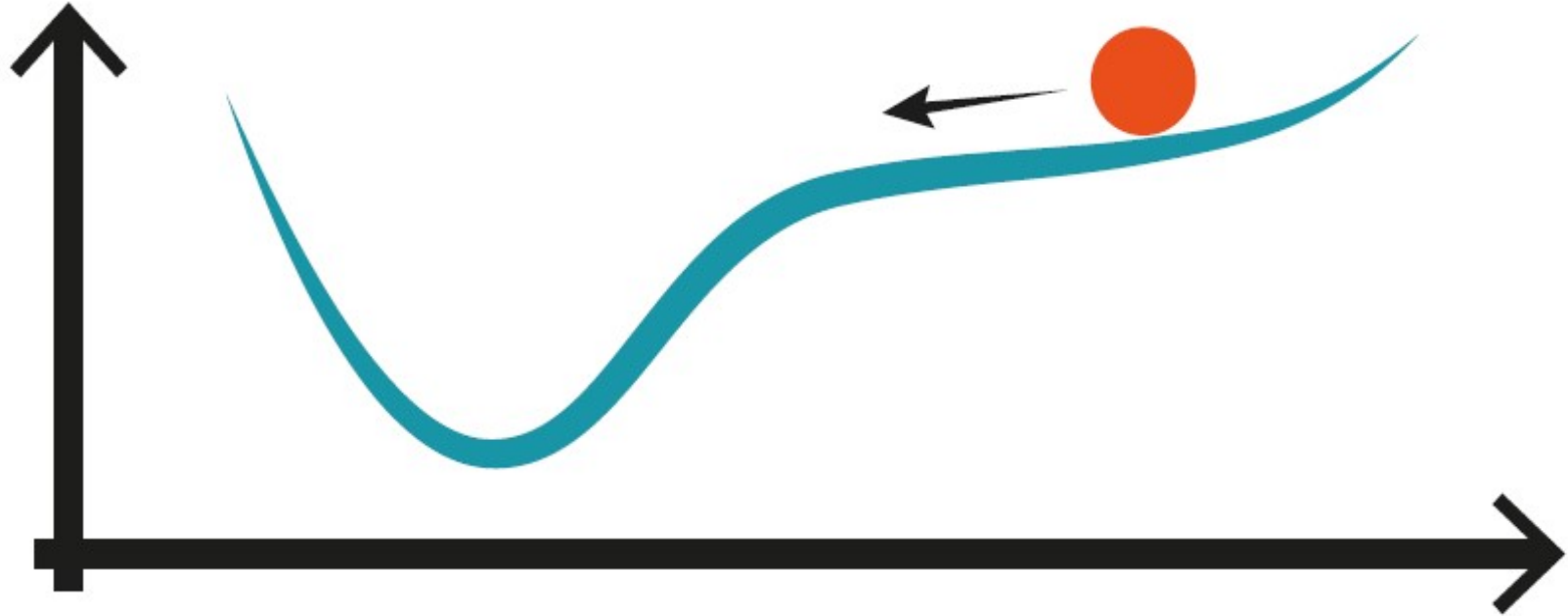
Stockholm Resilience Centre
Sustainability Science for Biosphere Stewardship

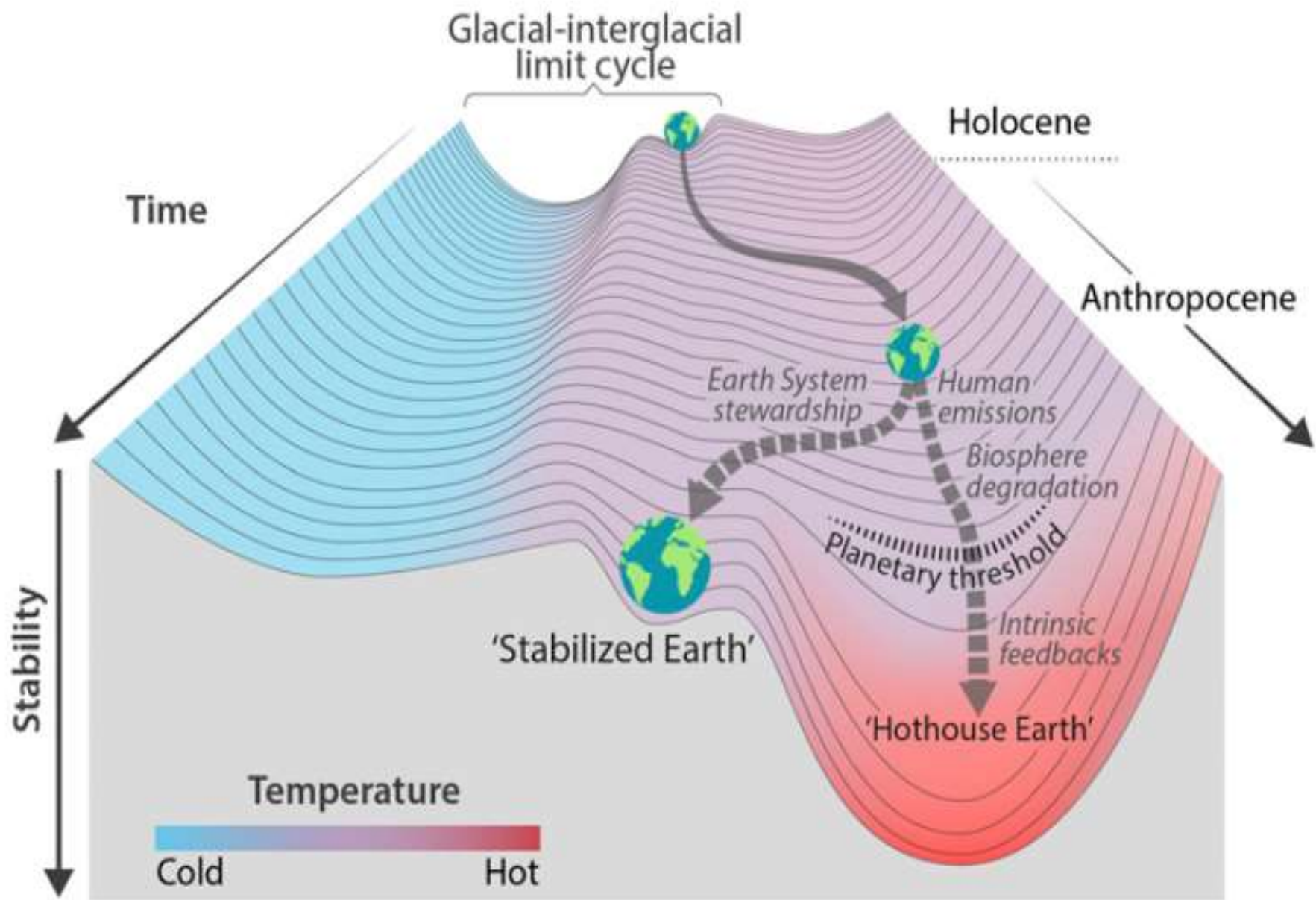


Stockholm University









SEEDS OF GOOD ANTHROPOCENES

identifying socially-ecological bright spots that could grow & connect to produce a better anthropocene



[about](#) / [seed collection](#) / [contribute a seed](#) / [map of seeds](#) / [about the anthropocene](#) / [contact us](#)

ABOUT THIS PROJECT

This project is a collaboration between the Stockholm Resilience Centre and "Bright Spots – Seeds of a Good Anthropocene" a FutureEarth funded project. Visit the 'About' page to find more project details and the 'Who we are' page find out more about us. The project was initiated in 2014 and will continue until 2016 and beyond.

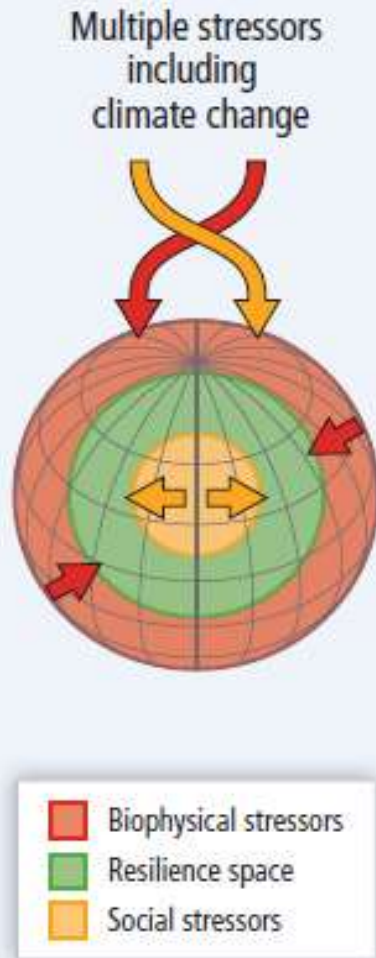


PROJECT UPDATE – WHAT ARE WE DOING WITH ALL THESE INTERESTING SEEDS?

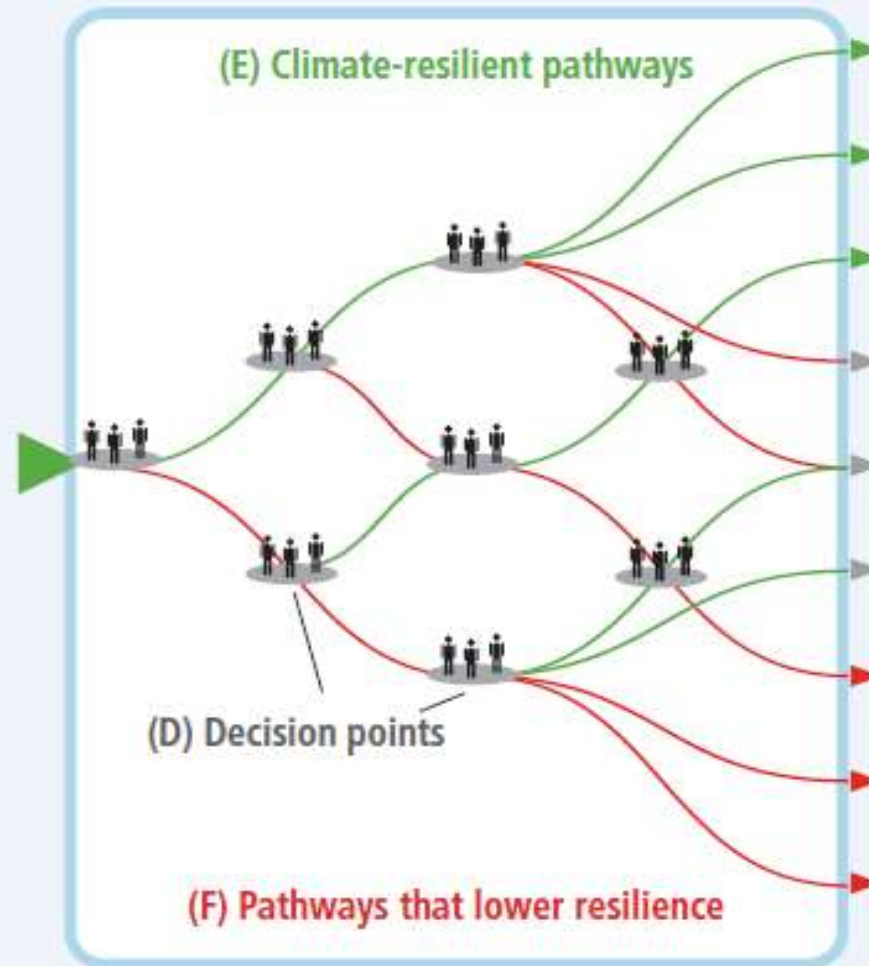


18 December, 2015

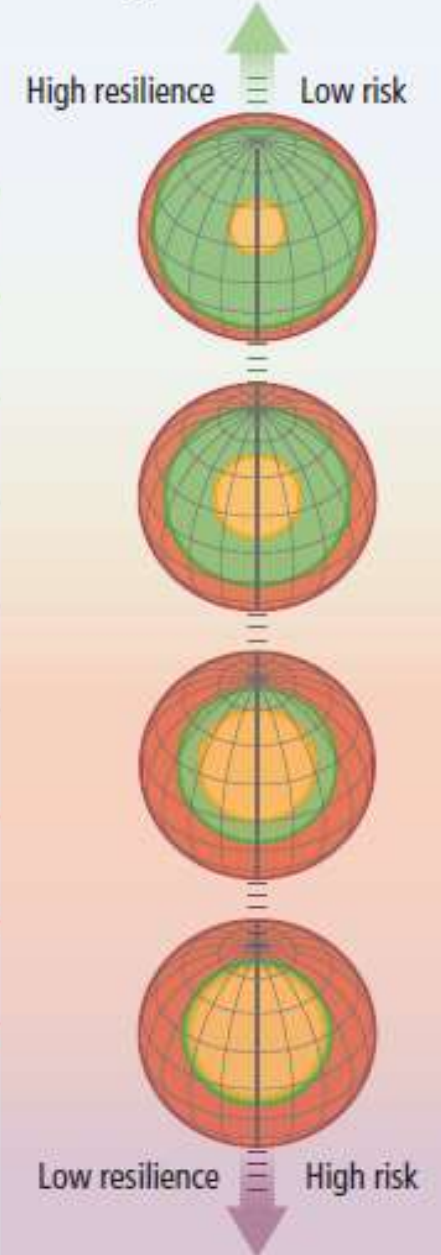
(A) Our world



(B) Opportunity space



(C) Possible futures



The Choice is Ours



Siti utili

- www.futureearth.org
- www.anthropocene.info
- www.ipbes.net
- www.stockholmresilience.org
- www.resalliance.org
- www.unenvironment.org
- www.undp.org
- www.fao.org
- www.ipcc.ch
- www.cbd.int

Libri utili

- Caserini S., 2009, *Guida alle leggende del clima che cambia*, Edizioni Ambiente
- Caserini S., 2016, *Il clima è (già) cambiato*, Edizioni Ambiente
- Hansen J., 2010, *Tempeste*, Edizioni Ambiente
- Jackson T., 2017, *Prosperità senza crescita*, Edizioni Ambiente
- Mercalli L. e altri, 2009, *Che tempo che farà*, Rizzoli
- Raworth K., 2017, *L'economia della ciambella*, Edizioni Ambiente
- Rockstrom J. e M. Klum, 2015, *Grande mondo piccolo pianeta*, Edizioni Ambiente
- Rockstrom J. e A. Wijkman, 2014, *Natura in bancarotta*, Edizioni Ambiente
- Wijkman A. e E. von Weizsacker, 2018, *Come On!*, Giunti editore