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Session 2: Climate Change, Environmentally-induced Migration and Peace Ecology

Sustainability Transition and Sustainable Peace as Transformative Science: A Peace Ecology Perspective

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Abstract (1)

- **Peace research should shift from disciplinary, multi-, inter-, and transdisciplinary research towards a transformative approach to anticipatory science and knowledge creation.**
- **Transformative science** is to contribute to anticipative learning for proactive political strategies, policies and measures to avoid self-destroying prophecies.
- **Peace ecology (PE)** aims at a 'widening' of sustainability transition research by overcoming overspecialization of science and linking the diagnosis of *global environmental change* (GEC) research with alternative scenarios and visions on development pathways to avoid 'dangerous climate change' and societal 'tipping points' with unpredictable geopolitical impacts for peace and security.
- **Key research questions are:**
  - What are possible conceptual links between 'sustainability transition' and 'sustainable peace'?
  - Will a transformative process towards sustainability contribute to a more peaceful world?
  - How could critical tipping points in the Earth and human systems be avoided?
  - May *business-as-usual* policies threaten the survival of millions of people and pose serious threats to international peace and security?
  - May anticipative learning and a discourse on necessary long-term transformative changes contribute to sustainable development and proactively address new dangers to peace and security?
  - Which policy lessons can be drawn from the violent consequences of the industrial and third technical revolution for a long-term transformative change towards sustainable development?

Abstract (2)

- This **peace ecology perspective** is inspired by both **conceptual theory** and a qualitative, conceptually-guided, prognostic approach and a **'conceptual thought experiment'** linking **different themes** (**sustainability transition [ST], Sustainable Peace [SP]) and research programmes (ecology, peace studies)**.
- The paper reviews impacts of the **'silent transition' from the Holocene to the Anthropocene for a new 'Copernican revolution to sustainability' with an alternative worldview.**
- The paper offers a holistic approach to transformative science linking a **policy process (ST)** with a **normative goal (SP),** presents a new model linking the diagnosis of GEC research with alternative strategic policies and visions towards sustainable development and sustainable peace based on a new *Handbook on Sustainability Transition and Sustainable Peace* and explores possible scientific approaches for a transformative approach to *sustainability transition* and *sustainable pace* taking possible impacts of strategies of sustainability transition for security and peace and geopolitical scenarios aiming at '**peace with nature**' or 'sustainable peace' into account as part of a heuristic thought experiment.
- However, while (populations, GHG emissions) **trends can be projected** based on model assumptions, the **probability of scenarios cannot be forecast and political decisions and events determining the outcomes of alternative strategies and policies cannot be foreseen**.
- As a new perspective linking peace studies and ecology research, a '**peace ecology' approach** needs to be developed from an **'action-' and 'change-' oriented perspective embedded in the developments of a transformative science**. A peace ecology perspective is to contribute *conceptually* to a **sharpening of the normative 'sustainable peace' concept** and ***politically* to strategies of a 'transition' to sustainable development** that may result in a **peaceful transformation of the processes of production, consumption** and towards alternative lifestyles in the Anthropocene era of earth and human history.

Contents

1. Introduction. Peace Research

- **My key argument is that peace research should shift from disciplinary, multi-, inter-, and transdisciplinary research towards a transformative approach to anticipatory science and knowledge creation.**
- **Peace is like security, environment, development an essentially contested concept.**
- **Which Peace and Whose Peace?**
  - **Many concepts: eirene, pax, peace, shalom, salam, ahimsha**
  - **Peace of the ruler (Pax Romana) or of the human being (internal peace of the mind), maintaining internal or external international peace**
  - **Negative, positive, cultural, engendered, sustainable peace**
- **What is Peace Research? Research on a normative goal of Peace?**
  - **A conceptual, methodological and political challenge to the realist maintream in IR and in security studies during early Cold War period**
  - **From many disciplines (**theology, philosophy, law, political science, sociology, psychology, anthropology, ecology et al.) **multidisciplinary**
  - **A few approaches** (projects) were inter- and transdiciplinary.

1.1. Peace Research & Ecology: Research Fields

- My discipline: political science, international relations
- My research areas: security & peace issues (until 1990), since 1991: international environment policy and since 2000: linking both -> as peace ecology in the making
- Peace Research: a normative approach to the world (how it is and how it should be: peace message of religions)
- My own focus dual challenge to human survival
  - Nuclear Era (deterrence, nuclear war, nuclear winter etc.)
  - Impact of Global Environmental Change (since 1970, 1990s)
- Linking both: peace/security and environmental studies
- Dual perspective of security & environment (environm. Security) or peace & ecology (peace ecology)

1.2. Security and Peace Concepts

- **Security concept: many origins, historical, religious traditions**
- **Occident: Greek-Roman tradition and in Cold War: US influence**
- **Nonwestern origins in Buddhism and Hinduism and in Islam in the holy Koran but also Confucian impact: Hexagon III:**
- **Contextual change: conceptual innovationa after end of Cold War**
  - **3 books. 3 reasons. End of Cold War, Globalisation, Global Environm. Change**
- **Peace concepts: difference due to different traditions: occidental vs. oriental but also different cultural and religious traditions**
- **1945: UN Charter: international peace and security, reference to „threat to the peace“ but a „Security Council“**
- **Occidental tradition: Pax Romana, Christian, now secular traditions**
  - **Hindus, M. Gandhi: ahimsa, peace with nature**
  - **Galtung: formal concept negative vs. positive peace**

1.3. ‘Sustainable Peace’: Facing Challenges of the Anthropocene

- **Galtung** distinguished:„negative vs. positive peace“, coined „cultural peace“ & **Oswald** added „engendered peace
- **„Peace with nature“ or „sustainable peace“**: underdefined normative goal used by some UN bodies (e.g. in Africa) and humanitarian NGOs (post conflict) and a few peace scholars.

Peace ecology in the Anthropocene or ‘**peace ecology quintet’:**

Five pillars: peace, security, equity, sustainability and gender.

- For linkages between peace and security: ‘**negative peace**’
- For relationship between peace & equity: ‘**positive peace**’
- For interactions: peace, gender & environment: ‘**cultural peace**’
- For relations of peace, equity & gender: ‘**engendered peace**.’

1.4. Widened Concept of Sustainable Peace

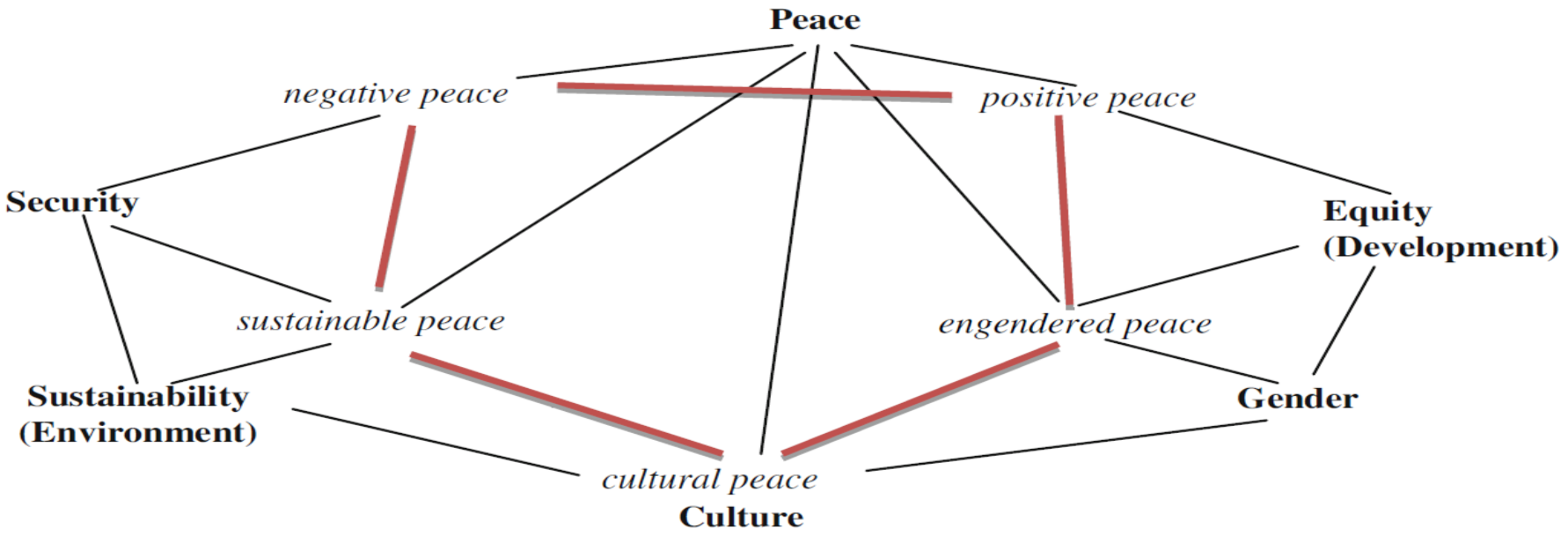


Fig. 1.1 Five pillars of peace ecology and their four linkage concepts of negative, positive, cultural and engendered peace. *Source* The Authors

Sustainable peace refers to the manifold links among peace, security and the environment, **where humankind & environment as 2 interdependent parts of global Earth face the consequences of destruction, extraction and pollution.**

The **sustainable peace concept** includes also processes of recovering from environmental destruction, reducing human footprint in ecosystems through less carbon-intensive, and in the long-term possibly carbon-free & increasingly dematerialized production processes, so that future generations may still be able to decide on their own resources & development strategies.

1.5. We are the Threat! We are the Victims!

1.6. We are Threatening Survival of Humankind!

- In classical conflict analysis: **we vs. them**: the „other“ is the attacker – „we“ are the defender.
- This is fundamentally changing in the Anthropocene
  - Since **1st industrial revolution** for first time **humankind (we)** have directly interfered into the earth system
  - **Cause of the threat**: our burning (consumption) of coal, oil and gas for agriculture, industrial production, housing (heating & coooling), transportation & consumption
  - **We are the threat** with our **ecological footprint**
  - **We are the victims of natural hazards (storms, floods, landslides, droughts, forest fires, heat waves etc.**
  - **„We“ differ in North (climate laggards) & South: equity**

1.7. Sustainable Peace in the Anthropocene

- This text conceptualizes possible linkages between the emerging 'sustainability transition' research para-digm and the conceptual debate on a rethinking of peace, security, development and the environment or ecology, within the context of four research programmes carried out since the end of the Cold War.
  - Within the framework of a **shift in earth history from the Holocene to the Anthropocene** during the past **70 years**, the threat to the survival of humankind has fundamentally changed. **No longer are 'others' the threat**, but '**we' are, due to the exponential increase in the burning of hydrocarbons and the resulting accumulation of greenhouse gases in the atmosphere**.
  - This new anthropogenic threat can no longer be countered with traditional military strategies & means.
  - In the 21 st century, **there needs to be a long-term transformative change towards a low-carbon economy, in production and consumption, and in the energy, transportation, agricultural and housing sectors**.
- Only thus **can dangerous climate change and chaotic tipping points in the climate system be avoided**. A low-carbon economy should be the result of a transition to sustainability, with sociotechnical changes & changes in perception, values, behaviour and lifestyles.
- A **long-term transformative change to sustainability** may possibly prevent **2 types of conflicts: climate-induced violent conflicts, & those driven by resource scarcity.**
- Its key message is the need for more conceptual, theoretical and empirical research into possible **linkages between peace studies and ecology that takes into account the changed human and environmental conditions in the framework of the Anthropocene**.
- The added value is to sensitize research on 'sustainability transition' so that it reflects on the impact of its realization on sustainable peace and human security.

1.8.Two examples: Towards a Political Geoecology and Peace Ecology in the Anthropocene

- **Political geoecology for the Anthropocene** (Brauch 2003; Brauch/Dalby/Oswald Spring, 2011):
  - **Physical geography**: Huggett: **geoecology** (detached from the social sciences): has resulted in a **research** and **degree programme** in a few universities
  - **Bringing politics** in: Moving from **ecological geopolitics** (Dalby) to **political geoecology for the Anthropocene**
  - **Searching for research/teaching programmes** linking natural & social sciences
- **Peace Ecology** (Oswald Spring/Brauch/Tidballs, 2014).
  - **Bridgebuilding among two distant programmes in the social sciences (since 1960s Kenneth Boulding)** of the
    - **Environmental or (sustainability) programmes**
    - **Peace programmes**
  - **Peace Ecology concept** (Kyrou 2007, Amster 2014, Brauch 2016, Brauch et al. 2017), e.g. environmental peacemaking (2004).

1.9. Peace Ecology: An Approach Linking Peace Studies & Ecology

- Thus, peace ecology is here being conceived primarily as a '**political concept' within an 'action perspective**,' and not as a scientific concept and research paradigm or programme.
- **'Peace ecology** in the Anthropocene' refers to the goal of **'peace**' (in its multiple dimensions as positive, negative, cultural, engendered and sustainable peace) **from the perspective of 'ecology'.**
- **Ecology** has expanded its meaning from the biophysical sciences after World War II, to include the social sciences and humanities.
- **Peace ecology in the Anthropocene** aims to address human-induced changes in the earth system, and lead them toward **peaceful alternatives** (Oswald Spring/Brauch/Tidball 2014a).
- **Dalby** has discussed conceptual issues of security during the Anthropocene, **Brauch et al.** approaches the socio-political problems triggered during the Anthropocene from a **scientific perspective of peace ecology.**
- These prolegomena need both thorough conceptual theoretical reflections and empirical research in the years to come, from both the peace and the environmental research communities as part of a combined effort across disciplines.

1.10. Peace Research as Transformative Science

- **My key argument is that peace research should shift from disciplinary, multi-, inter-, and transdisciplinary research towards a transformative approach to anticipatory science and knowledge creation** for proactive strategies, policies and measures aiming at sustainable development and sustainable peace.
- **Definition of action-oriented context changing transformative science: science as anticipative learning for proactive political strategies, policies and measure**s;
- Basic premise of 'transformative science': **avoiding a self-destroying prophecy**
- **For a bridge-building (ecology/peace studies) and a 'widening' of sustainability transition research: overcoming overspecialization of science and segmentalization of policies**
- Linking the **diagnosis of *global environmental change* (GEC) research with alternative scenarios and visions on development pathways to avoid 'dangerous climate change' & societal 'tipping points' with unpredictable geopolitical impacts**

3. Theory and Method

- **Theory: Conceptual theory**
  - concept formation,
  - concept history
  - conceptual mapping
- **Method:**
  - A qualitative (historical structural) approach
  - conceptually-guided,
  - prognostic approach (policy- and output oriented)
  - 'conceptual thought experiment' linking different themes (ST, SP) and research programmes (ecology, peace studies): no quantitative testing is possible

4. Change in Research Approach

- **Peace research** has been a value oriented **research programme** that has emerged often within a narrow **disciplinary**, sometimes **multidisciplinary**, and in a few cases as an **interdisciplinary & trans-disciplinar**y research project.
- During the **Cold War** policy oriented or critical peace researchers proposed initiatives for overcoming the military East-West divide what may be termed today as a "transformative approach" where the researcher tries to influence, change or modify the context.
- **Since 1990 social science research on Global Environmental Change (**from an environmental and peace perspective) **contributed to** anticipatory science & knowledge creation
  - aimed at policies to achieve sustainable development (goal);
  - called for proactive strategies, policies and measures of a **sustainability transition (process)**

4.1. From Disciplinary, to Multi- and Inter- and Transdisciplinary Approaches

Sciences & social sciences are organized along disciplinary lines

- Linkages between sustainability transition & sustainable peace **require bridge-building between different scientific disciplines in natural & social sciences** and **different research programmes** of political science: environmental & development studies, focus on sustainable development, between peace and security studies.

This requires a fundamental shift from narrow disciplinary and programme-specific approaches to *multi- and interdisciplinary perspectives* as well as *transdisciplinary and transformative research designs and policy proposals*.

- **Multidisciplinary:** offers a first step in analysing complex problems from different disciplinary perspectives. These multidisciplinary studies rely on the methodologies of their respective disciplines.
- **Interdisciplinary:** **Jean Piaget** worked in different disciplines, in developmental psychology, cognitive theory and genetic epistemology, pioneered a new **transdisciplinary scientific approach**. Piaget promoted communication among different disciplines, in 1960s he proposed using the term 'interdisciplinary' and applied it **to pedagogic units** or modules in order to **integrate knowledge from different disciplines**. This interdisciplinary approach was taken up by new approaches and fields, such as bioengineering and brain sciences.

4.2. Transdisciplinary Approaches

- **Complexity of the Anthropocene, global environmental change, of resource scarcity,** several research centres and think tanks proposed **transdisciplinarity as a new scientific approach** to overcome the disciplinary boundaries of specialized subfields & epistemic schools.
- For **Hirsch Hadorn et al. (2008), Jaeger and Scheringer (1998),** transdisciplinarity refers to "the cause of the present problems and their future development (***system knowledge***)"; to the "values and norms … [to] be used to form goals of the problem-solving process (***target knowledge***)"; and to "how a problematic situation can be transformed and improved (***transformation knowledge***)". They argue that "transdisciplinarity requires adequate [ways of] addressing … the complexity of problems and the diversity of perceptions of them, that abstract and case-specific knowledge are linked, and that practices promote common good".
- ***Multidisciplinarity*** draws on knowledge from different disciplines but stays within their boundaries", a definition of transdisciplinary/interdisciplinary research **states:**
  - ***Transdisciplinary Research*** is defined as research efforts conducted by investigators from different disciplines working jointly to create new conceptual, theoretical, methodological, and translational innovations that integrate and move beyond discipline-specific approaches to address a common problem**.**
  - ***Interdisciplinary Research*** is any study or group of studies undertaken by scholars from two or more distinct scientific disciplines. The research is based upon a conceptual model that links or integrates theoretical frameworks from those disciplines, uses study design and methodology that is not limited to any one field, and requires the use of perspectives and skills of the involved disciplines throughout multiple phases of the research process.

4.3. Transdisciplinary Approaches (2)

- In short, ***transdisciplinarity*** **r**efers to a research strategy that establishes a **common research objective that crosses disciplinary boundaries**.
- The goal is to create **a holistic approach by addressing complex problems that require close cooperation between several disciplines, such as brain or cancer research or issues of global environmental change**, where medical, behavioural, environmental, economic and political sciences work together.
- **Funtowicz and Ravetz (1993) argued that "transdisciplinarity can help determine the most relevant problems and research questions involved"** .
- **Holistic system** analysis also contributed to *transdisciplinary* research, which includes all possible aspects and focuses on the interaction among different elements.
- ***Transdisciplinarity*** **takes a structural approach (Nicolescu w/d) and distinguishes between different levels of analysis.** The surrounding conditions facilitate dynamic adjustment of undesirable disturbers.
- **The outcomes are permanently changing processes and new structures, which are far from equilibrium but able to maintain some dynamic functionality within the global system.**

4.4. From Systems Analysis to Transformative Science

- **These elements are essential for the analysis of new risks and uncertainties caused by changes in the environment and social behaviour in the Anthropocene.**
- **Schneidewind, Singer-Brodowski, Augenstein (2016)** proposed moving from a **'transdisciplinary' approach to a 'transformative science'**, while **Swilling (2016) suggested an 'anticipatory science**'.
- The concept of '**transformative research' or 'science'** has been used since the 2000s for a new **approach that cuts across the dominant scientific paradigms.**
- **US National Science Board (2007)** adopted this working definition of 'transformative research':
  - "[it] involves ideas, discoveries, or tools that **radically change our understanding of an important existing scientific or engineering concept or educational practice or leads to the creation of a new paradigm or field of science, engineering, or education**.
  - **Such research challenges current understanding or provides pathways to new frontiers**".

4.5. Transformative Science for Sustainability Transitions

- *Schneidewind*, *Singer-Brodowski*, and *Augenstein* (2016) suggested moving from **transdisciplinary to transformative research**, and discussed the institutional challenges of a transformative science that could **achieve institutional self-transformation and a 'new governance of science' by shifting from science policy to governance of science if civil society were given a larger role**. Their **main messages** are:
  - 2. '**Transformative science'** has catalysed necessary processes through suitable forms of knowledge production. **Transformative science is based on debates about transdisciplinary/transformative research and places emphasis on the aspirations of scientists to intervene in complex systems** and to carry out **research in real-world laboratories**. It focuses on the **problem dimensions of sustainability science** and aims for an institutional change as the framework condition for sustainability science. **Transformative science focuses on the whole science system, which faces massive transformations.**
  - 4**. In the context of sustainability transitions, science system transformations require reflection on the institutional conditions for a broadening and a quality enhancement of sustainability sciences as a whole.**

4.6. From Research on Transformation to Transformative Research

- Building on this approach, in ***World in Transition—A Social Contract for Sustainability*, the German Advisiry Council on Global Change** (2011: 21–23, 321–356) referred to "four transformative pillars of the knowledge society":
  - '**transformation research**' and '**transformation education**', as well as
  - '**transformative research**' and '**transformative education**'.
- It proposed (2011: 21) that '**transformation research**' should "specifically addresses the **future challenge of transformation realisation**" by exploring "transitory processes in order to come to conclusions on the factors and causal relations of transformation processes" and should "draw conclusions for the transformation to sustainability based on an understanding of the decisive dynamics of such processes, their conditions & interdependencies.
- **Transformative research supports transformation processes** with specific innovations in the relevant sectors and it should encompass, for example, "**new business models such as the shared use of resource-intensive infrastructures, and research for technological innovations like efficiency technologies" by aiming at a "wider transformative impact**".
- **Uwe Schneidewind and Mandy Singer-Brodowski (2013) and Maja Göpel** (2017) have developed this **transformative approach** further for **climate policy and for research on sustainability transition.**

4.7. ISSC: *Transformative Cornerstones of Social Science Research for Global Change*

- **UNESCO's International Social Science Council** (ISSC 2012: 21–22) in its report on the *Transformative Cornerstones of Social Science Research for Global Change* identified six cornerstones: **1) historical and contextual complexities; 2) consequences; 3) conditions and visions for change; 4) interpretation and subjective sense-making; 5) responsibilities; and 6) governance and decision-making.** The report concluded that
  - the **transformative cornerstones framework** speaks to the full spectrum of social science disciplines, interests and approaches—theoretical and empirical, basic and applied, quantitative and qualitative. By not fashioning a global change research agenda around a substantive focus on concrete topics—water, food, energy, migration, development, and the like—the **cornerstones are not only inclusive of many social science voices** but, perhaps most importantly, show that **climate change and broader processes of global environmental change are organic to the social sciences, integral to social science** preoccupations, domains par excellence of social science disciplines. …
  - **The transformative cornerstones of social science function not only as a framework for understanding** what the social sciences can and must contribute to global change research.
  - They function as a **charter for the social sciences, a common understanding of what it is that the social sciences can and must do to take the lead** in developing a **new integrated, transformative science of global change**.

4.8 Transformative Approaches

- **The seventh conference of the Sustainability Transitions Research Network (STRN) in Sep. 2016 addressed "Exploring Transition Research as Transformative Science".**
- Various initiatives by the **US National Science Board (2007), the ISCC (2012), and the STRN (2016) have called for a new scientific paradigm in research into both global environmental change and sustainability transitions.**
- **The policy dimension should be included in the research design, by moving from knowledge creation to action, to policy initiatives, development and implementation.**
- These excluded social groups promote transformative processes from their daily situation of marginalization, violence and exclusion, and **promote sustainable livelihoods not for elites, but for wider social groups.**

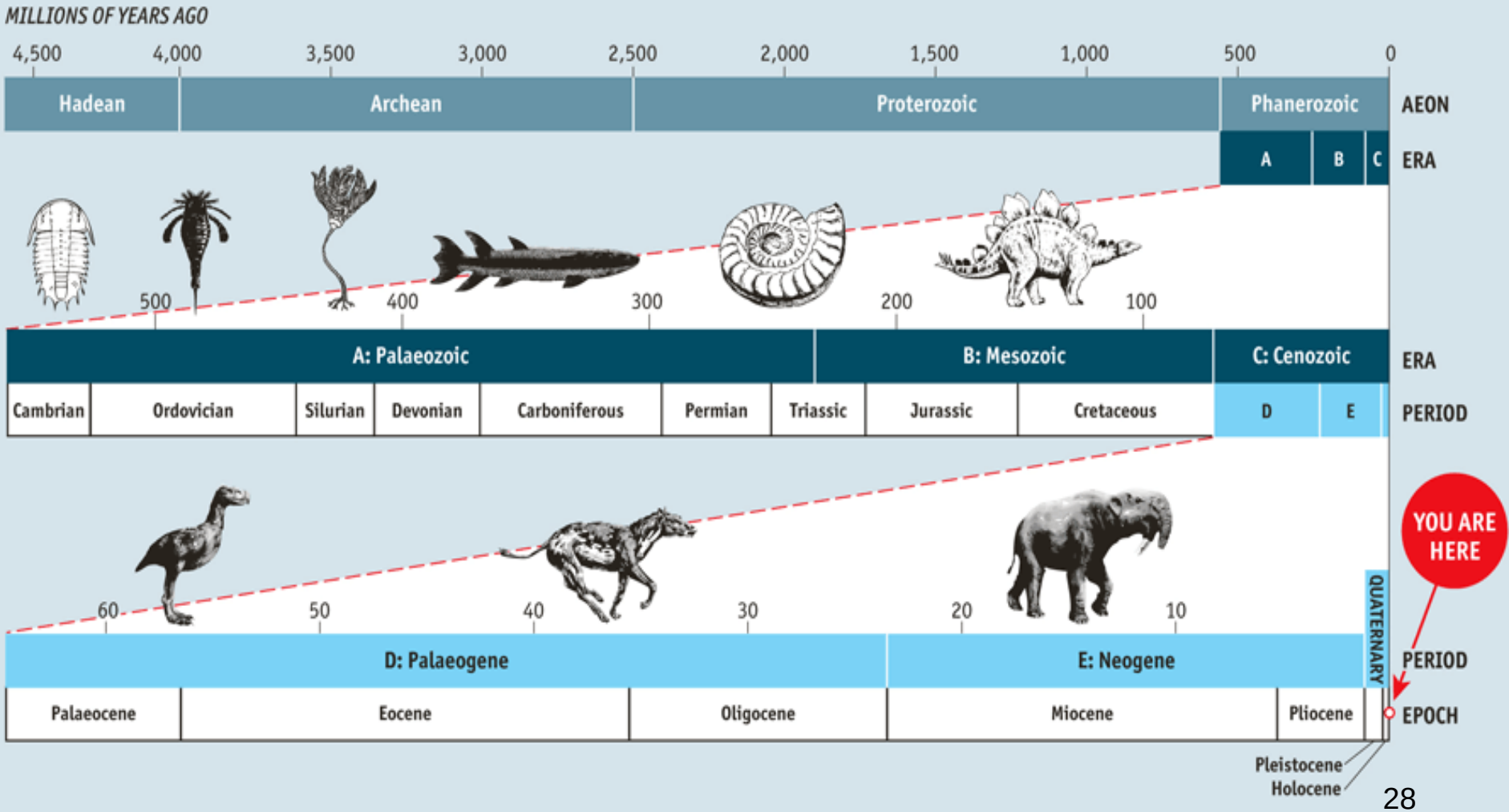
4.9. Transformative Science Requires Bridge-building Between Disciplines and Programmes

- **Opposing trends:**
  - **Overspecilization of science** (know more & more on less, communicated in highly specialized journals with very few readers)
  - **Overspecialized scientific results** can hardly be translated for a wider societal, economic, political and scientific audience
  - **Impacts of climate skepticism on political ideologues** and populists in North America (D. Trump) and in Europe (Le Pen, AFD etc.)
- **Need for scientific bridgebildung & responsibility**
  - **Max Weber to Hans Jonas: *Ethics of Responsibility***
  - **E.O. Wilson** referred to **Consilience (1988)** as an
    - (interlocking of causal explanations across disciplines) in which the "interfaces between disciplines become as important as the disciplines themselves"
    - that would "touch the borders of the social sciences and humanities."

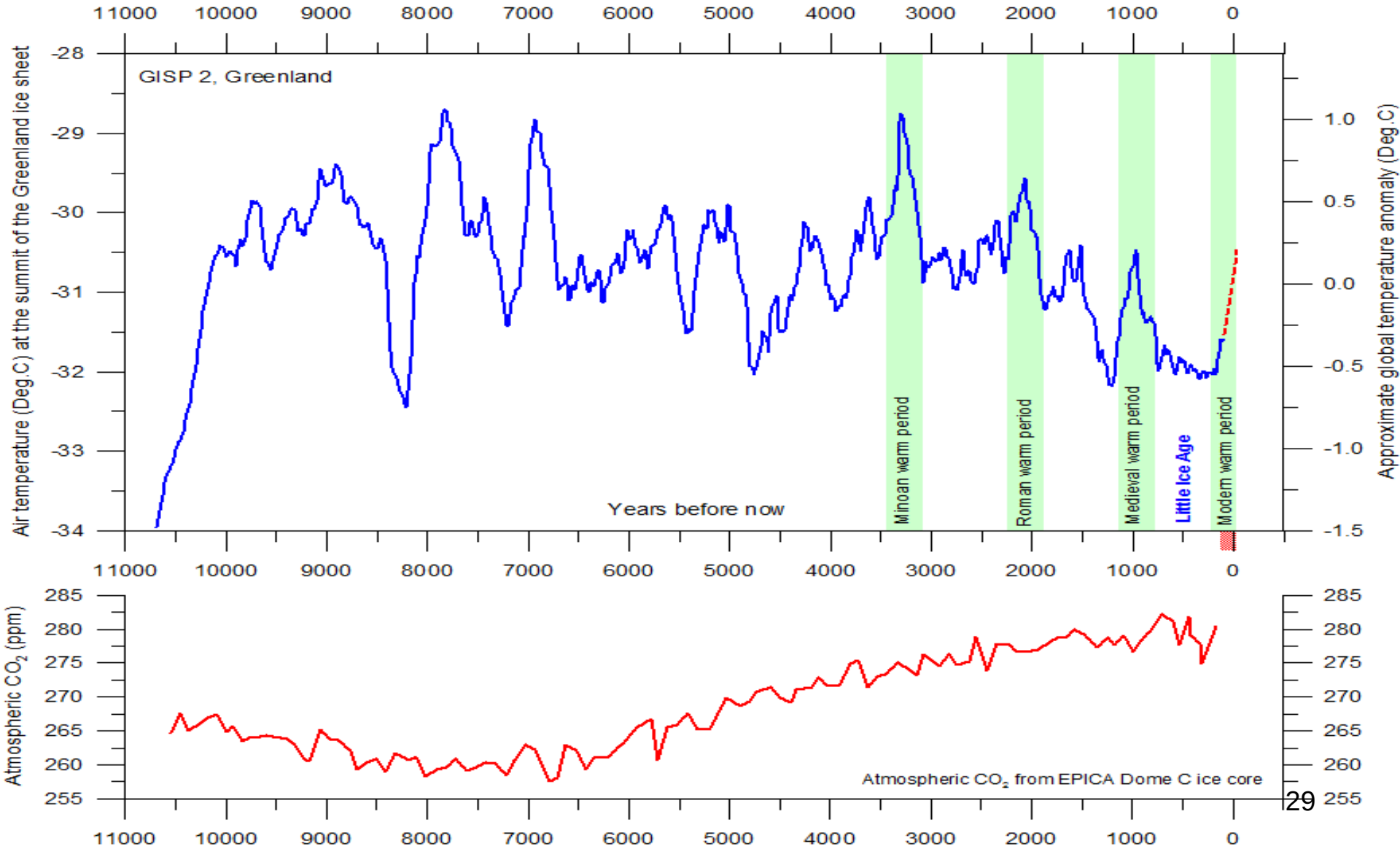
5. Historical Times

- From the **'silent transition' from the Holocene to the Anthropocene** towards a new 'Copernican revolution to sustainability' with an alternative worldview
- Six historical times: cosmic, **geological, technical**, structural, cyclical, eventual
  - '**Technical time'** (industrial revolution) triggered a change in the '**geological time**
  - Hypothesis **human activity** (burning of hydrocarbons) since industrial revolution cased a transition from Holocene to Anthropocene
- **Social sciences as intellectual latecomers:**
  - Global change research since early 1990s (IHDP)
  - Sustainability transitions research: Tellus (1976), NRC (1999), KNI (2005ff.), STRN (2009)
  - Late social construction of 'silent transition' to Anthropocene

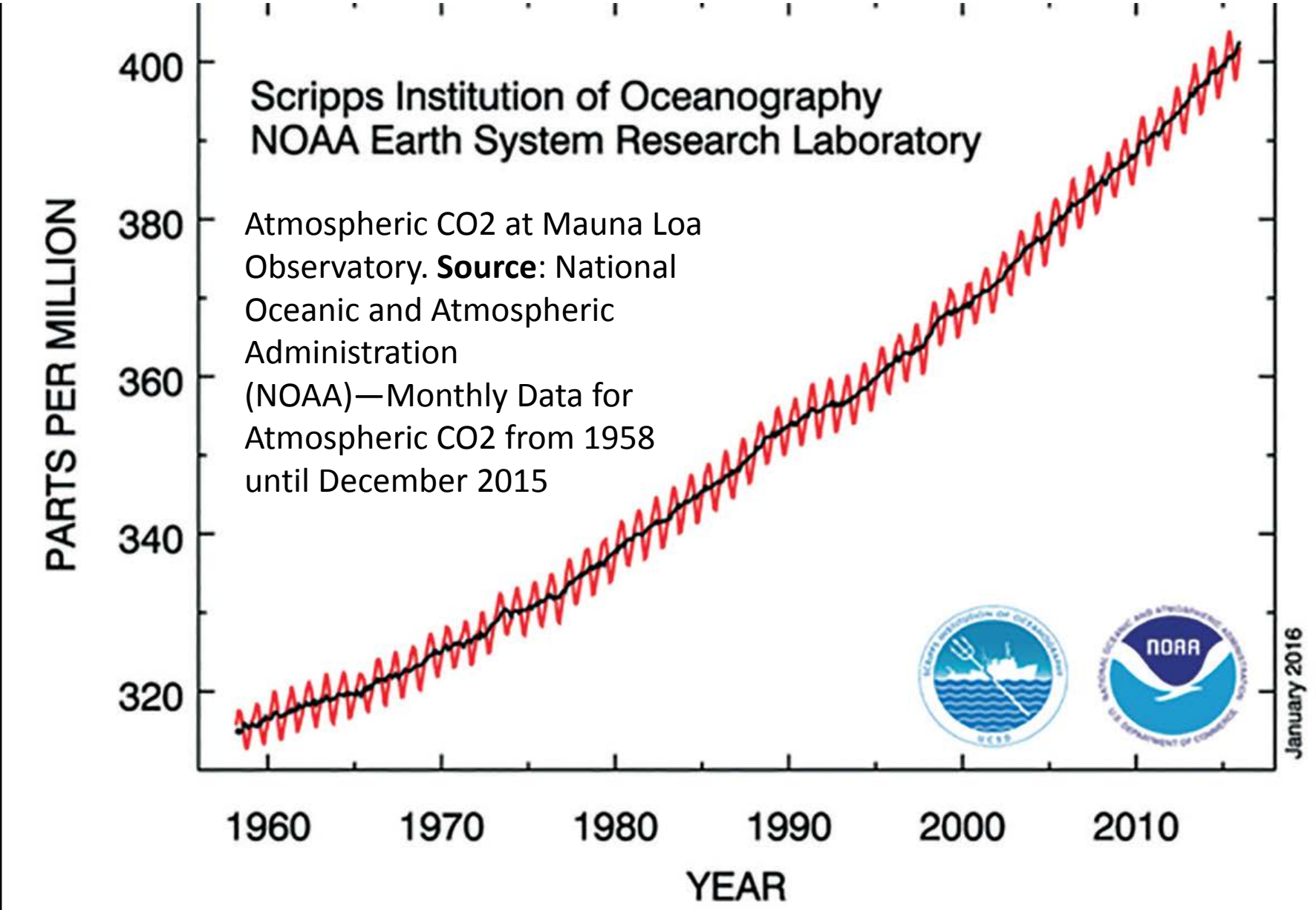
5.1. Geological Time: Earth History



5.2. The Holocene (11600 BP-now)



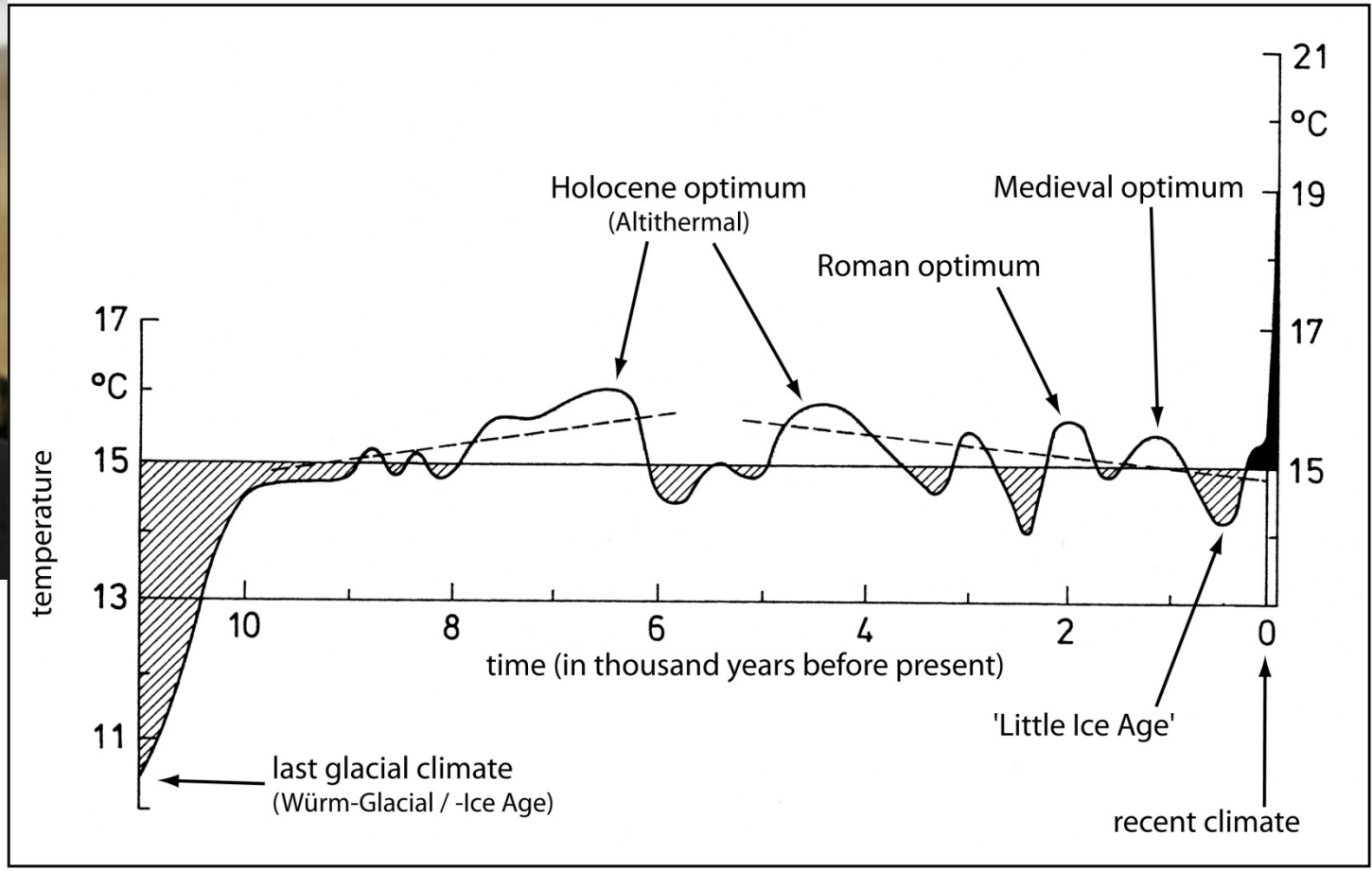
5.3. Concentration of CO2 (1958-2015)



Atmospheric CO2 at Mauna Loa Observatory. **Source**: National Oceanic and Atmospheric Administration (NOAA)—Monthly Data for Atmospheric CO2 from 1958 until December 2015

5.4. From the Holocene (12.000 years b.p.) to the Anthropocene (1784 AD or by 1950)

Paul Crutzen, Nobel Laureate for Chemistry (1995)



In Geology/geography: **Holocene** era of earth history since end of glacial period (10-12.000 years ago, Anthropocene, since industrial revolution: anthropogenic climate change: burning of coal, oil, gas➔GHG increase

5.5. A Major Silent Transition: We are now in the Anthropocene!

- **In 2000: Nobel Laureate Paul J. Crutzen claimed: We are now in the Anthropocene!**
- **My thesis: We as humankind have for the first time intervened into earth history.**
- **We are all the common threat to our own survival. We must also be the solution. Science and education is crucial for changing our lifestyles, economic performance by moving to a green economy (with decarboni-zation)**

5.6. A Context, Process, Goal, a Need, and an Audience

A silent revolutionary change in earth/human history

- Arrhenius (1896): hypothesis linking burning of hydrocarbons with CO2 accumulation in atmos-phere, since 1970s: **scientization** of global & climate change
- **Politicization** (1988, 1992 (UNFCCC), 1997 (Kyoto P.), 2015 (Paris Agreement)
- Since 2000: **Securitization** of Climate Change

- **Context: We are in the Anthropocene! Paul J. Crutzen claimed in 2000 in Cuernavaca & in Capetown Int. Geological Conference accepted report in August 2016**

5.7. AWG Report, Capetown 2016

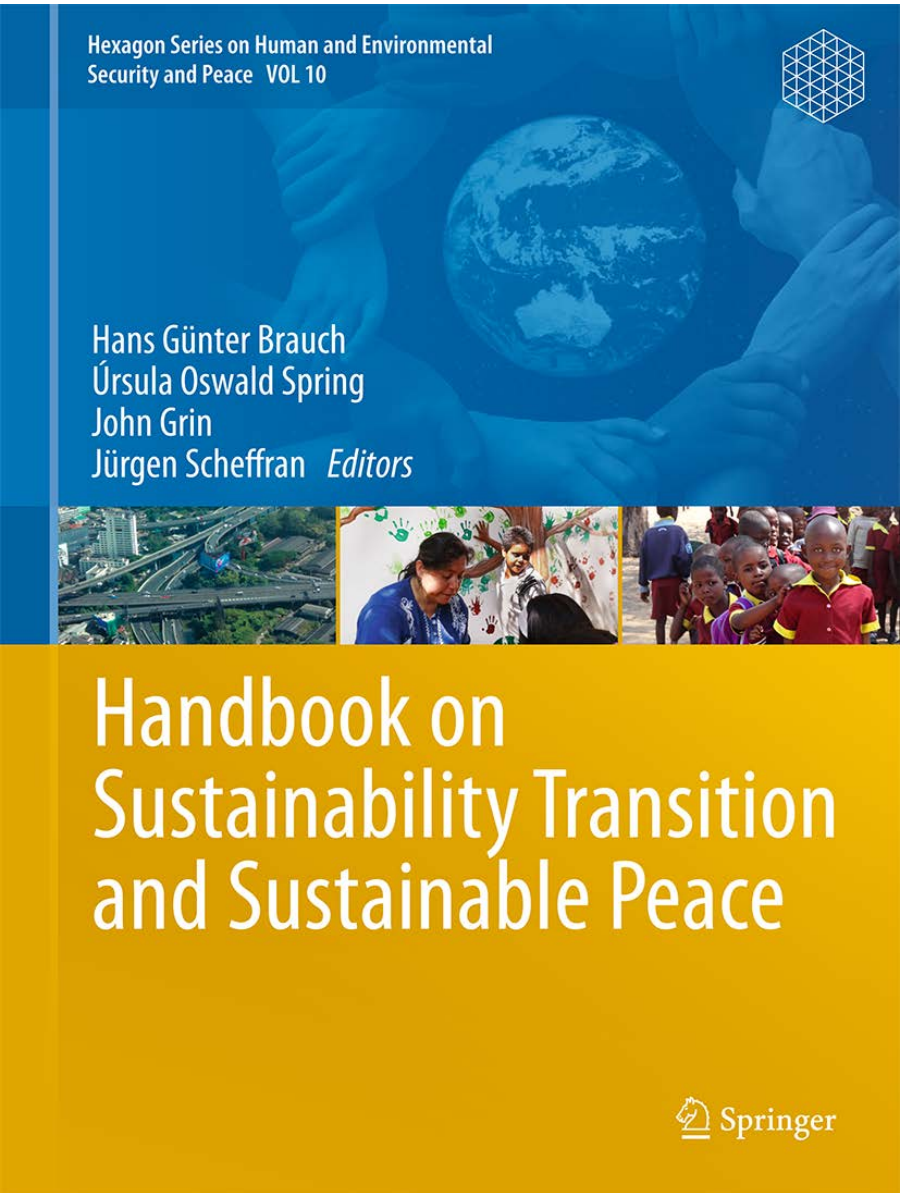
Majority current opinion on Anthropocene working group indicates the following:

- **The Anthropocene concept, as articulated by Paul Crutzen and Eugene Stoermer in 2000, is geologically real.** The phenomenon is of sufficient scale to be considered as part of the International Chronostratigraphic Chart, more commonly known as the Geological Time Scale.
- **Majority AWG opinion is for assignation as an Epoch/Series**. This option is preferred over either a lower rank (e.g. Age/Stage, i.e. as a subdivision of the Holocene) or a higher rank such as a Period or Era. In such a step, and in common with all other geological time units, the **Anthropocene would comprise both a 'pure time' unit (an Anthropocene Epoch)** and an equivalent unit of strata (an Anthropocene Series).
- **If the Anthropocene is adopted as an Epoch, this would mean that the Holocene has terminated**, but that we remain in the Quaternary Period
- **Human impact has left discernible traces on the stratigraphic record for thousands of years – indeed, since before the beginning of the Holocene. However, substantial and approximately globally synchronous changes to the Earth System most clearly intensified in the 'Great Acceleration of the mid-20th century. The mid-20th century also coincides with the clearest and most distinctive array of signals imprinted upon recently deposited strata.**
- Hence, the mid-20th century represents the **optimal beginning of a potential Anthropocene Epoch** (base of the Anthropocene Series).
- **The Anthropocene beginning might conceivably be defined by a Global Standard Stratigraphic Age (GSSA), i.e. a numerical age that can be expressed as a calendar date such as 1945**.

5.8. We need a New Copernican Scientific Revolution towards Sustainability

- Hans Joachim **Schellnhuber (1999) called for a 'Second Copernican revolution'** and William C. Clark contributed to the NRC Study (1999) ***Our Common Journey. A Transition towards Sustainability***
- Natural scientists (Clark/Crutzen/Schellnhuber 2004) have called for a '**second Copernican revolution in science'** (Kuhn 1962) and development of a **new scientific world view** and a new **sustainability paradigm**.
- They called **for a new Copernican revolution, a new paradigm for sustainability and a new 'social contract'** between science and society for **planetary stewardship** (Clark/Crutzen/Schellnhuber 2004)
- **Such a Copernican Revolution requires a fundamental change in the mindset of policymakers and a worldview of scientists and society and a Global Mindshift in the political and economic thinking.**
- **Combine and broaden two separate debates on Sustainability Transition**
  - **US debate (Tellus Institute, 1976ff., NRC, 1999)**
  - **Dutch and European Debate (STRN, IST conferences, Amsterdam, 2009 – today)**

6. Holistic Approach to Transformative Science:



- **This handbook is inspired by the debate on transformative science or research (e.g. WBGU 2011)**
- It combines a **policy process** (sustainability transition) with a **dual normative goal** (sustainable development & sustainable peace)
- From the 'PEISOR model': a diagnostic pressure response model on GEC and security
- To a new model linking the diagnosis of GEC research to alternative strategic policies and visions towards sustainable development and sustainable peace

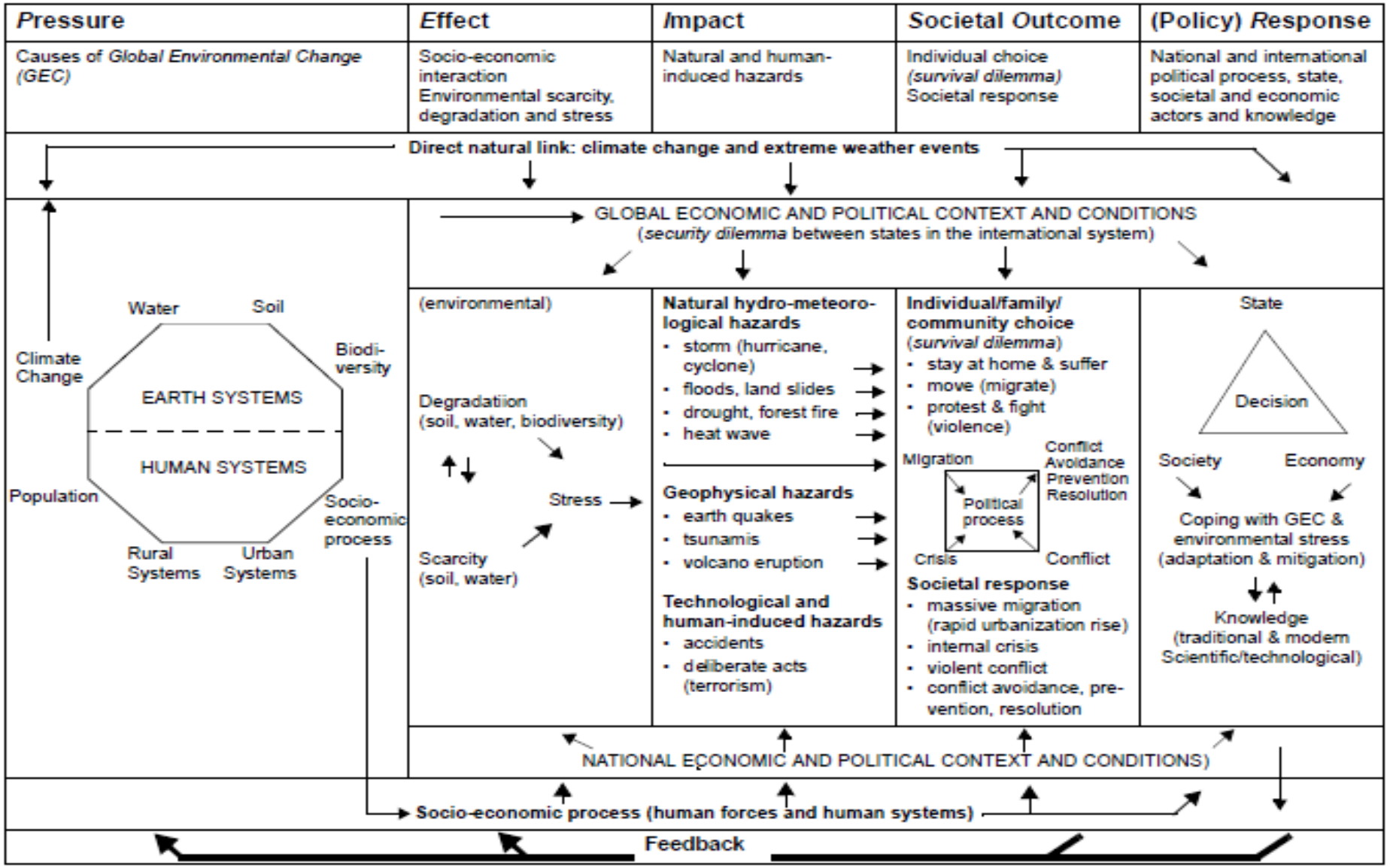
6.1. From Sustainable Development to Sustainable Development Goals

- **Stockholm Conference on the Environment 1972**
- **Establishment of United Nations Environment Programme (UNEP)**
- **World Commission on Environment and Development (WCED) (Brundtland) of 1987; sustainable development goal formulated**
- This report defined sustainable development as a form of development **that "meets the needs of the present without compromising the ability of future generations to meet their own needs"** (Brundtland Commission 1987).
- **1988: establishment of IPCC & negotiation mandates: UNFCC, CBD**
- **UN Conference on Environment and Development (UNCED), Rio de Janeiro, June 1992: legally binding international treaties**
  - **United Nations Framework Convention on Climate Change (UNFCCC)**
  - **United Nations Convention on Biological Diversity (CBD)**
  - **Mandate for UN Convention to Combat Desertification (UNCCD)**
- **World Summit on Sustainable Development (WSSD), Johannes-burg, 2002**
- **UN Conference (Rio+20), Rio de Janeiro, 2012: The Future We Want**
  - **No legally binding Policy Goals, no clear targets, collection of proposals**

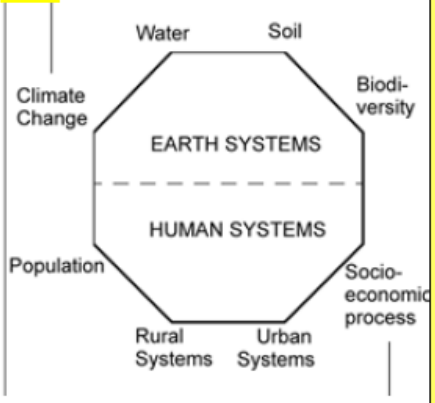
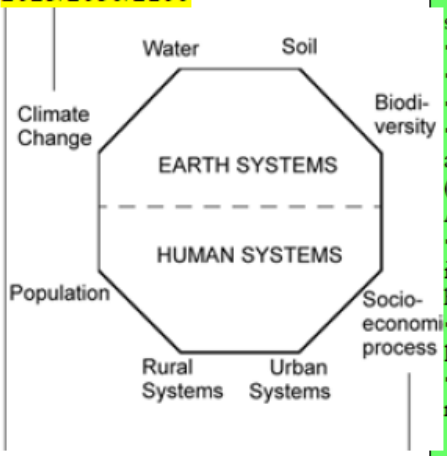
6.2. Sustainable Development Goals

- **Sustainable Development Goals were adopted by UN GA in September 2015 and succeeded Millenium Development Goals (2000)**

6.3. PEISOR Model: Linking Effects && Impacts of GEC with Societal Outcomes & Responses



6.4. Two Alternative Strategies

Diagnoses of Global Environmental and Climate Change (chapter 1)			Alternative Strategies: BAU (1) vs. Sustainability Transition (2)			
Drivers	**Pressures and Interactions**	**Impacts (Outcomes)**	**Actors**	**Sectors (policies)**	**Social impacts**	**Security/peace**
→ Capitalism industrial revolution, →Fossil energy ↓ →Population growth →biodiversity loss →Food, soil, water → Production →Consumption →Transportation →Trade →Housing →Lack of urban, rural, environmental planning	**2015** 	→ Environmental Scarcity Degradation Stress →Temperature rise → Precipitation change *Climate-induced extreme weather events.* ▪ Storms, floods, landslides ▪ Drought, forest fire, heat waves → Glaciers melting →Sea-level rise → Health impacts	**BAU mindset worldview→** **Economy** (profit-driven, lobbies) **Politics, polity** (reactive) **Society/media** (consumerist lifestyle, waste) **Science** (disciplinary, conservative)	**Energy** (fossil energy growth, GHG) **Transport** (fossil energy: cars, trucks, planes, ships) **production** (fossil-driven) **Habitat/Housing** (urban sprawl) **Agribusiness** (energy intensive, agrichemicals)	Dominance of Western way of life & lifestyles (consumerist, abundance, waste) - highways - suburbia - meat-based diet - high water footprint - greed Land-use change (deforestation, desertification)	**Climate change as a threat multiplier** **→Resource scarcity and conflicts** **Climate-driven conflict constellations:** →water scarcity →food scarcity/hunger →migration →climate hazards & disasters
Stimuli for sustainable development →population stabilization → waste reduction **Sustainable** →production →consumption →transportation → ecological recovery →landscape planning →zero energy housing	**2025/2050/2100** 	→recovery of ecosystem services →water security →soil recovery →GHG reduction →Stabilization of global average temperature (UNFCCC, Paris Agreement) →Decline in number & intensity of climate-induced hazards & societal disasters →decrease of the ozone layer →climate change as threat minimizer	**Mindset for sustainability transition →** **Politics, polity** (proactive) **Economy →** (sustainable, innovative, energy efficient) **Society/Media →** (alternative lifestyles) **Science →** (transformative)	**Energy** (renewables, efficiency) **Transport** (public transportation) **production** (sustainability-driven) **Habitat** (parks) **Housing** (urban, rural protected areas) **Agriculture/Food** (organic, healthy)	- Energy & resource efficiency in production & consumption - Sustainable cities & rural areas - Sustainable architecture - Vegetarian diet - New values, behaviour, lifestyles, - Sustainable ethics - Reduction, reuse and recycling of waste	**Sustainable peace** - International cooperation on SDGs - Reduction of poverty & inequity - Gender equity - Dignified jobs - Decline in dependence on oil/gas rich regions - Elimination of land grabbing
↑------ (Strategies, policies, measures of decarbonization, dematerialization)----------↓----------↓----------↓----------↓						

7. Transformative Approach to Sustainability Transition

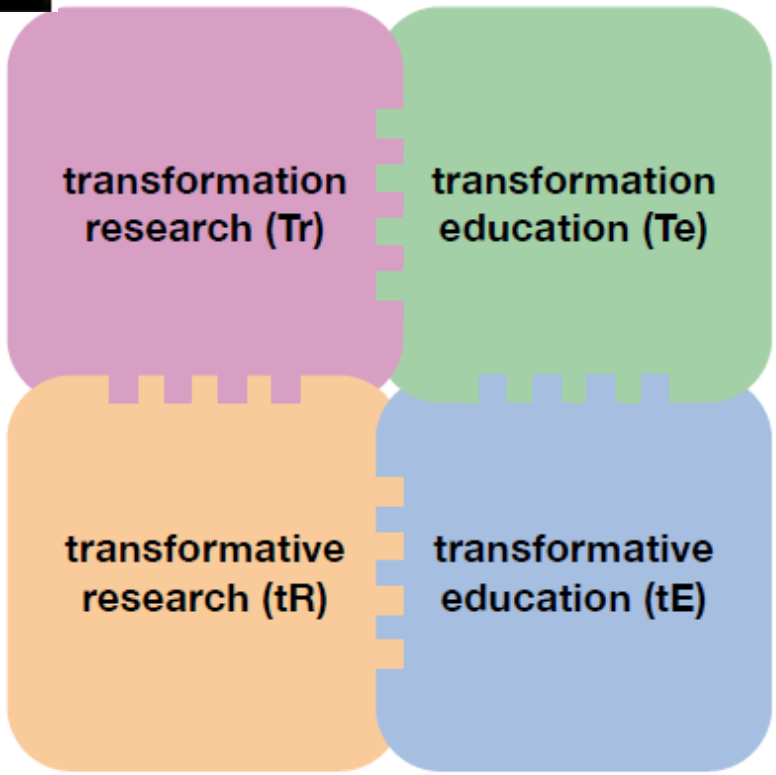


Figure 3
Typification of transformation research and education.
Source: WBGU

The WBGU distinguished four transformative pillars of the knowledge society:

- **Transformation Research:** addresses future challenges of transformation realisation
- **Transformative Research** research that actively advances transformation **(Action-oriented, proactive and context changing research perspective)**
- **Transformation Education**
- **Transformative Education**

8. Transformation and Transformative Approaches to Sustainable Peace

- So far no literature exists on **Transformation Research** and **Transformative Research** addressing the goal of **Sustainable Peace as 'Peace with Nature'**
- The **ST and SP Handbook** suggested research on possible impacts of strategies of sustainability transition for **security and peace.**
  - So far all **technical revolutions** (agricultural, industrial) resulted in **higher forms of killing**!
  - Will **sustainability transition** change this trend?
  - **Geopolitical scenarios** aiming at 'peace with nature' or 'sustainable peace' may be needed as heuristic tools.

9. Transformative Approach on Linking ‘Sustainability Transition’ & ‘Sustainable Peace’

- There is little or no scientific knowledge on possible consequences and impacts of global and national strategies, policies and measures dealing with national and international peace and security or achieving the goal of sustainable peace with increased global equity and social justice. Policy-relevant considerations on the linkages between “Sustainability Transition with Sustainable Peace” are even scarcer.
- How can we move from knowledge to action to achieve ‘sustainability transition’ with ‘sustainable peace’ in the Anthropocene? ‘Anticipatory’ and ‘transformative’ research and science mean integrating a ‘proactive policy perspective’ into the research design.
- There must be a shift away from the dominant policy perspective of business-as-usual.
- This leads to ignoring the challenges and postponing action (or to non-action) and calls for ‘reactive policies’ of adaptation by technical and military means.
- In this way the aim is to contain the causes instead of addressing them in a sustainable scientific way and developing a process of ‘anticipatory’ sustainability transition.
- This alternative paradigm and vision has almost totally ignored the dimension of international peace and security. A proactive policy perspective requires a systematic analysis of the constraints and opposed political and societal actors at national and local levels.
- This should include, for example, businesses and workers involved in the fossil fuel industries, especially in coal, natural gas and oil and in the fossil fuel and nuclear energy sectors.
- Apart from global climate change, losses in biodiversity and increased levels of soil degradation and desertification and degradation, scarcity and stress of water have received less scientific attention; similarly, there is less public awareness of these issues and they are accorded a much lower political priority. For all these sectors both ‘anticipative’ scientific research and ‘proactive’ policy activities are needed.

10. Conclusions: Result of Thought Experiment: Mapping Research Deficits

- **While trends** (population & economic growth & anthropogenic climate change) **can be projected based on model assumptions**, the **probability of scenarios cannot be forecast** and **political decisions** & events determining the **outcomes of alternative strategies & policies** (including those resulting from tipping points) **cannot be foreseen.**
- The discussion of **possible linkages between processes** aiming at a sustainabiity transition and the **goal of a sustainable peace** may be **at present only of** a heuristic nature.
- Addressing these **hypothetical linkages** challenges the traditional thinking and approaches as well as the prevailing theories and methods in the social sciences.
- A **transformative approach** addressing hypothetical linkages between sustainability transition and sustainable peace **remains a challenge**.

10.1 Sustainability Transition and Sustainable Peace as Transformative Science: A Peace Ecology Perspective

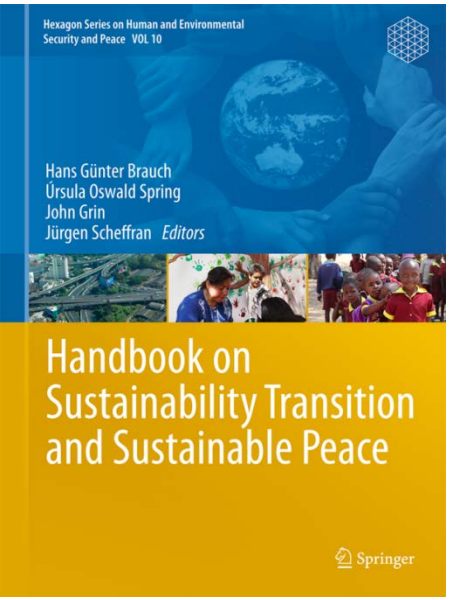
- **Sustainability Transition** is a recognized research paradigm that is being pursued by scholars in the framework of **the Sustainability Transition Research Network (STRN)**
- **Sustainable Peace** is an emerging normative concept that is being used by different social science and humanitarian communities where „Peace with Nature“ refers to one aspect only.
- **Transformative Science** is a new research approach that suggests to integrate „transformative“ aspects into the research design.
- **Peace Ecology is** a new scientific perspective that tries to conceptually bridge peace studies and ecological approaches.
- **All four components need more research as well as conceptual and policy relevant thinling in the years to come.**

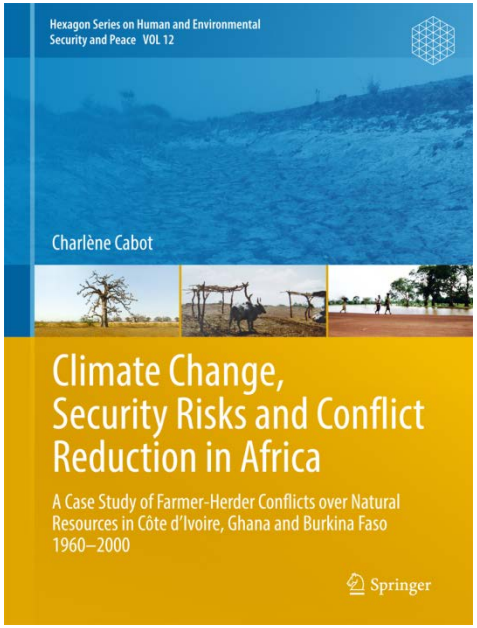
10.2. Scientific Agenda Setting

- **In the Anthropocene, we are the threat, the victims and we must be also the solution** by developing the knowledge for a peaceful sustainability transition.
- **This is the task of research and teaching and of universities as the creators of transformative sustainable knowledge.**
- **Peer-reviewed scientific publications as tools of agenda setting for transformative research and education!**
- **My task as an editor of five book series: advance innovative and transformative knowledge creation and learning.**
- **Make it available to graduate students around the world many of whom can download all texts for free what guarantees quite high chapter download rates.**

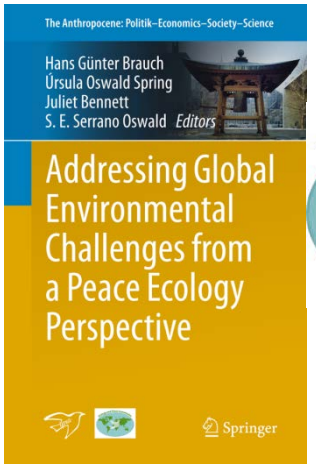
10.3. We Launched five books in two peer reviewed book Series: Hexagon & APESS

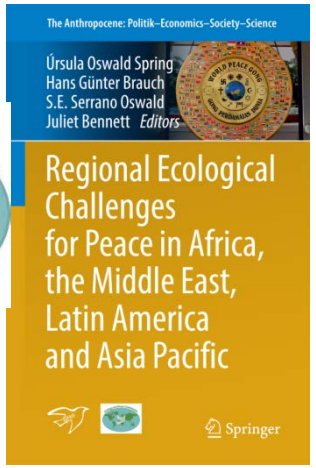
Hexagon Book Series on Human and Environmental Security and Peace

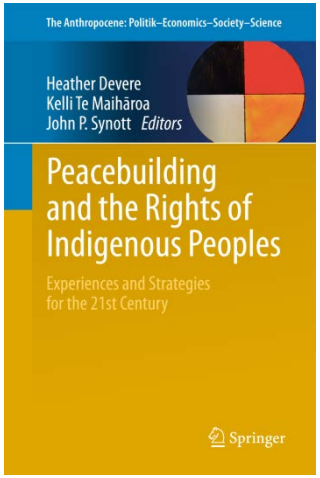




The Anthropocene: Politik, Economics, Society and Science (APESS)







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