Globalization, Ecosystem Support and Inequality:

Advancing science by stepping outside your disciplinary comfort zone

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Globalization, Ecosystem Support and Inequality:

Advancing science by stepping outside your disciplinary comfort zone

1. **My multi-disciplinary background**
2. **Worldviews & Resilience**
3. **Your questions, self-reflection & break**
4. **Disciplinarity**
5. **Globalization, Ecosystem Support and Inequality: Latin America**
6. **Questions?**

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RESEARCH QUESTIONS:

1. What are the ways global trade changes the mix of food and feed inputs?
2. Where are the ecosystem support areas? How do they change over time?
3. How do cities achieve food security? How has this changed over time?
4. How can we tie agricultural management practices to water-related ecosystem services (WRES)?
5. Is intensification of Uruguayan livestock production driving a regime shift?

METHODS & CASES:

Estimate ecosystem subsidies needed for food consumption & production

Method: crop and pasture areas, food flows

Cases: Sweden - national level; Capital cities - Tokyo, ACT, Copenhagen

Method: Fishmeal – quantities produced, traded, consumed

Cases: aquaculture production in Thailand and Norway

Effects on WRES due to livestock intensification – e.g. Regime shift?

Method: interviews, CLDs, conceptual matrix, quantification of WRES based on local contacts and literature

Case: Uruguay

Stockholm Resilience Centre
Sustainability Science for Biosphere Stewardship
Stockholm
University

Beijer Institute
OF ECOLOGICAL ECONOMICS
KUNGL. VETENSKAPS AKADEMIEN
THE ROYAL SWEDISH ACADEMY OF SCIENCES

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Worldviews

How do you see the world?

Do you see nature?

What does it matter?

What is important?

Who cares ?

5

What is important to you?

- reflecting through the lens of food -

- Sufficient food production
- Prices & affordability

- Farmers' livelihoods
- Urbanization & empty local farms

- Climate change
- Biodiversity loss

- Essential protein
- Obesity
- Pesticide residues

- Animal ethics

- Gastronomy - local food culture

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My worldview

1. Nature as base – rebuild 3 pillars of development
2. Coupled social-ecological systems
3. Anthropocene - human-dominated planet
4. Thresholds exist

BASIS FOR RESILIENCE THINKING / APPROACH
(not yet a theory)

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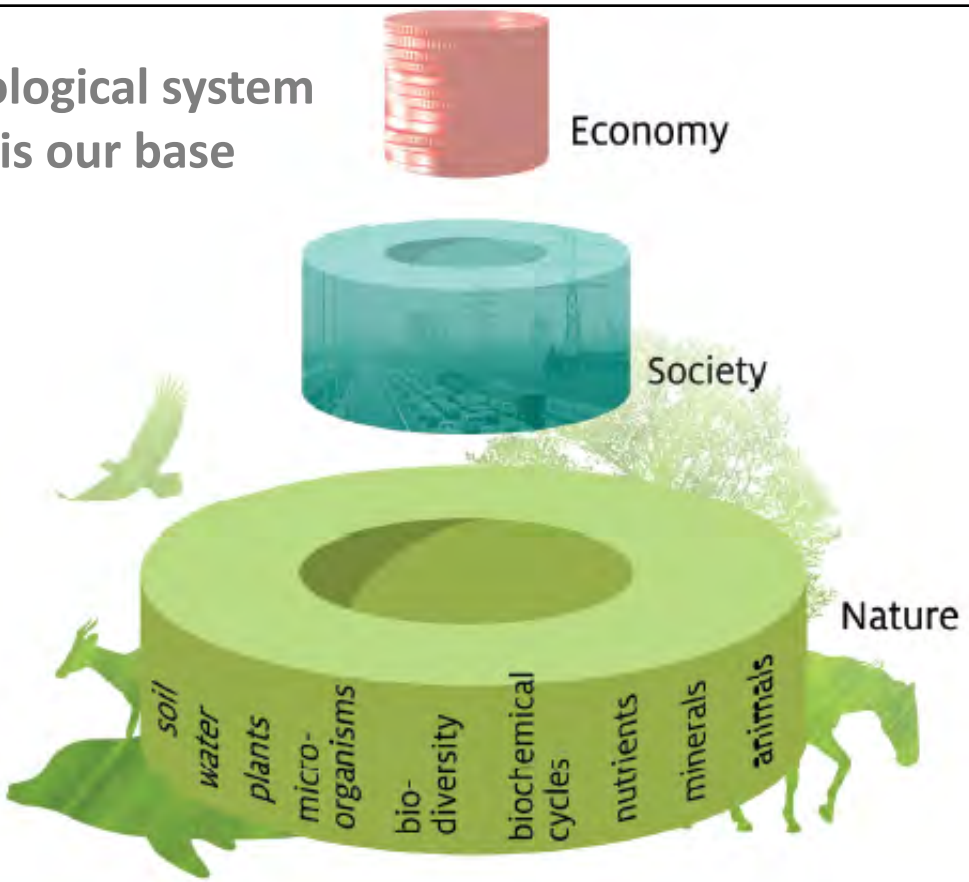
1. Ecological system is our base



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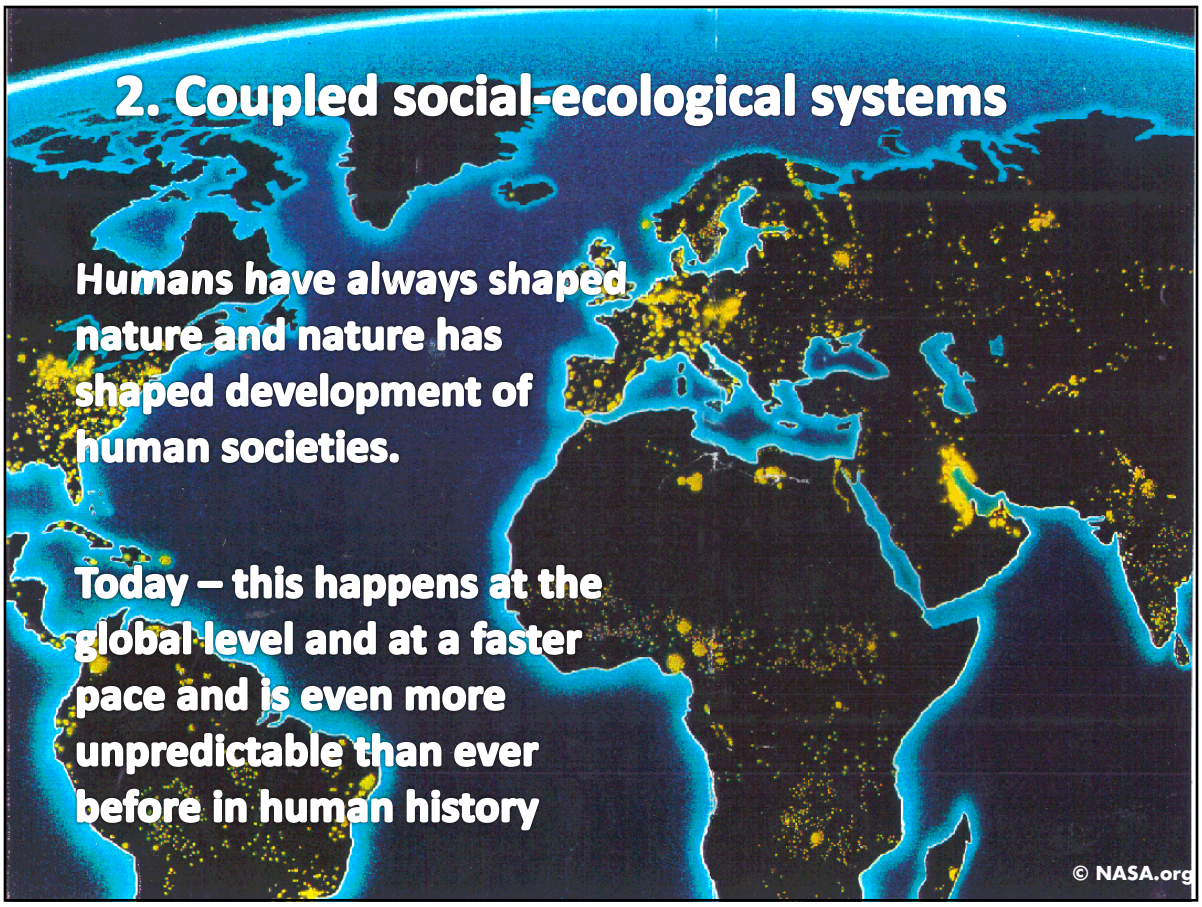

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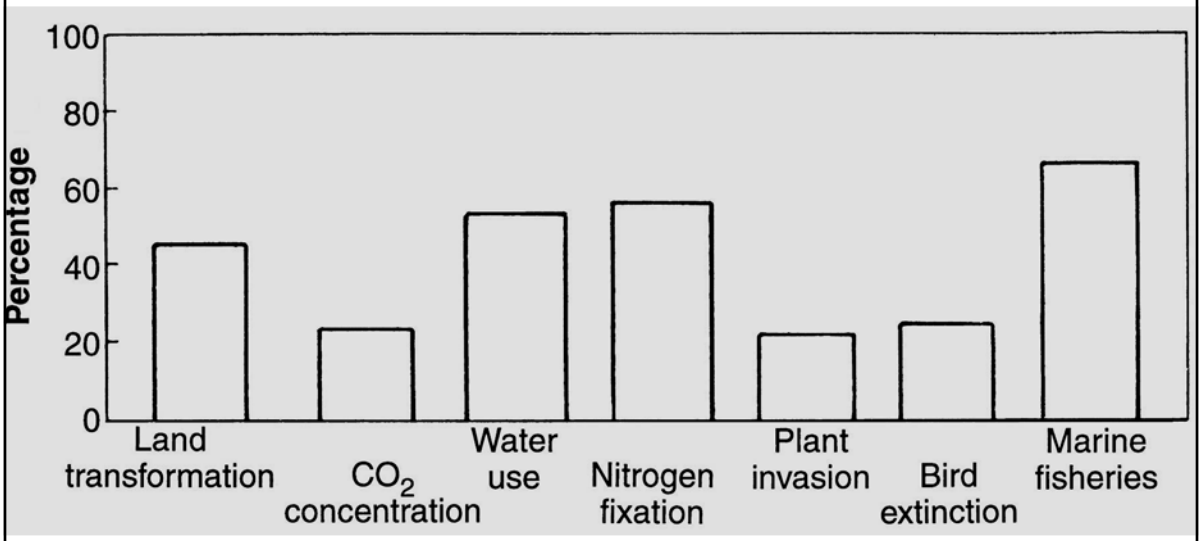
3. Anthropocene: we live on a "Human-dominated planet"



Vitousek, P., H. Mooney, J. Lubchenco, and J. Melillo. 1997. Human domination of Earth's ecosystems. Science **277**:494-499.

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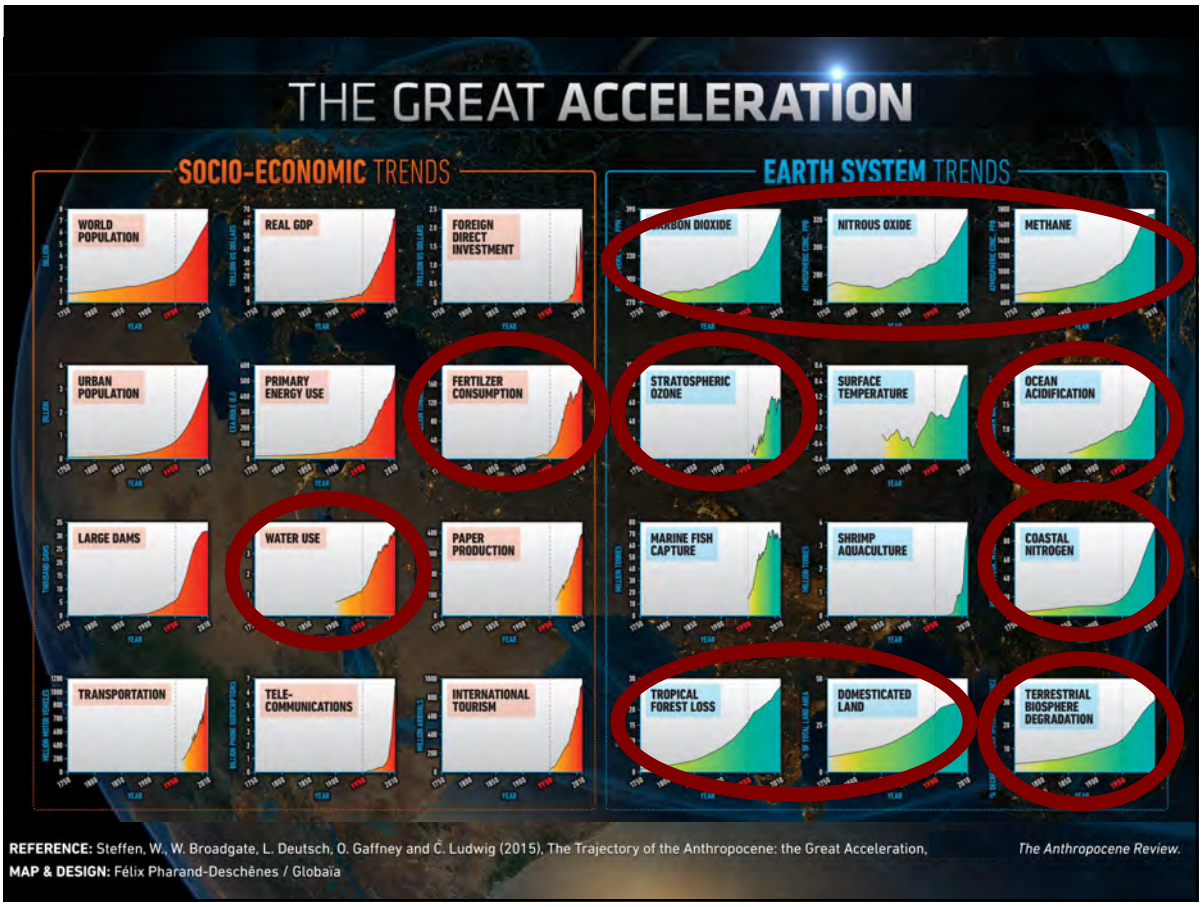
THE GREAT ACCELERATION
SOCIO-ECONOMIC TRENDS
EARTH SYSTEM TRENDS
WORLD POPULATION
REAL GDP
FOREIGN DIRECT INVESTMENT
URBAN POPULATION
PRIMARY ENERGY USE
FERTILZER CONSUMPTION
LARGE DAMS
WATER USE
PAPER PRODUCTION
TRANSPORTATION
TELE-COMMUNICATIONS
INTERNATIONAL TOURISM
CARBON DIOXIDE
NITROUS OXIDE
METHANE
STRATOSPHERIC OZONE
SURFACE TEMPERATURE
OCEAN ACIDIFICATION
MARINE FISH CAPTURE
SHRIMP AQUACULTURE
COASTAL NITROGEN
TROPICAL FOREST LOSS
DOMESTICATED LAND
TERRESTRIAL BIOSPHERE DEGRADATION
REFERENCE: Steffen, W., W. Broadgate, L. Deutsch, O. Gaffney and C. Ludwig (2015), The Trajectory of the Anthropocene: the Great Acceleration,
The Anthropocene Review.
MAP & DESIGN: Félix Pharand-Deschênes / Globaia

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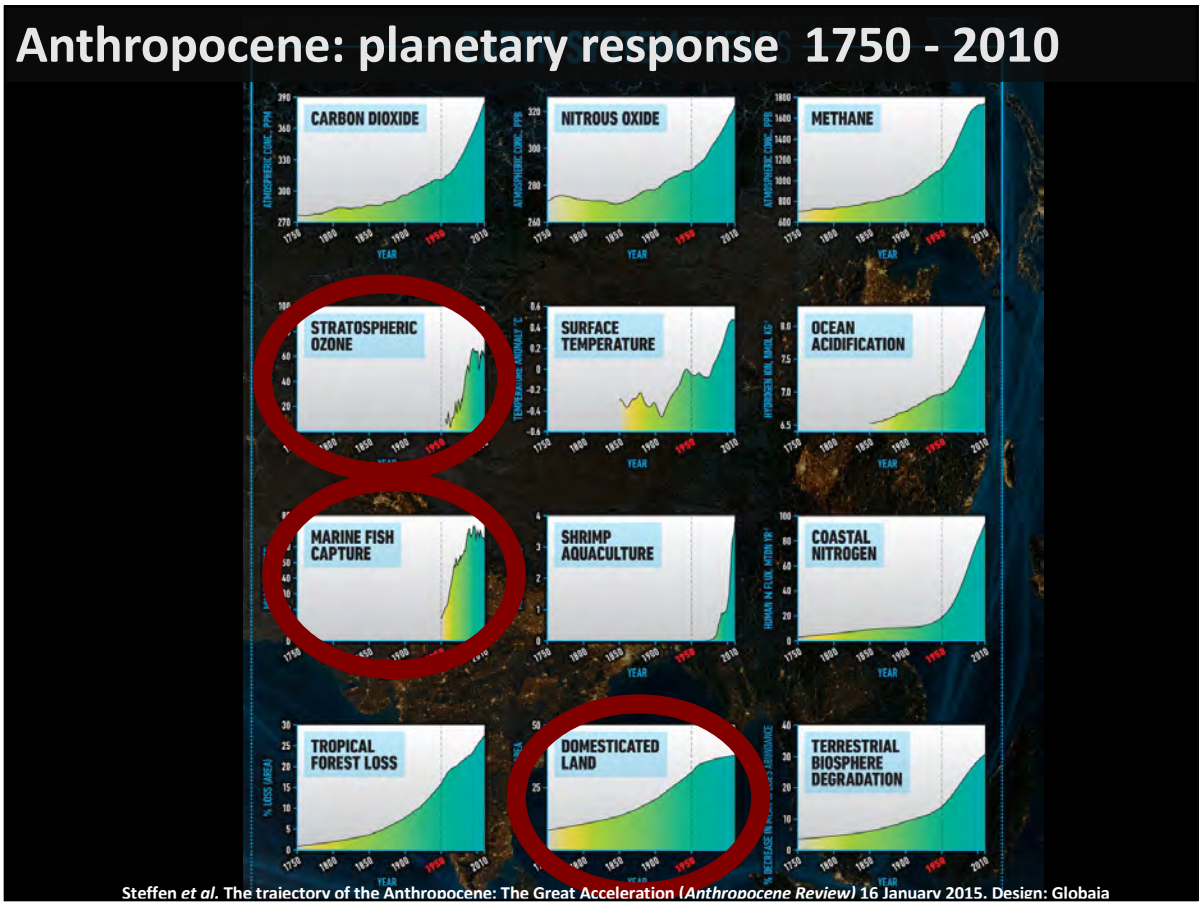
Anthropocene: planetary response 1750 - 2010
CARBON DIOXIDE
NITROUS OXIDE
METHANE
STRATOSPHERIC OZONE
SURFACE TEMPERATURE
OCEAN ACIDIFICATION
MARINE FISH CAPTURE
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TROPICAL FOREST LOSS
DOMESTICATED LAND
TERRESTRIAL BIOSPHERE DEGRADATION
Steffen et al. The trajectory of the Anthropocene: The Great Acceleration (Anthropocene Review) 16 January 2015. Design: Globaia

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SOCIO-ECONOMIC TRENDS
WORLD POPULATION
REAL GDP
FOREIGN DIRECT INVESTMENT
URBAN POPULATION
PRIMARY ENERGY USE
FERTILZER CONSUMPTION
LARGE DAMS
WATER USE
PAPER PRODUCTION
TRANSPORTATION
TELE-COMMUNICATIONS
INTERNATIONAL TOURISM
Steffen et al. The trajectory of the Anthropocene: The Great Acceleration (Anthropocene Review) 16 January 2015. Design: Globaia

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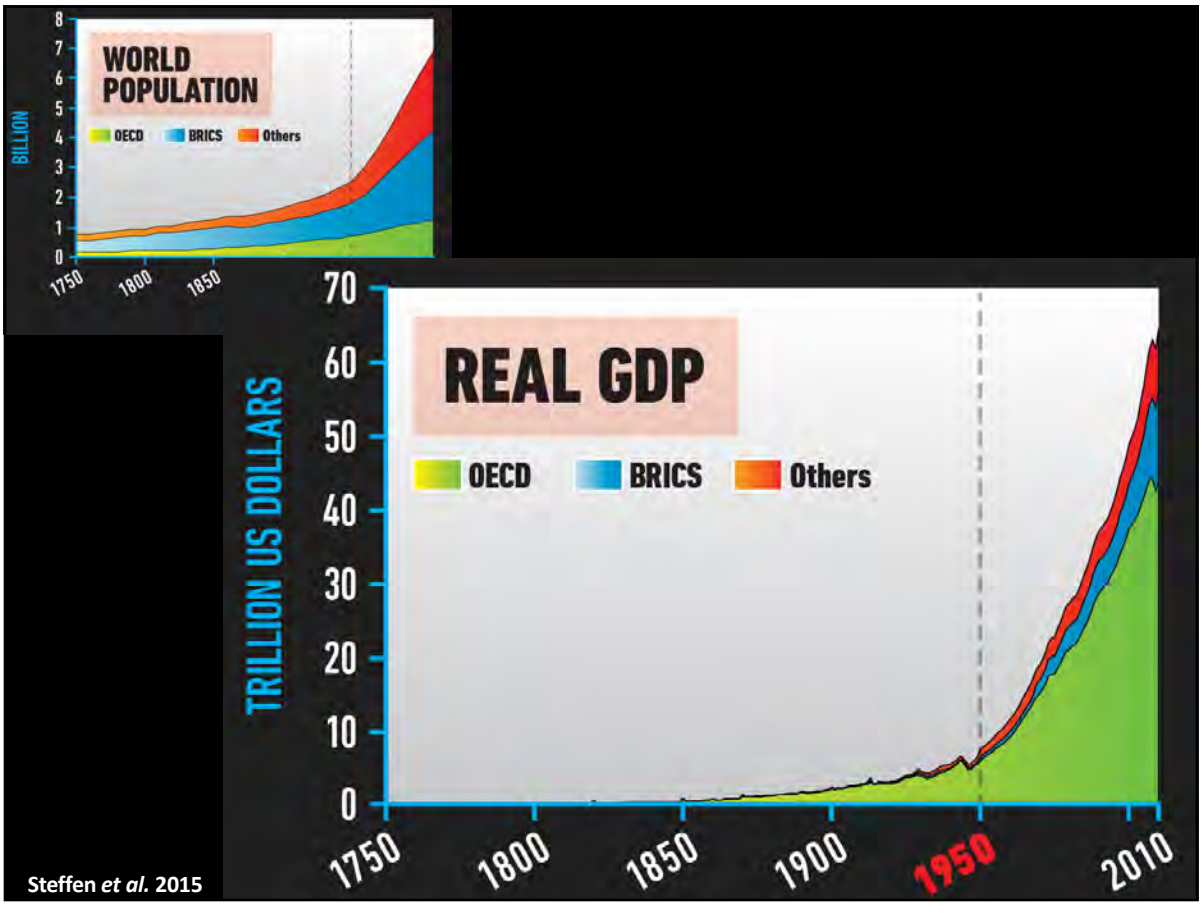
WORLD POPULATION
OECD
BRICS
Others
BILLION
REAL GDP
TRILLION US DOLLARS
Steffen et al. 2015

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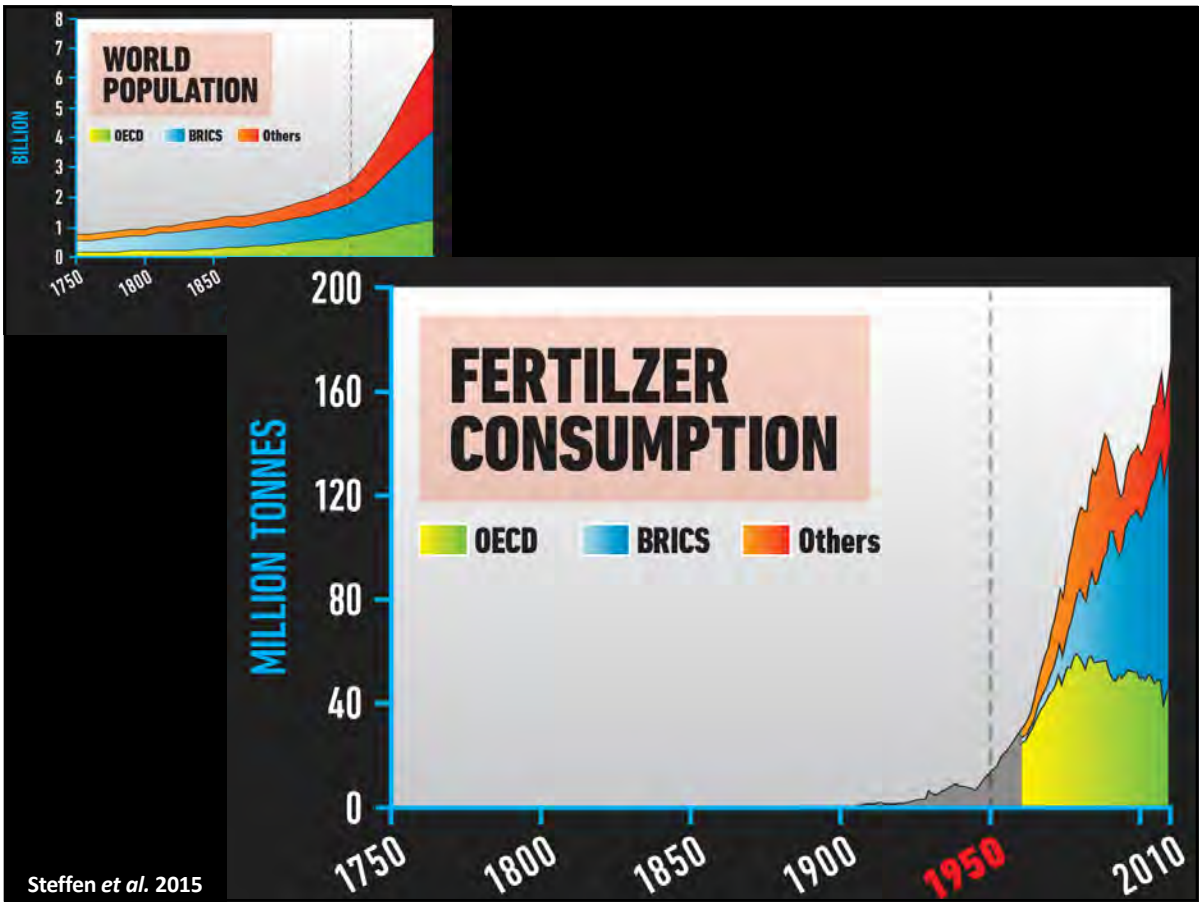
WORLD POPULATION
OECD
BRICS
Others
BILLION
8
7
6
5
4
3
2
1
0
1750
1800
1850
FERTILZER CONSUMPTION
OECD
BRICS
Others
MILLION TONNES
200
160
120
80
40
0
1750
1800
1850
1900
1950
2010
Steffen et al. 2015

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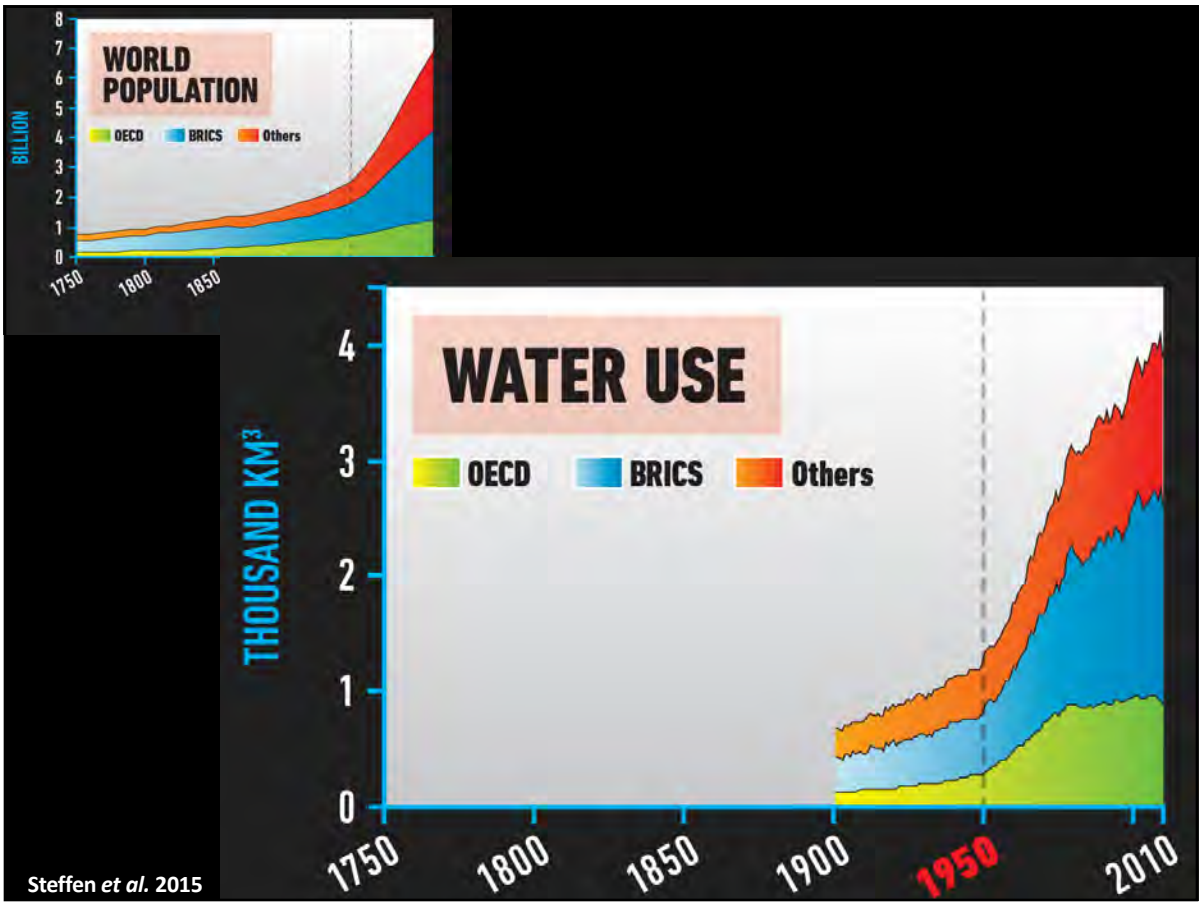
WORLD POPULATION
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BRICS
Others
BILLION
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1750
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1850
WATER USE
OECD
BRICS
Others
THOUSAND KM³
4
3
2
1
0
1750
1800
1850
1900
1950
2010
Steffen et al. 2015

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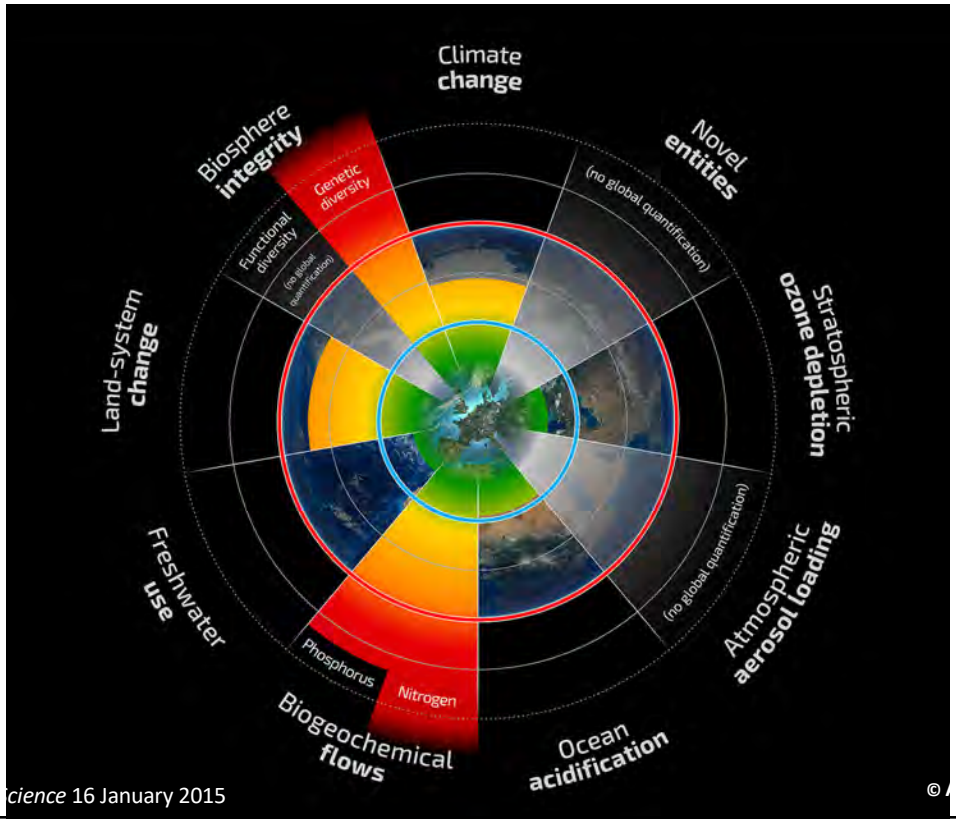
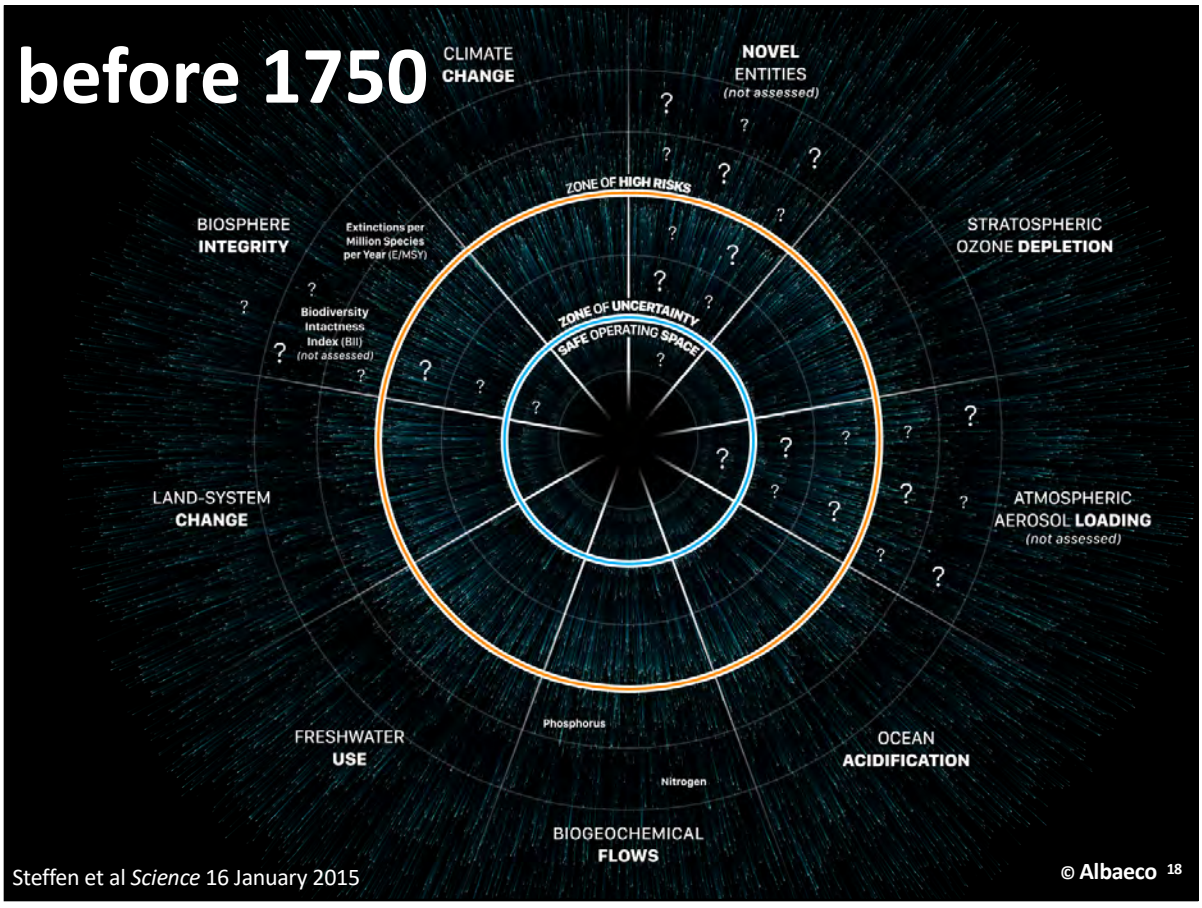
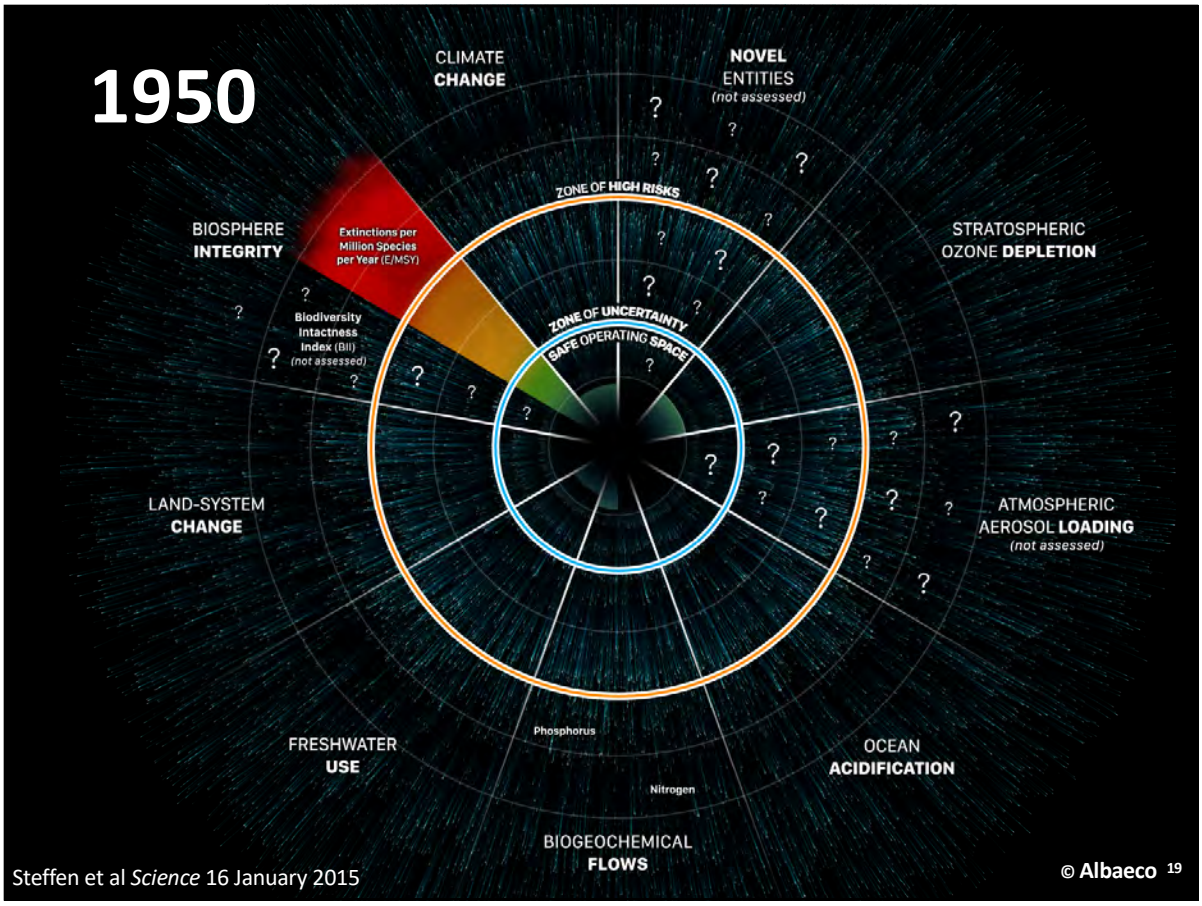
4. Thresholds exist. What are the planet's boundaries?



cience 16 January 2015



Steffen et al *Science* 16 January 2015


1950
CLIMATE CHANGE
NOVEL ENTITIES (not assessed)
ZONE OF HIGH RISKS
BIOSPHERE INTEGRITY
Extinctions per Million Species per Year (E/MSY)
Biodiversity Intactness Index (BII) (not assessed)
ZONE OF UNCERTAINTY
SAFE OPERATING SPACE
STRATOSPHERIC OZONE DEPLETION
LAND-SYSTEM CHANGE
ATMOSPHERIC AEROSOL LOADING (not assessed)
Phosphorus
Nitrogen
FRESHWATER USE
OCEAN ACIDIFICATION
BIOGEOCHEMICAL FLOWS
Steffen et al Science 16 January 2015
© Albaeco 19

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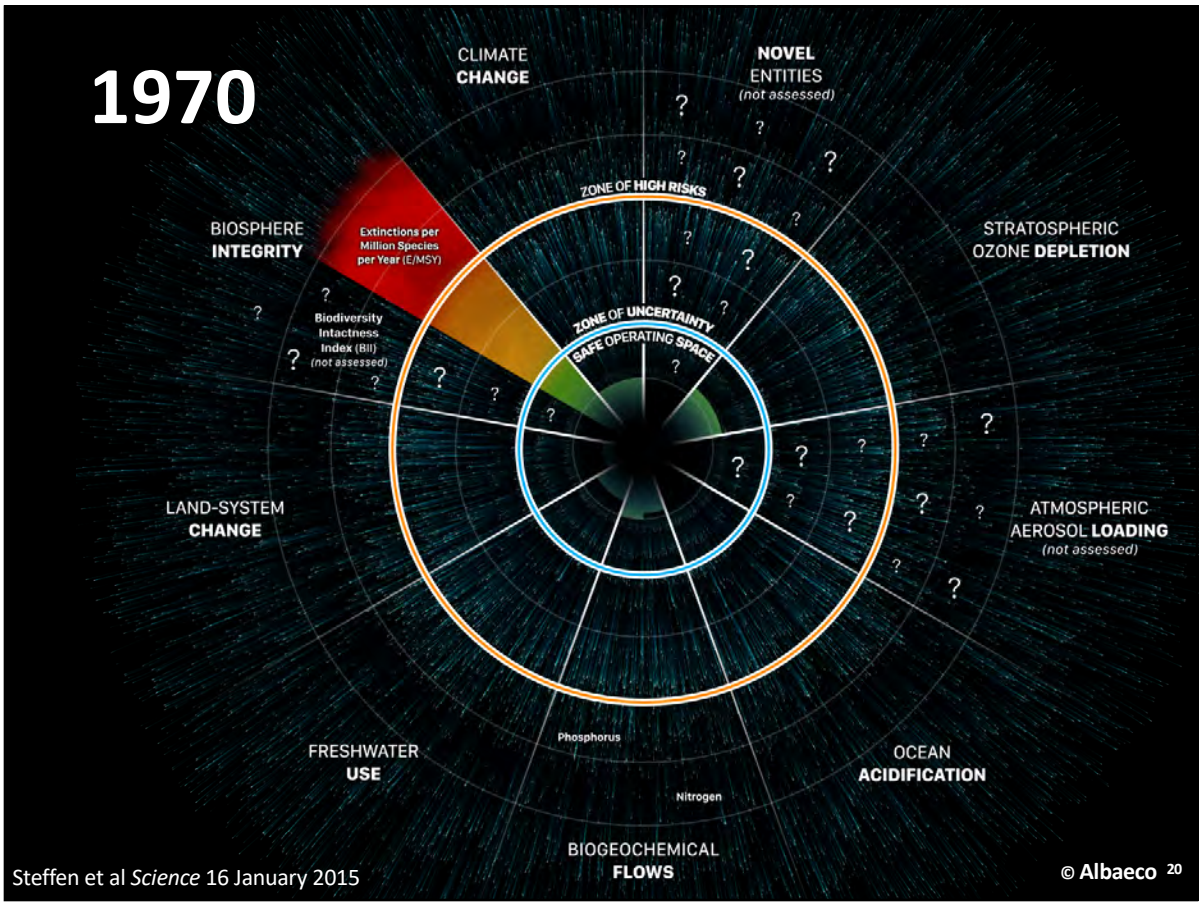
1970
CLIMATE CHANGE
NOVEL ENTITIES (not assessed)
ZONE OF HIGH RISKS
BIOSPHERE INTEGRITY
Extinctions per Million Species per Year (E/MSY)
Biodiversity Intactness Index (BII) (not assessed)
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SAFE OPERATING SPACE
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Phosphorus
Nitrogen
FRESHWATER USE
OCEAN ACIDIFICATION
BIOGEOCHEMICAL FLOWS
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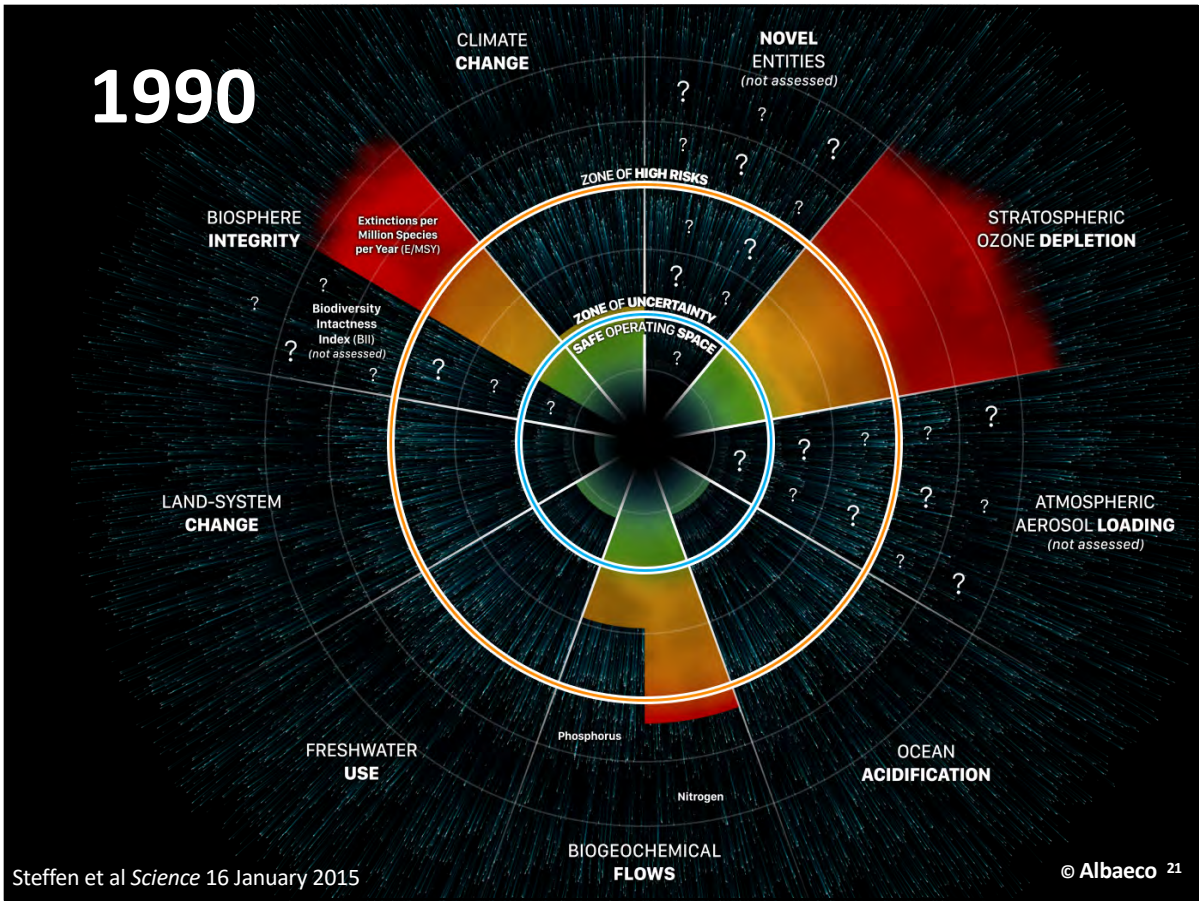
1990
CLIMATE CHANGE
NOVEL ENTITIES (not assessed)
ZONE OF HIGH RISKS
BIOSPHERE INTEGRITY
Extinctions per Million Species per Year (E/MSY)
Biodiversity Intactness Index (BII) (not assessed)
ZONE OF UNCERTAINTY
SAFE OPERATING SPACE
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Phosphorus
FRESHWATER USE
OCEAN ACIDIFICATION
Nitrogen
BIOGEOCHEMICAL FLOWS
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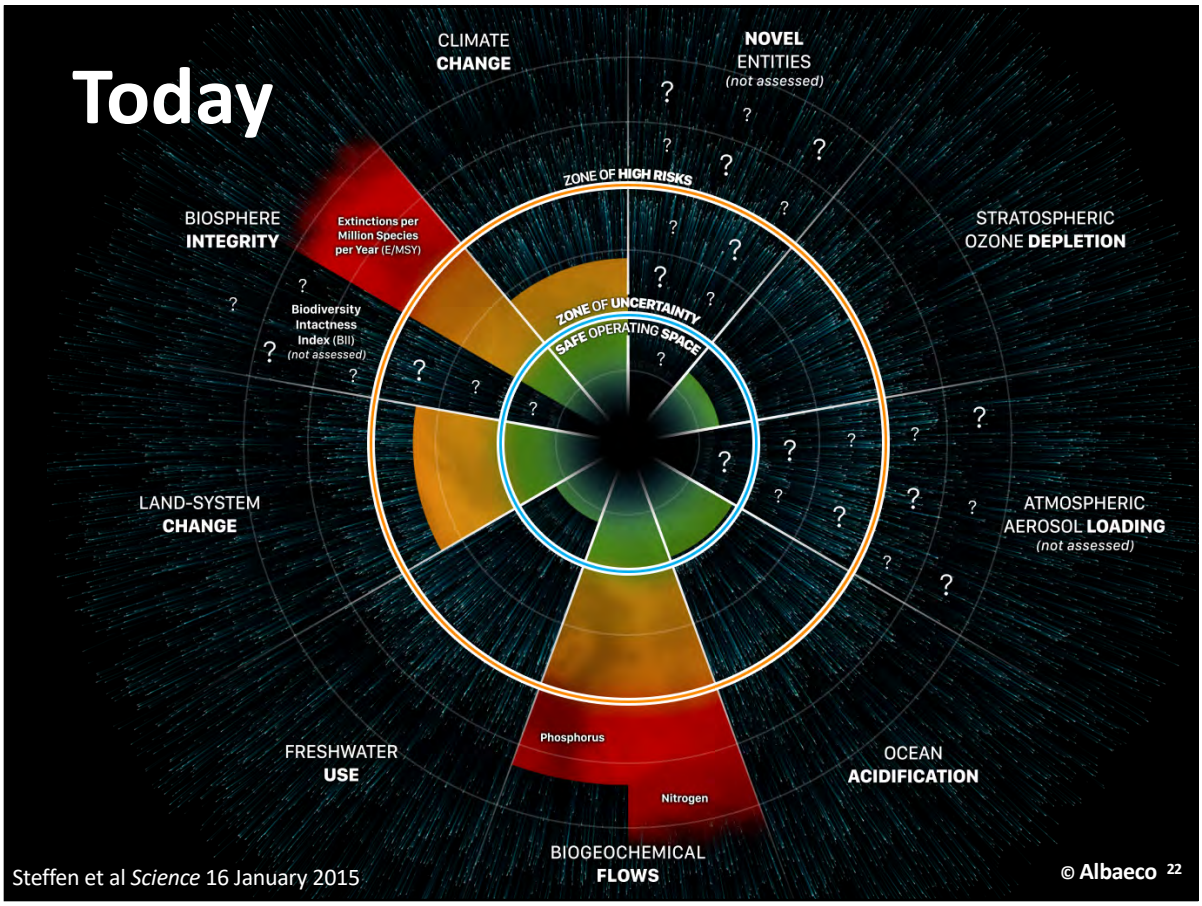
Today
CLIMATE CHANGE
NOVEL ENTITIES (not assessed)
ZONE OF HIGH RISKS
BIOSPHERE INTEGRITY
Extinctions per Million Species per Year (E/MSY)
Biodiversity Intactness Index (BII) (not assessed)
ZONE OF UNCERTAINTY
SAFE OPERATING SPACE
STRATOSPHERIC OZONE DEPLETION
LAND-SYSTEM CHANGE
ATMOSPHERIC AEROSOL LOADING (not assessed)
Phosphorus
FRESHWATER USE
OCEAN ACIDIFICATION
Nitrogen
BIOGEOCHEMICAL FLOWS
Steffen et al Science 16 January 2015
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Resilience is the **capacity of a system**,

be it an individual, a forest, a city or an economy,

to deal with change and continue to develop.

It is about the **capacity to use shocks and disturbances** like a financial crisis or climate change

to spur renewal and innovative thinking.

Resilience thinking embraces **learning**, **diversity** ..

…and above all the belief that

humans and nature are so strongly coupled

that they are **one social-ecological system**.

https://www.stockholmresilience.org/research/research-news/2015-02-19-what-is-resilience.html

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What is your world view?

Write down as many words that describe it
what your assumptions, what matters to you?

How would you describe yourself?
vegetarian, realist, poor, student, Capitalist, optimist

Pause – reflect - Come back with a word/phrase to share

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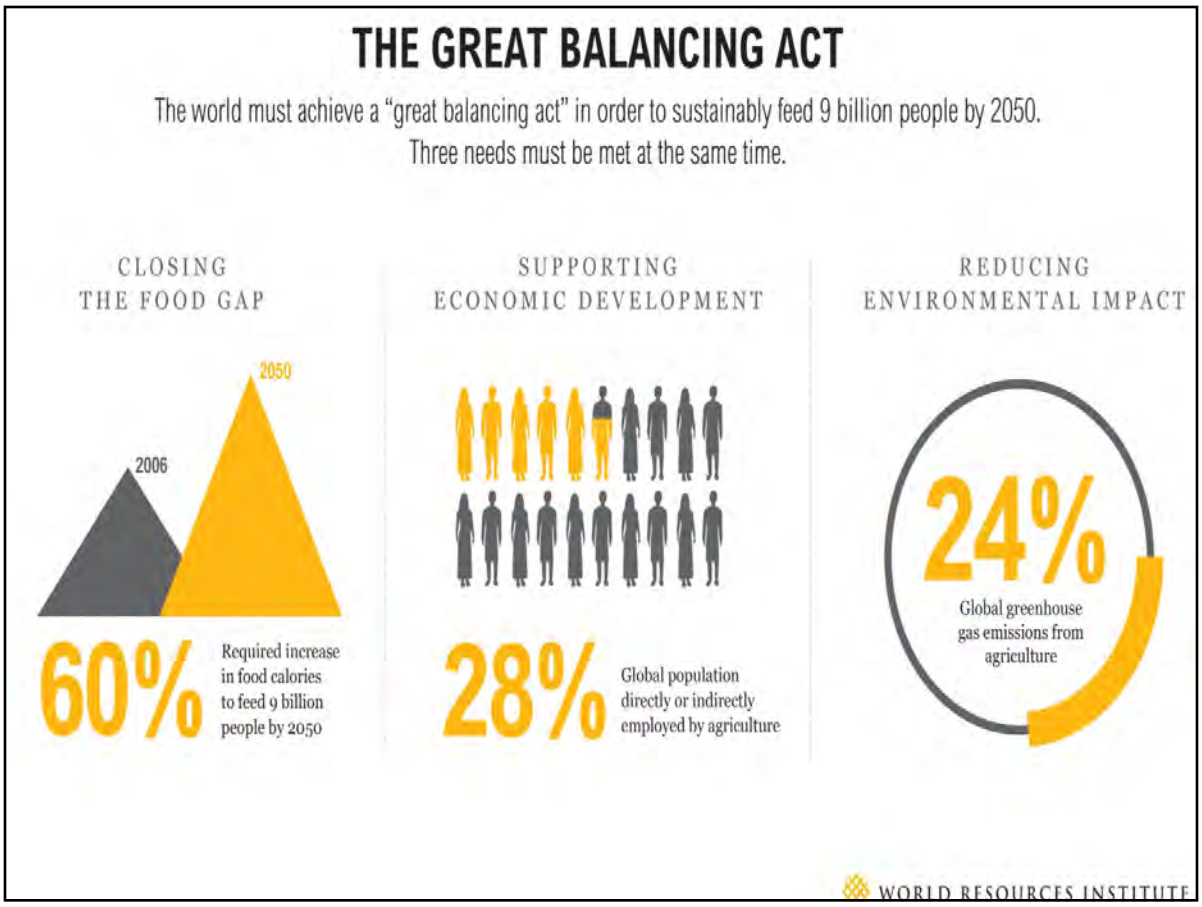

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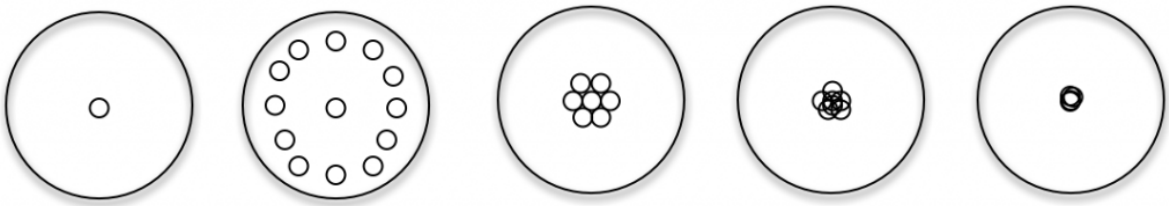

Intradisciplinary → Crossdisciplinary → Multidisciplinary → Interdisciplinary→ Transdisciplinary

Different levels of disciplinarity:

Intradisciplinary: working within a single discipline.

Crossdisciplinary: viewing one discipline from the perspective of another.

Multidisciplinary: people from different disciplines working together, each drawing on their disciplinary knowledge.

Interdisciplinary: integrating knowledge and methods from different disciplines, using a real synthesis of approaches.

Transdisciplinary: creating a unity of intellectual frameworks beyond the disciplinary perspectives.

Marilyn Stember (1991) Advancing the social sciences through the interdisciplinary enterprise. Originally based on Zeigler (1990).

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Multidisciplinarity - Interdisciplinarity - Transdisciplinarity

Multidisciplinarity draws on **knowledge from different disciplines** but stays within the (e.g. study and researcher) boundaries of those fields.

Interdisciplinarity analyzes, **synthesizes** and harmonizes links between disciplines into a coordinated and coherent whole.

Transdisciplinarity **integrates** different sciences (e.g. natural, social, humanities, health sciences), and in doing so transcends each of their traditional boundaries. Transdisciplinary researchers **work jointly** to create new conceptual, theoretical, methodological, and translational innovations that **integrate and move beyond discipline-specific approaches** to address a **common problem**.

(Choi and Pak 2006, 359; Frances Westley, Philip S. Miller . 2003. Experiments in Consilience: Integrating Social And Scientific Responses To Save Endangered Species; Nicolescu 1996)

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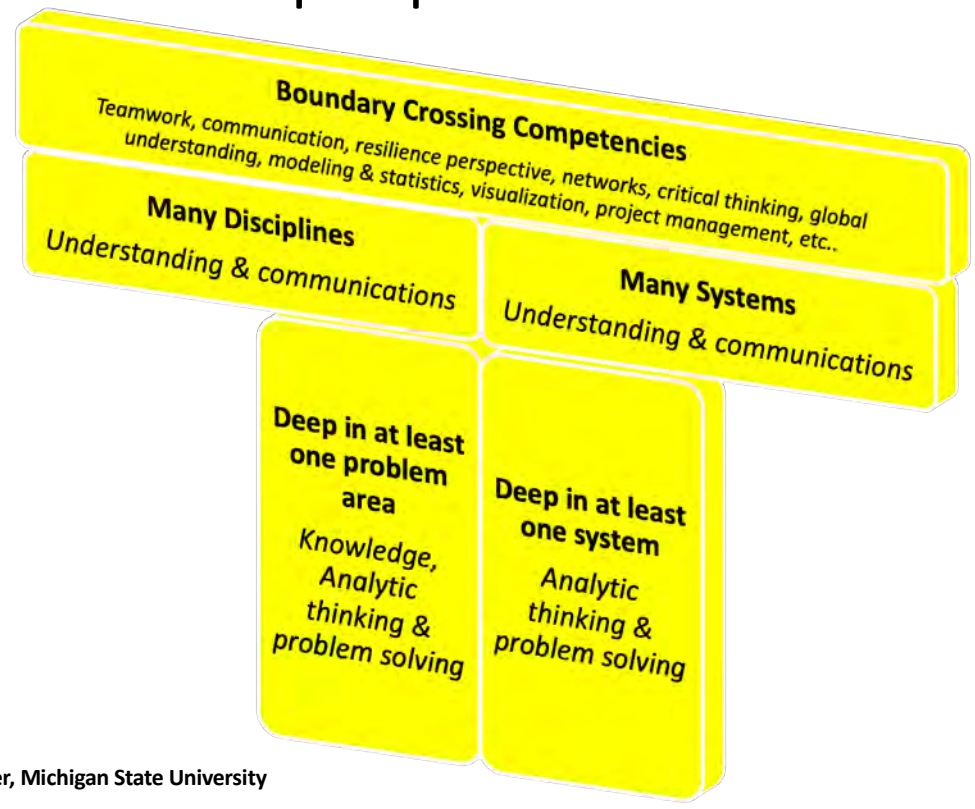
T-shaped professional



Phil Gardner, Michigan State University

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Non-academic stakeholders – to be included? – how?

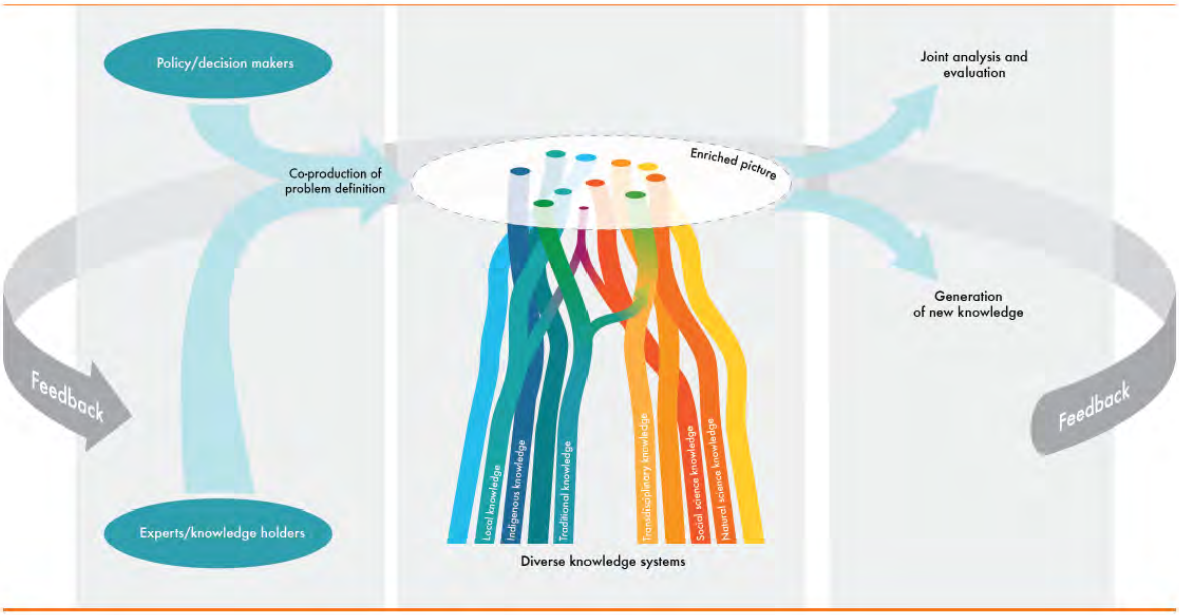

Figure 1. Outlining three phases of a Multiple Evidence Base approach, that emphasizes the need for co-production of problem definitions as well as joint analysis and evaluation of the enriched picture created in the assessment process. Phase 1 Concerns defining stakeholders, problems and goals in a collaborative manner. Phase 2 entails bringing together knowledge on an equal platform, using parallel systems of valuing and assessing knowledge, and Phase 3 is the joint analysis and evaluation of knowledge and insights to generate multi-level synthesis and identify and catalyze processes for generating new knowledge. *(Tengö et el 2014)*

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The Soybean through World History

What can the soybean tell us about big changes in power, risk, ecosystems, norms and practices in the global food system?

Soybean as a lens into changes in the international agro-food system.

Project complements and integrates theories and methods in *political economy and world systems theory* with *ecology and complexity theory* in a world historical and transdisciplinary way

- ***Food Regimes*** approach (Friedmann & McMichael):
  - a) first international food regime (1870-1914)
  - b) second international food regime (1950s-1973)
  - c) third regime (1980s - present)

- ***Global Commodity Chain*** Analysis (Gereffi)

- ***Resilience Thinking*** (Gunderson and Holling 2002, Biggs 2015)

Matilda Baraibar & Lisa Deutsch

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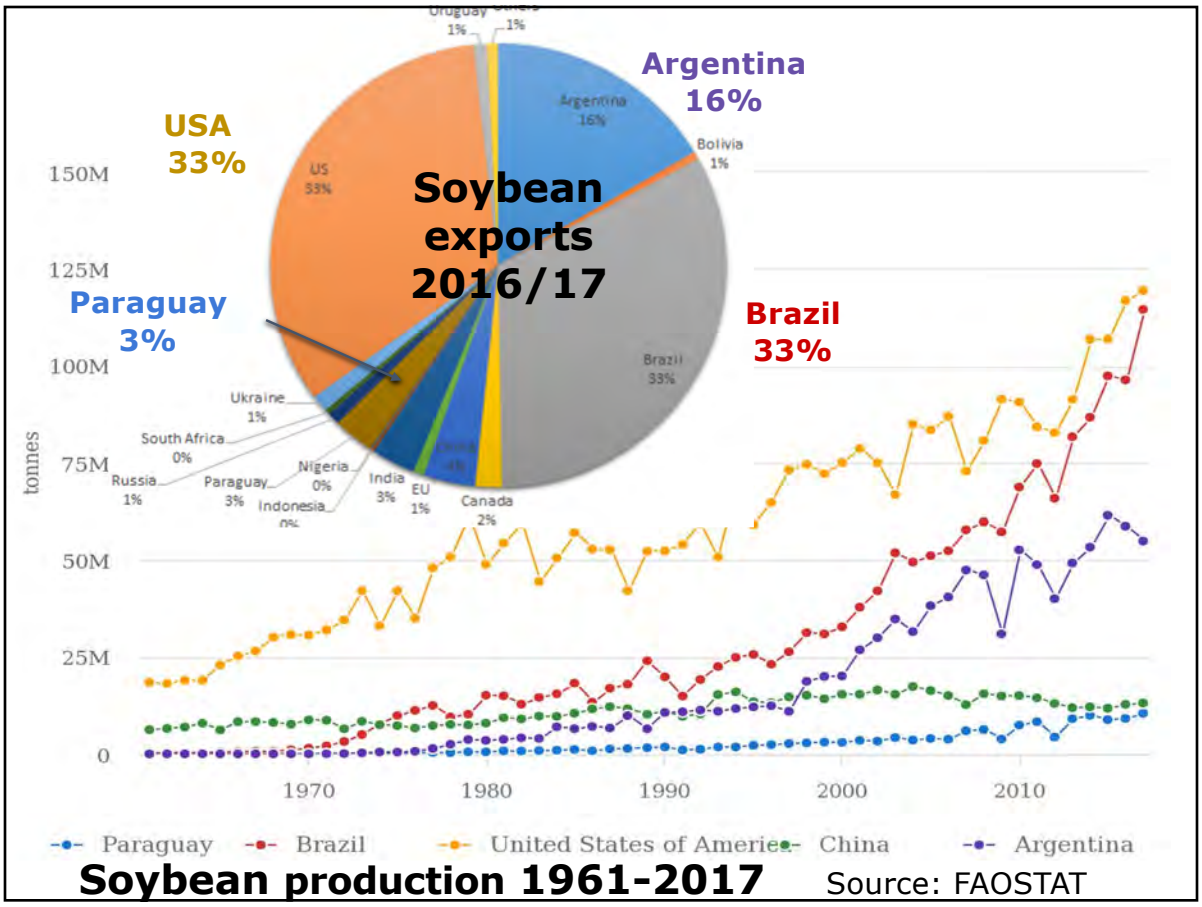
Soybean exports 2016/17
USA 33%
Argentina 16%
Paraguay 3%
Brazil 33%
Argentina 16%
Bolivia 1%
US 33%
Brazil 33%
Ukraine 1%
South Africa 0%
Russia 1%
Paraguay 3%
Nigeria 0%
India 3%
EU 1%
Canada 2%
Indonesia
Uruguay 1%
1%
150M
125M
100M
75M
50M
25M
0
tonnes
1970
1980
1990
2000
2010
Paraguay
Brazil
United States of Americ
China
Argentina
Soybean production 1961-2017
Source: FAOSTAT

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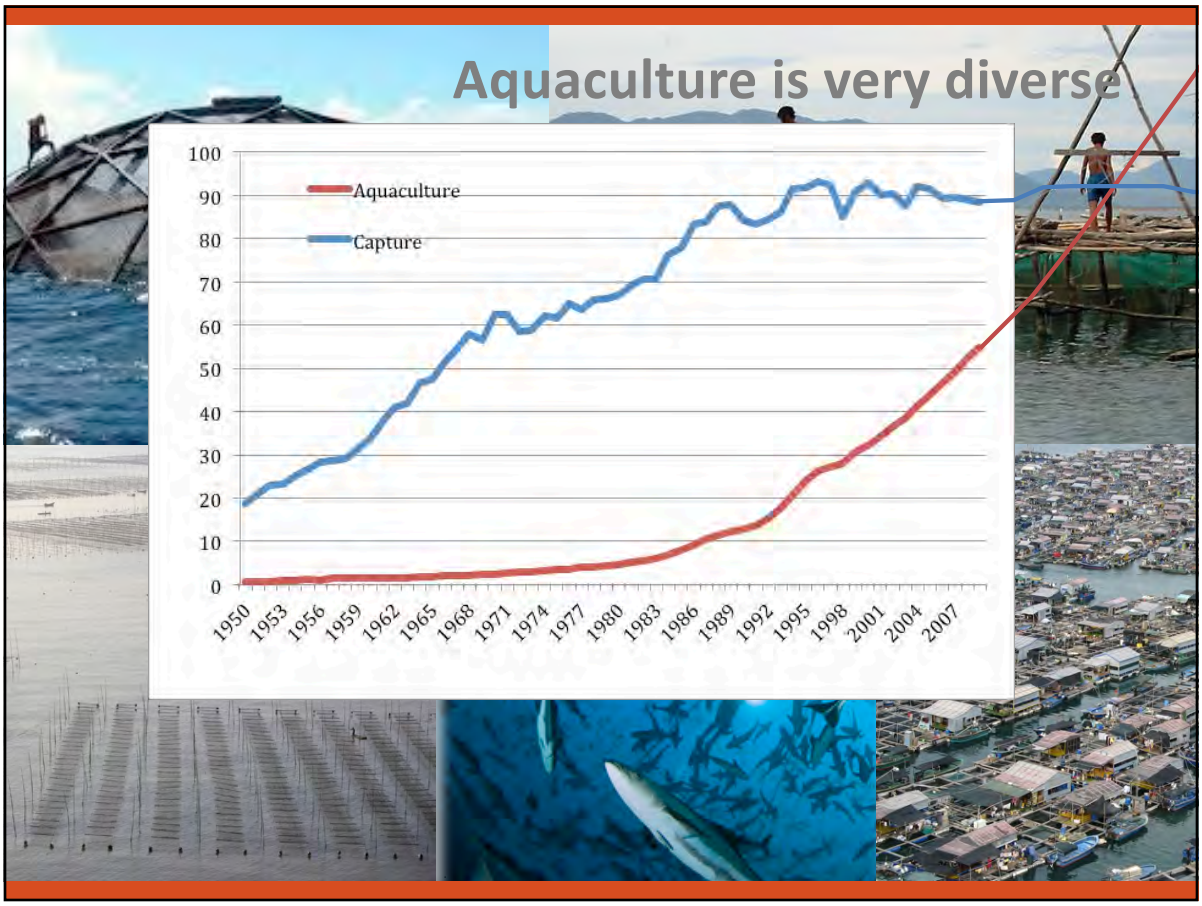
Aquaculture is very diverse
Aquaculture
Capture
100
90
80
70
60
50
40
30
20
10
0
1950
1953
1956
1959
1962
1965
1968
1971
1974
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1980
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1992
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2007

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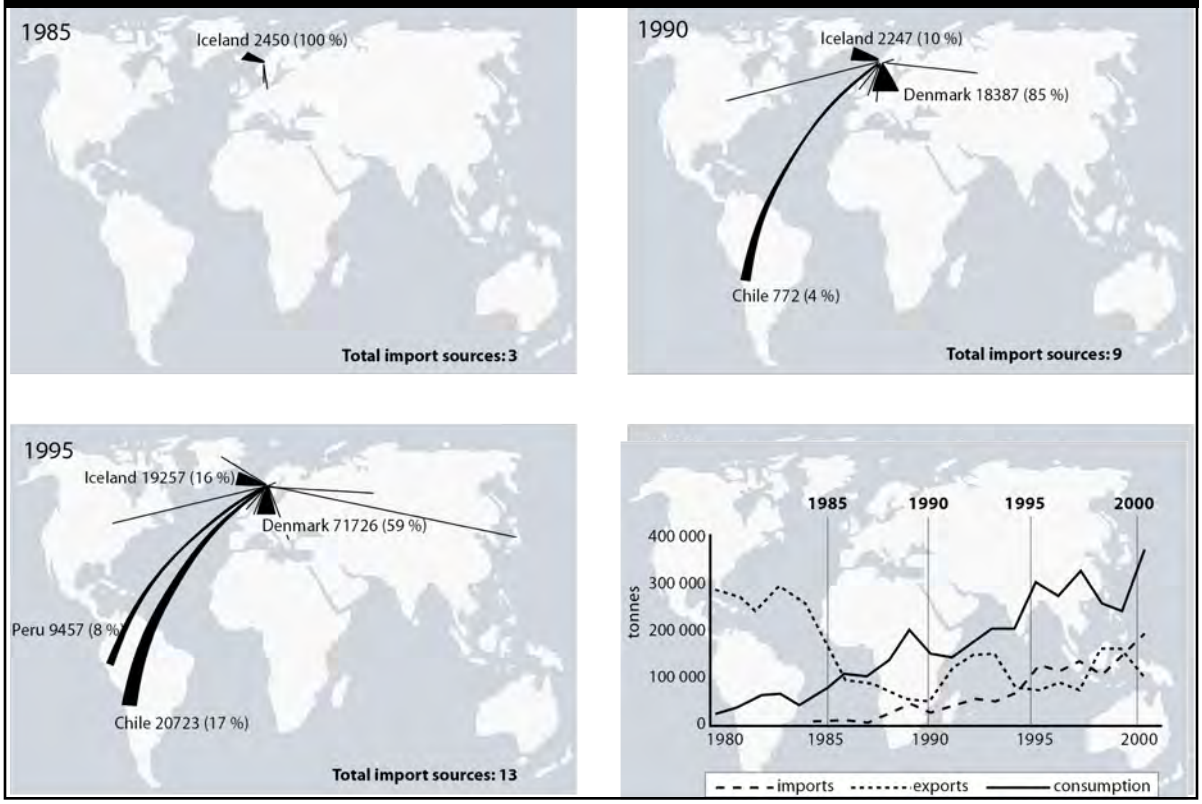
Fishmeal trade and consumption in Norway – salmon

Deutsch et al. 2007. Feeding aquaculture growth through globalization. *Global Environmental Change* 17:238-249.



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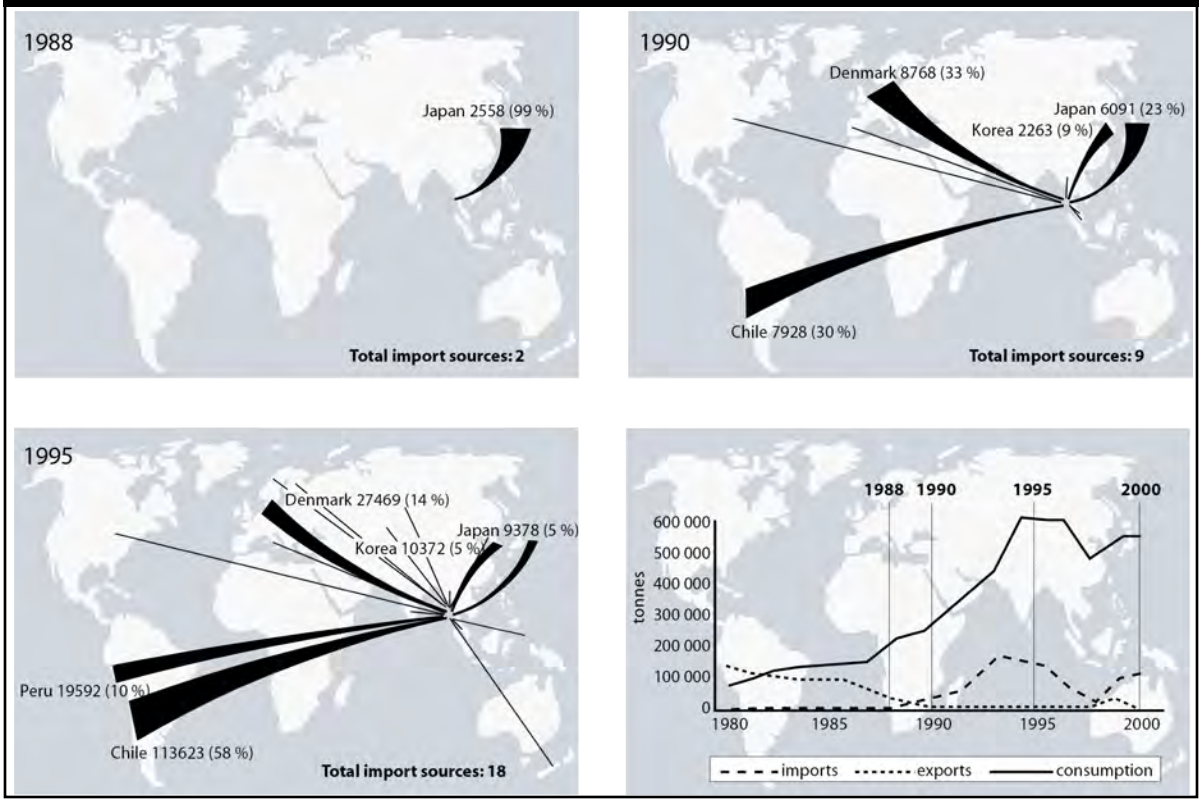
Fishmeal trade & consumption in Thailand – shrimp

Deutsch et al. 2007. Feeding aquaculture growth through globalization. *Global Environmental Change* 17:238-249.



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Three overarching Resilience Strategies

Source: Biggs, O., et al. 2014

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What is missed by 'popular' notions of Resilience

Resilience is not something that should be maximized

Resilience is not something that is "good""

Resilience is:

- dynamic
- emerges from cross-scale connections
- requires embracing uncertainty & enriching diversity

Resilience should be 'navigated' rather than optimized

- strategies need to change over time
- deal with tension & tradeoffs

"Desired" resilience can be enhanced while

"Peverse" resilience can be reduced

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