

Our Future on Earth

GEF Trust Fund
7th Replenishment meeting
March 28th 2017
Paris

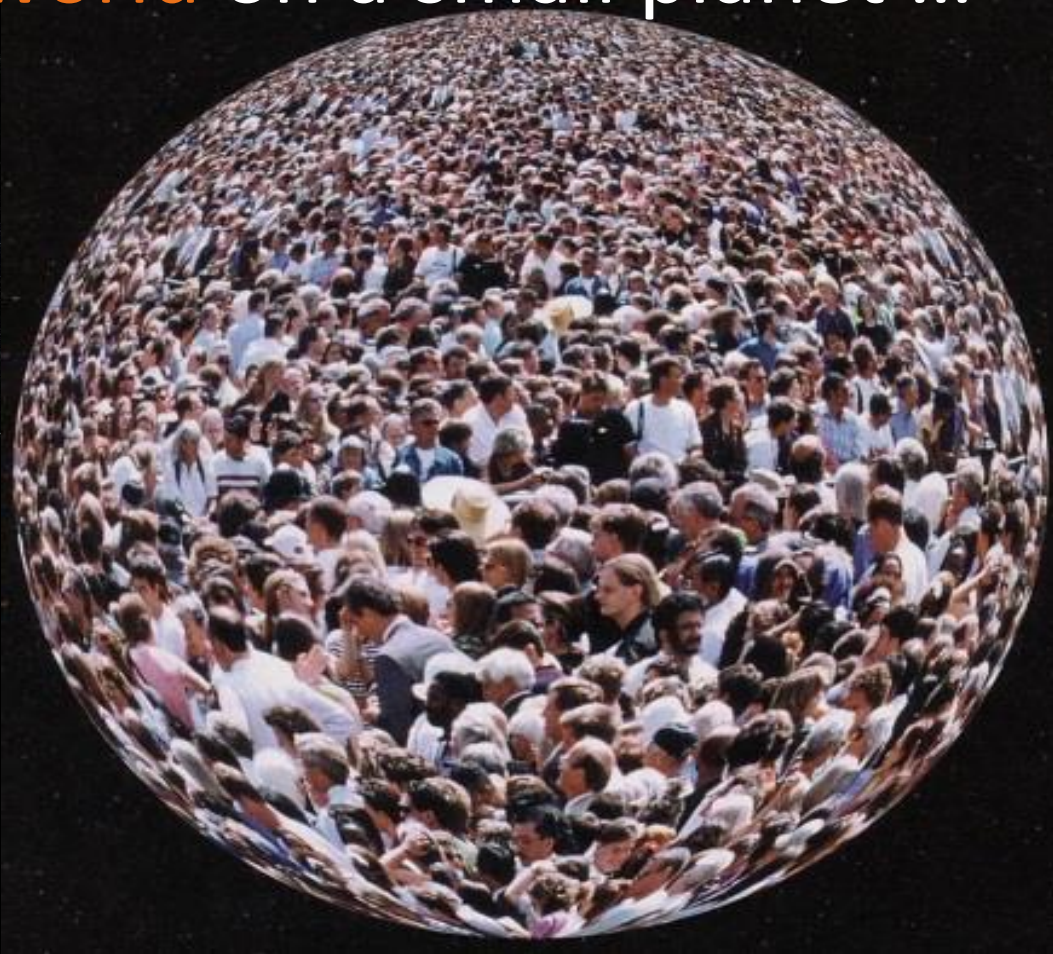
Professor Johan Rockström
Executive Director, Stockholm Resilience Centre
Professor of Environmental Science, Stockholm University

Photo: Yann Arthus-Bertrand

From a **small world** on a large planet ...



To a **large world** on a small planet ...





Living Planet Report - The trajectory for the future decline of vertebrate wildlife populations is 67% by 2020

A full-page background image of an Arctic landscape. The foreground is filled with large, jagged ice floes in a body of water. In the distance, a flat horizon line separates the water from a clear blue sky. A bright sun is positioned in the upper right quadrant, creating a prominent starburst effect with long, thin rays extending across the sky. The overall color palette is dominated by blues and whites, with the sun adding a warm, bright focal point.

A 5°C Arctic in a 2°C World

CHALLENGES AND RECOMMENDATIONS FOR IMMEDIATE ACTION
FROM THE JULY 21-22, 2016 WORKSHOP

Briefing Paper for Arctic Science Ministerial

September 20, 2016

AUTHORS

Peter Schlosser
Stephanie Pfirman
Rafe Pomerance
Margaret Williams
Brad Ack
Phil Duffy
Hajo Eicken;
Mojib Latif
Maribeth Murray
Doug Wallace



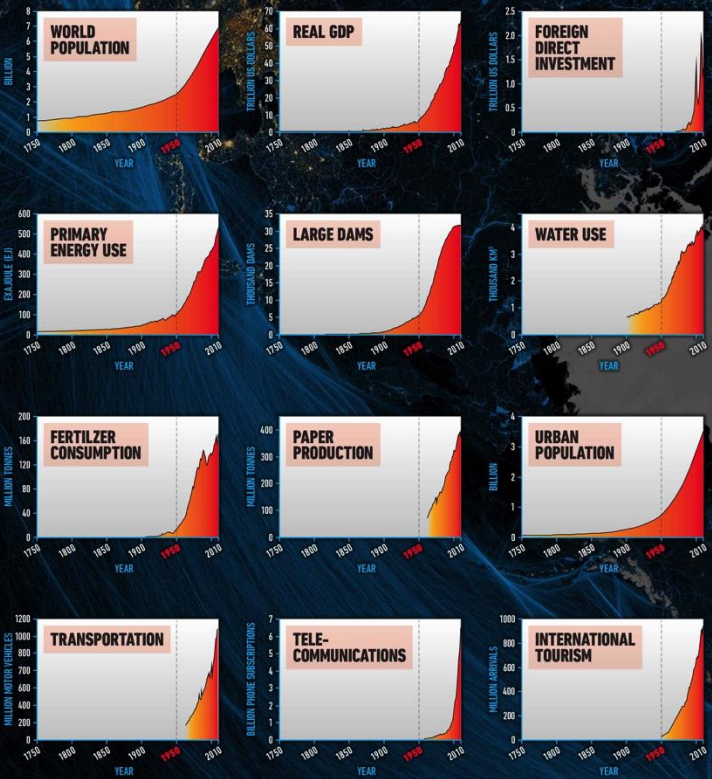
A Biosphere shaped by humanity

What is the nature of the sustainability challenge on a human-dominated planet?



The great acceleration and the global food system

SOCIO-ECONOMIC TRENDS

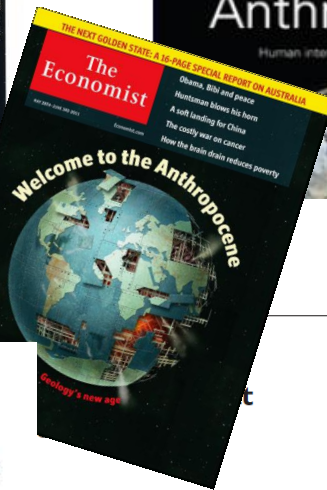


EARTH SYSTEM TRENDS



The image shows a view of Earth from space, with the curvature of the planet visible on the left. The landmasses are dark, and the oceans are a deep blue. Overlaid on the Earth is a complex, glowing blue network of lines that resemble a global communication or data network. These lines are most dense over the continents and spread out over the oceans. A semi-transparent black horizontal band runs across the middle of the image, containing the text "Welcome to the Anthropocene".

Welcome to the **Anthropocene**



THE ANTHROPOCENE REVIEW

The Anthropocene Review

1-18

© The Author(s) 2015

Reprints and permissions:

sagepub.co.uk/journalsPermissions.nav

DOI: 10.1177/2053019614564785

anr.sagepub.com



The human age

Momentum is building to establish a new geological epoch that recognizes humanity's impact on the planet. But there is fierce debate behind the scenes.

BY RICHARD MARSHALL

At least all the theories have started from the United States of America. In 1961, the geologist William S. Stearns had to move northwards and passed in his laboratory a plan to create a new geological epoch. The name was 'the human age'.

His proposal was not accepted at the time. It was not until 1982, when a report was published in 1982, that the world was in more than one geological epoch. Alongside the typical stages of 'Prehistoric' and 'Historical', there is a new one: the 'Anthropocene'.

The concept of the 'Anthropocene' is not new. It has been around for decades. It is the idea that the human impact on the planet is so significant that it should be recognized as a new geological epoch. The concept has gained momentum in recent years, particularly in the field of geology. It is the idea that the human impact on the planet is so significant that it should be recognized as a new geological epoch. The concept has gained momentum in recent years, particularly in the field of geology.



ELEMENTA
Science of the Anthropocene

Dating the Anthropocene: Towards an empirical global history of transformation of the terrestrial

Erle C. Ellis^{1*} • Dorian Q. Fuller² • Jed O. Kaplan³ • Wayne G. Lutters⁴

The New World of the Anthropocene¹

IAN ZALASIEWICZ^{*}
Department of Geology, University of Leicester, U.K.

MARK WILLIAMS
Department of Geology, University of Leicester, U.K. and British Geological Survey, Nottingham, U.K.

WILL STEFFEN
Australian National University, Canberra

PAUL CRUTZEN
Max-Planck-Institute for Chemistry, Mainz, Germany

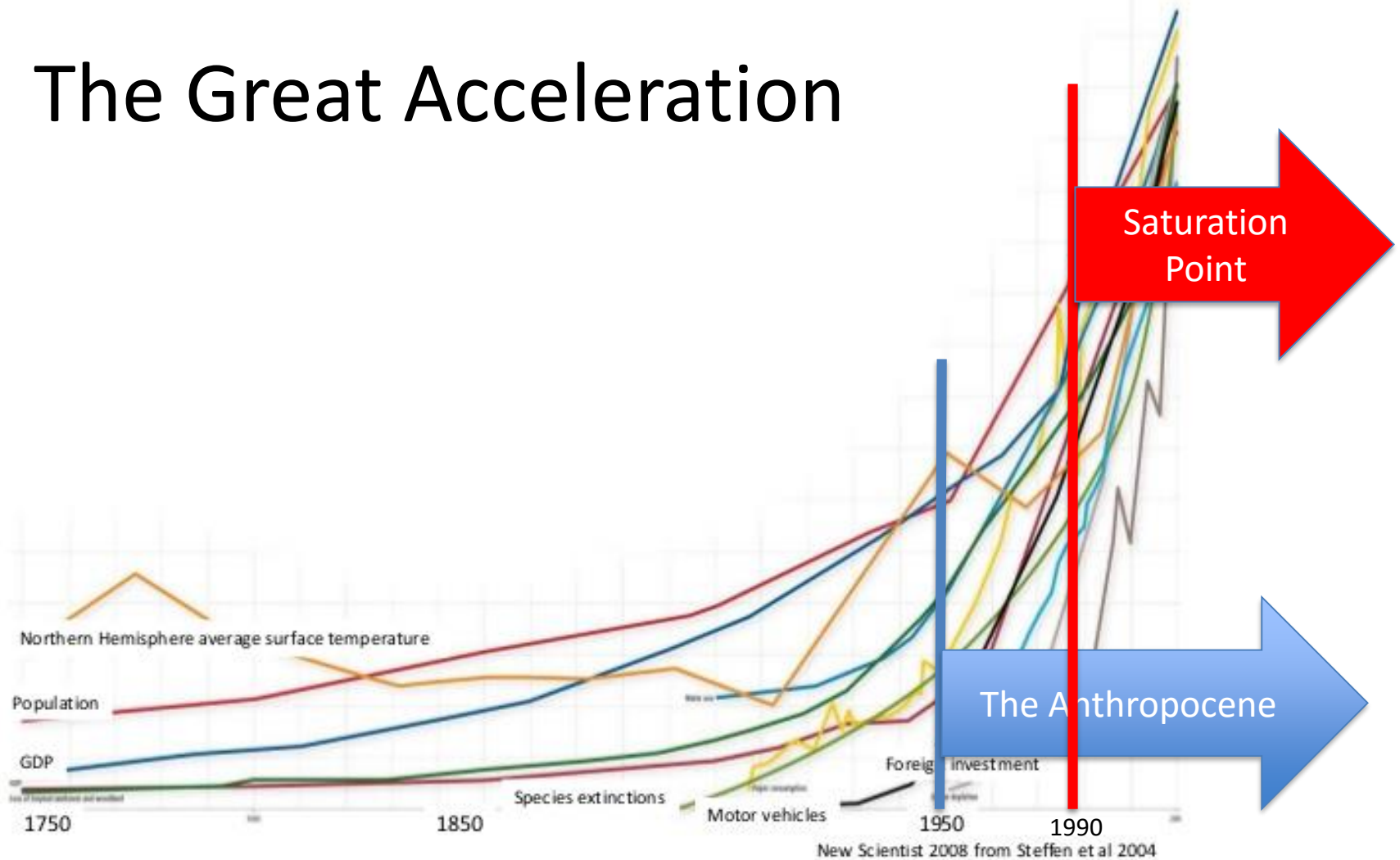


² Wendy Broadgate, ³ Lisa Deutsch, ¹ and ³ and Cornelia Ludwig¹

The Anthropocene biosphere

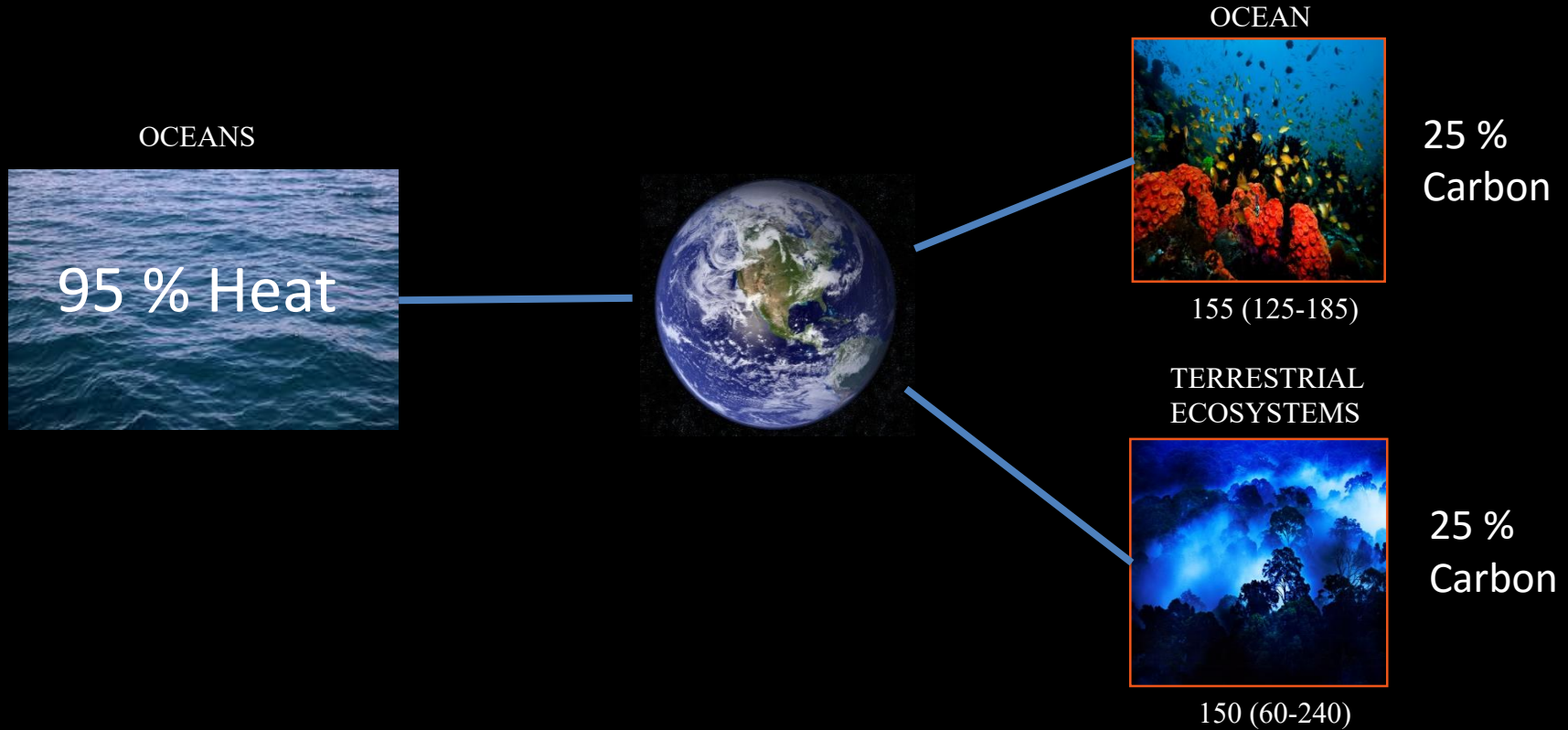
Mark Williams,¹ Jan Zalasiewicz,¹ PK Haff,² Christian Schwägerl,³ Anthony D Barnosky^{4,5,6} and Erle C Ellis⁷

The Great Acceleration



Earth Resilience Critical for Humanity's Future

Are we Tipping from Friend to Foe?





Because...

Entering the Anthropocene

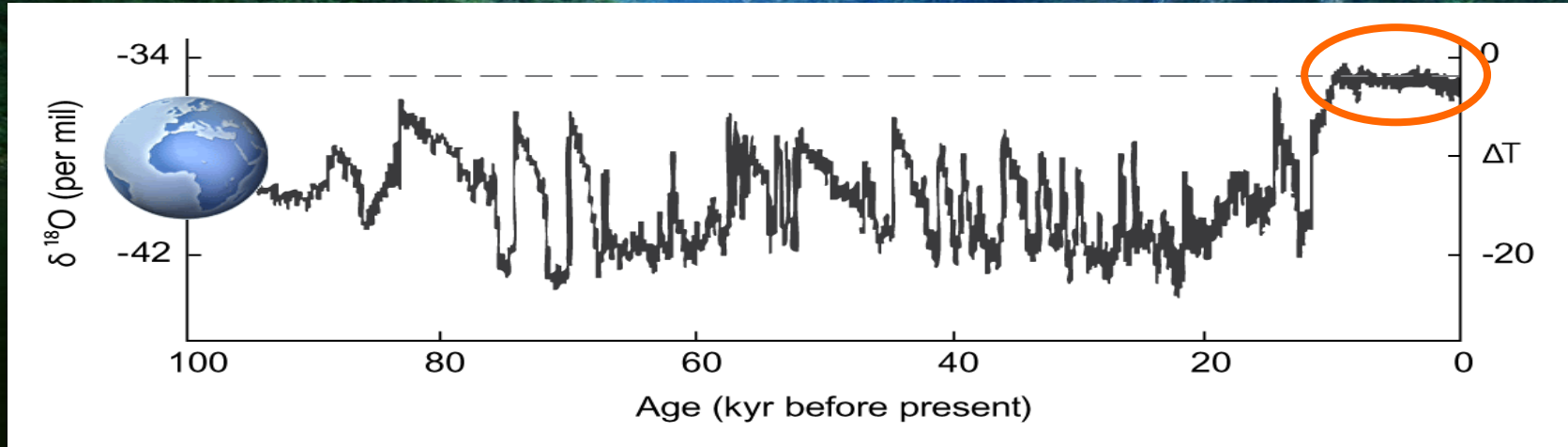
means Leaving the Holocene
Our Garden of Eden



Photo: Mattias Klum

The Holocene - Humankind's 10 000 years of grace

Stockholm Resilience Centre and Rockström and others, Ecology and Society 2009:14





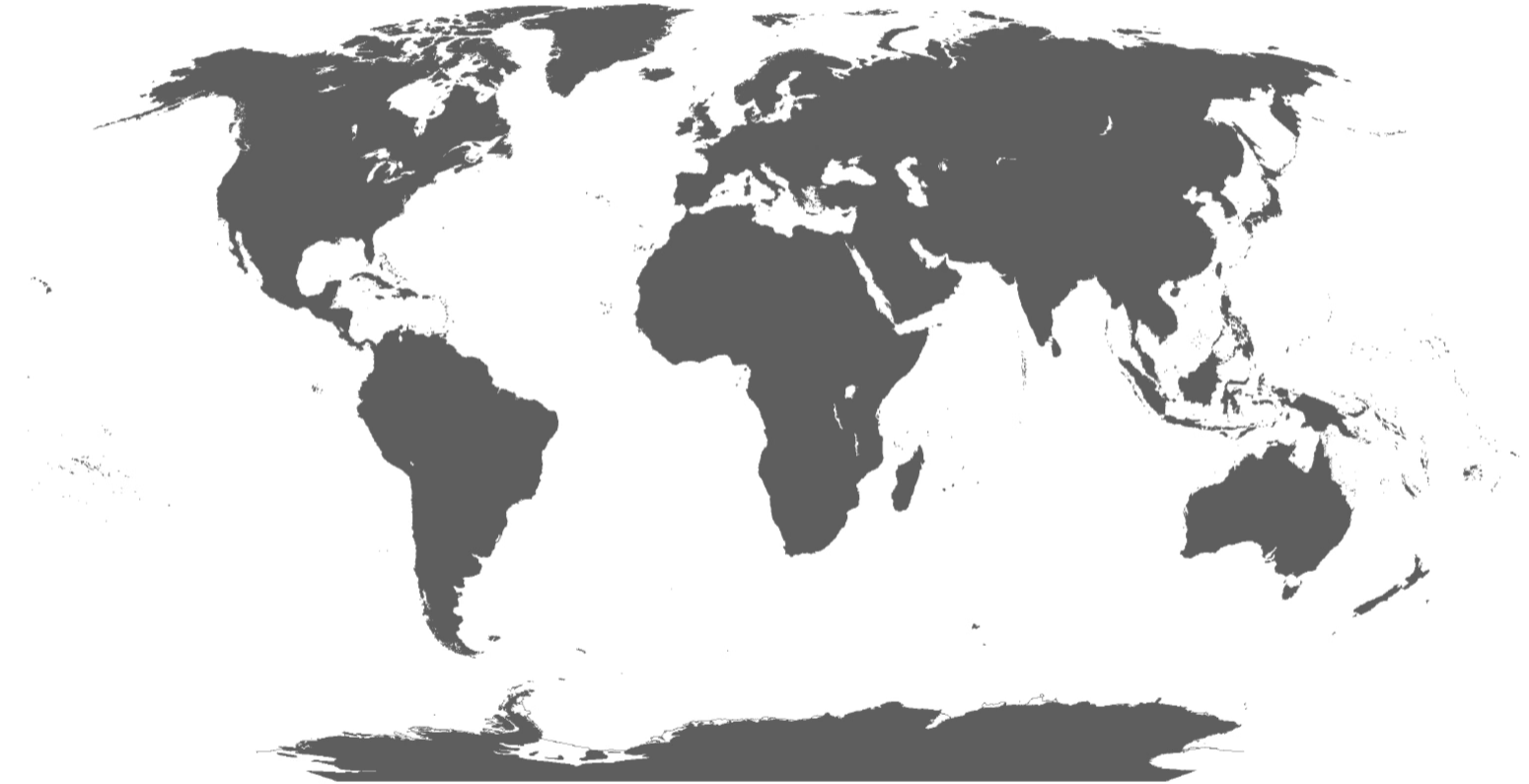
Earth System tipping points



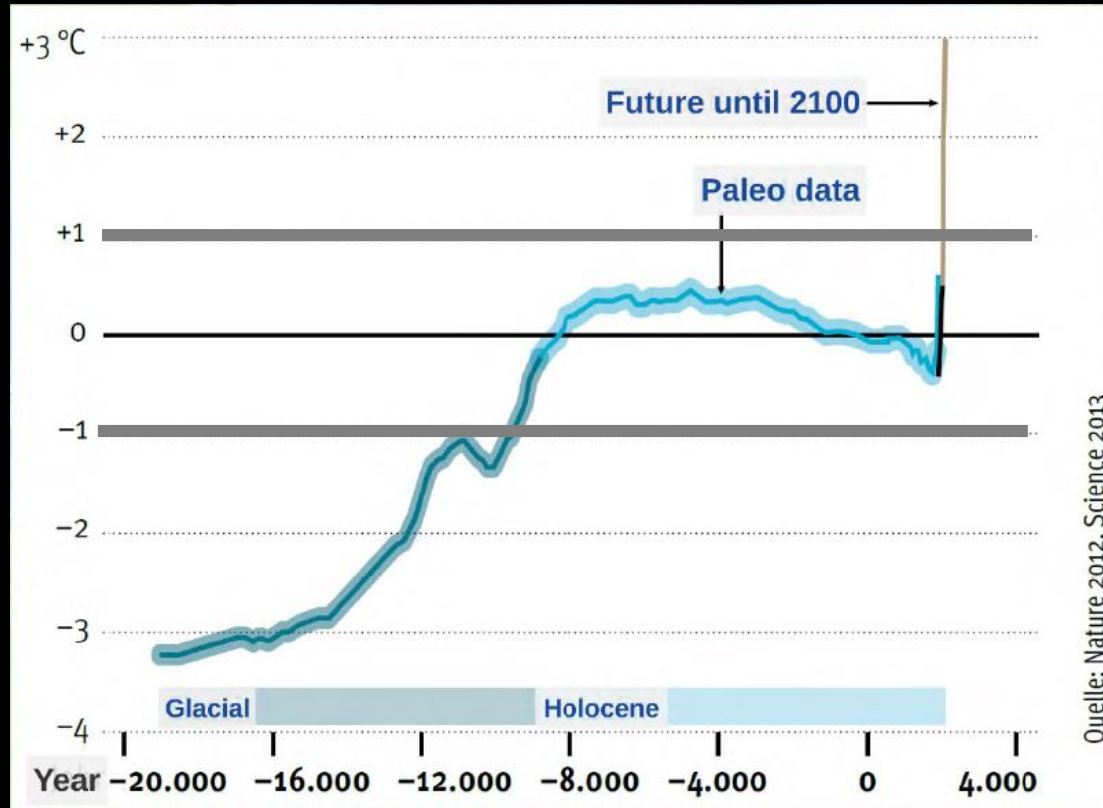




Global Tipping Points



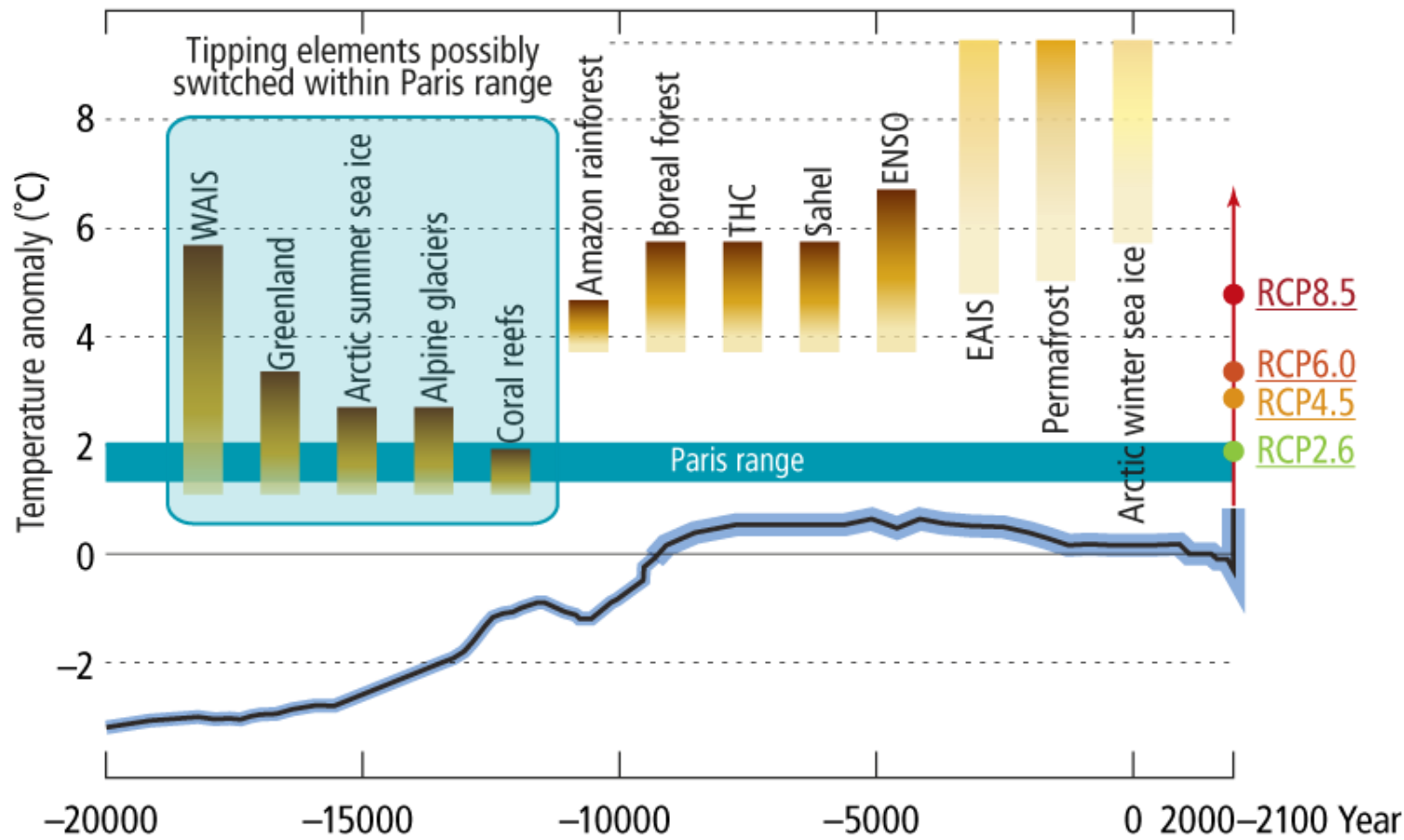
Global Temperature Since last Ice Age



Adapted by Stefan Rahmstorf

Tipping Points & the Paris Agreement

Sources: Adapted from Schellnhuber et al. (2016). Nature Climate Change





In 50 years we tipped from 10,000 year Holocene to
Anthropocene

What we do next 50 years will determine next 10,000 years

Anthropocene

+

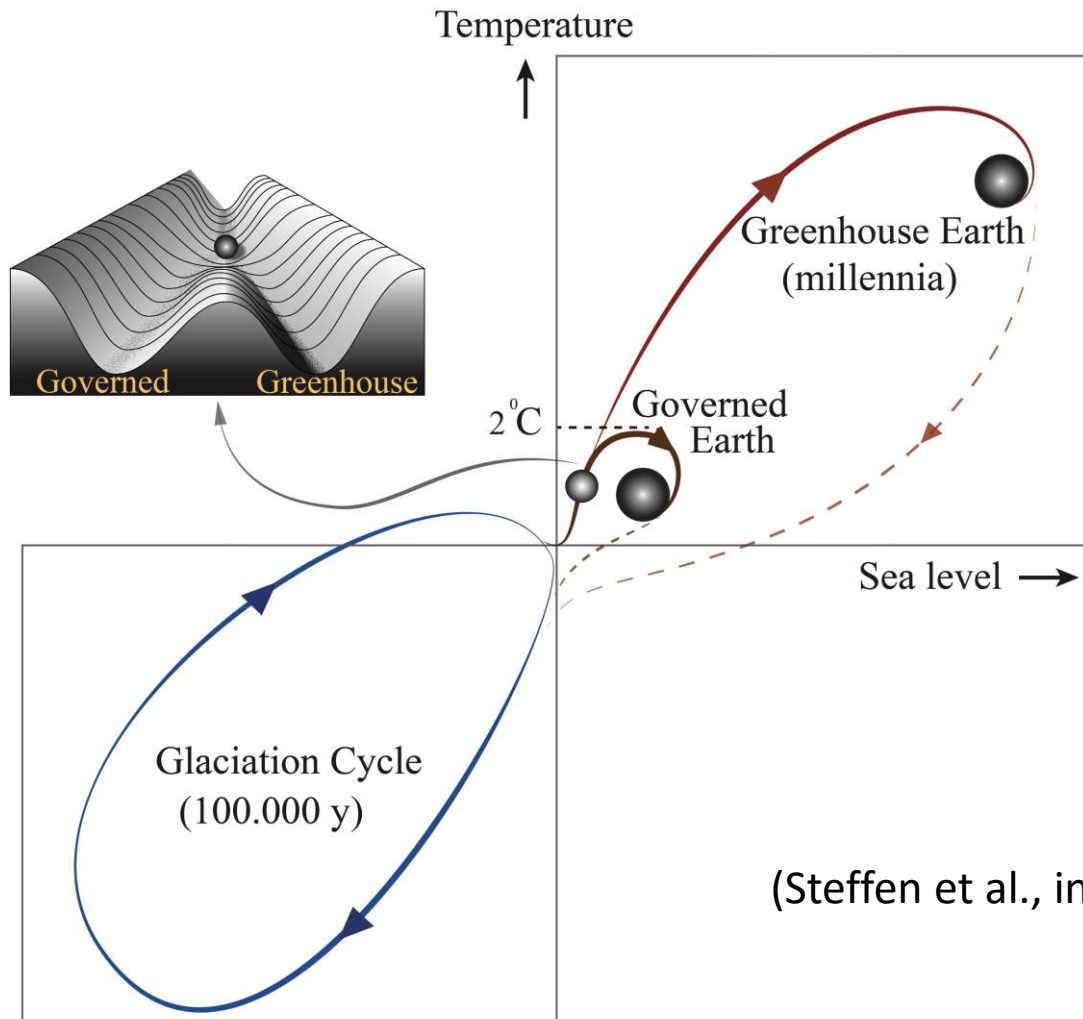
Holocene

+


Tipping Points

=

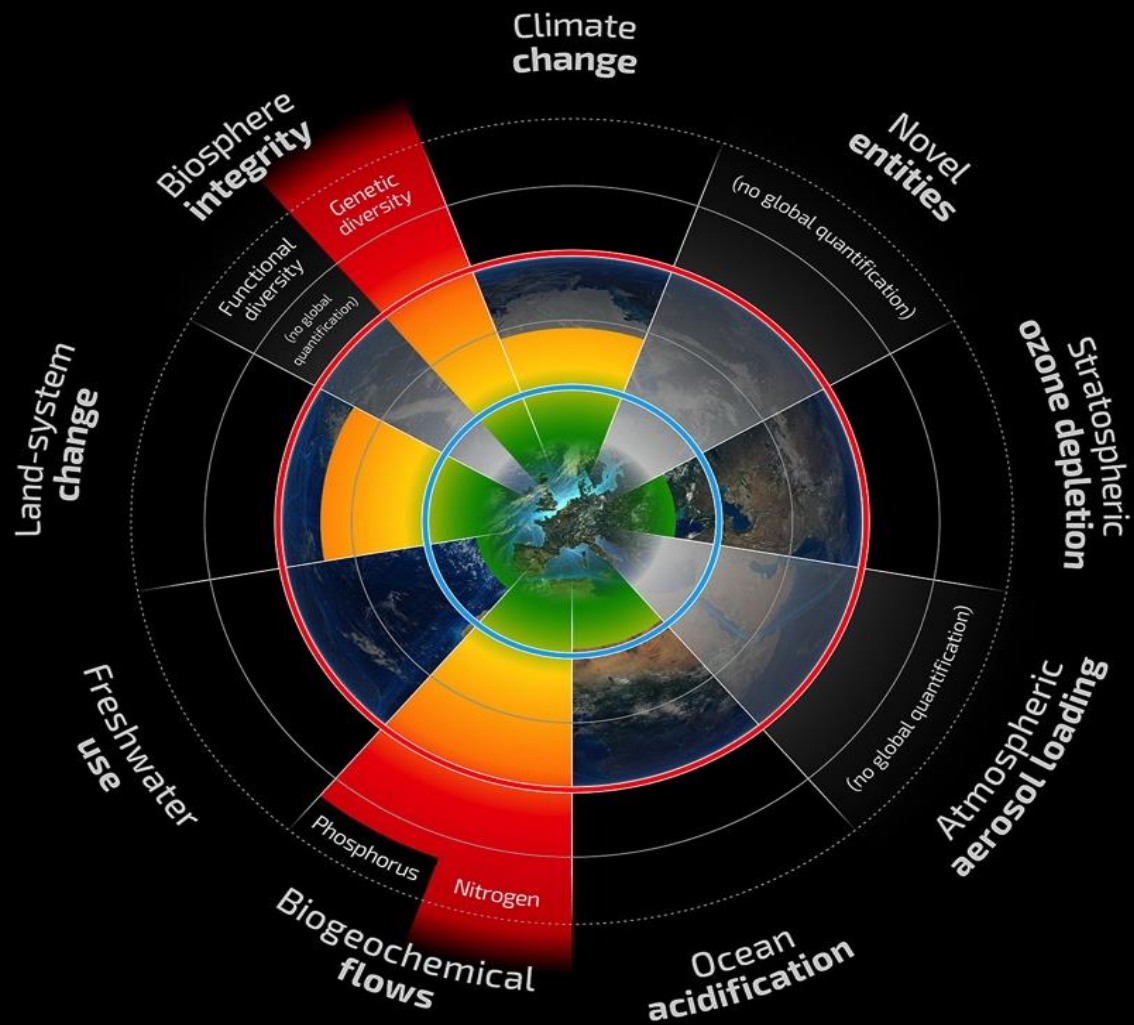
Planetary Boundaries

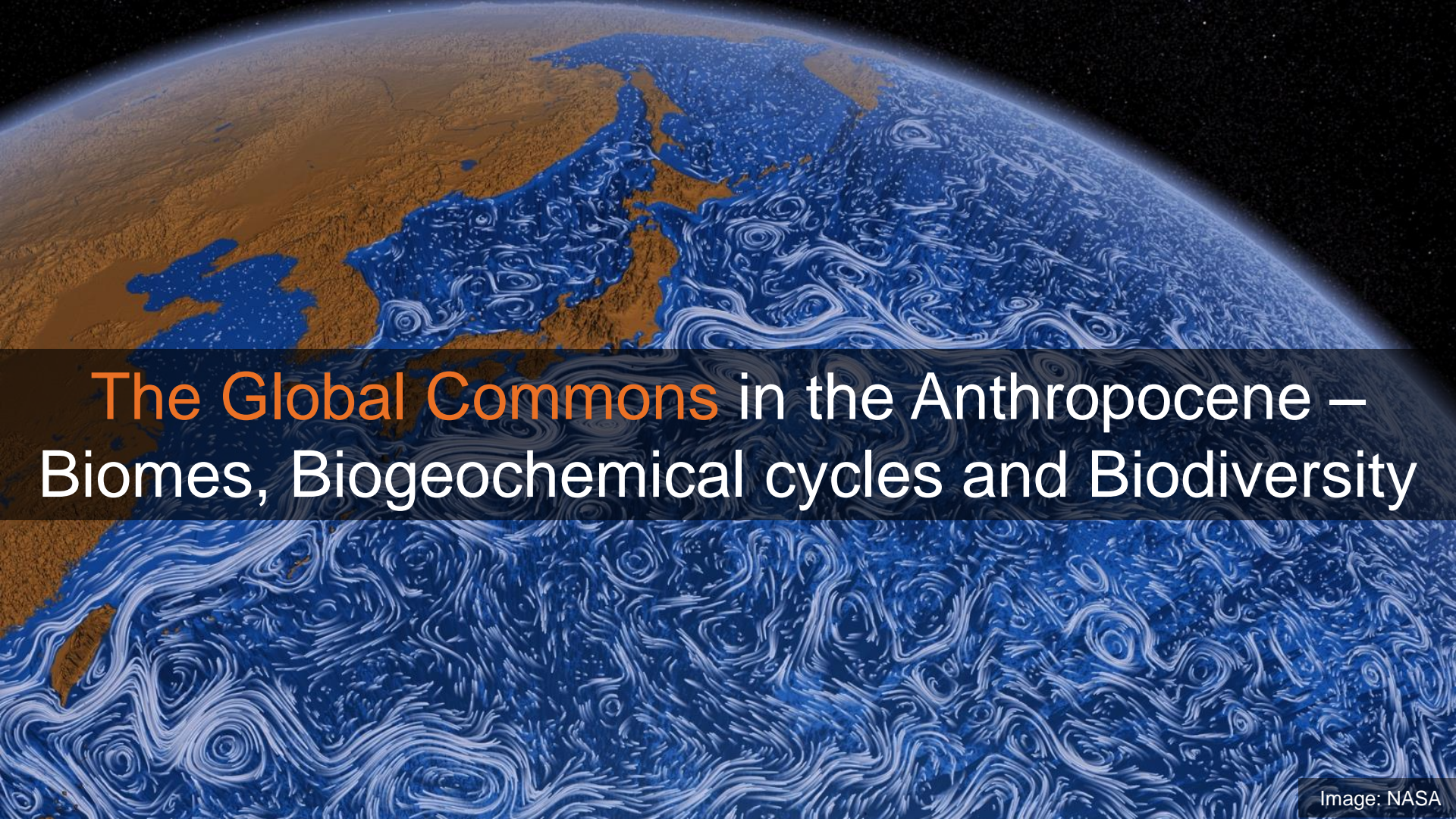


(Steffen et al., in progress)



Planetary Boundaries – Towards a safe and just operating space





The Global Commons in the Anthropocene – Biomes, Biogeochemical cycles and Biodiversity



3

PRINCIPLES

FOR GLOBAL COMMONS IN THE ANTHROPOCENE



Principle 1: The inclusivity principle

The Global Commons are not external to human activity; they are internal to development at all scales and need to be treated inclusively



Principle 2: The universality principle

Managing the Global Commons requires a paradigm shift in human worldviews toward planetary stewardship.



Principle 3: The resilience principle

Planetary stewardship of the Global Commons is fundamentally about safeguarding social-ecological resilience, from local communities to Earth stability.

A savanna landscape under a clear blue sky. In the foreground, a herd of antelope, likely topi, is grazing in a field of dry, yellowish grass. Several white birds, possibly egrets, are scattered among the antelope. In the background, there are several acacia trees, including a prominent one with a wide, flat canopy. A black horizontal band with white text is overlaid across the middle of the image.

Major Biomes on earth that regulate ‘Earth Resilience’

Photos: World Wildlife Fund, breakingenergy.com, saguidedtours.com, Sierra Club Pennsylvania, Projectaware.com, Duncan Greene/Wired UK.



CLIMATE POLICY

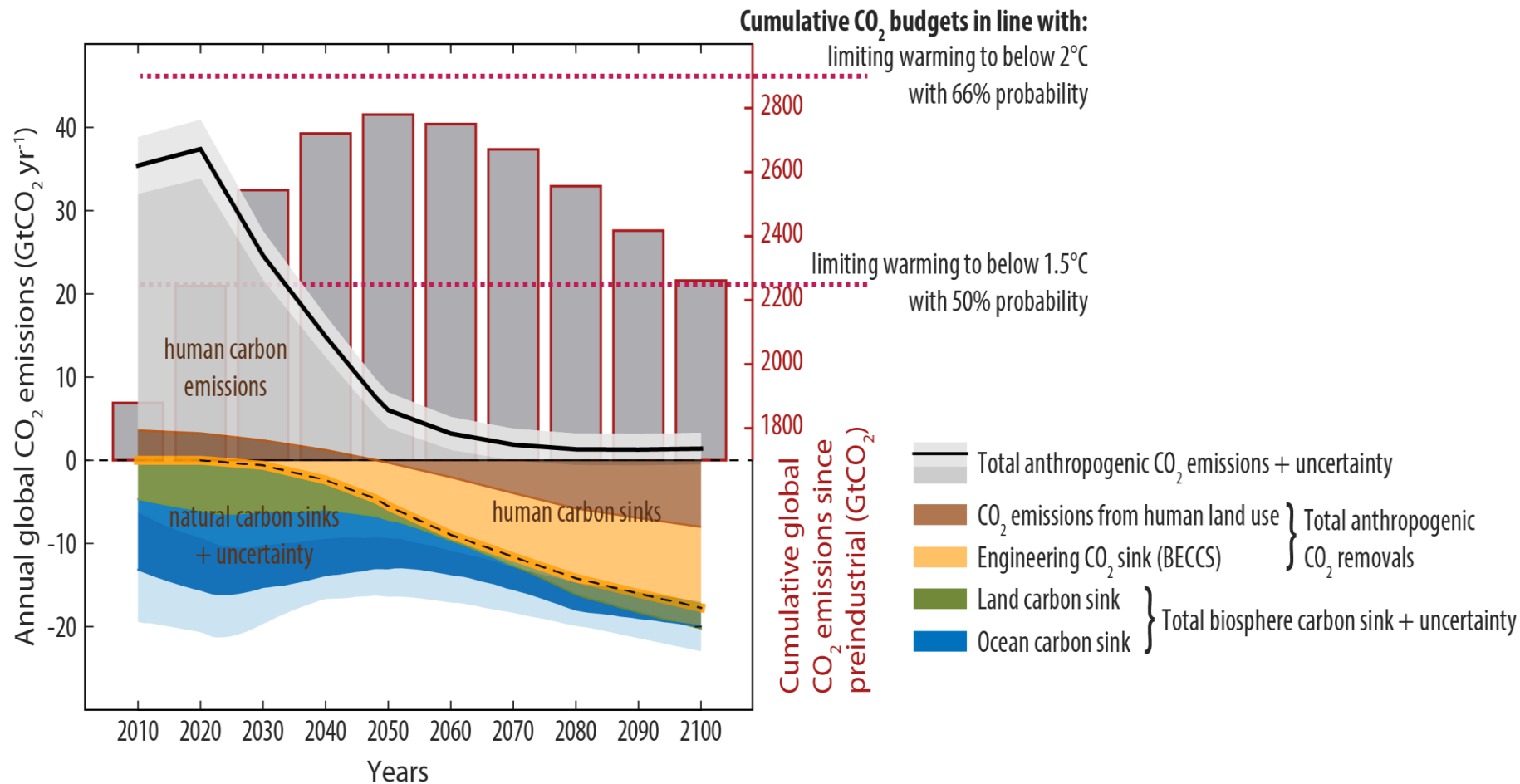
A roadmap for rapid decarbonization

Emissions inevitably approach zero with a “carbon law”

By Johan Rockström,¹ Owen Gaffney,^{1,2}
Joeri Rogelj,^{3,4} Malte Meinshausen,^{5,6}
Nebojsa Nakicenovic,⁴ Hans Joachim
Schellnhuber^{1,5}

pose framing the decarbonization challenge in terms of a global decadal roadmap based on a simple heuristic—a “carbon law”—of halving gross anthropogenic carbon-dioxide (CO₂) emissions every decade. Comple-

A global transformation – to a safe climate future

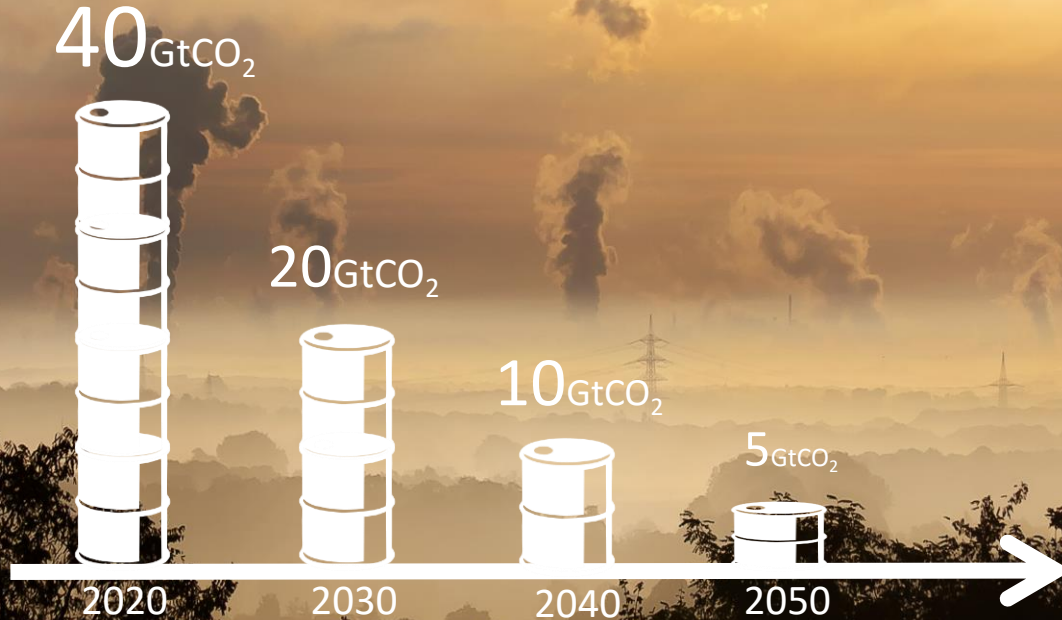


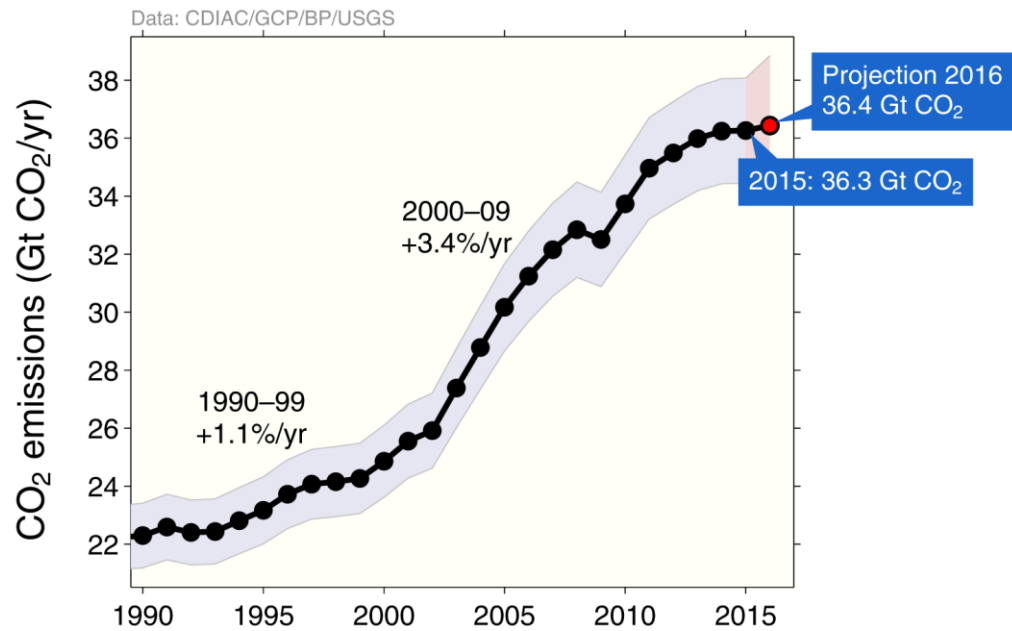


The Carbon Law – A Moore's law for climate stability

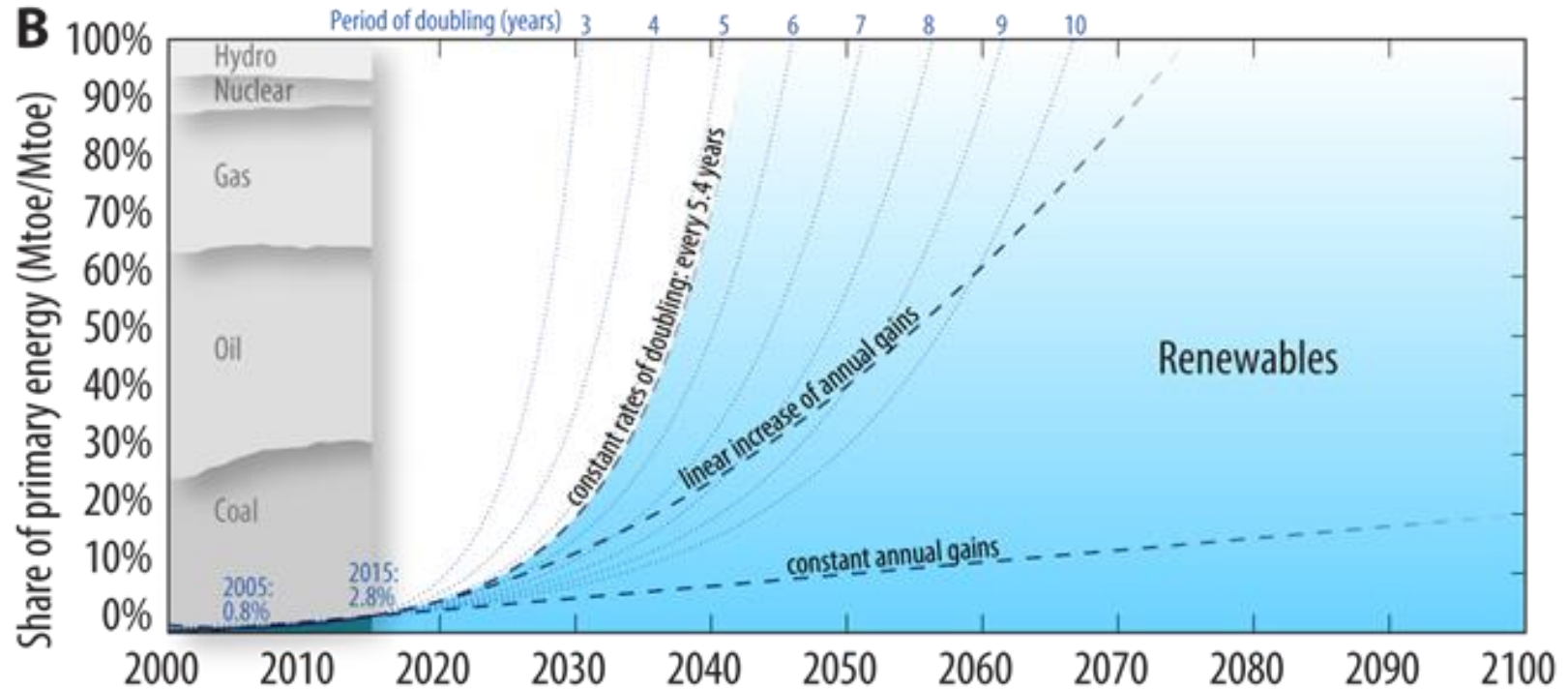
A Global Carbon Law

Halving Emissions Every Decade

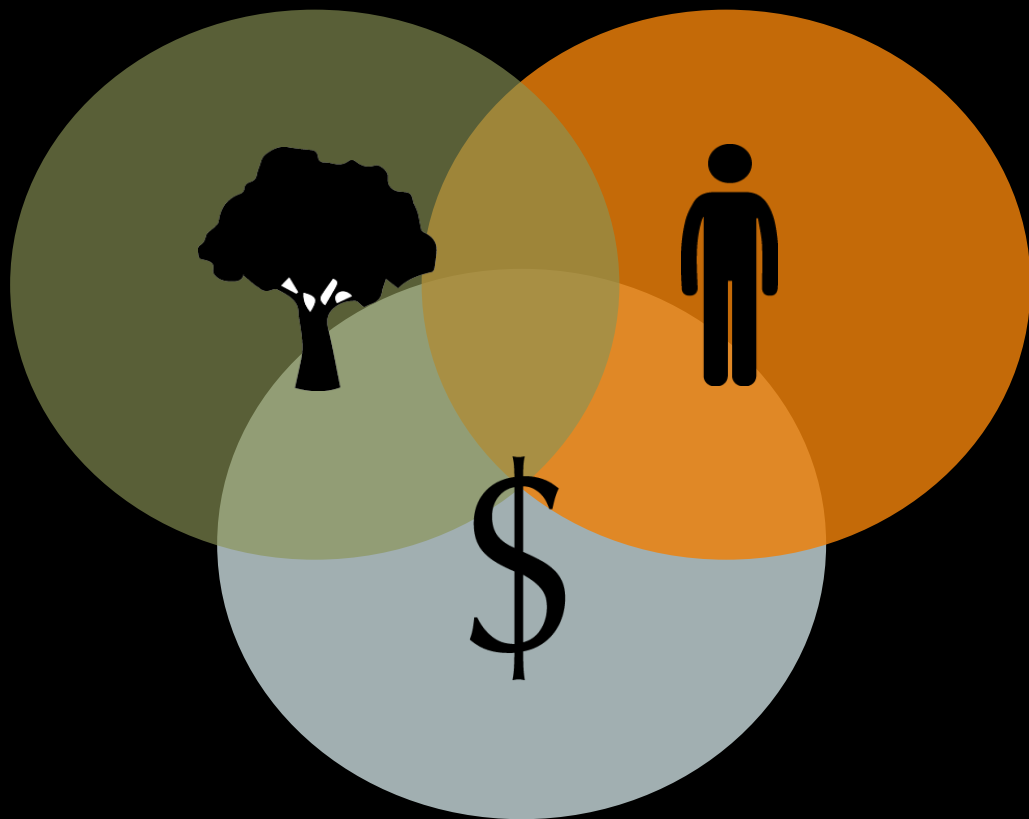




Where Exponential trajectories on Renewable Energy will take us



(Rockström et al., 2017 in review)





SUSTAINABLE DEVELOPMENT GOALS

1 NO POVERTY



2 ZERO HUNGER



3 GOOD HEALTH AND WELL-BEING



4 QUALITY EDUCATION



5 GENDER EQUALITY



6 CLEAN WATER AND SANITATION



7 AFFORDABLE AND CLEAN ENERGY



8 DECENT WORK AND ECONOMIC GROWTH



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



10 REDUCED INEQUALITIES



11 SUSTAINABLE CITIES AND COMMUNITIES



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



14 LIFE BELOW WATER



15 LIFE ON LAND



16 PEACE, JUSTICE AND STRONG INSTITUTIONS

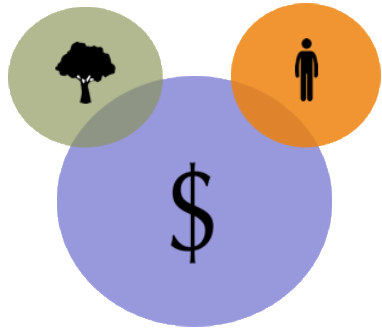


17 PARTNERSHIPS FOR THE GOALS

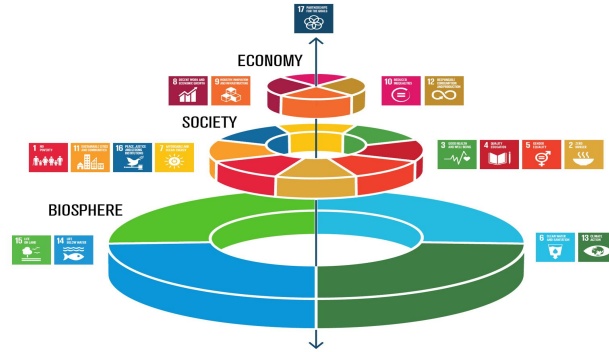


SUSTAINABLE
DEVELOPMENT
GOALS





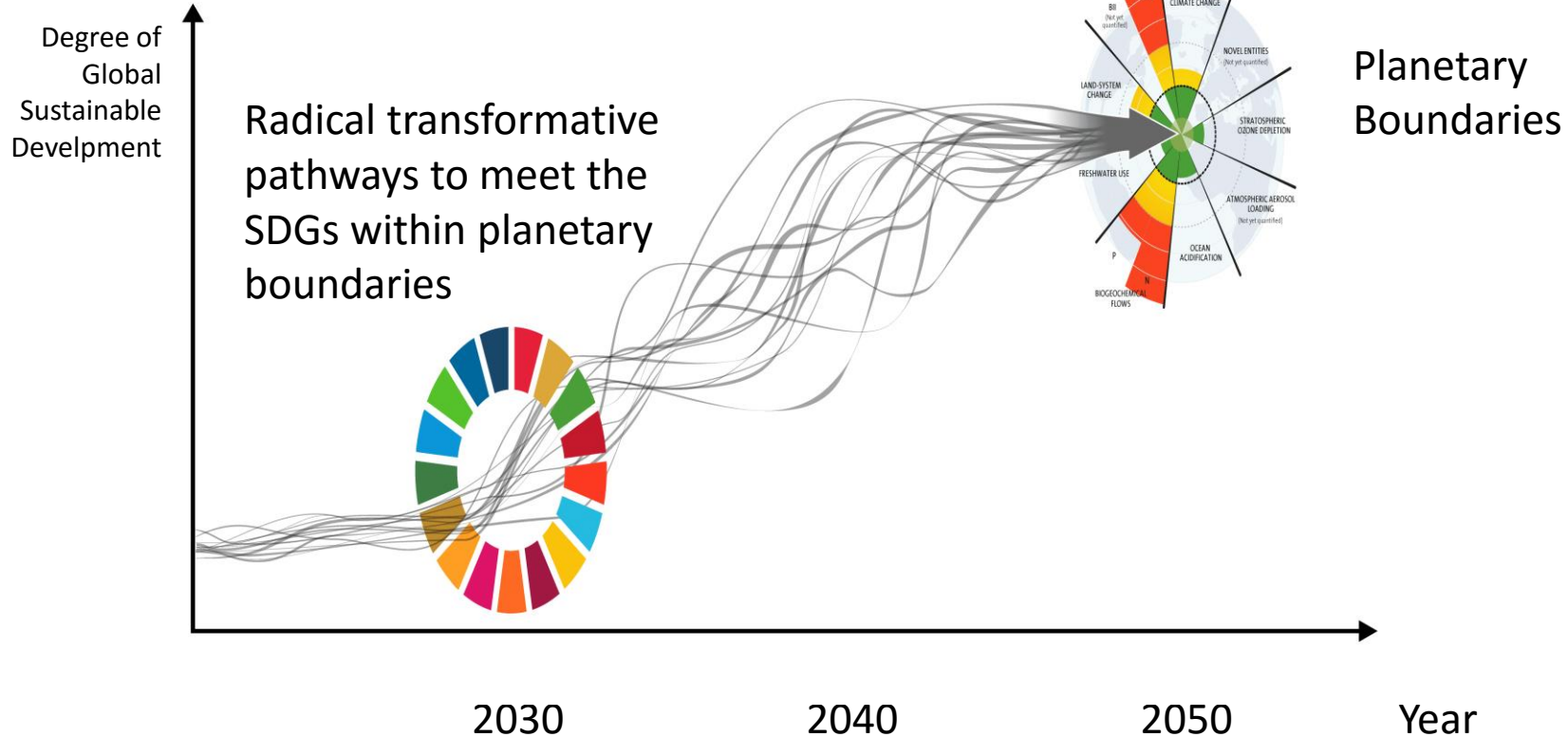
+



=

Reconnecting
World
Development
with
Global
Commons

The World In 2050





Thank you

www.stockholmresilience.su.se

Photo: O.Henriksson/Azote

Stockholm Resilience Centre
Sustainability Science for Biosphere Stewardship



**Stockholm
University**

THE
BEIJER
INSTITUTE
OF ECOLOGICAL ECONOMICS



**KUNGL.
VETENSKAPS-
AKADEMIEN**
THE ROYAL SWEDISH ACADEMY OF SCIENCES

FUNDED BY

MISTRA

The Swedish Foundation for
Strategic Environmental Research