Our Future on Earth

UNU
Tokyo
19 April 2017

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Professor of Environmental Science, Stockholm University

Photo: Yann Arthus-Bertrand

Stockholm Resilience Centre
Sustainability Science for Biosphere Stewardship

Stockholm University

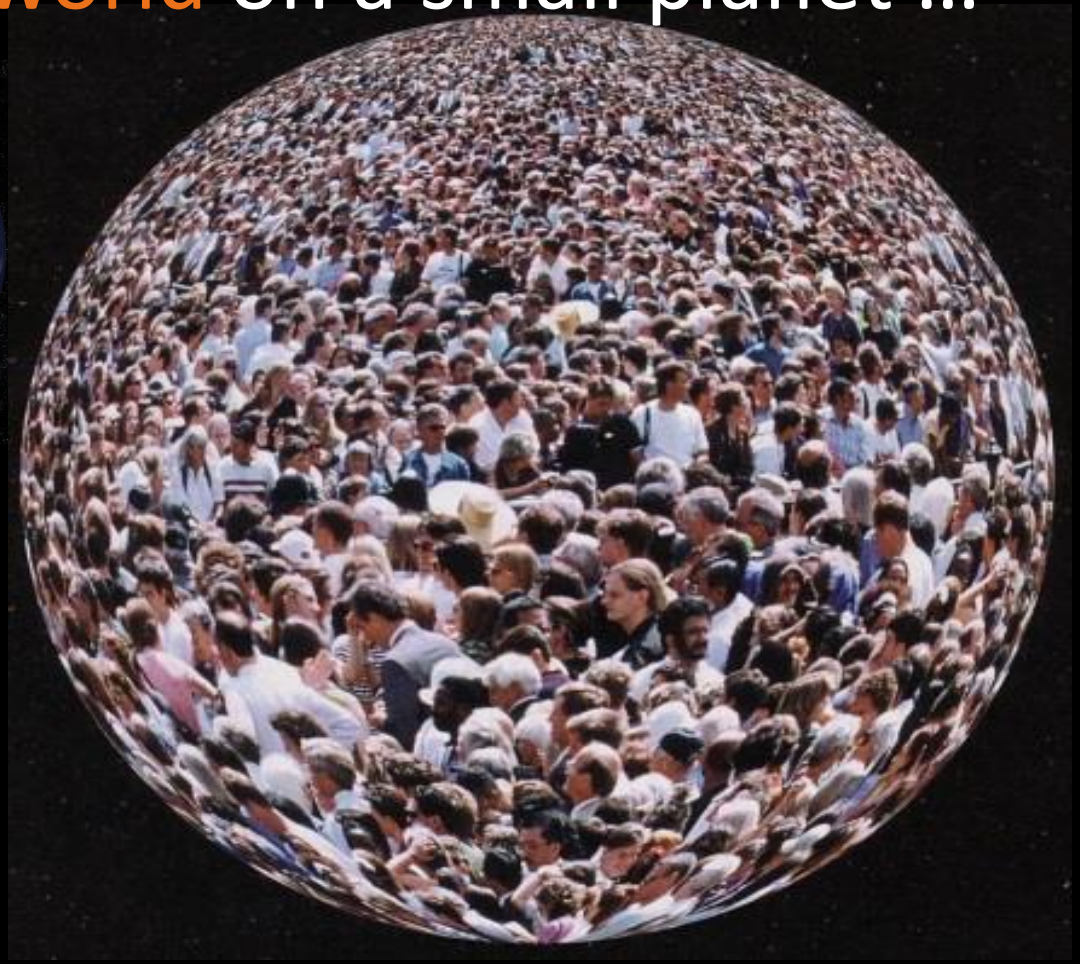
The Beijer Institute of Ecological Economics

Kungl. Vetenskaps-Akademien
The Royal Swedish Academy of Sciences

FUNDED BY
MISTRA
The Swedish Foundation for Strategic Environmental Research

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 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?

Photo: Yann Arthus-Bertrand

The great acceleration and the global food system

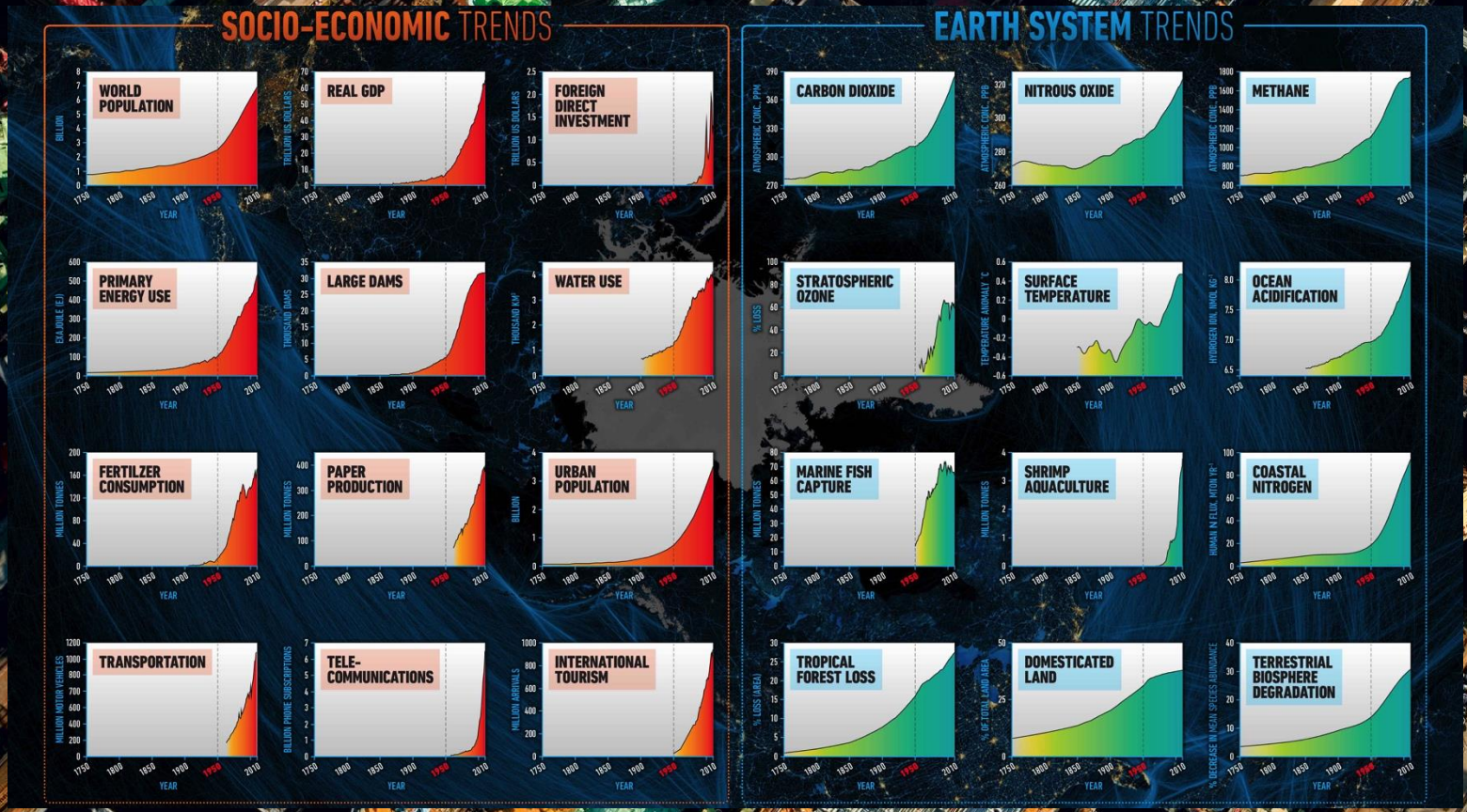


Image: GLOBAIA

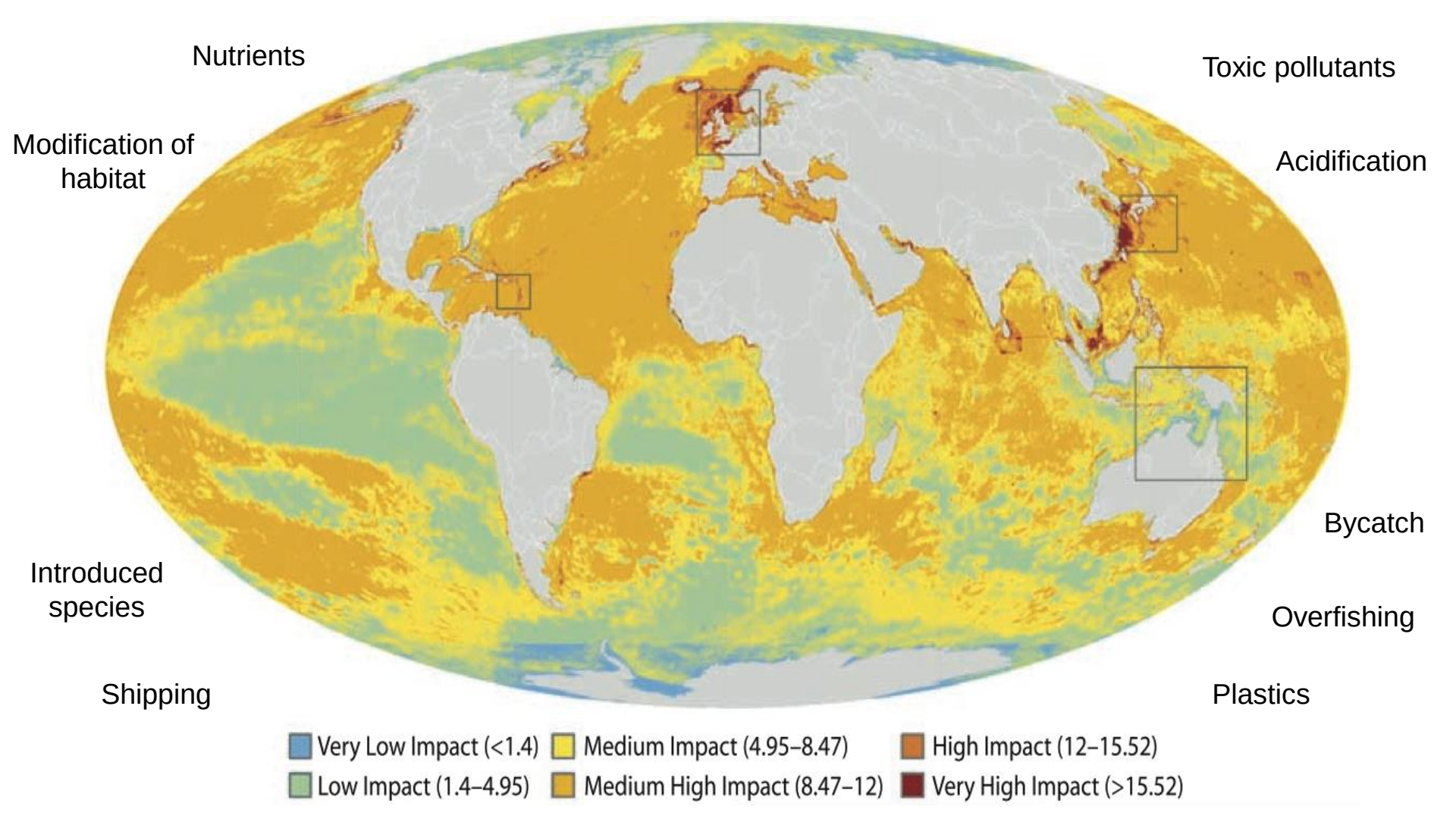

Nutrients
Toxic pollutants
Modification of habitat
Acidification
Bycatch
Introduced species
Overfishing
Shipping
Plastics
Very Low Impact (<1.4)
Medium Impact (4.95–8.47)
High Impact (12–15.52)
Low Impact (1.4–4.95)
Medium High Impact (8.47–12)
Very High Impact (>15.52)

Image: GLOBAIA

THE ANTHROPOCENE REVIEW

The Anthropocene Review
1–18
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DOI: 10.1177/2053019614564785
anr.sagepub.com
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ELEMENTA
Science of the Anthropocene

The New World of the Anthropocene[1]

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MARK WILLIAMS
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WILL STEFFEN
Australian National University, Canberra

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

Dating the Anthropocene: T… an empirical global history of… transformation of the terrest…

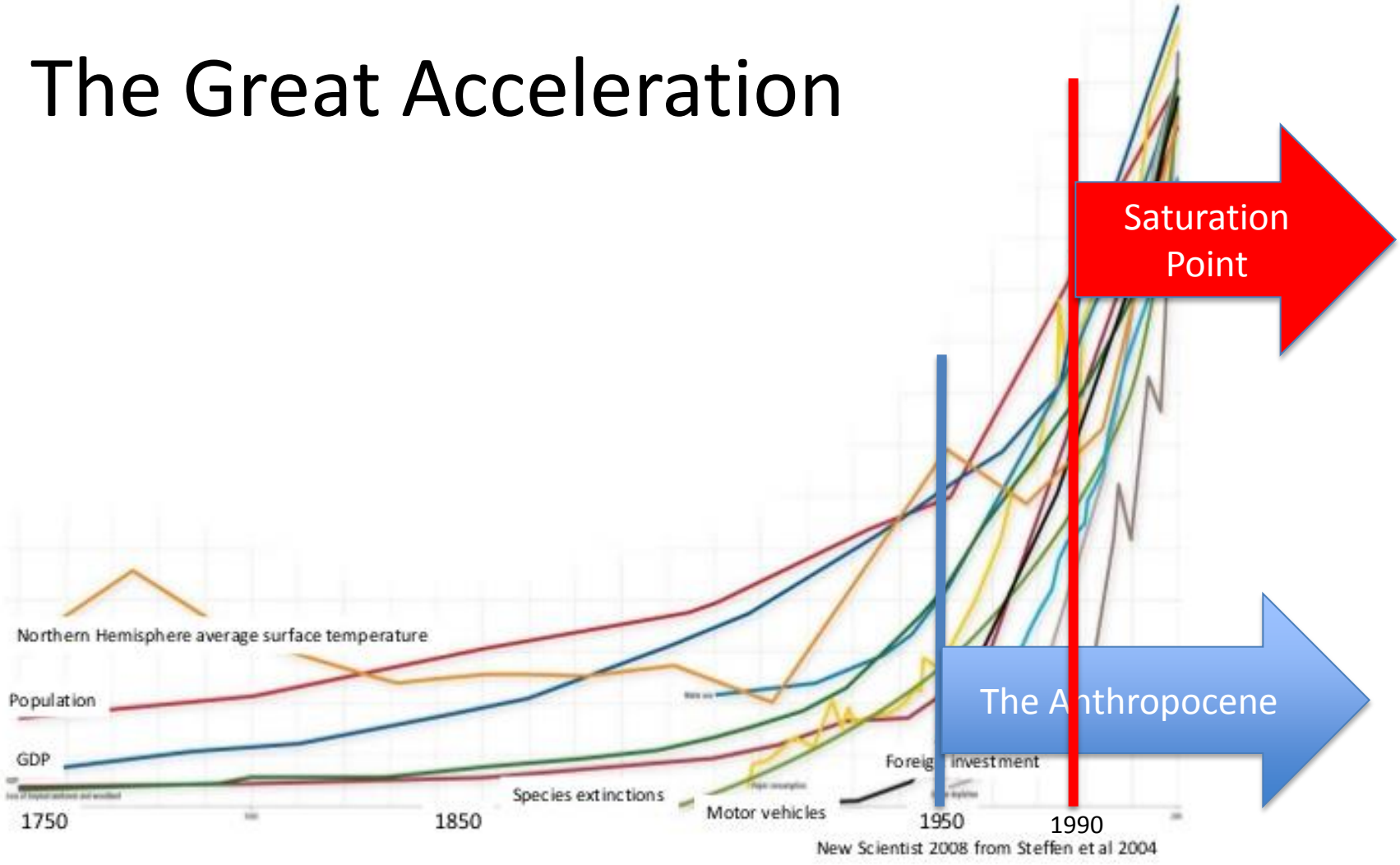
Erle C. Ellis[1*] • Dorian Q. Fuller[2] • Jed O. Kaplan[3] • Wayne G. Lutters[4]

…e Anthropocene biosphere

…² Wendy Broadgate,[3] Lisa Deutsch,[1]
…[3] and Cornelia Ludwig[1]

…k Williams,[1] Jan Zalasiewicz,[1] PK Haff,[2]
…istian Schwägerl,[3] Anthony D Barnosky[4,5,6]
and Erle C Ellis[7]

The Great Acceleration



Earth Resilience Critical for Humanity's Future
Are we Tipping from Friend to Foe?

OCEANS

OCEAN

25 % Carbon

155 (125-185)

TERRESTRIAL ECOSYSTEMS

25 % Carbon

150 (60-240)

Because…

Entering the Anthropocene

means Leaving the Holocene

Our Garden of Eden

Photo: Mattias Klum

The Holocene - Humankinds 10 000 years of grace

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

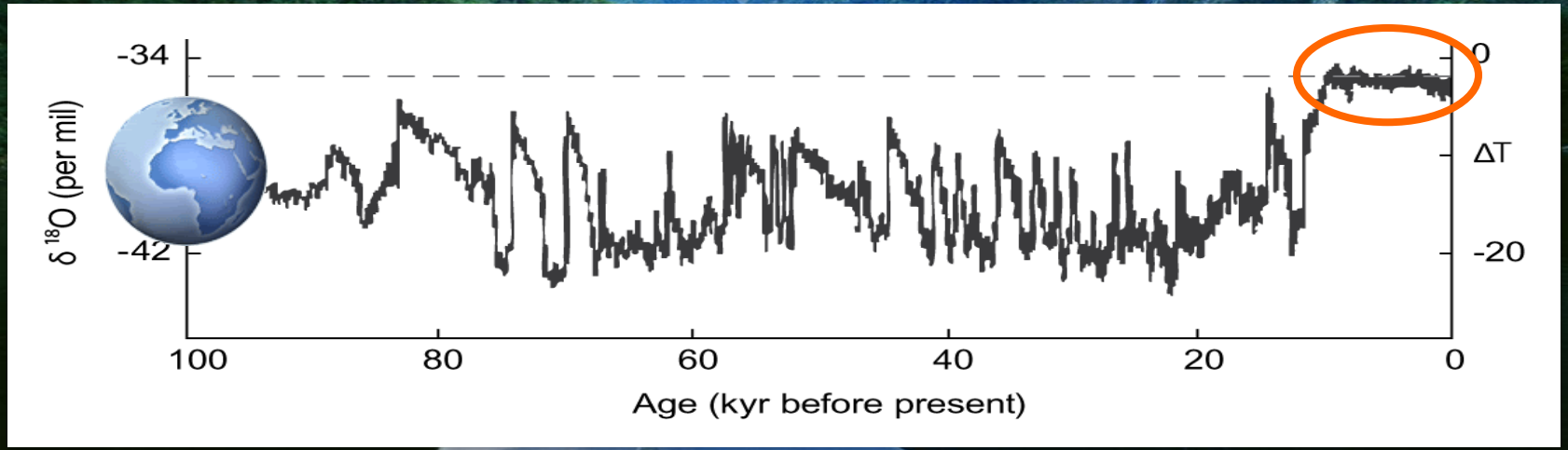


Photo: Michael A. Stecker

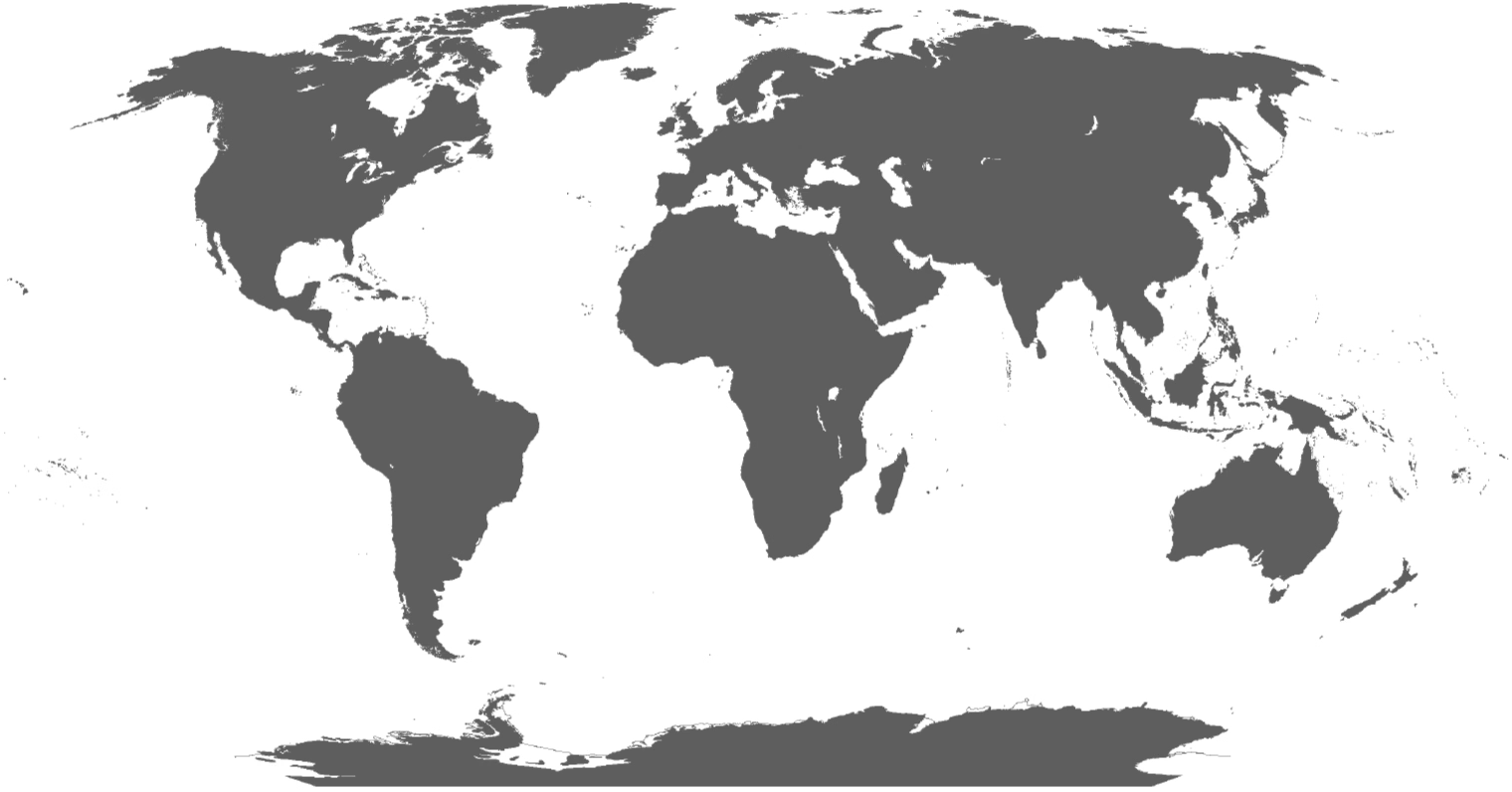
Earth System tipping points

Photo: Mattias Klum

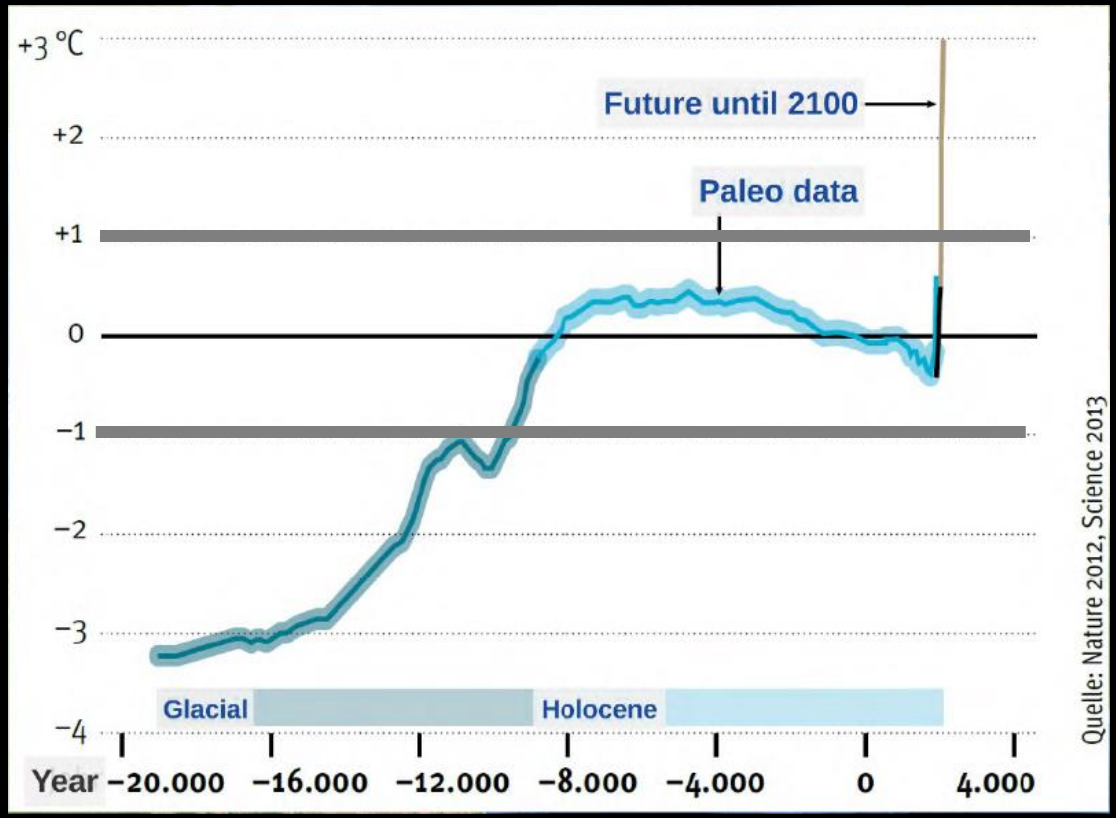
Photo: B Christensen/Azote


Image: B Christensen/Azo

Global Tipping Points



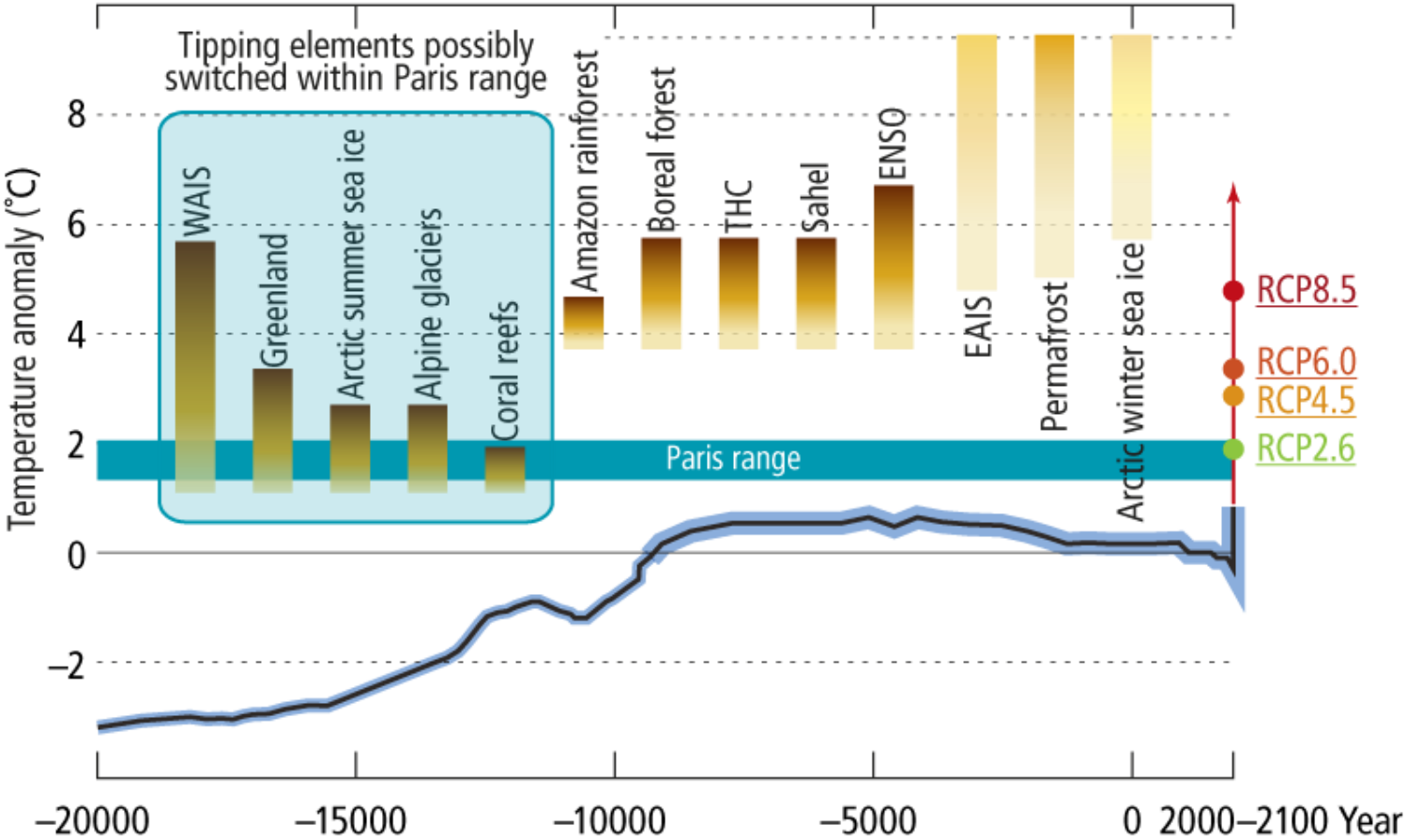
Global Temperature Since last Ice Age



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
Image: Mattias Klum

Anthropocene

+

Holocene

+

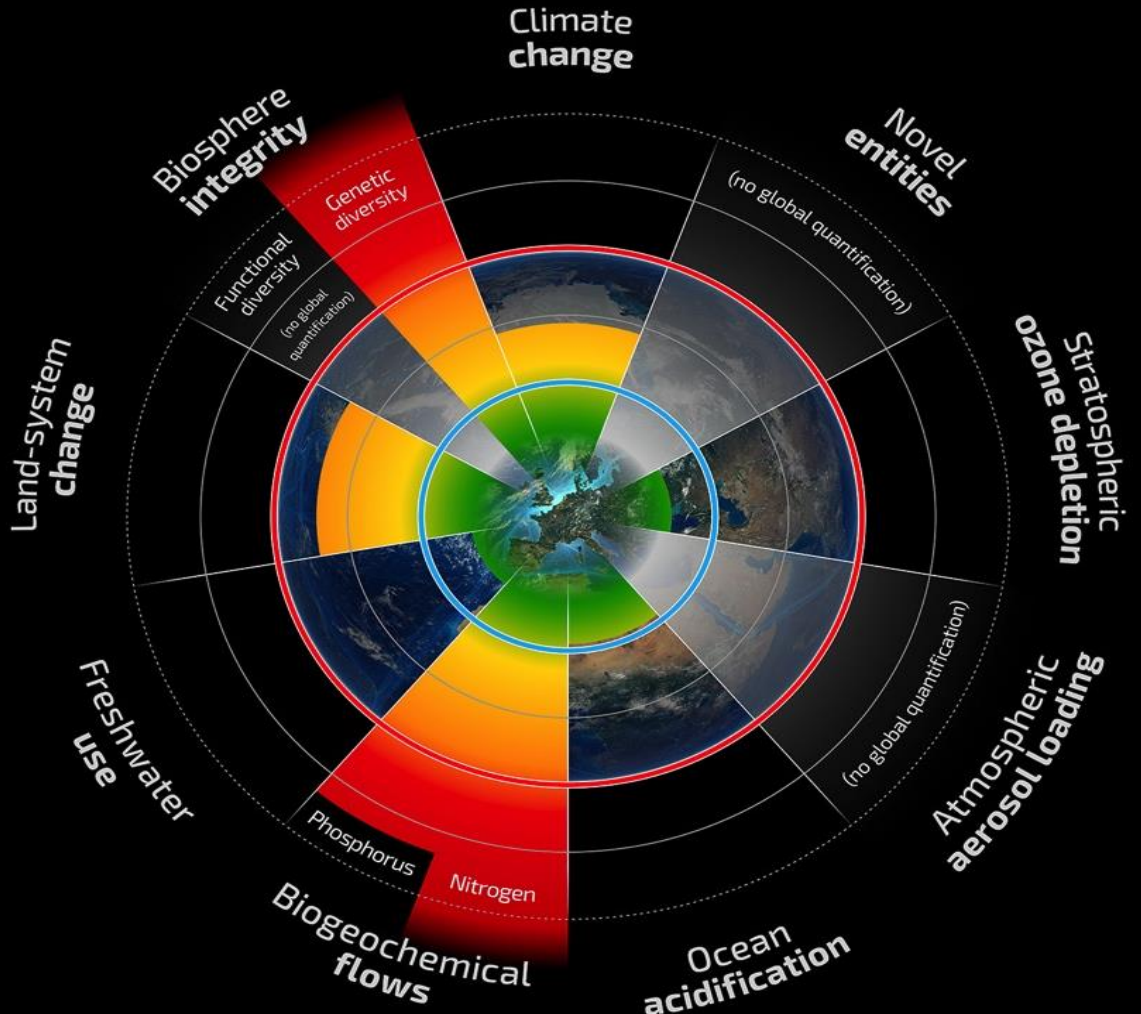
Tipping Points

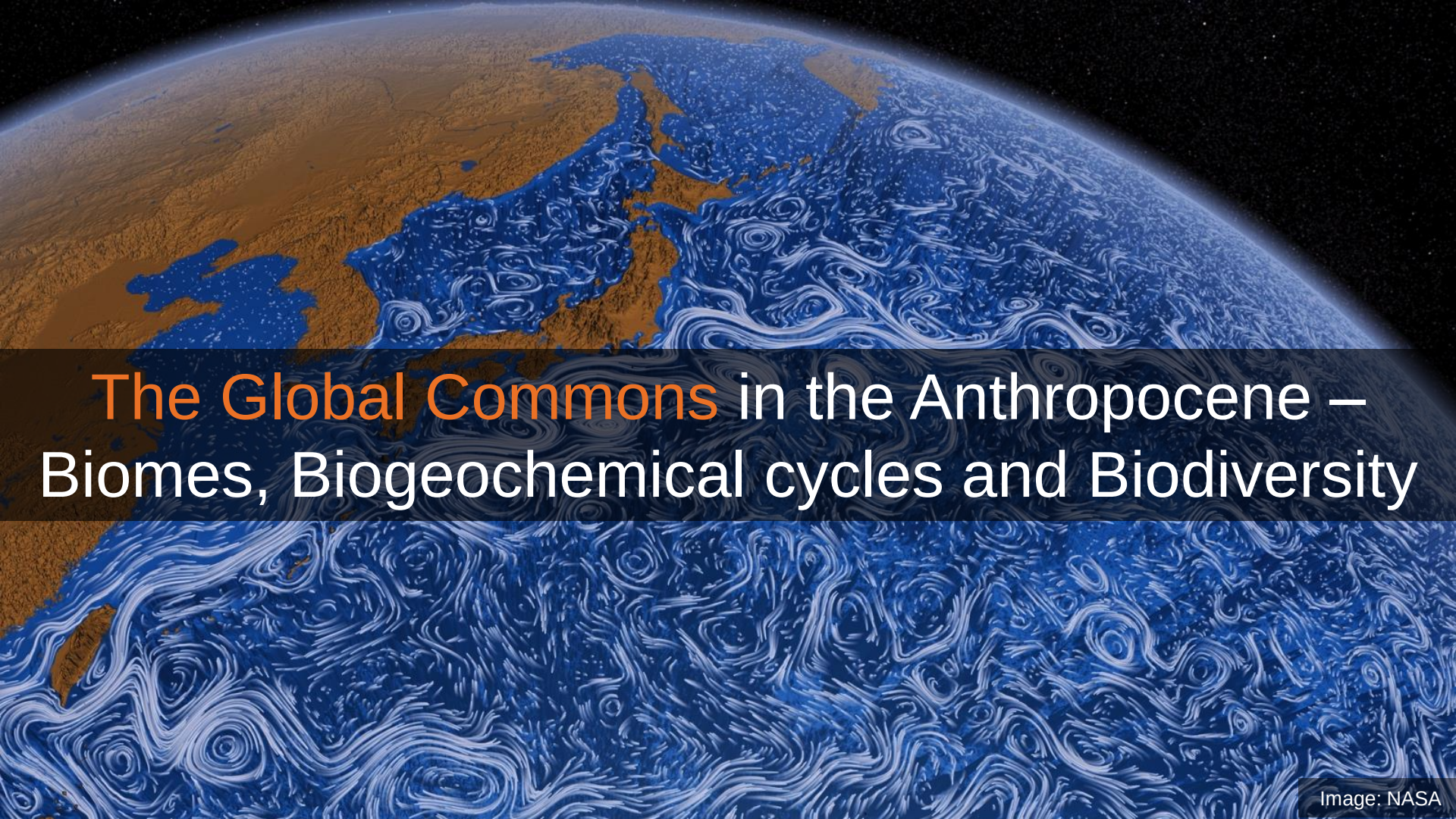
=

Planetary Boundaries

Planetary Boundaries – Towards a safe and just operating space

Image: Mattias Klum


Climate change
Novel entities
(no global quantification)
Stratospheric ozone depletion
Atmospheric aerosol loading
(no global quantification)
Ocean acidification
Biogeochemical flows
Phosphorus
Nitrogen
Freshwater use
Land-system change
Biosphere integrity
Genetic diversity
Functional diversity
(no global quantification)



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

Image: NASA

3 PRINCIPLES FOR GLOBAL COMMONS IN THE ANTHROPOCENE

NASA 2014

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.

Photo: Wikimedia commons

Principle 3: The resilience principle

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

Photo: timsteeves.com

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

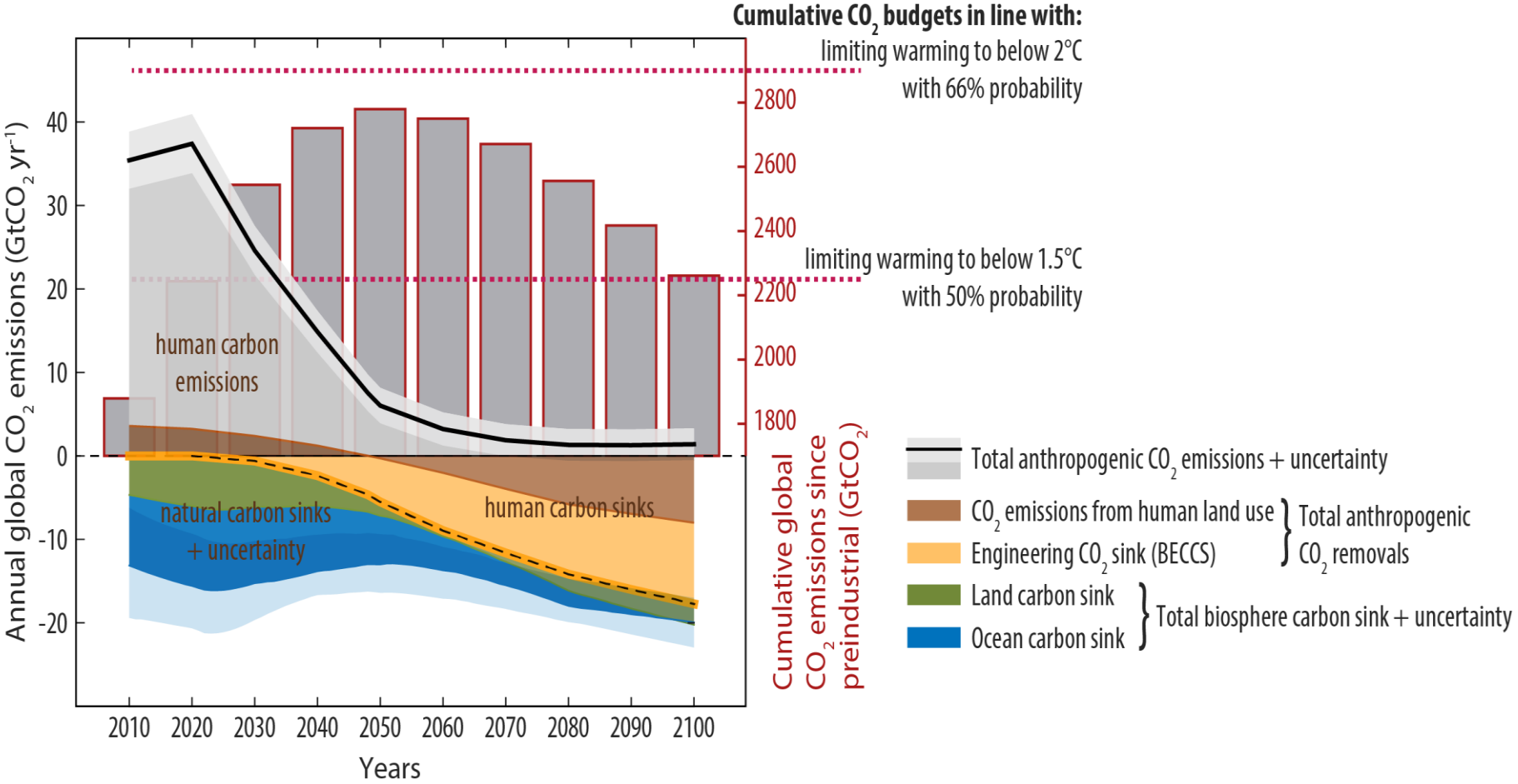
A roadmap for rapid decarbonization

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 (CO_2) emissions every decade. Comple-

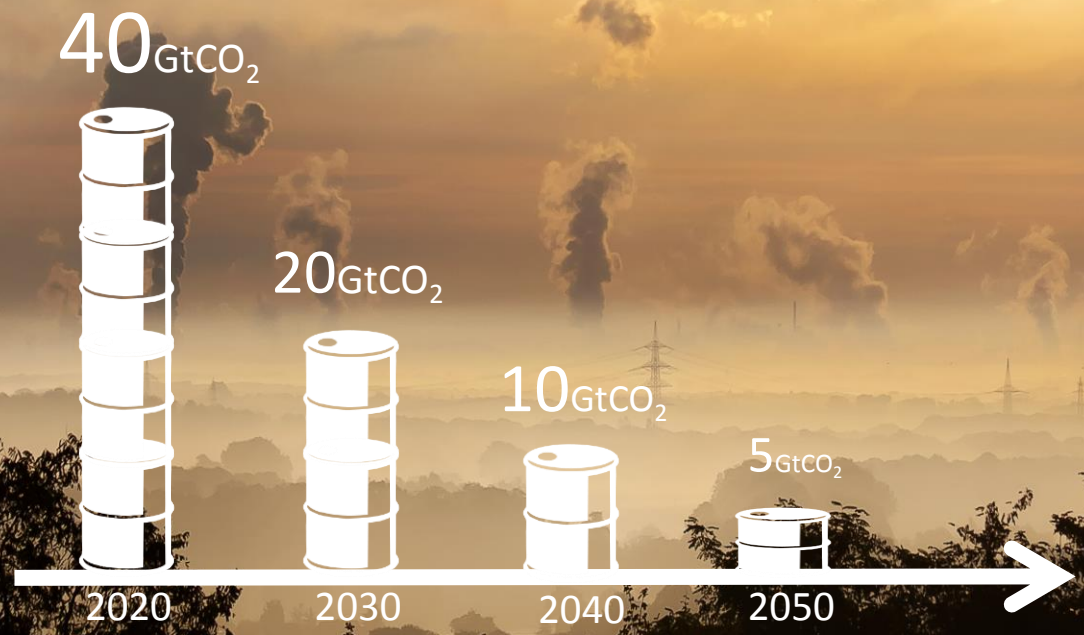
A global transformation – to a safe climate future

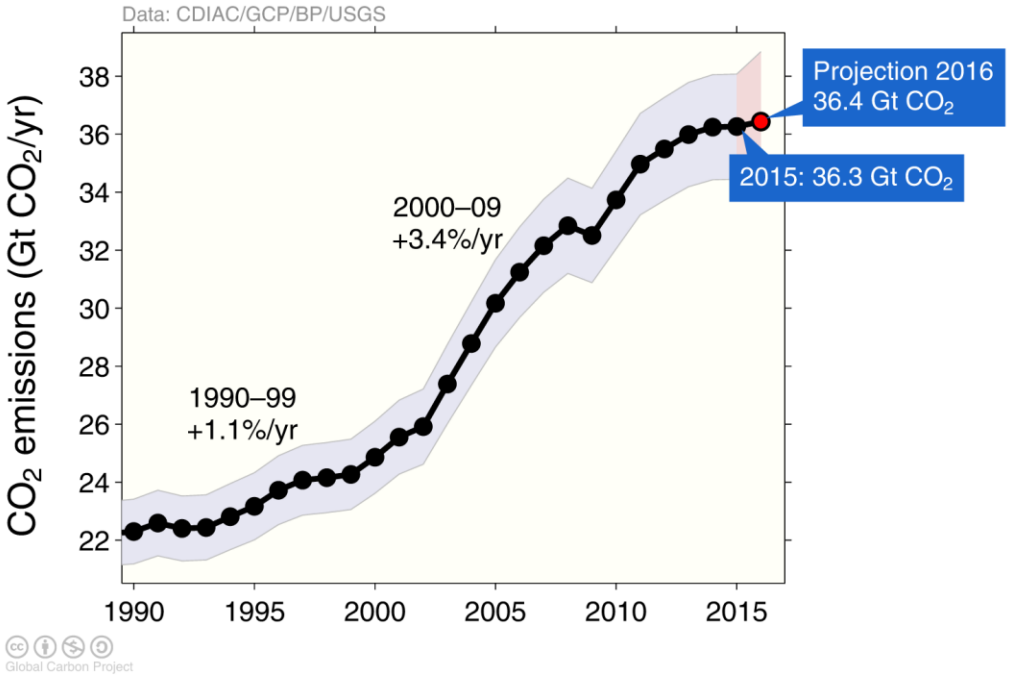


The Carbon Law – A Moore's law for climate stability

Photo: Google

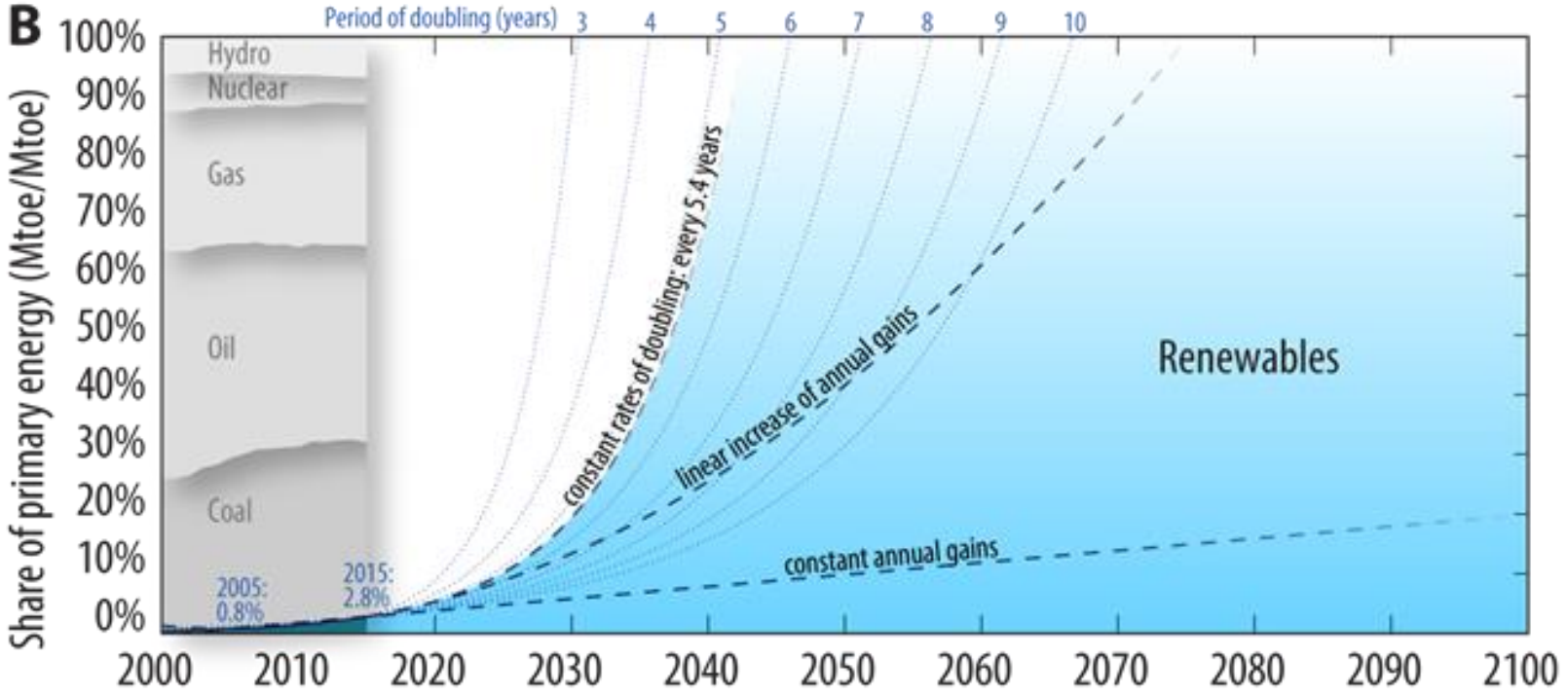
A Global Carbon Law
Halving Emissions Every Decade





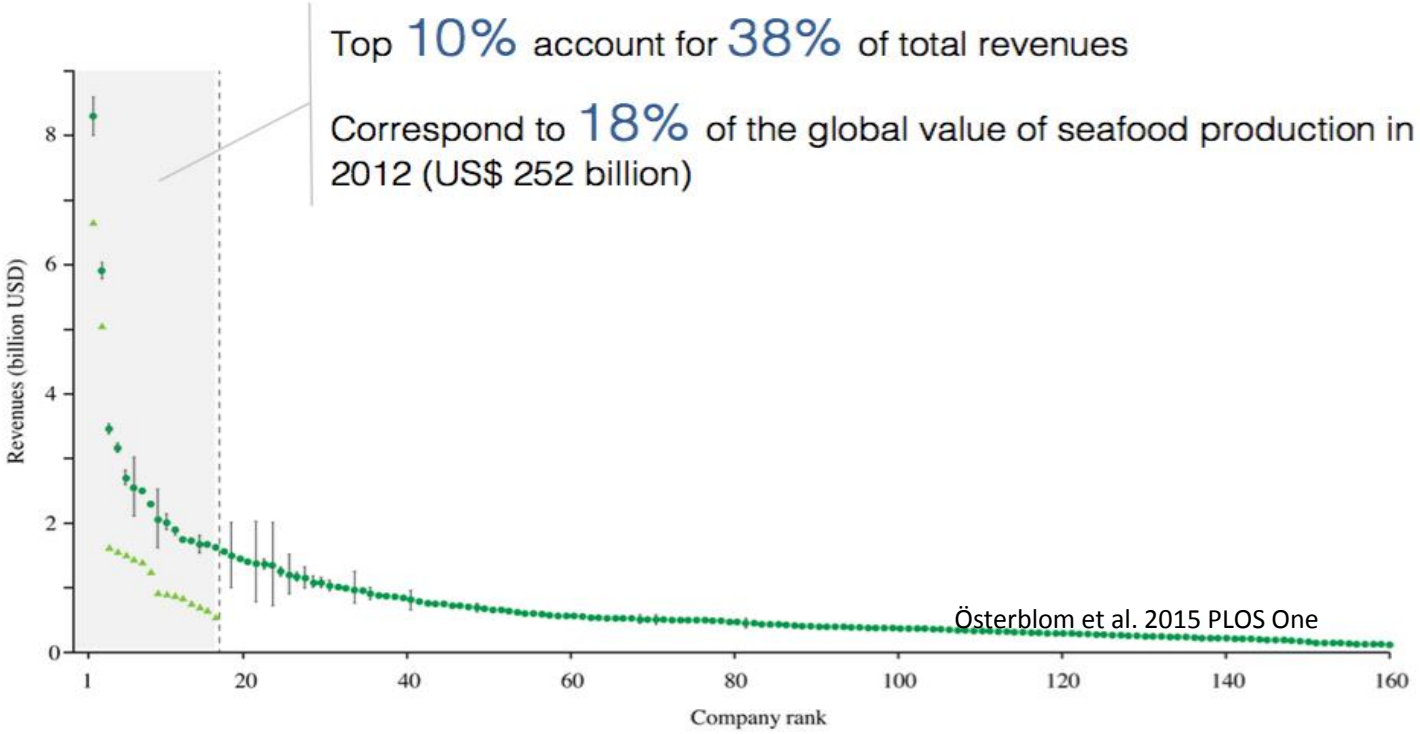
2016 Global Carbon Project

Where Exponential trajectories on Renewable Energy will take us



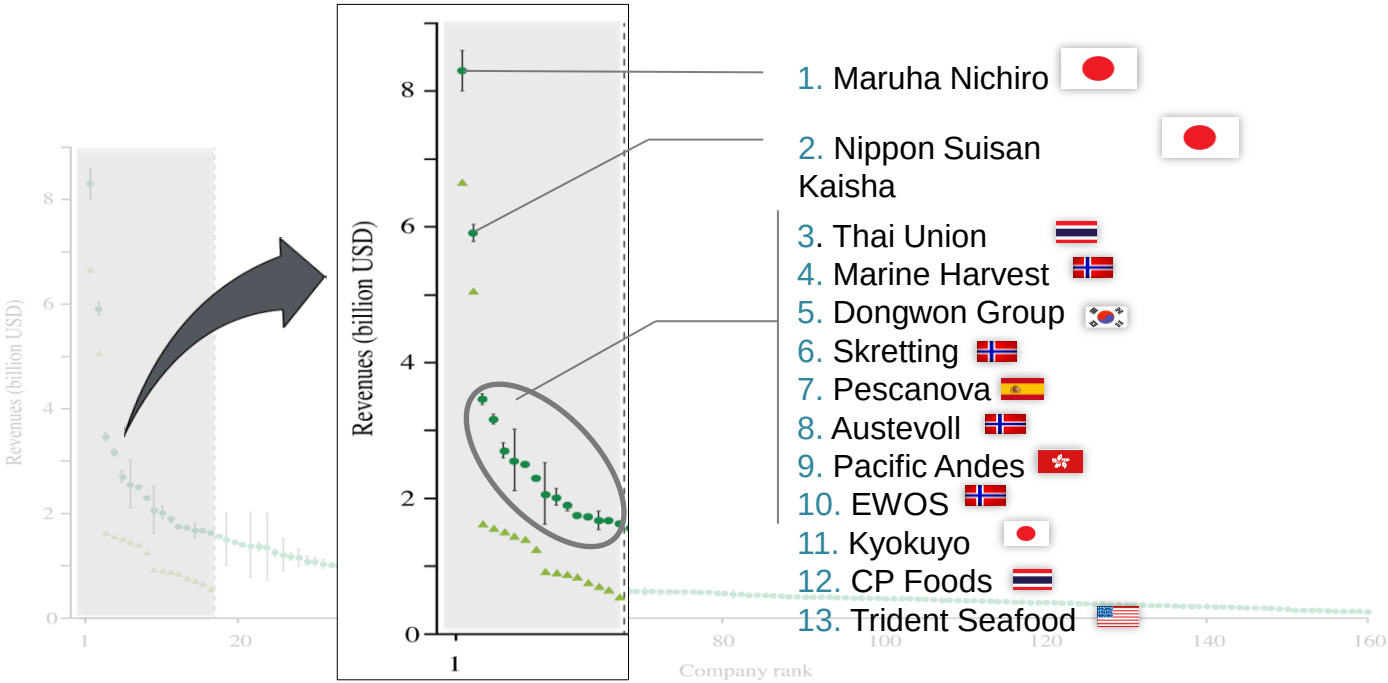
(Rockström et al., 2017 in review)

Concentration in the seafood industry



Österblom et al. 2015 PLOS One

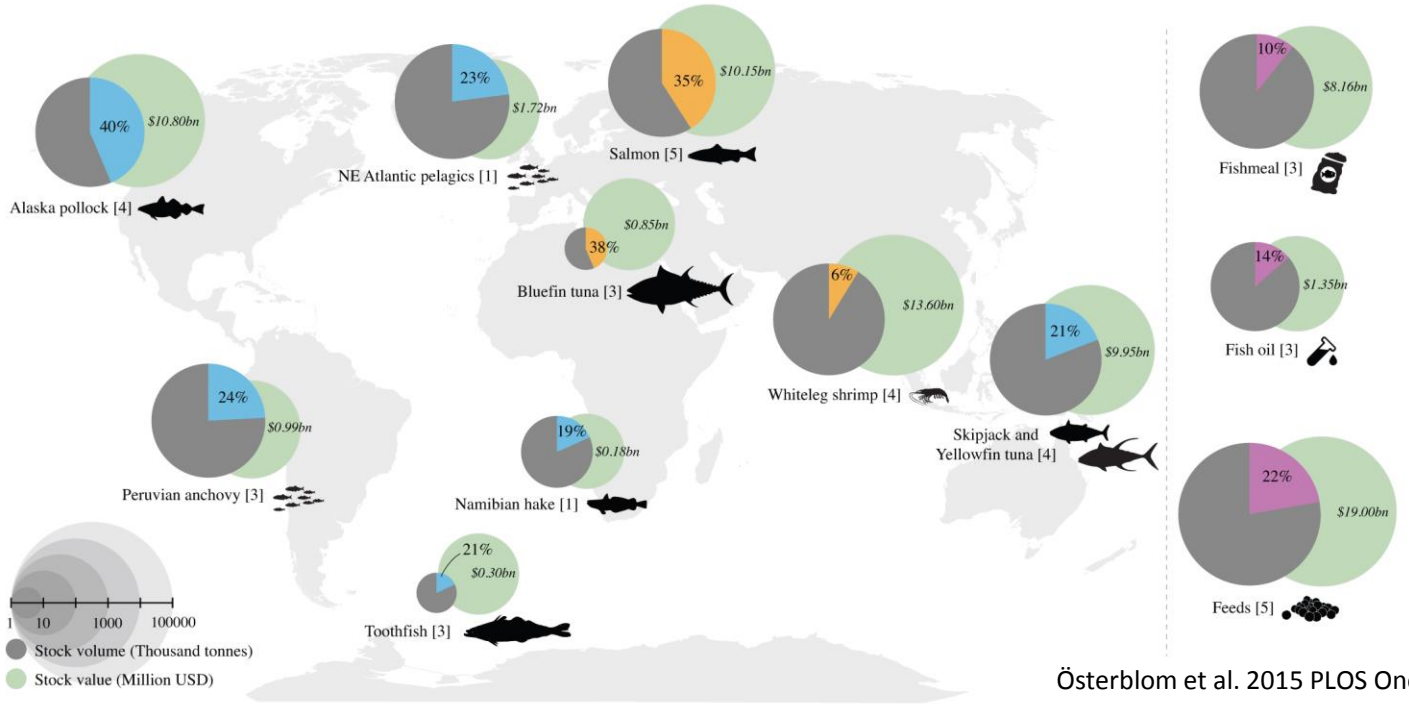
Who are the “keystone” actors?



How much do they produce?

Catch 11-16% of global marine catch

Control 19-40% of several of the world's largest or most valuable capture fisheries



Österblom et al. 2015 PLOS One

The Soneva Dialogue

Transformative Risks and Opportunities for the Global Seafood Industry

A Stockholm Resilience Centre event supported by Forum for the Future and hosted by the Soneva Foundation.

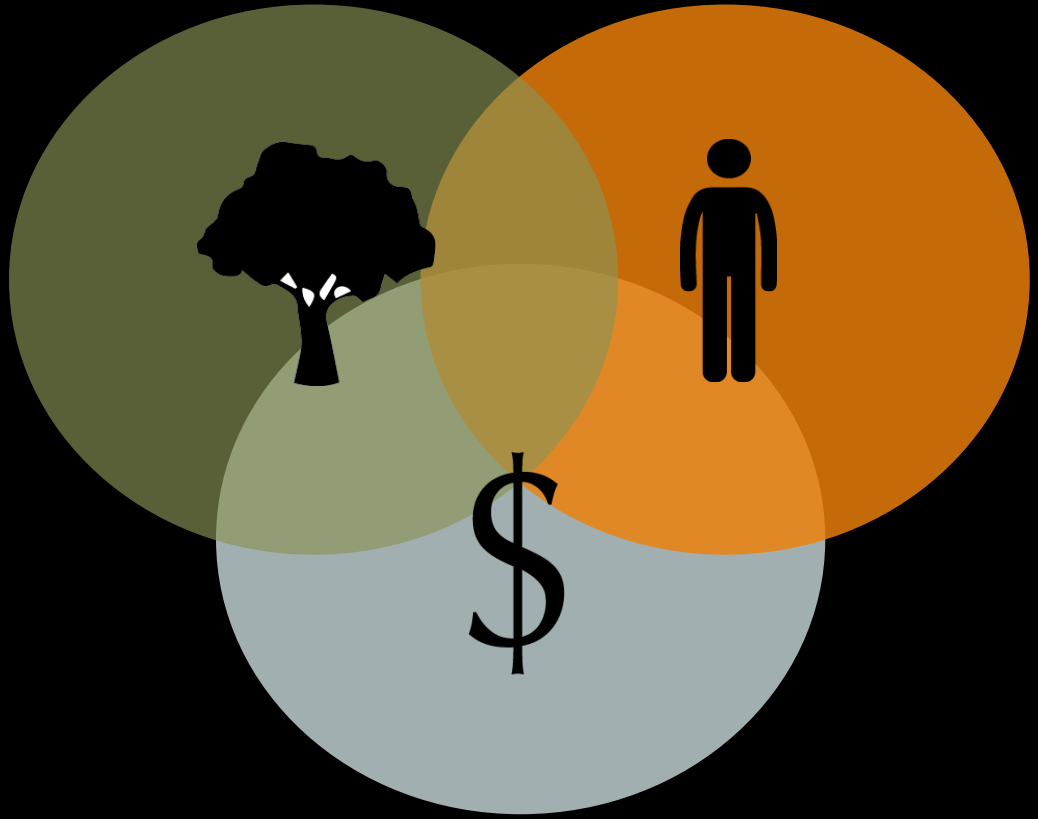
11 - 13th November 2016,
Soneva Fushi, Maldives

Stockholm Resilience Centre
Sustainability Science for Biosphere Stewardship

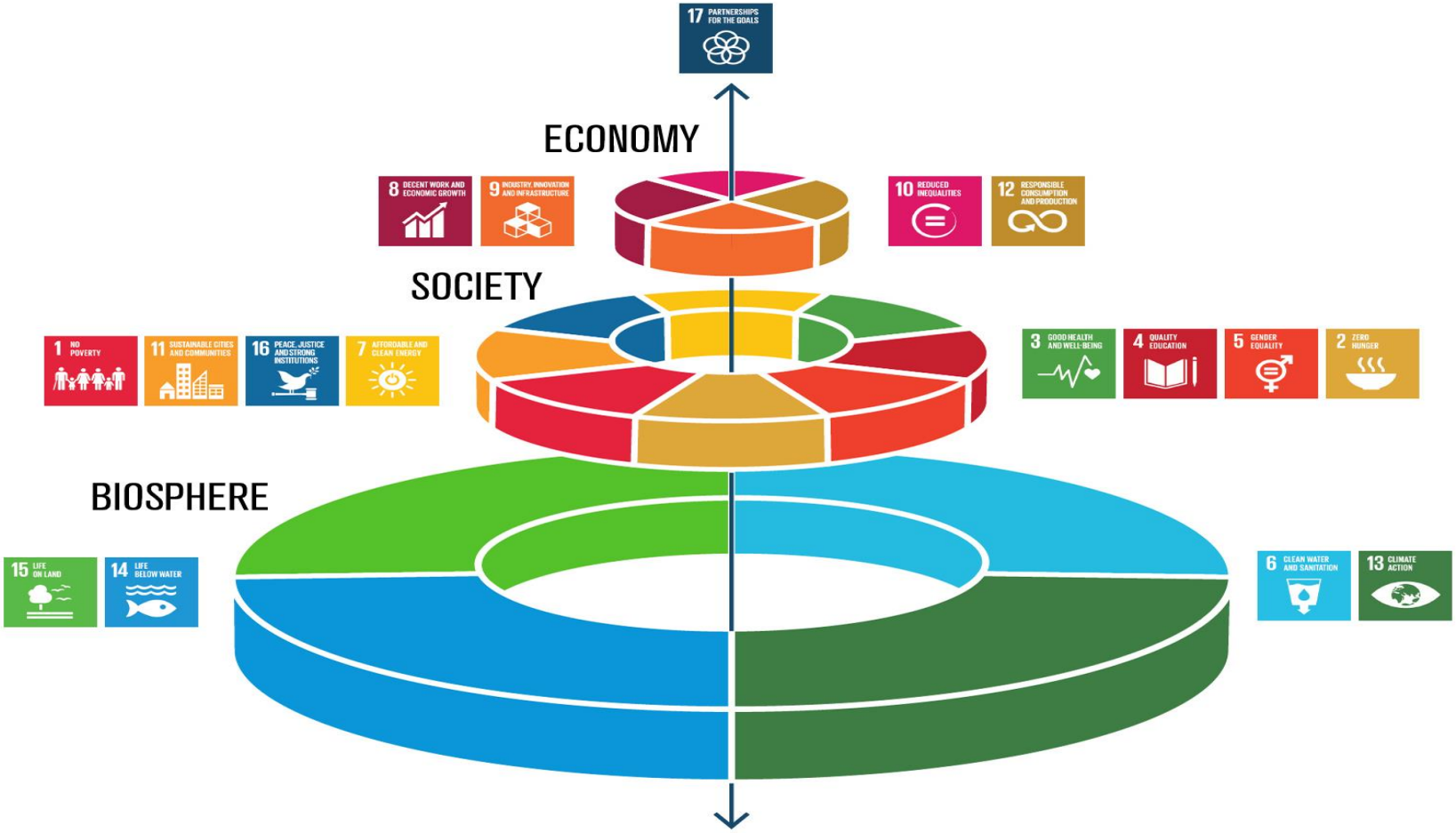
Stockholm University

forum for the future

Soneva
FOUNDATION




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


17 PARTNERSHIPS FOR THE GOALS
ECONOMY
8 DECENT WORK AND ECONOMIC GROWTH
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3 GOOD HEALTH AND WELL-BEING
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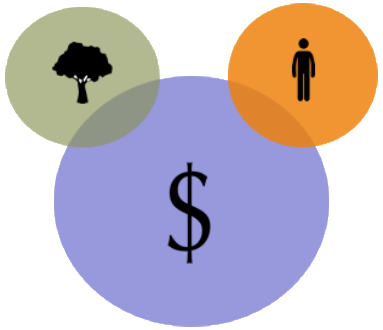
15 LIFE ON LAND
14 LIFE BELOW WATER
6 CLEAN WATER AND SANITATION
13 CLIMATE ACTION



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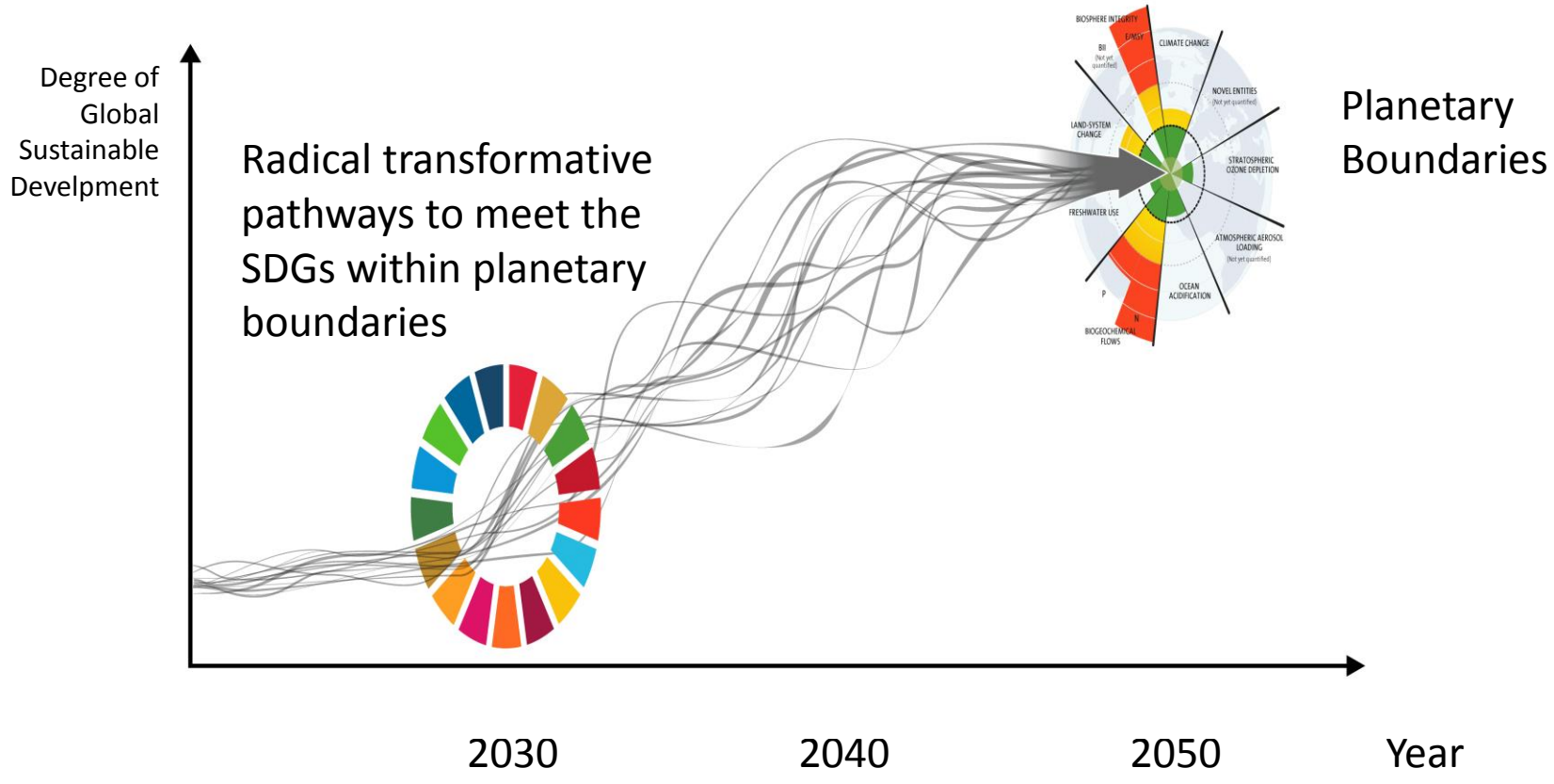
Reconnecting World Development with Global Commons

The World In 2050



Thank you

www.stockholmresilience.su.se

Photo: O.Henriksson/Azote

Stockholm Resilience Centre
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Stockholm University

The Beijer Institute of Ecological Economics

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