Societal Transformation

From Risk Management to Collapse of Societies

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Outline

- Introduction: megatrends and societal transformation
- Exercise: localizing and combining
- Collapse of society: two approaches
- Risk management: fields of action
- Synthesis and further reading

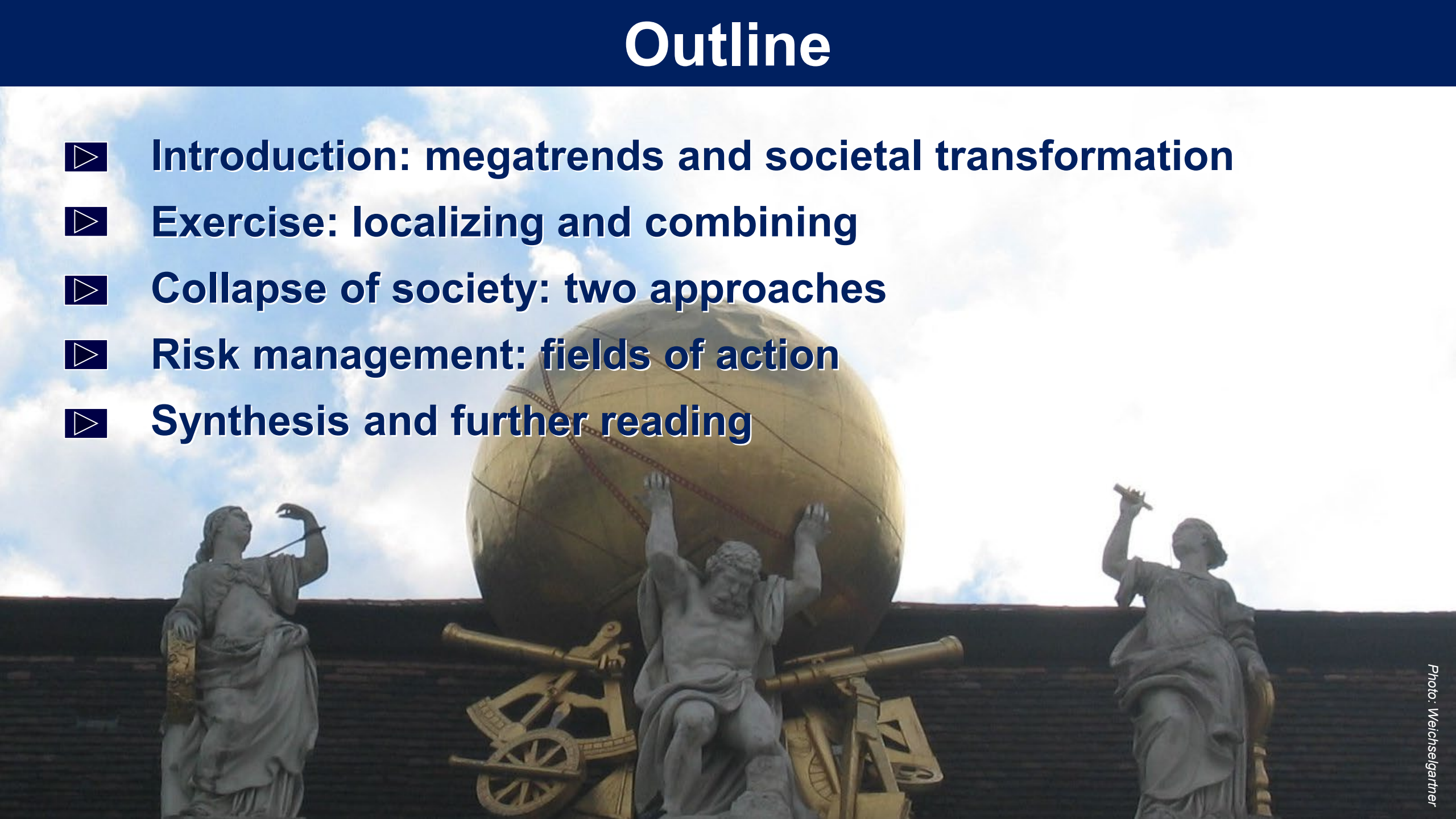
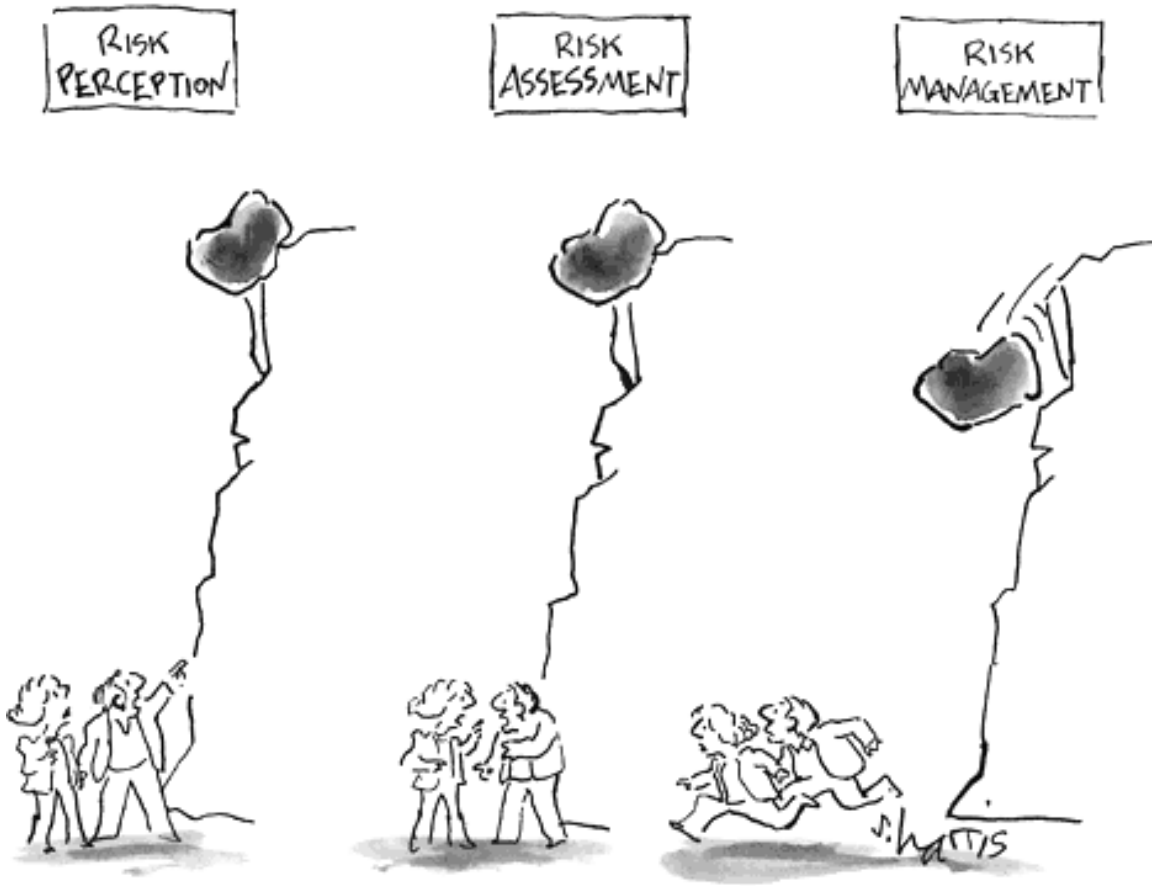


Photo: Weichselgartner

In your opinion: what are the most severe risks …

… on a **global** scale over the **next 10 years?**



Cartoon: Sidney Harris

The most severe risks …

… on a **global** scale over the **next 10 years**,
according to a Global Risks Perception Survey (i.e., answers from 1,000 global experts and leaders)*

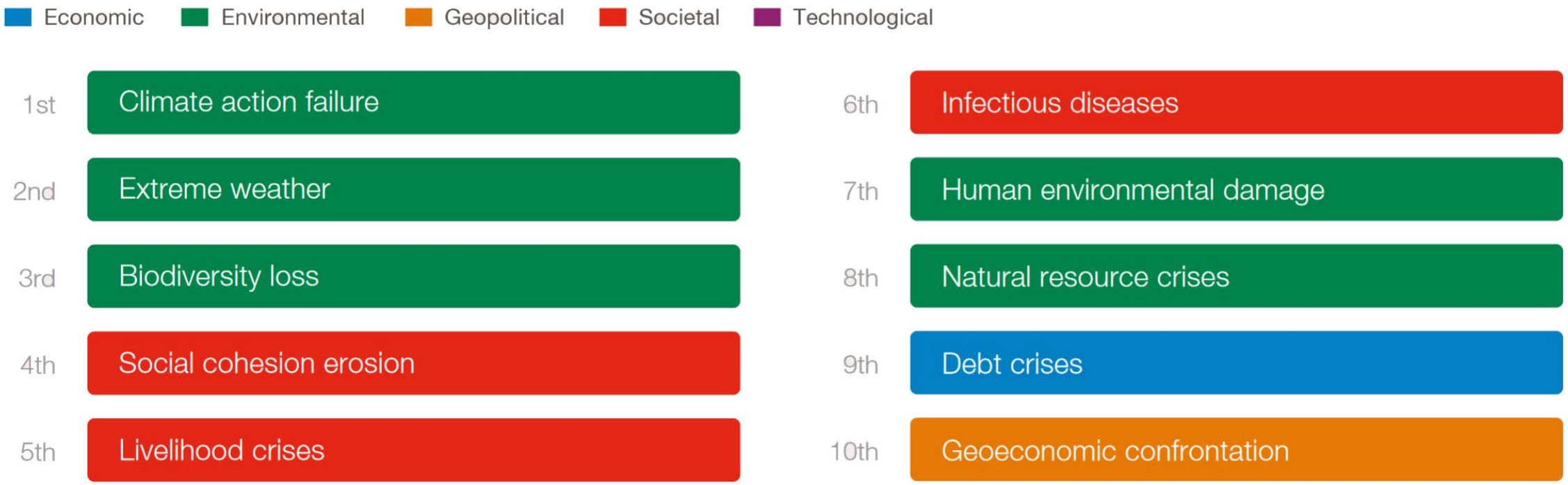


Fig.: WEF (2022:14)

Note: **environmental** and **societal risks** accounted for 8 of the top 10 risks!

* WEF (2022): The global risks report 2022. World Economic Forum, Geneva.

What are current global change processes?

- Climate change
- Land-use change, land degradation and desertification
- Loss of biodiversity
- Ocean acidification
- …

- Demographic changes
- Urbanisation
- Energy demand
- Technological developments
- …

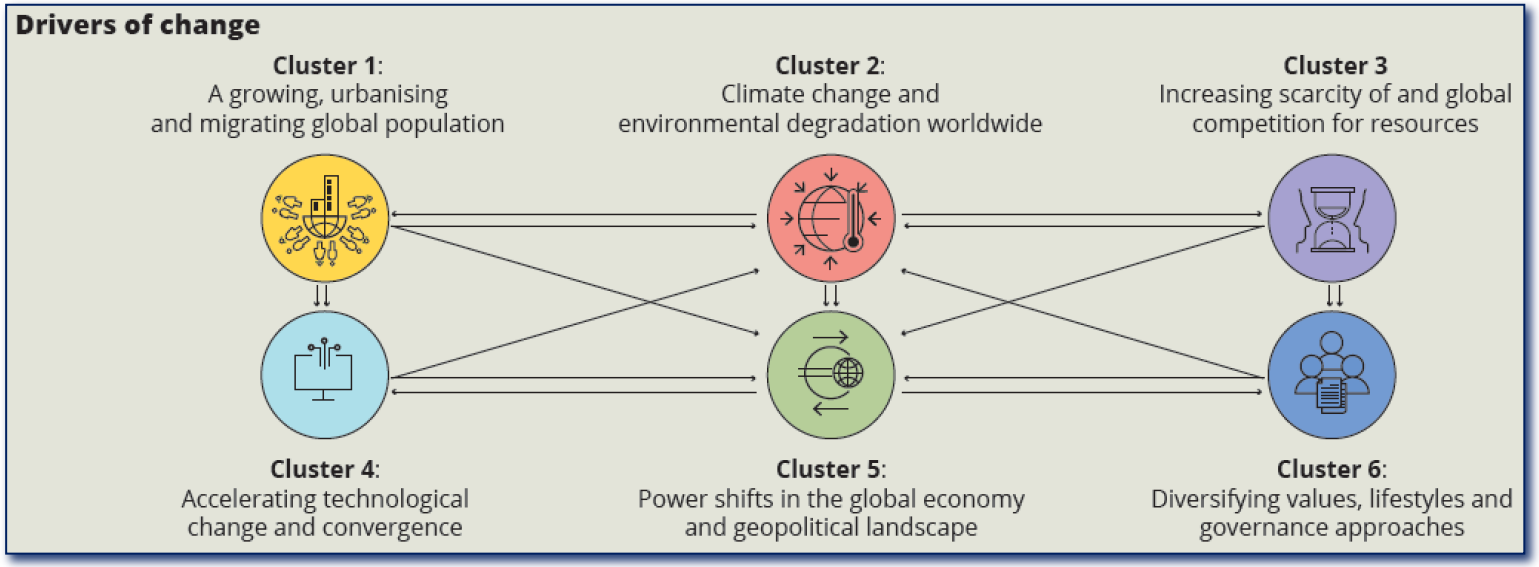


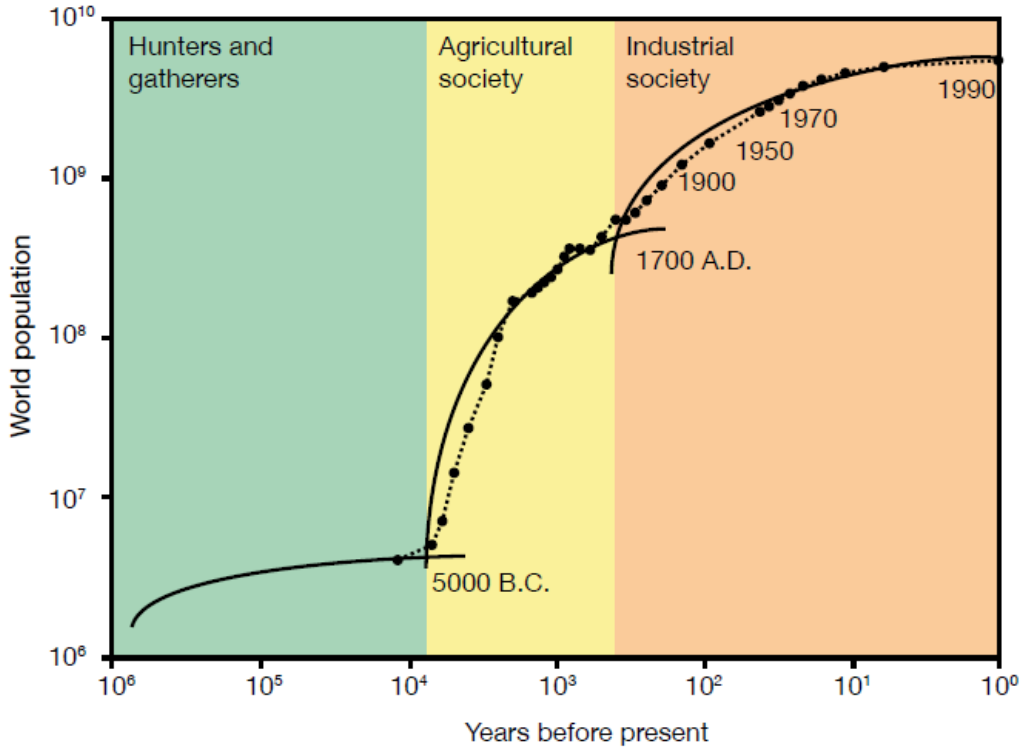
Fig.: EEA (2020:17)

Weichselgartner J. & Marandino C.A. (2012): Priority knowledge for marine environments: Grand challenges at the society-science nexus. *Current Opinion in Environmental Sustainability* 4 (3): 323-330.
EEA (2020): Drivers of change of relevance for Europe's environment and sustainability. European Environment Agency, Copenhagen.

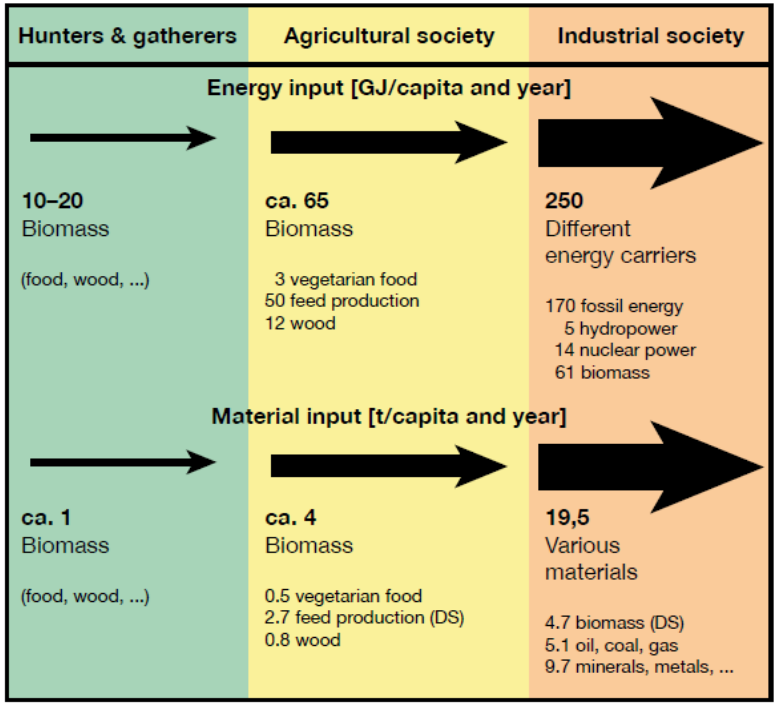
What are historical great transformations?

- **Neolithic Revolution** (transition from **hunter-gatherer** to **agricultural** society)
- **Industrial Revolution** (transition from **agricultural** to **industrialised** society)

Population growth



Energy and material input



WBGU (2011:94ff.), Figure left: WBGU (2011:86), after Kates (1996), Figure right: WBGU (2011:86), after Fischer-Kowalski & Haberl (1997)

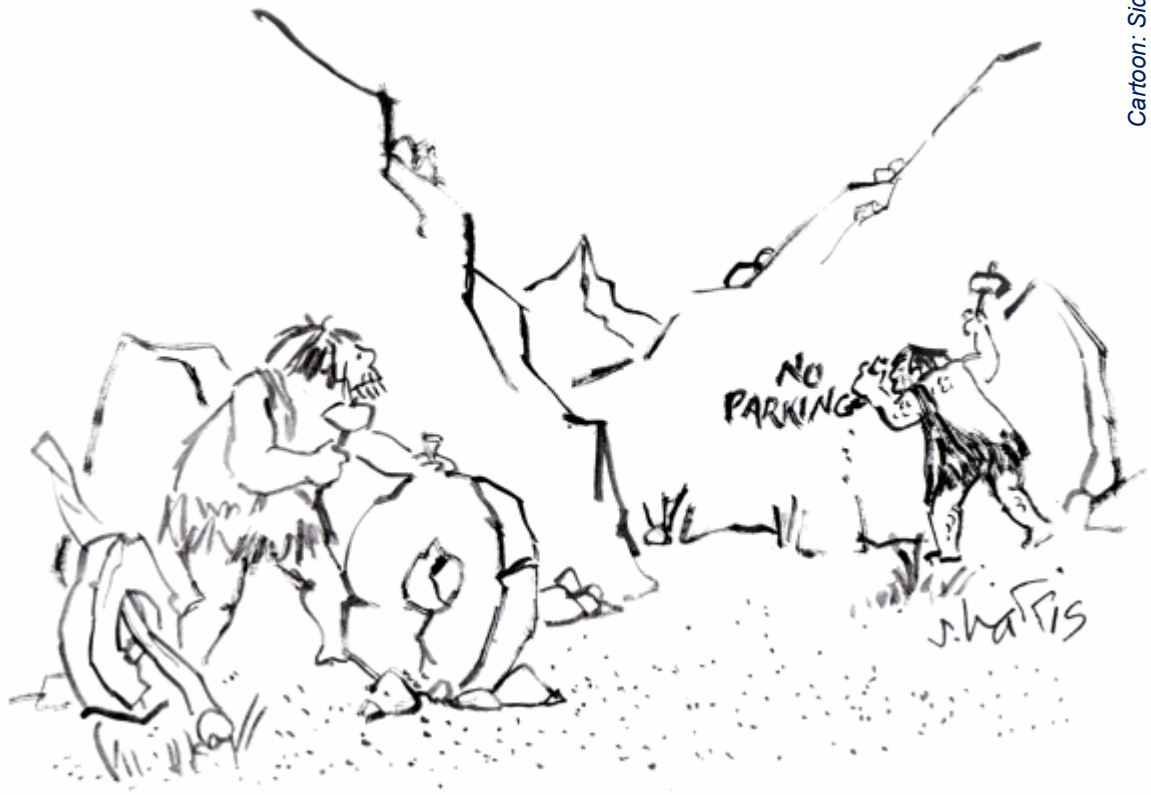
What is Neolithic Revolution?

- Describes the emergence and expansion of **sedentary societies** during the New Stone Age
- Between 10.000 and 5.000 BC, after previously living exclusively in nomadic hunter-gatherer communities, humankind developed **agriculture**, **animal husbandry** and how to **store food** in different regions around the globe at the same time, thus creating the preconditions for sedentariness
- Sedentariness, agriculture, and food storage brought **material wealth** and **economic growth**
- It allowed the evolution of more **complex** and **differentiated societies** and led to fundamental differences with regard to **technological development** and **social organisation**
- **Energy demand** and the **degree** of **interference** in natural environments also **increases**

WBGU (2011:82ff.), Sieferle (2001), Sieferle R.P. (2010): Lehren aus der Vergangenheit für die Transformation zu einer klimafreundlichen Gesellschaft. Expertise for WBGU (2011)

What is Neolithic Revolution?

- A larger share of **biomass net primary production** is used as food and feedstock, firewood, and construction material
- It brought compulsory **needs to adapt** and **co-evolutionary processes** in agriculture (e.g., emergence of parasites) and settlement (e.g., competitive pressure through foes)
- The solution of a problem usually led to an unforeseen set of new problems, which again called for responsive action, thereby promoting **innovation** and **development**



Cartoon: Sidney Harris

WBGU (2011:82f.), Sieferle (2001, 2010)

What is Industrial Revolution?

- From England, the process of **industrialisation** spread to the European continent, North America, and Japan during the course of the 19th century
- **Biomass**, **manpower** and **animal power** were gradually **replaced** by **fossil energy carriers** in combination with **new technologies** (steam engine, railway, car, tractor)
- It was based on an **overlapping** and the **concentration** of far reaching **change processes** with regard to
  - the **energy basis** for economy and society
  - the significance of **time** for the economy, and in society
  - communication, knowledge, and logistics **infrastructures**
  - **power transformation** and **social change**
- **Mass production** allowed cheap manufacturing of products

WBGU (2011:85f.), Sieferle (2001, 2010)

What is Industrial Revolution?

- An **intellectual elite** started to emerge, and there was a high degree of willingness on the part of the wealthy to **invest** in **new ideas** and **technologies**
- Cities grew and developed, aiding the **diffusion** of **socio-technical innovations** and **innovation processes**
- It allowed humankind **emancipation** from the energy basis and resource '**land**', and to **increase productivity**
- **Preconditions**: functioning **system** of **law** and **order**, **land reforms**, **investment** in **human resources**, skilled **labour**, access to **natural resources**, sufficient **capital** and a **willingness** to embrace **progress**
- **Conversion** of the **economy** and the **energy system** was a long-term evolutionary process, accompanied by **modifications** to existing **institutions** and **labour structures**

WBGU (2011:85f.), Sieferle (2001, 2010)

What is societal transformation?

- Grin et al. (2010) refer to '**transition**' when analysing comprehensive change processes, and to '**transformations**' as phases within a transition
- Can be understood as processes during the course of which **changing practices**, **structural change**, and **exogenous tendencies** occur in parallel to each other and may sometimes interact so as to produce **non-incremental changes** in **practices** and **structures**
- Refers to the **concept** of **co-evolution**, i.e., economic, cultural, technological, ecological, and institutional subsystems co-evolve and can reinforce each other to co-determine a transition, leading to irreversible patterns of change
- They do not occur simply as a **uncontrolled** self-propelling process, but can also be **influenced** by identifiable **actor constellations** with sufficient power, resources, and creativity

Grin et al. (2010), WBGU (2011:81), Feola (2015)

What are characteristics?

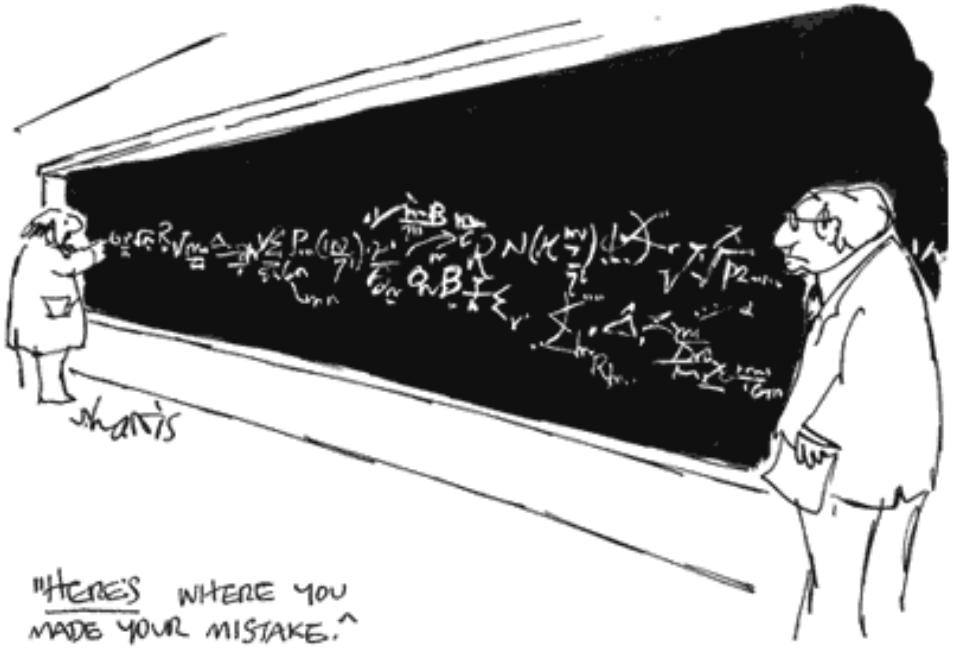
- Major change processes occur in a **co-evolutionary** manner, rely on a **great number** of **changes** in **different socio-technical (sub)systems**, and take place at **local**, **national**, and **global** action levels
- They include the **development** of (niche) **innovations** as well as their **selection** on the part of the users, and their social embedding through markets, regulations, infrastructures and new social guiding principles
- They are influenced by a **large number** of political, scientific, economic and civil social **actors** and **consumers**
- Different changes **influence** and **enforce each other**, pushing development in a specific direction
- Profound changes of **all** societal sectors, incl. the **relationship** between **society** and **environment**, **cultural identity**, and familiar **patterns** of **problem solving** and **concepts** of **development/progress**

Grin et al. (2010), WBGU (2011:83ff.), Feola (2015)

How does today's transformation differ?

The current transformation has **three peculiarities**:

1) It must **occur intentionally** and **under time pressure**
2) It must **take place** at a **global level** in a **short time**
3) It must **take** the **planetary boundaries into account**



Cartoon: Sidney Harris

WBGU (2011:91)

What are peculiarities – intension?

1) It must **occur intentionally** and **under time pressure**

- While the industrial society was an **evolutionary process**, for which there was no ‘master plan’, the transformation into a sustainable society must **occur intentionally** and **under time pressure** to achieve a trend reversal towards a climate-friendly and resource efficient society
- There will be no sustainability turnaround without **major, strategically targeted efforts** by policy-makers, social actors, and economy
- It is the first great transformation in the history of humankind that has to be **consciously effected** on the strength of politics and policies

WBGU (2011:91)

What are peculiarities – space and time?

2) It must **take place** at a **global level** in a **short time**

- The Industrial Revolution initially took place in only a **few countries**, it also took more than a **century** for it to become an (almost) global phenomenon
- This transformation must be **globally** embraced by industrialised, newly industrialising and even developing countries in order to avoid dangerous climate change
- The course towards a **sustainable global economy** must be set within a **very short time** in order to provide prosperity, stability and security within the planetary boundaries for as many people as possible
- This requires an unprecedented level of **global cooperation**

WBGU (2011:91)

What are peculiarities – planetary boundaries?

3) It must **take** the **planetary boundaries into account**

- Primary motive of the era of industrialisation was the overcoming of the boundaries set by nature (**dis-embedding**)
- Guiding principles of **social development** must undergo some **radical changes**
- **Planetary boundaries** must serve as the **starting point** of all social development and prosperity increase (**re-embedding**)

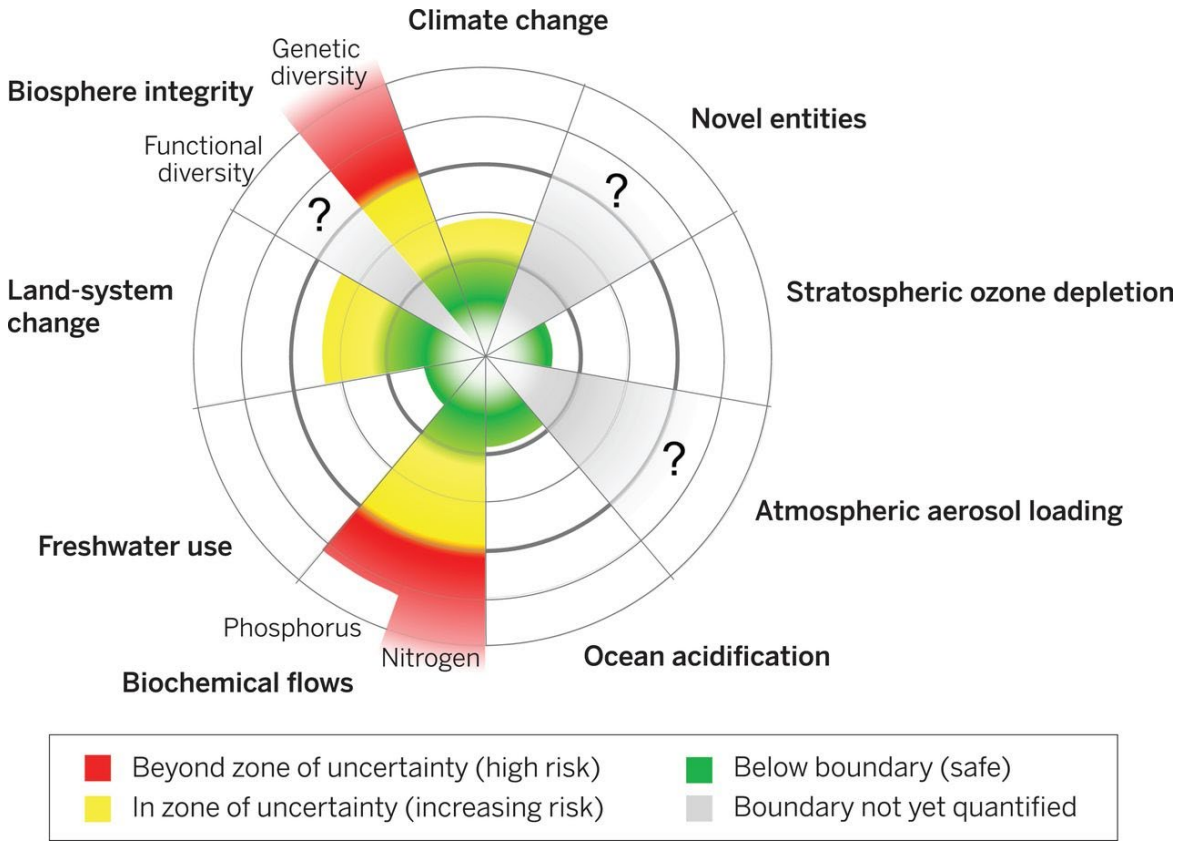


Fig.: Steffen W., Richardson K. et al. (2015): Planetary boundaries: guiding human development on a changing planet. *Science* 347 (6223):1259855.

WBGU (2011:91)

What can we synthesise?

- There are both **natural** and **social**, often **interconnected** processes at place that severely impact coupled human-environment systems on a global scale
- They **modify** existing **risks** and **vulnerabilities** and/or **create new** one
- 10.000-5.000 BC: **sedentariness**, **agriculture**, and **food storage** forced a cultural, social, technological, and economic development
- 19th century: **energy** became the central **leitmotif** and the industrialisation allowed for great scientific, technical, and economic advances
- Imply **drawbacks** and **risks**, e.g., large-scale warfare and factory farming; only half of humankind has benefited and many developments threaten the continued ability of humans to give meaning to their lives, among others
- We are currently perceiving the **third (steered) great transformation**

Exercise:

Localizing and Combining

What should be trained?

A key objective is to **develop skills** and **aptitudes** that enable us to **manage information** and **develop** a **critical attitude** when handing of information, including ...

1. ... **examine** pictures in a **thoughtful** and **detailed way**, i.e., focus on the overall picture as well as on details, specific structures, and features
2. ... **ask questions** and **develop hypotheses**, e.g., how to explain contents, how the location looked liked in the past or will look like in the future
3. ... **identify „answers“** from the picture and thus **extend knowledge**, i.e., combine previous knowledge with new information in order to answer the questions raised and, thus, **discover new interrelations**.

What should be done?

1. Have a **close look** at the following photos and **reflect** about the **potential locations** of the shown buildings.
2. Have a **guess** and **justify your hypothesis**.
3. Have another look at the photos from a **risk perspective** and **outline your assumptions**.

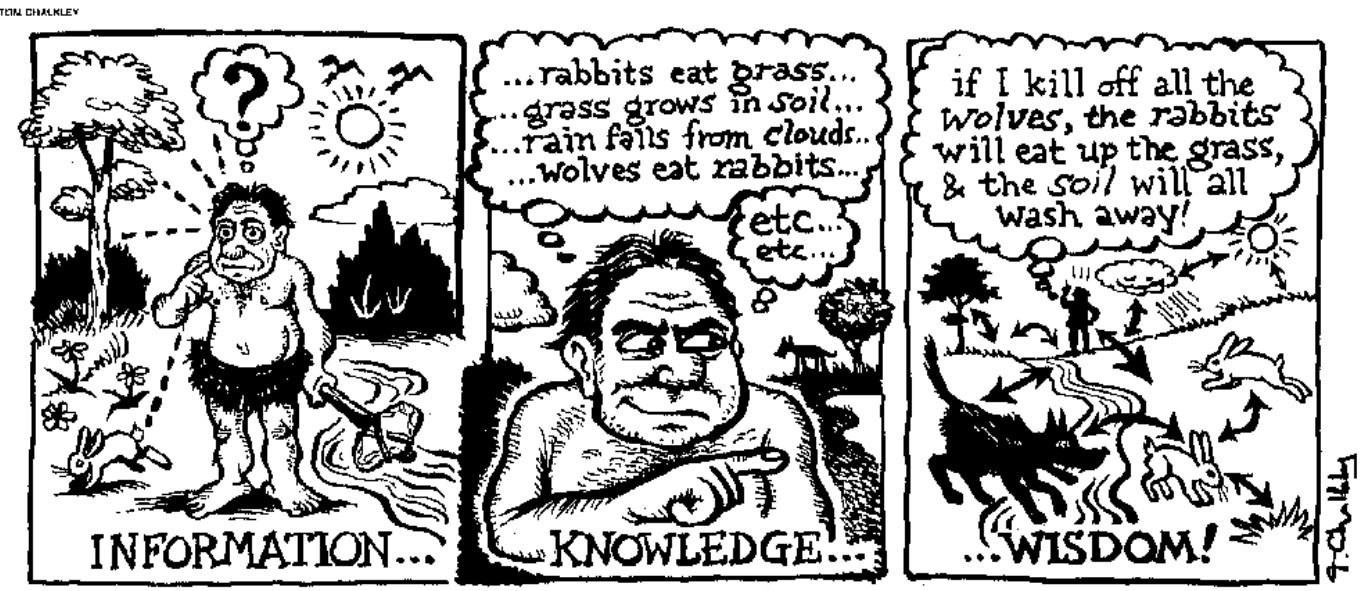


Fig.: Cleveland H. (1982): Information as resource. *The Futurist*, Dec. 1982, p.34-39.

Photo: Weichselgartner

Photo 2

Photo: Weichselgartner

A short break?

Pausing and Reflecting

Where are we? Focus on risk and transition

- Framework: the nature of **risk** and the notion of **transition**
- Focusing on issues on the **underestimated** probability of **breakdowns** in an **entire system**, as opposed to the breakdown of individual parts or components, i.e., **systemic risk** (Kaufman & Scott 2003:371)
- Hendricks et al. (2006:2) note that the key characteristic of systemic risk is *"the **movement** from one stable (**positive**) **equilibrium** to another stable (**negative**) **equilibrium**"*
- Centeno et al. (2015:68) define systemic risks as the *"threat that individual failures, accidents, or disruptions present to a system through the process of **contagion**"*

Centeno M.A., Nag M., Patterson T.S., Shaver A. & Windawi J.A. (2015): The emergence of global systemic risk. *Annual Review of Sociology* 41: 65-85.
Hendricks D., Kambhu J. & Mosser P. (2007): Systemic risk and the financial system. *Economic Policy Review* 13 (2): 65-80.
Kaufman G.G. & Scott K.E. (2003): What is systemic risk, and do bank regulators retard or contribute to it? *The Independent Review* 7 (3): 371-391.

What is our first focus?

Type of risk	Definition	Main features	Examples	Implications
Conventional risks	Known and well-defined risks	• Familiarity – recognisable patterns and management regimes that are relatively stable and have proven to be effective if implemented according to certain rules	• Bicycle theft • Salmonella infection • Car accidents • Obesity	Use standard risk management practices, e.g., regulation
Emerging risks*	New risks or known risks that become apparent in new context conditions (IRGC 2015)	• Uncertainty regarding causes, potential consequences, and probabilities of occurrence • Lack of familiarity with the risk	• New processes and products in the field of synthetic biology • Malaria spreading to higher latitudes	Focus on early detection and analysis of elements that trigger emerging risks. Prepare to revise decisions and adapt
Systemic risks	Threats that individual failures, accidents or disruptions present to a system through the process of contagion	• Highly interconnected risks with complex causal structures, non-linear cause-effect relationships • Lack of knowledge about interconnections in an interdependent and complex environment, prevention	• Desertification and collapse of the Aral Sea • 2008 global financial crisis • Pandemics • Cyber-security • Global climate change • Fish stocks depletion	Focus on adaptation and transformation of the organisation and the system

Table: IRGC (2015): Guidelines for Emerging Risk Governance. International Risk Governance Council, Lausanne, p.12.

What is our second focus?

- Multi-stage concept describes the **basic pattern** of transformative change
- Transformation progress is determined through the **pace** of the **changes**, the **scale** of **transformation**, and the **stages** of the **transformation process**
- Transformation is **complex**, **dynamic**, **hardly predictable**

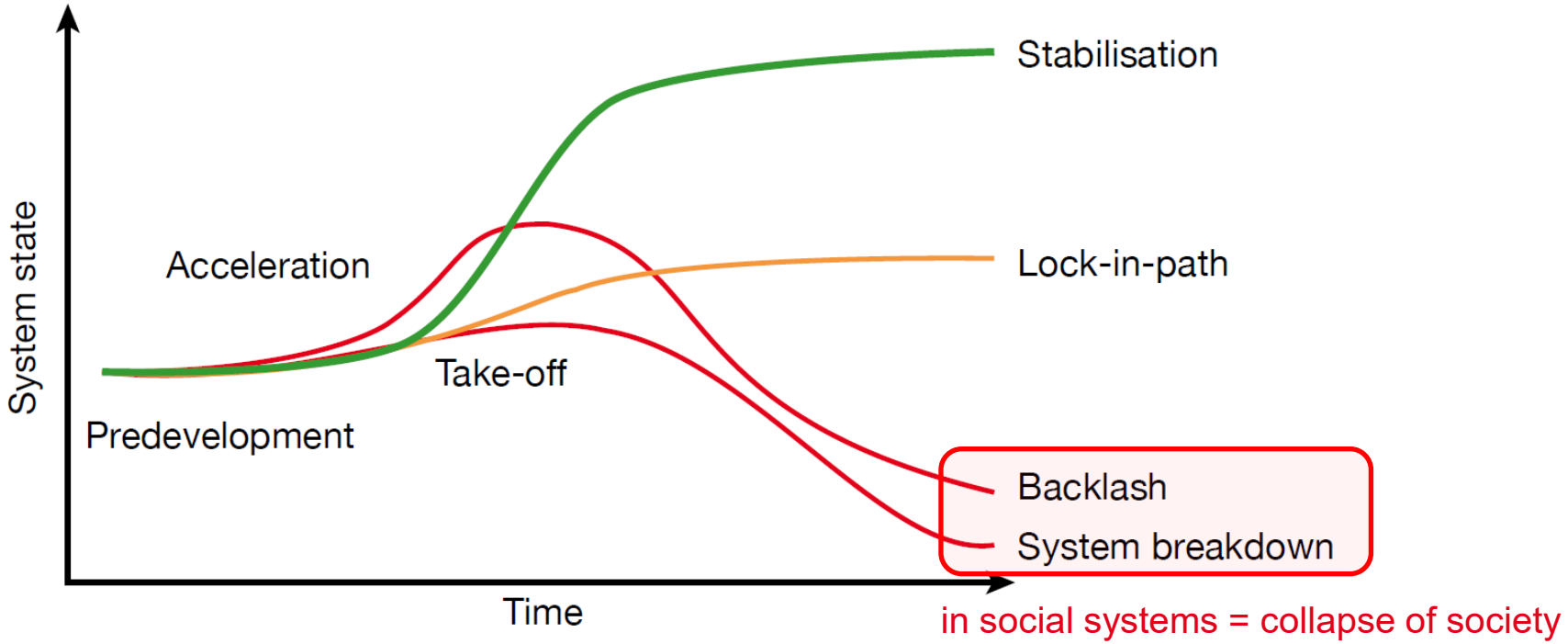
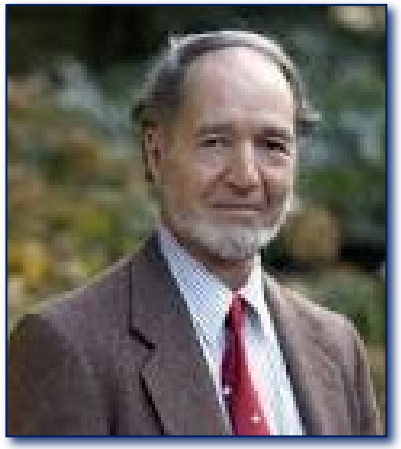


Fig.: WBGU (2011:92), after Grin et al. (2010)

Collapse of society: two approaches

Jared Diamond: US geographer,
examines historical cases (Easter, Pitcairn, and Henderson Island, the Anasazi and Maya, Greenland)
to identify the causes of societal collapse, particularly with regard to **environmental** and **climate change**, **neighbours** and **trade partners**, and **societal responses**



Joseph Tainter: US anthropologist,
examines the collapse of civilisations
(Maya, Chacoan, Roman Empire, among others)
in terms of **network theory**, **energy economics**, and **complexity theory**

What is the approach of Jared Diamond?

- Defines collapse as a **drastic decrease** in **human population size** and/or **political/economic/social complexity**, over a considerable area, for an extended time
- Focuses on the forms of **interactions** and **interdependencies** between/ to other societies and to the environment
- Argues that **maximum population**, **wealth**, **resource consumption**, and **waste production** mean **maximum environmental impact**, approaching the limit where impact outstrips resources
- Five factors contribute to collapse: **climate** change, **environmental** problems, **hostile** neighbours, collapse of essential **trading partners**, and the **society's response** to the foregoing four factors

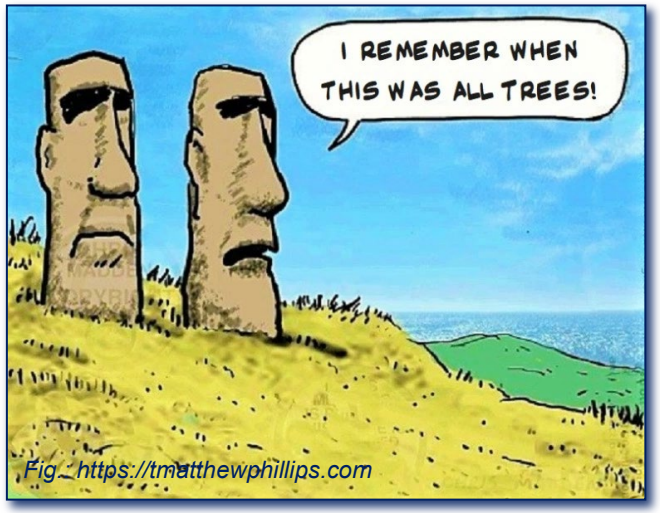


Fig.: https://tmatthewphillips.com

Diamond (2005)

What are links to current society?

- Diamond lists 12 environmental problems facing humankind today and 8 of them have contributed to the collapse of past societies: **deforestation** and **habitat destruction**, **soil** problems, **water** management problems, **overhunting**, **overfishing**, effects of **introduced species** on native species, **overpopulation**, increased per-capita **impact** of people
- 4 **new** factors may contribute to the weakening/collapse of present/future societies: anthropogenic **climate change**, buildup of **toxins** in the **environment**, **energy shortages**, full human use of the Earth's **photosynthetic capacity**
- 2 **choices** are crucial:
  i. Courage to practice **long-term thinking** and to make bold, anticipatory decisions at a time when problems have become perceptible;
  ii. Willingness to reconsider and the courage to make painful decisions about **values**

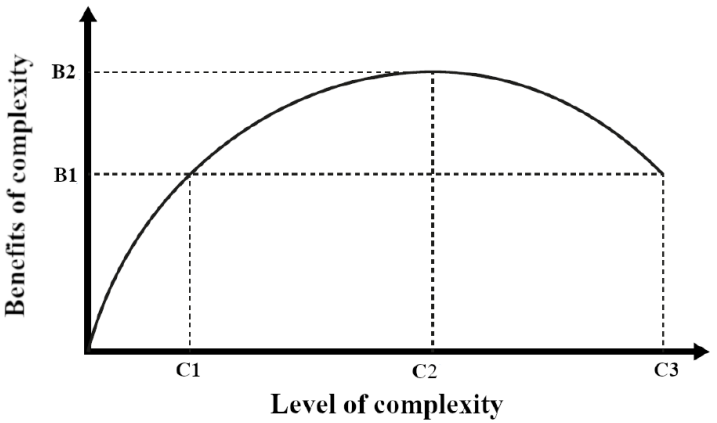
What is the approach of Joseph Tainter?

- For Tainter, the essence of **collapse** is a marked **reduction in complexity**
- As societies become larger, **more complex control structures** (e.g., government, military, bureaucracy) are **needed** to maintain the cohesion of society and solve the problems that appear along their path
- **More complex** societies are **more costly** to maintain than simpler ones, requiring greater support levels per capita
- As these structures become larger, they become **less efficient**, and continued **investment** in **sociopolitical complexity** reaches a point where the **benefits** for such investment begin to **decline**
- Societies decline or collapse when their **investments** in **social complexity** and their **energy subsidies** reach a point of **diminishing marginal returns**

Tainter (1988, 2006)

What are links to current society?

- **Substantial increased costs** occurred shortly before collapse
- **Energy-complexity spiral** is crucial, i.e., **abundant, inexpensive energy** generates **increasing complexity** and **simultaneously produces** new kinds of **problems** (e.g., waste, climate change), and addressing the problems requires complexity to **grow**, imposing a need for still more energy
- The times when humans have had **surplus energy** have been rare and short-lived, and the fact that we are in such a period today **biases** us to think that surplus energy is **normal**
- The challenges that any society might confront are, for practical purposes, **endless in number** and **infinite in variety**; that being so, **sustainability** is a matter of **solving problems**



Tainter J.A. (2011): Energy, complexity, and sustainability: A historical perspective. Environmental Innovation and Societal Transitions 1 (1): 89-95.

Fig.: Bardi U., Falsini S. & Perissi I. (2019): Toward a general theory of societal collapse: a biophysical examination of Tainter's model of the diminishing returns of complexity. *Biophysical Economics and Resource Quality* 4 (1): 1-9.

Comparing Diamond and Tainter

- They have different academic **backgrounds** and, hence, use different **methodologies** and **perspectives** to study society and collapse
- Diamond applies a more **humanist perspective** to the problem and the role that human **morals**, **value**, and **choices** can play in problem-solving the case of collapse
- Tainter applies a more **economic perspective**, drawing upon the **principle** of **diminishing returns**: complexity as a strategy becomes increasingly costly and yields decreasing marginal benefits
- They differ regarding their **messages** and **solutions** for our current and future society

Moll R.F. (2008): Extended book review. *Complicity: An International Journal of Complexity and Education* 5 (1): 169-178.

What is your opinion?

Which approach is more convincing and why?

In a nutshell

- Diamond argues that

  1) **environmental damage**, 2) **climate change**, 3) **hostile neighbours**, and 4) **friendly trade partners** may or may not prove significant for a particular society, but that one factor is always significant:
  the **society's responses** to its **environmental problems**

- Tainter argues that

  1) human societies are **problem-solving organisations**,
  2) socio-political systems **require energy** for their maintenance,
  3) **increased complexity** carries with it **increased costs** per capita, and
  4) investment in socio-political complexity as a **problem-solving response** often reaches a point of declining returns

- Both approaches characterise societies and the factors that contribute to their collapse, thus invite us to **reflect** on our **current** and **future practices**

What is your opinion?

Do you believe that our current society will collapse?

How to address transformation?

Four fields of action are critical for the current (steered) transformation into a **sustainable society**:

1) **Energy basis**: expansion of a **renewable energy infrastructure**, leaving behind the 'fossil age', which will lead to a radically **changed economic structure**

2) **Time regime**: people, companies, and political organisations have to apply a **long-term perspective** to their **actions**

3) **Basic infrastructures**: energy, urban, and land-use systems must be **redirected** towards **decarbonisation**

4) **Social change** and **power shifts**: changing global **power constellations**, patterns of **production** and **consumption**, **social guiding principles**, and **development paradigm**

WBGU (2011:90f.)

How to address systemic risks?

The International Risk Governance Center (IRGC) suggests 7 interlinked steps:

1. **Explore** the **system**, **define** its **boundaries** and **dynamics**
2. **Develop scenarios** considering possible ongoing and future transitions
3. **Determine goals** and the **level** of **tolerability** for risk and uncertainty
4. **Co-develop management strategies** dealing with each scenario
5. **Address** unanticipated **barriers** and sudden critical **shifts**
6. **Decide**, **test** and **implement strategies**
7. **Monitor**, **learn** from, **review** and **adapt**

IRGC (2018): Guidelines for the Governance of Systemic Risks. International Risk Governance Center, Lausanne.

What are governance characteristics?

- The 7 steps can be **ordered** in **different sequences** depending on the **application**, existing **knowledge** and **context**
- The whole sequence should be seen as a **reflective exercise** that includes all steps in a variety of orders and a system of **iterations** and **feedback loops**
- The extent of iteration within each step **depends** on the **circumstances** and whether the various stakeholders agree on **priorities** and **decisions** to be taken
- It includes a **step** to **address** unanticipated **barriers** and sudden critical **shifts**

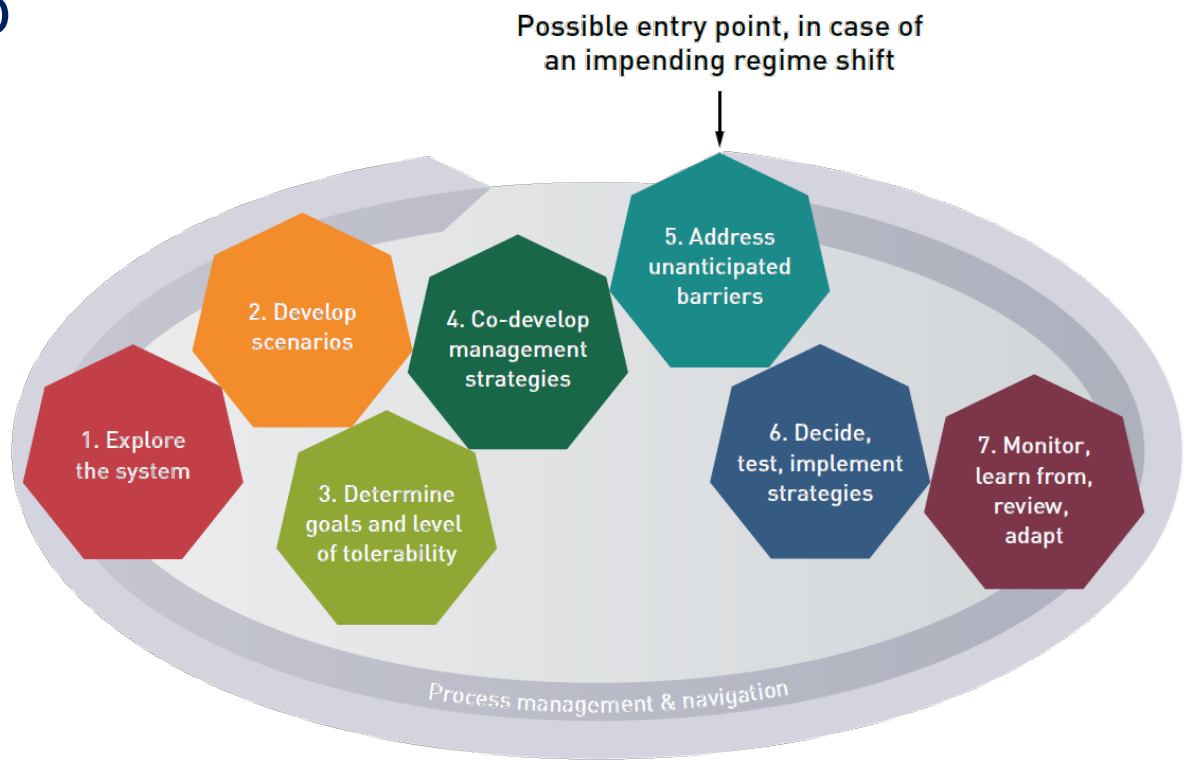


Fig.: IRGC (2018:19)

Synthesis

- Collapses, regime shifts, and catastrophes (i.e., systemic risks) are **part** of **complex systems**
- Conventional risk approaches are **not sufficient** for dealing with systemic risks because they are often too **reductionist** and **limited** in **scope** to account for complex **system interactions** and **challenges**
- **Developing resilient** social and economic **structures** that are able to **respond** and **adapt** to **change** is the best way to **cope** with **systemic risks**
- There is an urgent need for a **new paradigm** that integrates the continued **development** of **human societies** and the **maintenance** of the **Earth system** in a resilient and accommodating state
- Diamond reminds us: since we are the **cause** of environmental problems, we are the ones in **control** of them, and **we can choose or not choose** to **stop causing** them and **start solving** them

Further reading

Diamond J. (2005): *Collapse: how societies choose to fail or succeed*. New York.

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