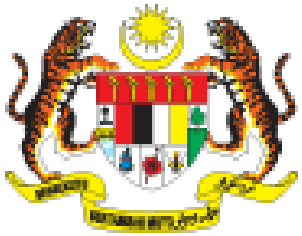



# 28 October, Melacca, Lecture on Sustainability Transitions and Sustainable Peace as Transformative Science

**Hans Günter Brauch**

**Adj. Prof. (PD), Free University Berlin, Otto-Suhr-Institute (Ret.)**

**Chair, Peace Research and European Security Studies (AFES-PRESS)**

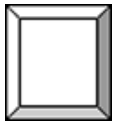
**Editor, Hexagon-Book Series on Human, Environmental Security and Peace (HESP)**

**Editor, The Anthropocene: Politik, Economics, Society, Science (APESS)**

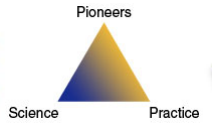
**Editor, SpringerBriefs in Environment, Security, Development and Peace (ESDP)**

**Editor, SpringerBriefs series on Pioneers in Science & Practice (PSP)**

**Editor, Pioneers in Arts, Humanities, Science, Engineering, practice (PAHSEP)**

SPRINGER NATURE




# Contents

# 1. My Role: Retired Scholar and Editor of 5 Scientific Book Series with Springer

- **Retired  Adj. Prof. of Political Science, International Relations, FU Berlin, OSI**
- Studied **Political Science, History & International Law** at Heidelberg University (Germany) and Univ. College in London (UK)
- **2PhDs** from **Heidelberg** (1976) & **FU Berlin** (1998, habilitation, PD)
- Published widely in German & English with translations in more than 10 languages including Russian, Chinese, Turkish, Spanish

**Not an employee of Springer**, nor sales representative, but a **scholar**

**Publishing Experience with many national & international publishers:**

- **Ballinger books (1983), disappeared**
- **Macmillan (Palgrave Macmillan now prt of Sprigner Nature): 1987, 1989, 2000**
- **Crane Russak (today Taylor & Francis): 1990, 1991, 1992**

**My Cooperation with Springer as an author & Editor (since 1996- 20 years**

- **1996/97:** Springer author of two German books in **Climate Policy & Energy Policy** (**Multidisciplinary Study books)**
- **2003:** launched the English language **Hexagon book Series**: 10 volumes (2012-2016): more than 800.000 chapter downloads
- **2012:** launched 2 Springer Briefs: **ESDP & PSP: ca. 30 titles each**
- **2016: launched 2 new series: APESS & PAHSEP**

# 1.1 My Five Book Series

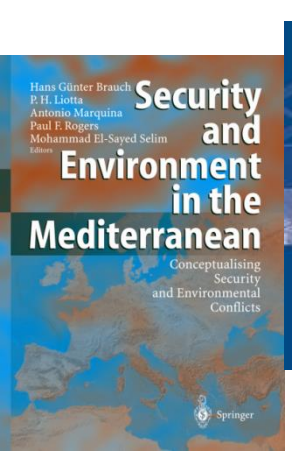
## Three Peer Reviewed Book Series

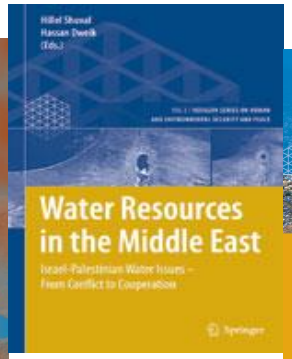
- **Hexagon Book Series on Human and Environmental Security and Peace (HESP):** <http://www.afes-press-books.de/html/hexagon.htm> & <http://www.springer.com/series/8090>.
- **SpringerBriefs in Environment, Security, Development and Peace (ESDP):** <http://www.afes-press-books.de/html/SpringerBriefs_ESDP.htm> & <http://www.springer.com/series/10357>.
- **The Anthropocene: Politik – Economics – Society – Science (APESS):** <http://www.afes-press-books.de/html/APESS.htm> & <http://www.springer.com/series/15232>.

## Two Anthology Series on Senior Scholars and Policymakers

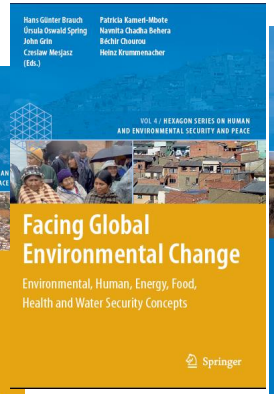
- **Springer Briefs on Pioneers in Science and Practice (PSP):** <http://www.afes-press-books.de/html/SpringerBriefs_PSP.htm> & <http://www.springer.com/series/10970>.
- **Pioneers in Arts, Humanities, Science, Engineering, Practice (PASEP):** <http://www.afes-press-books.de/html/PAHSEP.htm> & <http://www.springer.com/series/15230>.

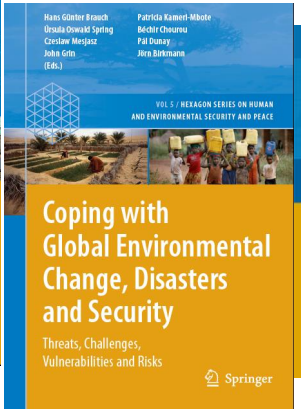
# 1.2 Hexagon Series: Volumes I-XIII

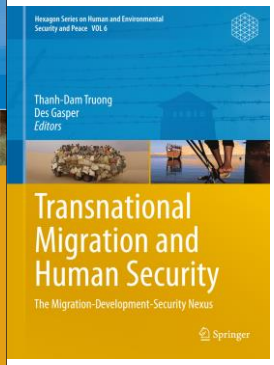


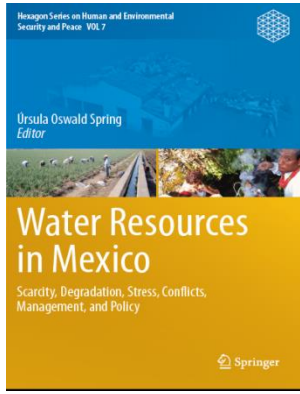



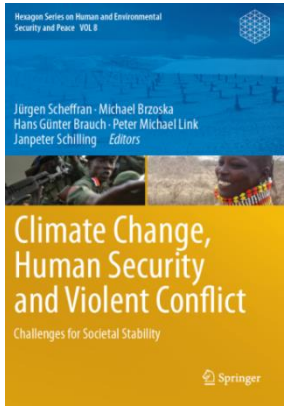


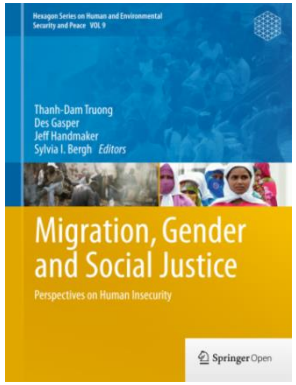


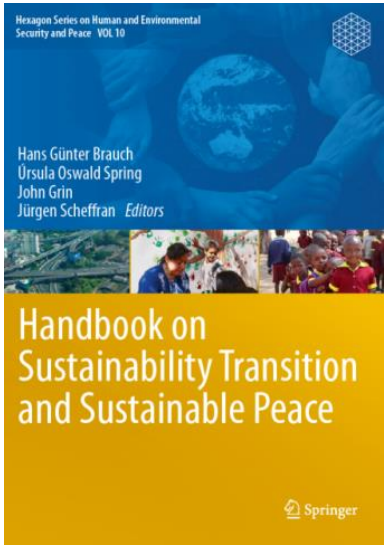



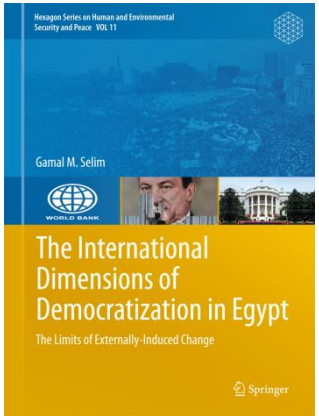



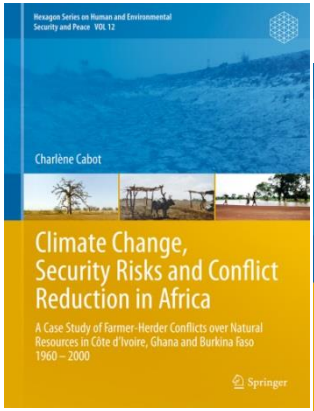



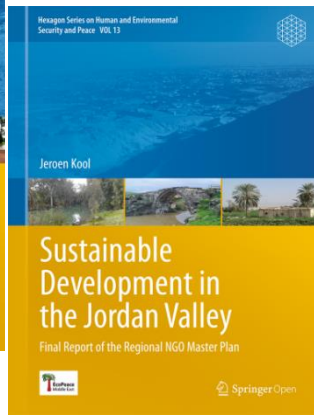



# 1.3. Global Environmental and Human Security Handbook for the Anthropocene



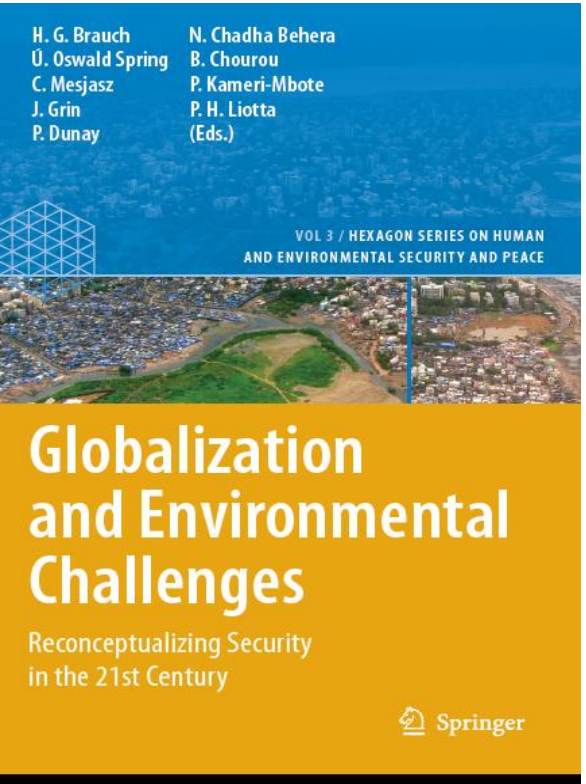

[http://www.afes-press-books.de/html/hexagon.htm](http://www.afes-press-books.de/html/hexagon.htm)

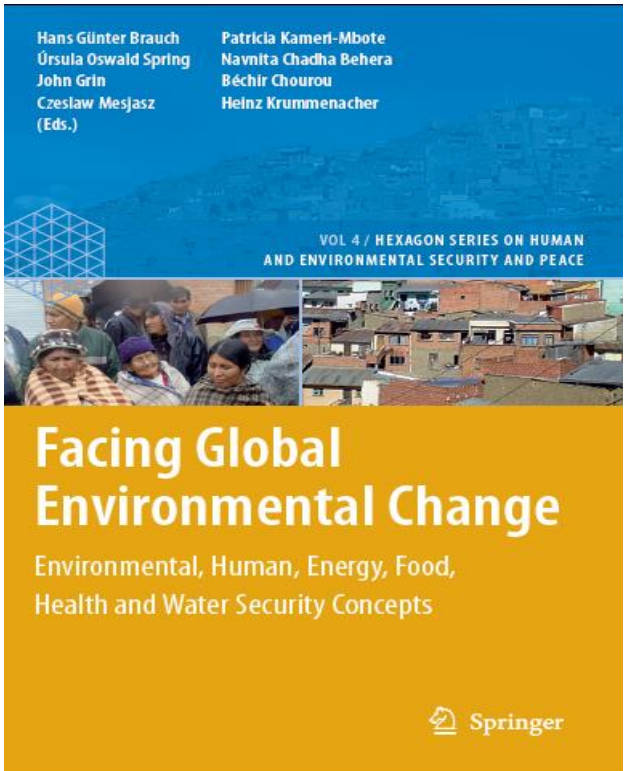
**Vol. 3 (1): Globalization and Environmental Challenges: 92 authors, 36 countries, 16 disciplines**, (2008)

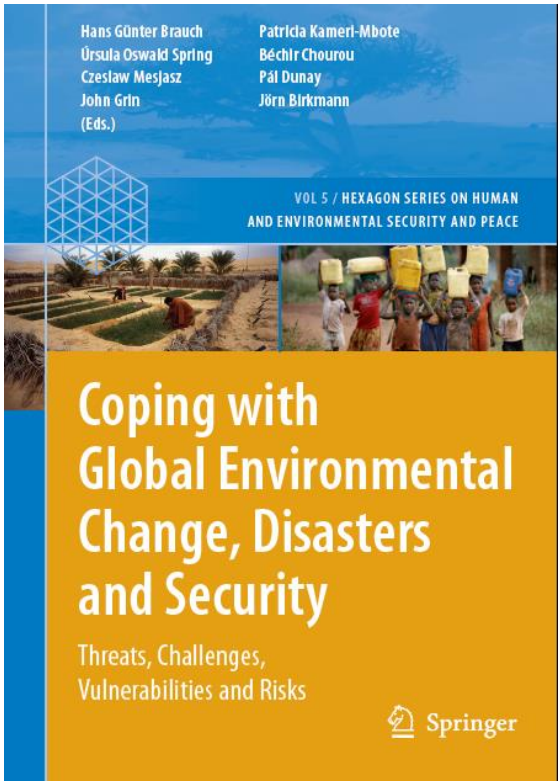
**Vol. 4 (2): Facing Global Environmental Change: 132 authors, 49 countries** on global debate and problems of environmental, human, energy, food, health, water security (2009)

➔**Vol. 5 (3): Coping with Global Environmental Change:** ***Disasters and Security – Threats,Challenges, Vulnerabilities and Risks*** **164 authors, 48 countries (2011).**

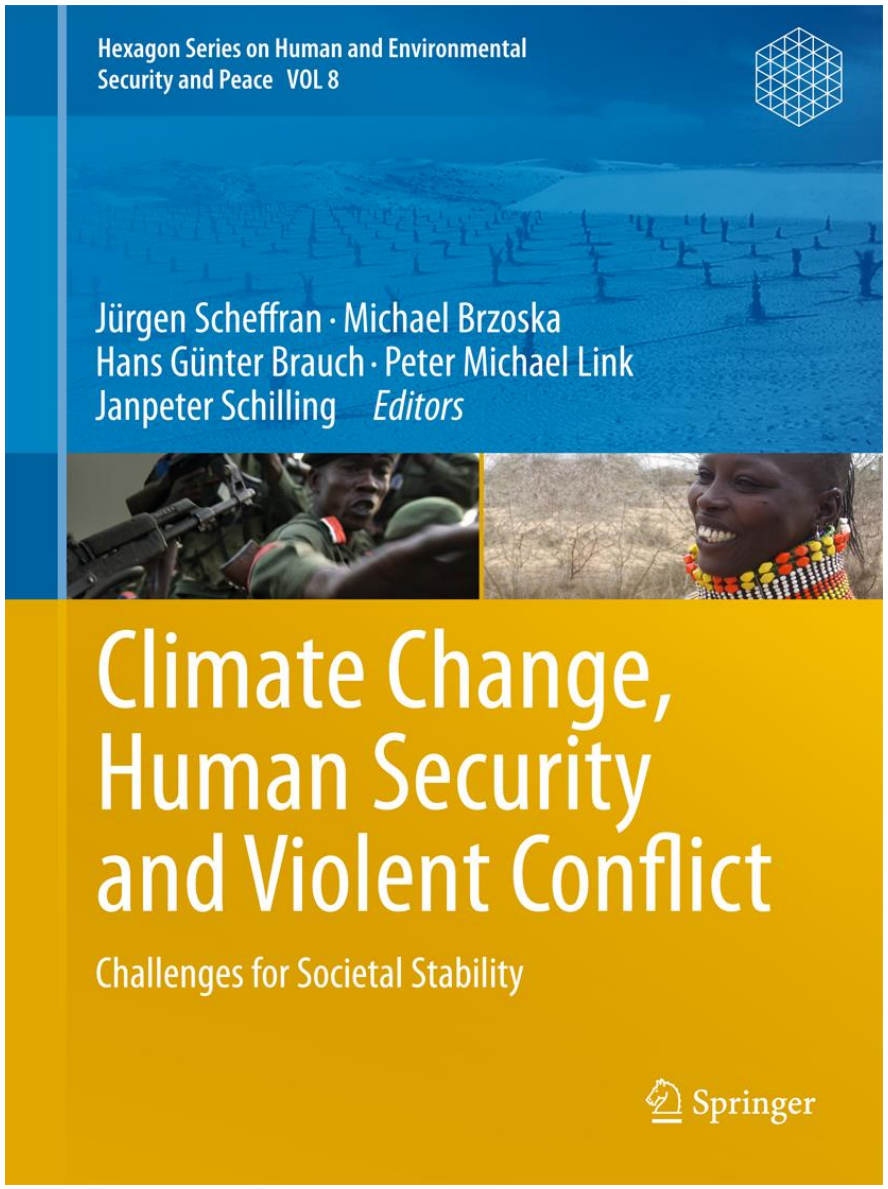
**4 years: 2012-2016: more than 540.000 chapter downloads**

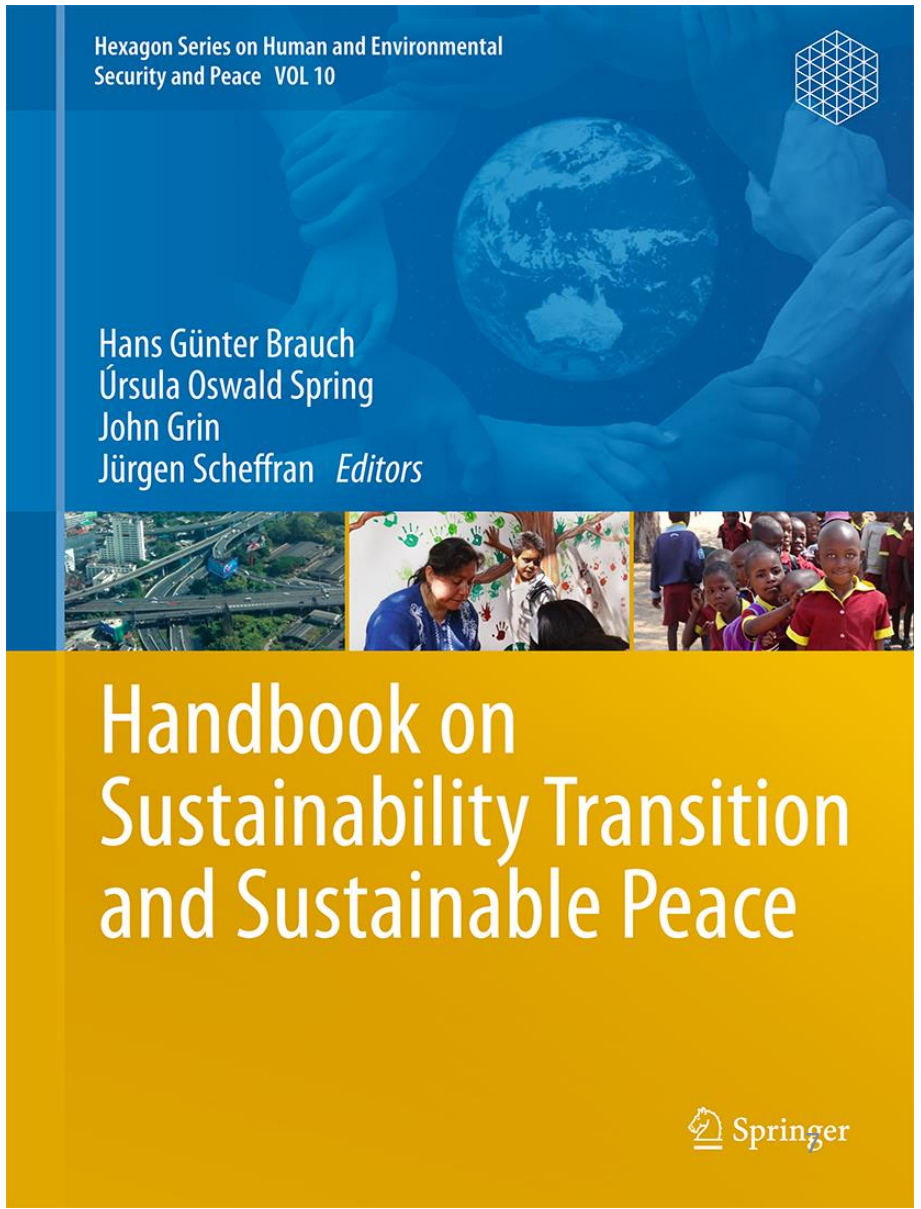


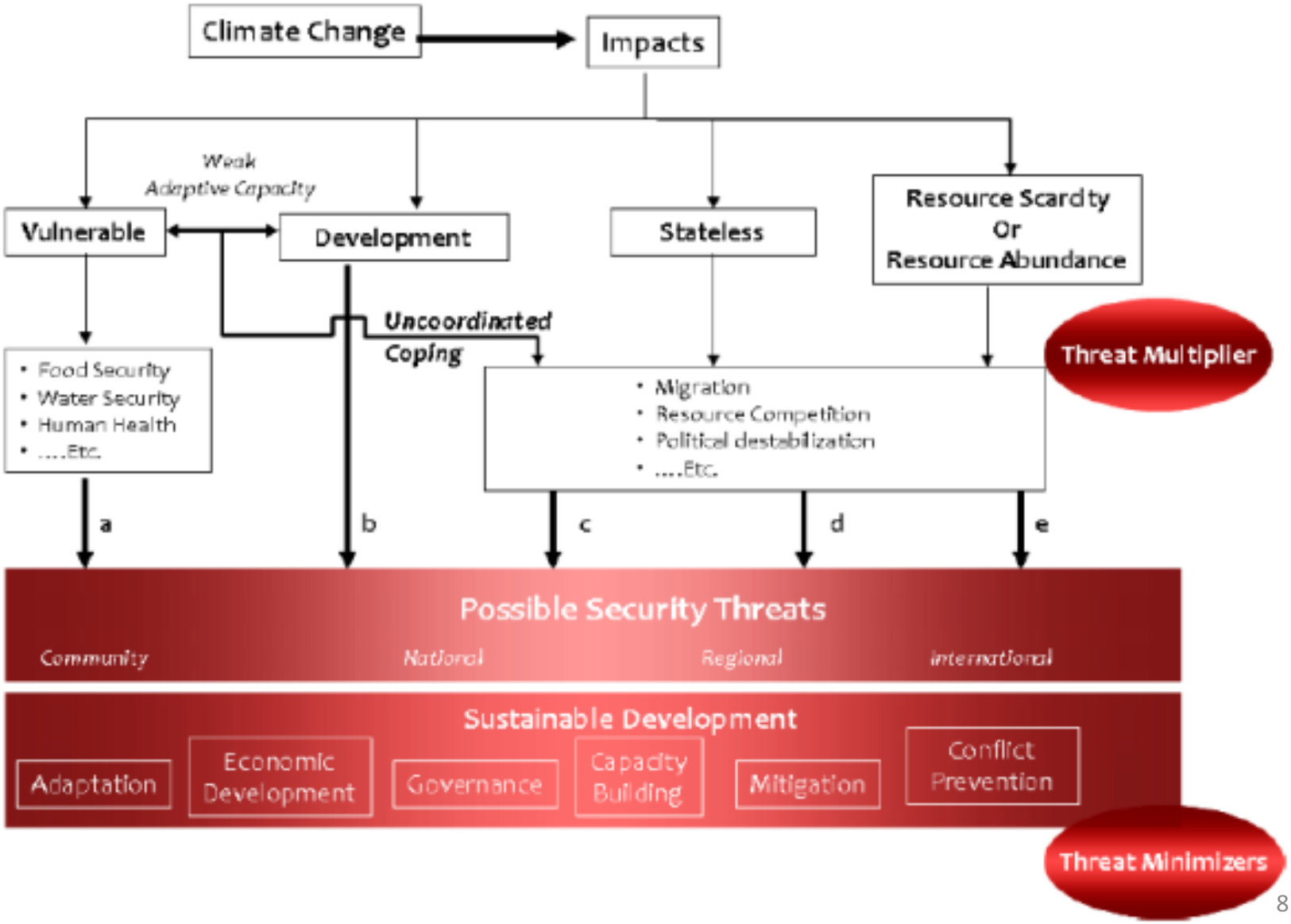



# 1.3. Two Handbooks (2012, 2016)



# 1.4. Dual focus: Climate Change & Security from threat multiplier to threat minimizer

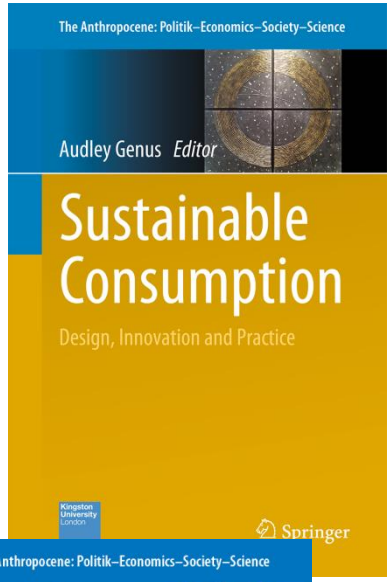


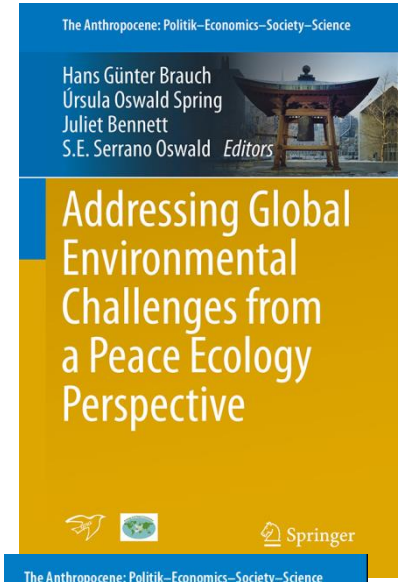
# 1.5. Goal of the Handbook on STSP

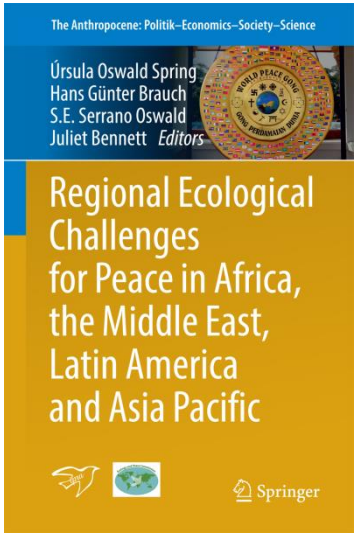
- **Oswald Spring and Brauch (2011)** argued that in the Anthropocene humankind faces two alternative visions and policy strategies:
  - ***Business-as-usual* (BAU) in a Hobbesian world**. Here economic and strategic interests and actions dominate and may lead to a major crisis for humankind, inter-state relations and nature.
  - The need for a ***transformation*** in **cultural, environmental, economic and political relations**
- **Scheffran, Brzoska, Brauch et al. (2012) examined possible consequences of the *first* alternative and showed, by addressing climate change as a 'threat multiplier**', that in the case of **no action it might lead to "dangerous climate change"** (UNFCCC 1992).
- This volume deals **'sustainability transition' that may serve as a sustainable alternative and avoid the negative consequences of climate change for human, national and international security.**
- Both visions address different coping strategies for this century for *global environmental change* (GEC) and climate change:
  - In **first vision, *cornucopian perspectives* or *business-as-usual*** suggest technical fixes and defence of economic, strategic & national interests, with the adaptation and mitigation strategies that are affordable for industrialized countries.
  - In the **alternative vision of a comprehensive transformation of the global economy,** *Politik*, society and culture, a *sustainable perspective* requires effective new strategies and policies.
  - **Their goal should be decarbonization, dematerialization, reduction of the water and environmental footprint, and global cooperation and solidarity. These would contribute to a sustainable peace with more global equity and social justice.**
- **The consequences of both scientific visions and policy perspectives are:**
  - The **first vision**—with minimal reactive adaptation and mitigation strategies—would increase the probability of dangerous global changes in the environment, water, food and climate, and there would be linear and chaotic changes in the earth system.
  - The **sustainability perspective requires** a change in ***culture*** (thinking on the human–nature interface), ***world views*** (thinking on systems of rule, e.g. democracy vs autocracy, on domestic priorities and policies, and on inter-state relations in the world), ***mindsets*** (the strategic perspectives of policymakers), and new forms of national and global sustainable ***governance***.

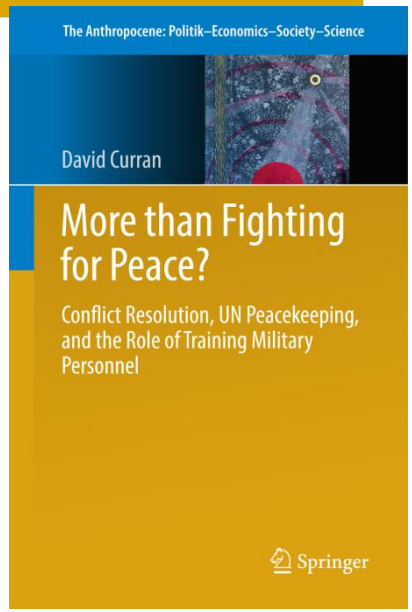
# 1.6. SpringerBriefs in Environment, Security, Development and Peace (ESDP): 28 titles

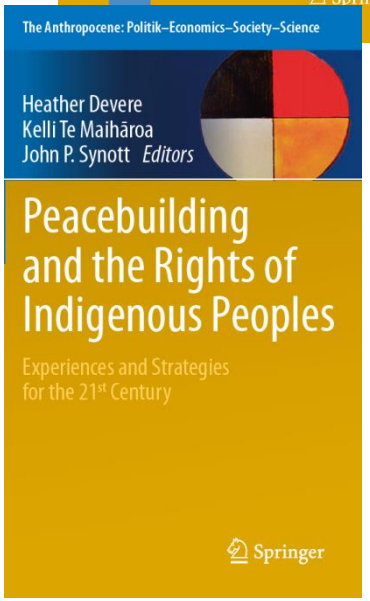
# 1.7. The Anthropocene: Politik – Economics – Society – Science (APESS): 15 titles (2016)

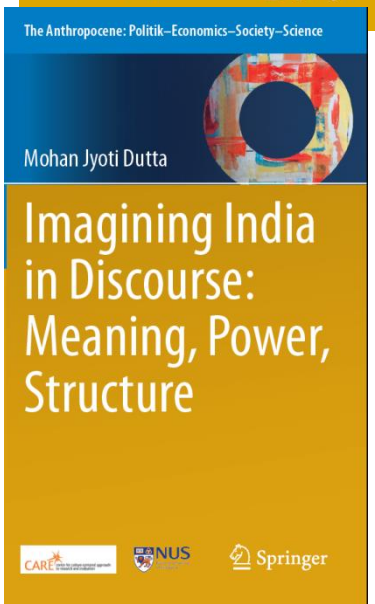




# 1.8. Springer Briefs on Pioneers in Science and Practice (PSP): since 2012: 34 titles

# 1.9. Pioneers in Arts, Humanities, Science, Engineering, Practice (PASEP): 9 volumes

# 1.10. My Personal Mission: Co-Publishing

- **High Quality Books** & Publisher‘s Ethics
- **Fair Peer Review Process**: Reviewers from the region
- **Intensive Counselling** through the whole Proces
- **Copublishing**: Global Visibility & Affordable Price
- A personal Gift: **A Website on each Book**
- **My Co-Publishing started 2016 in Penang in Malaysia**

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

**Six different types of time** according to their duration:

1. ***Cosmic time*** (*physical cosmology* (M. Planck) refers to time since Big Bang ca. 13.8 billion years ago;
2. ***Geological time*** describes the timing of & relationships between events throughout the earth's history of about 4.54 billion years; its scales are adopted by geologists & earth scientists & defined ***International Commission on Stratigraphy***. Its most recent accepted epoch is the ***Holocene***, the period some 12,000 years ago that made the rise of human civilizations possible.

In August 2016 **Int. Geological Conference accepted a report in Capetown of the AWG on a new phase of the Anthropocene.** In claiming that "**we are in the Anthropocene**", **Nobel Laureate Crutzen** stated in Mexico that since the Industrial Revolution or 1945 (Nuclear Age) humankind has for the first time directly interfered in the earth system, triggering complex processes of global environmental (soil, water, biodiversity) and climate change.

1. The time of the ***technical revolutions*** (the '**Neolithic' or 'agricultural**' revolution of 10,000 to 6,000 BCE, and the '**Industrial Revolution**' from about 1750/1782 CE and its different phases of innovation).

In human history the French social historian **Fernand Braudel** in his masterpiece *The Mediterranean and the Mediterranean World in the Age of Philip II* (1946, 1969, 1972) distinguished between three historical times:

4. **long duration (*la longue durée*), I refer to eras of international order**
5. repeating **historical cycles (*histoire de conjuncture*), e.g. lifespan of a president or prime minister**
6. **events (*l'histoire événementielle***). Braudel's periodization is extensively used in history & social sciences. Other periodizations in economic history and theory (e.g. mercantilism, capitalism, socialism, neo-liberalism.

**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 (& religion) is crucial for changing our lifestyles, economic performance by moving to a green economy (with a decarbonization)**

# 2.1. A Context, Process, Goal, a Need, and an Audience

**A silent revolutionary change in earth and human history**

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

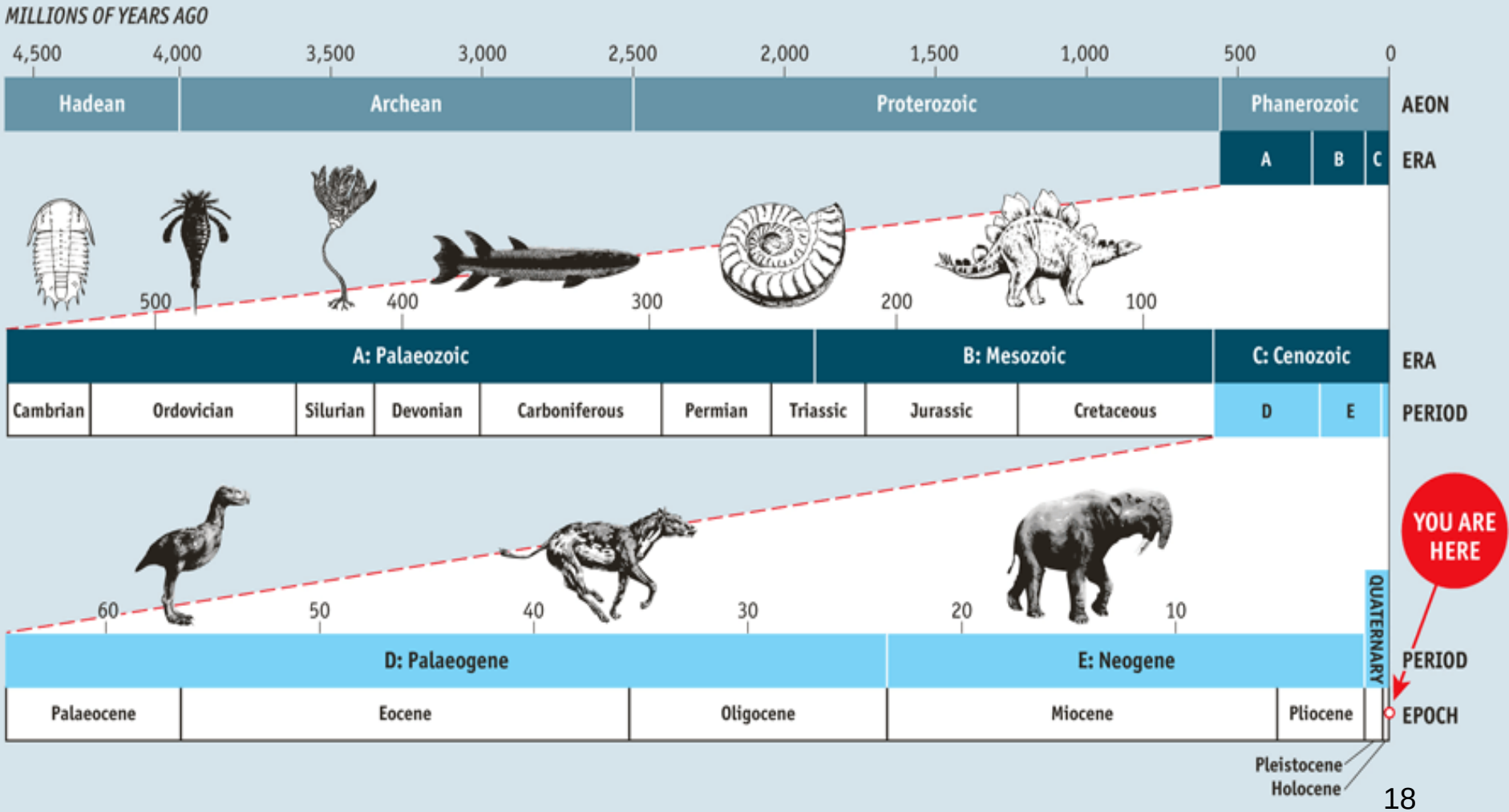
- **Context: We are in the Anthropocene! Paul J. Crutzen claimed in 2000 in Cuerna-vaca and in Capetown Int. Geological Conference accepted a report last week**
- **A Dual Political & Normative Goal:**
  - **Political: Sustainable Development (Brundtlandt Report 1987)**
  - **Normative: Sustainable Peace (alhimsa, peace with nature, peace as a goal of transition towards sustainability and a transformation requires a Global Mindshift**
- **A Dual Process:**
  - **STRN, IST 2016: Institutional Context: Sustainability Transition**
    - **Polanyi: Great Transition (1944) Göpel: Great Mindshift (2016)**
  - **Sustainable Peace: from a negative towards a positive peace (Johan Galtung)**
    - **Negative peace: transition without violent conflict and war: avoding resource and climate conflicts**
    - **Positive peace: transition towards a global presently utopian context of peace with nature**
- **A Dual Audience:**
  - **Narrow audience: Purely scientific community**
  - **Wider audience of Politik, Economics, Society and Science (4 pillars)**
- **Means to reach an Audience:**
  - **Scientific Journals: to scientists only (important for the career)**
  - **Scientific Books with one of the 3 largest scientific publishers**

# 2.2. AWG Report, Capetown 2016

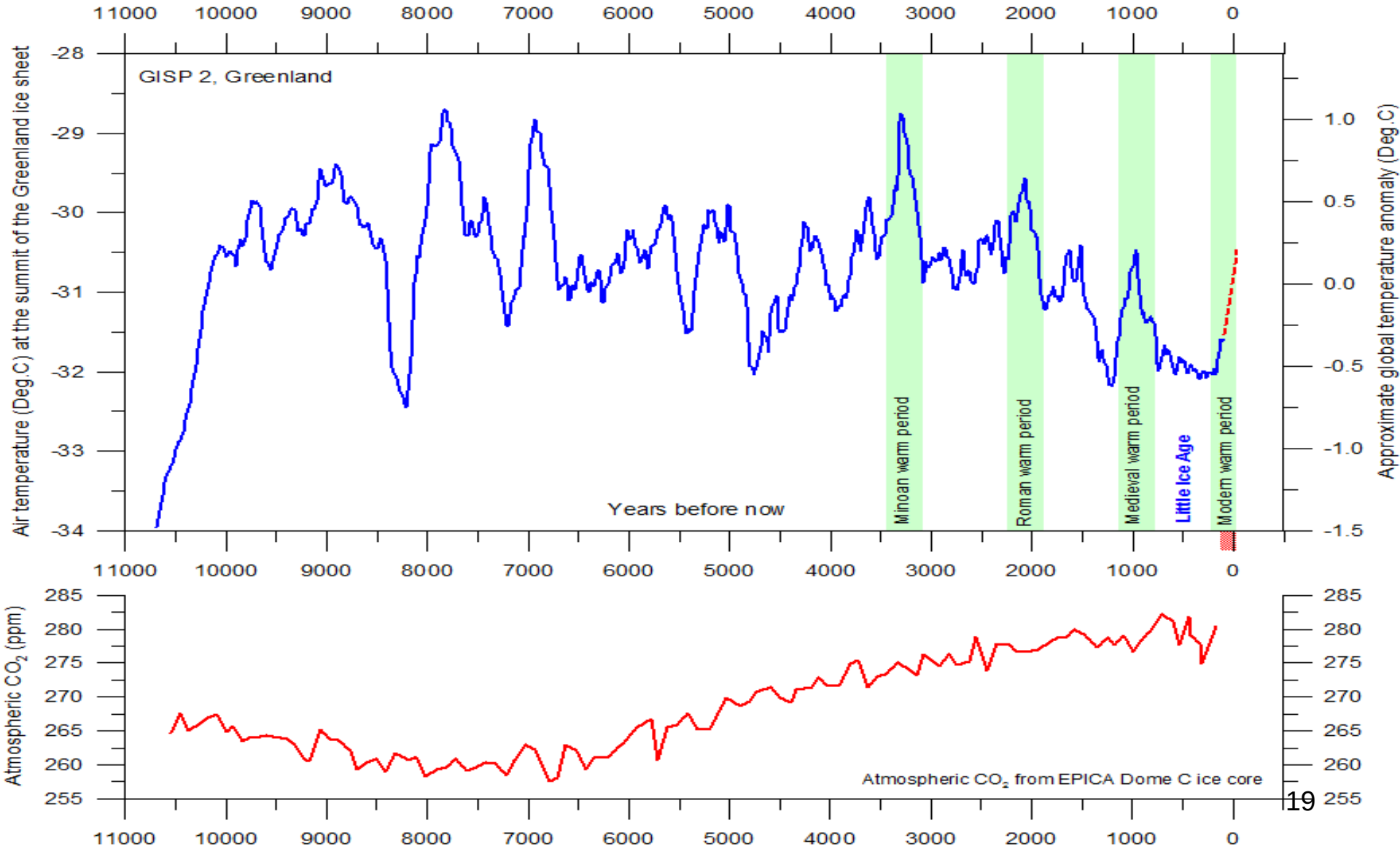
**Majority current opinion on Anthropocene working group indicates the following:**

- **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-20$^{th}$ century. The mid-20$^{th}$ century also coincides with the clearest and most distinctive array of signals imprinted upon recently deposited strata.**
- Hence, the mid-20$^{th}$ 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**.

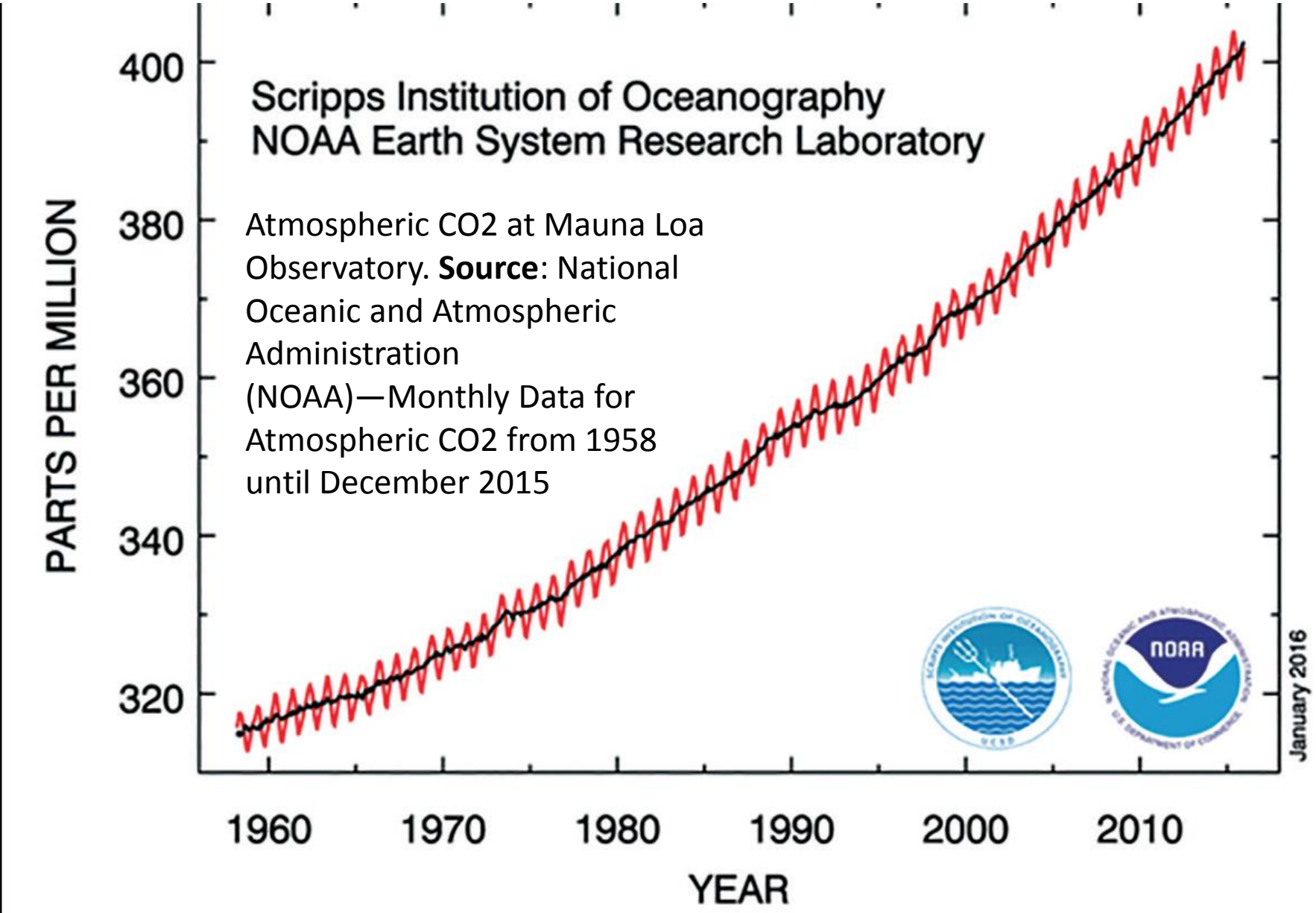
# 2.3. Geological Time: Earth History



# 2.4. The Holocene (11600 BP-now)



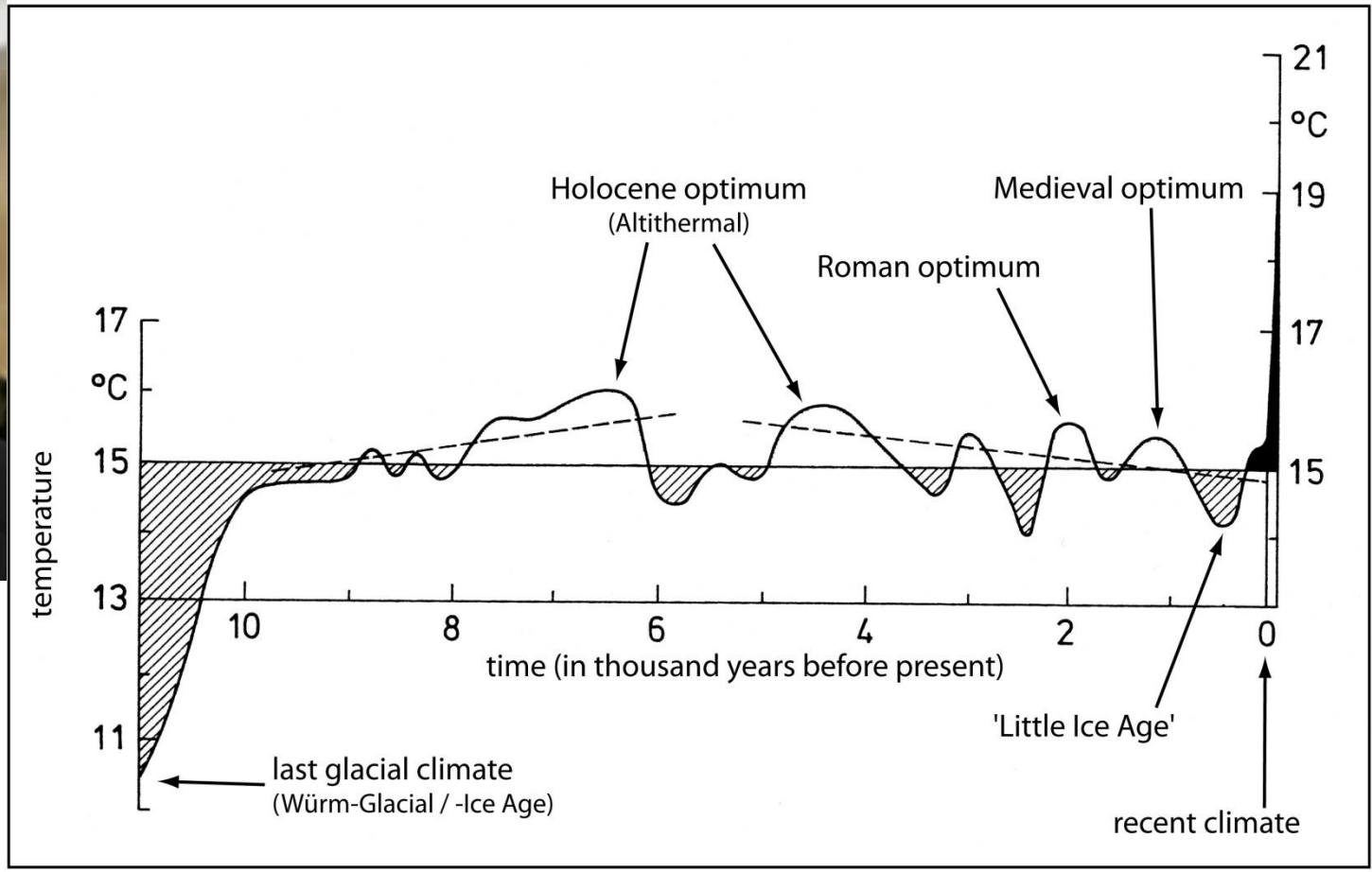
# 2.5 Concentration of CO2 (1958-2015)




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

# 2.6 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

# 2.7. 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)**

# 2.8.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).

# 3. 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)

# 3.1 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**

# 3.2. ‘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’:** 5 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**.’

# 3.3. Widened Concept of Sustainable Peace

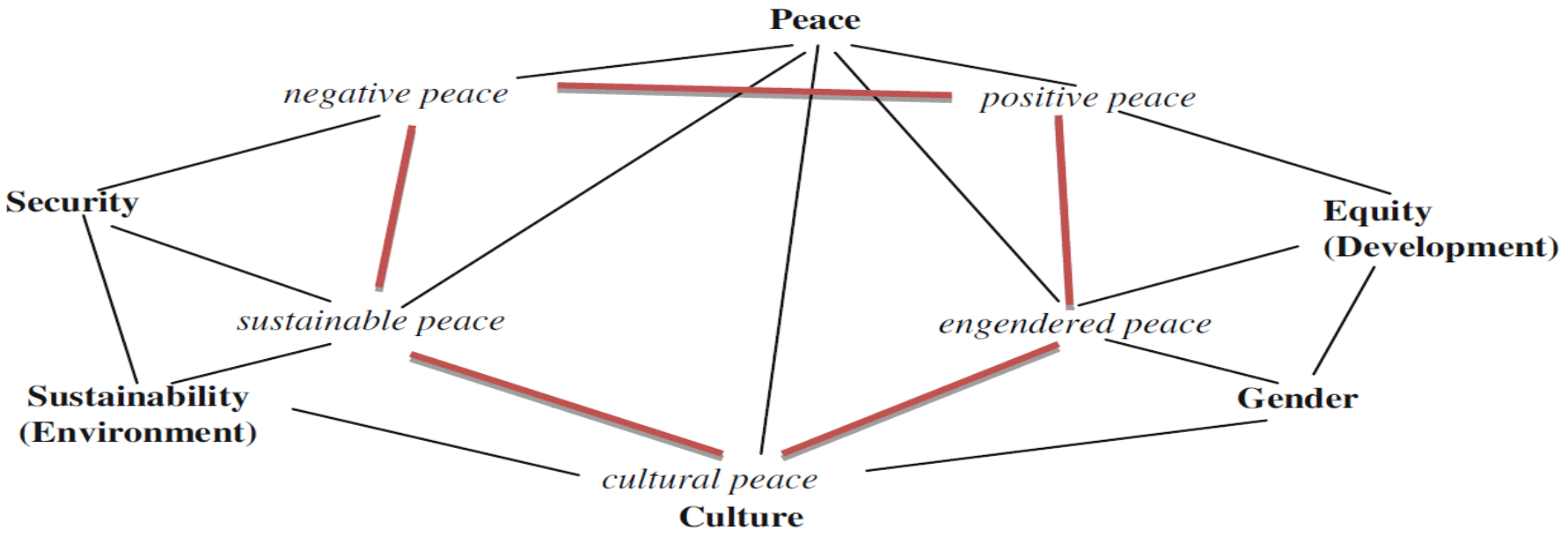



**Fig. 1.1** Five pillars of peace ecology and their four linkage concepts of negative, positive, cultural and engendered peace. *Source* The Authors

*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.

# 3.4. We are the Threat! We are the Victims!


# 3.5. 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**

# 3.6. Sustainable Peace in the Anthropocene

- This chapter conceptualizes possible and plausible linkages between the emerging 'sustainability transition' research paradigm 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 sixty 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 and means. I
- n the twenty-first 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. Such a low-carbon economy should be the result of a transition to sustainability, necessitating not just sociotechnical changes but changes in perception, values, behaviour and lifestyles.
- Such a long-term transformative change to sustainability may possibly prevent two types of conflicts: climate-induced violent conflicts, and those driven by resource scarcity.
- On the conceptual level, this chapter suggests possible linkages that may be developed in the Anthropocene between sustainable development, human security and sustainable peace in the context
  - of both a *political geoecology*—between the natural and social sciences—
  - and a *peace ecology*—between peace, security, development and environmental studies.
  - 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.
-

# 3.7. 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** (2013, 2013a, 2014, 2015) has discussed conceptual issues of security during the Anthropocene, **Brauch et al.** (2017) 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.

# 4. 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: environ-mental & 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 interdisci-plinary 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* refers 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, inger-Brodowski, and 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 'transforma-tive 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.**

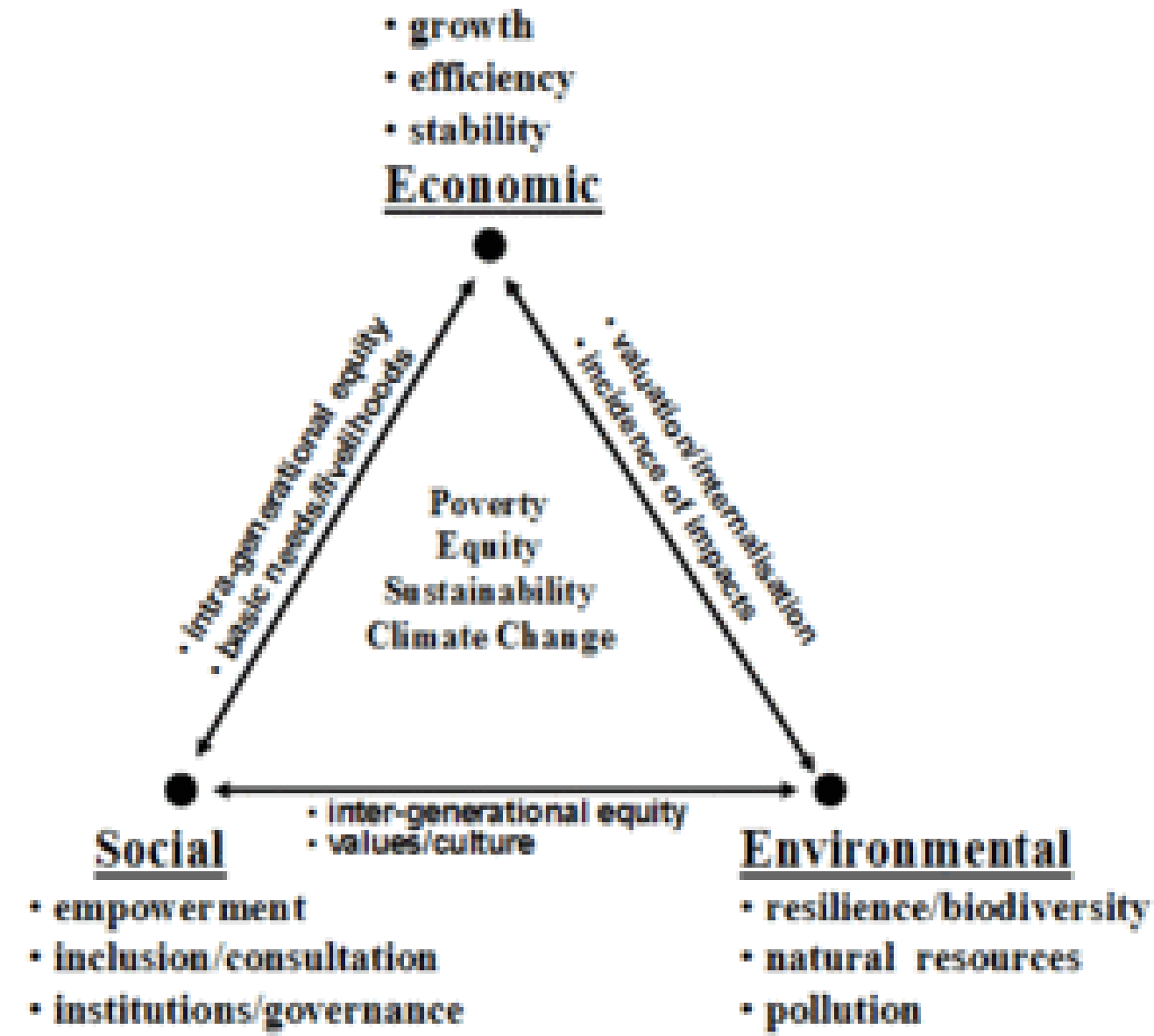
# 4.9. Transformative Science Requires Bridge-building Between Disciplines and Programmes

- **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. From Sustainable Development to Sustainable Development Goals

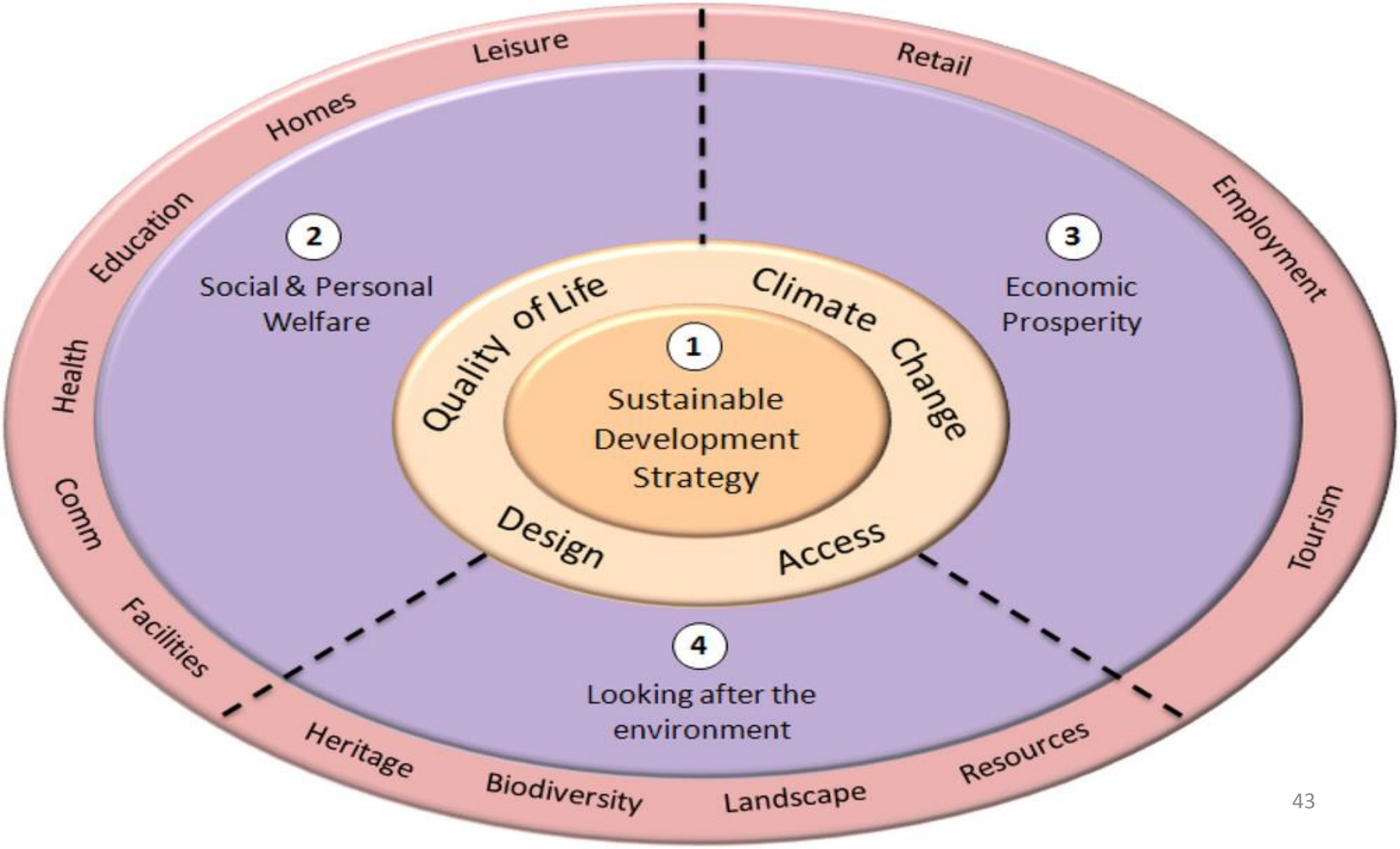
- **Stockholm Conference on the Environment 1972**
- **Establishment of United Nations Environment Programme (UNEP)**
- **World Commission on Environment and Development (WCED) (Brundtland) of 1987; sustainable development goal formulated**
- This report defined sustainable development as a form of development **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**

# 5.1. Sustainable Development Goal




- **Sustainable develop-ment** is an organising principle for human life on a finite planet.
- **It posits a desirable future state for human societies in which living condi-tions and resource-use meet human needs without undermining the sustainability of natural systems and the environment,** so that future generations may meet their needs.
- **Combines 3 -4 dimensions:**
  - **social**
  - **economic,**
  - **environ mental**
  - **cultural (or institutional, as good governance)**

# 5.2. Sustainable Development Strategy



# 5.4. Scientific Debates on Sustainable Development and on Sustainability

- **Today an ambiguous, disputed & essentially contested concept**
- IUCN–World Conservation Union, in a report on *Caring for the Earth* **(1980),** defined SD as "improving the **quality of human life** while living **within** the **carrying capacity** of **supporting ecosystems**", where sustainability is understood as "a characteristic of a **process that can be maintained indefinitely**"
- **Trzyna (1995)** SD: multidisciplinary, social process, moral principle
- **Neoclassical & ecological perspectives** differ in assessment of likelihood of sustainable outcomes from real/world market economies.
- **US National Research Council (NRC 1999)** on ***Our Common Journey: A Transition toward Sustainability*** tried to
  - **"reinvigorate the essential strategic connections between scientific research, technological development & societies' efforts to achieve environmentally sustainable improvements in human well-being" focus on: 1) common concerns and differing emphases on SD, 2) trends and transitions, 3) exploring the future, 4) environmental threats and opportunities, 5) on reporting on transition, and 6) integrating knowledge and action.**
- **No study discussed the linkages between SD and ST and war, crises, conflict and world peace or sustainable peace.**
- **Goal of our Handbook: Sustainability Transitions and Sustainable Peace (40-60 chapters) in the Hexagon Book Series (2015)**

# 5.5. Sustainable Development Goals

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

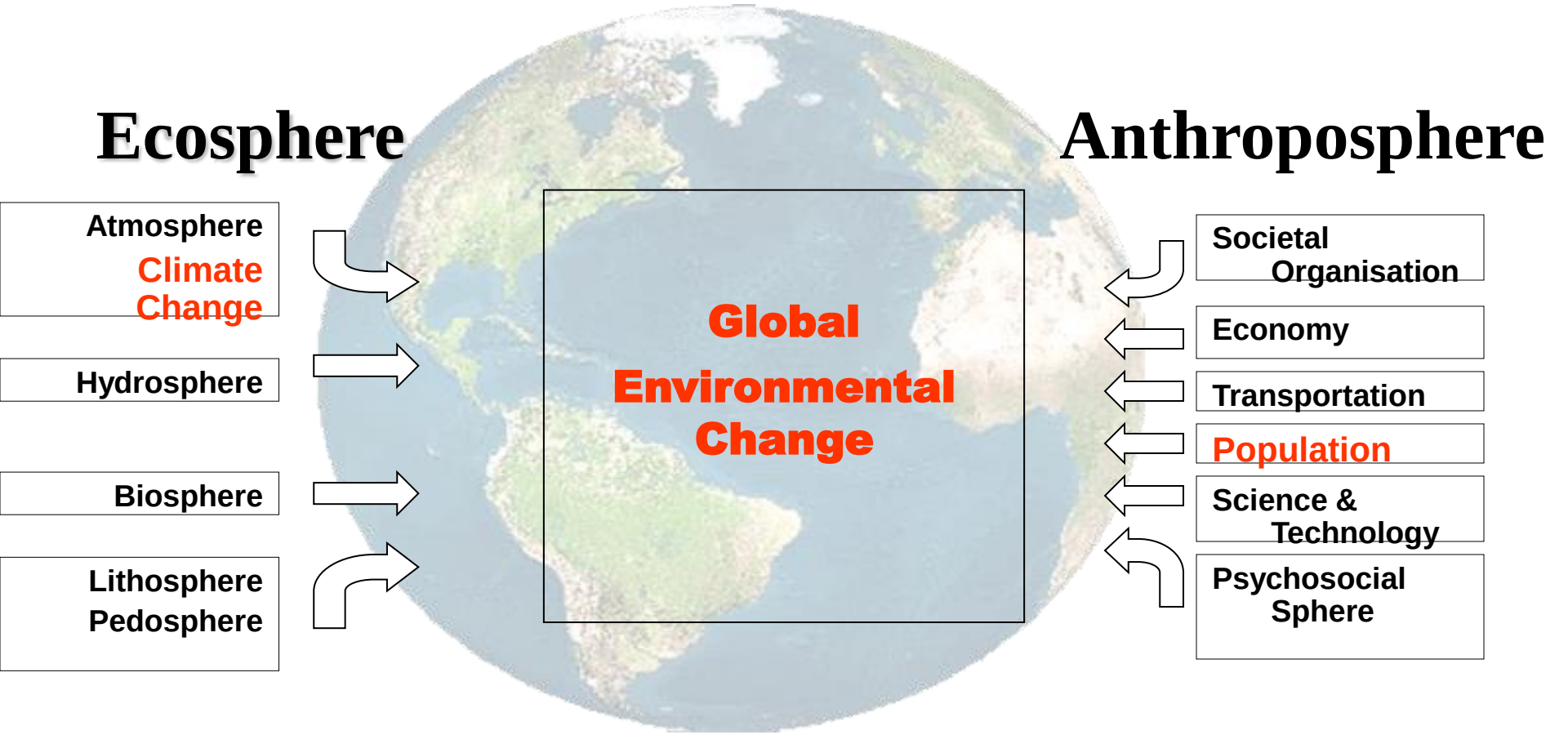
# 5.6. SDG 16: Peace and Justice

**SD Goal 16 "is dedicated to the promotion of peaceful and inclusive societies for sustainable development, the provision of access to justice for all, and building effective, accountable institutions at all levels". Among its twelve key targets are:**

- **Significantly reduce all forms of violence and related death rates everywhere**
- End abuse, exploitation, trafficking and all forms of violence against and torture of children
- Promote the rule of law at the national and international levels and ensure equal access to justice for all
- By 2030, significantly reduce illicit financial and arms flows, strengthen the recovery and return of stolen assets and combat all forms of organized crime
- Substantially reduce corruption and bribery in all their forms
- Develop effective, accountable and transparent institutions at all levels
- Ensure responsive, inclusive, participatory and representative decision-making at all levels
- Broaden and strengthen the participation of developing countries in the institutions of global governance
- By 2030, provide legal identity for all, including birth registration
- Ensure public access to information and protect fundamental freedoms, in accordance with national legislation and international agreements
- Strengthen relevant national institutions, including through international cooperation, for building capacity at all levels, in particular in developing countries, to prevent violence and combat terrorism & crime
- Promote and enforce non-discriminatory laws and policies for sustainable development.

**In the short-term targets there is no reference to 'sustainability transition' as a process to achieve a 'sustainable peace', nor is this term mentioned. Thus the concept lacks an action component to promote sustainable peace among nations, regions, and people.**

# 5.7. Global Environmental Change (GEC)




**GEC poses a threat, challenge, vulnerabilities and risks for human security and survival.**

# 5.8. Global Environmental & Climate Change

## Global Environm. Change (GEC) & Climate Change (GCC) are

- **scientific issues since e 1970s, new topic in natural & social sciences**
  - **4 Scientific Programmes**
    - World Climate Change Programme (WCP)
    - Diversitas
    - International Geophysical Biological Programme (IGBP)
    - **International Human Dimensions Programme (1995 ff,)**
  - **Amsterdam 2001: Earth Sytems Science Partnership (ESSP)**
  - **Rio De Janeiro (2012): Future Earth Initiative**
- **political problems since late 1980s & they have been discussed as**
  - Climate Change: 1988: issue of G7; 1990: UN GA mandate; 1992: Rio summit: UNFCC (1992) and Kyoto Protocol (1997)
  - Desertification: UNCCD (1994)
- **security-related threats, challenges risks since 2002 (decade)**
  - **International, national and human security**

## 2 Policy Debates and Scientific discourses:

- **Climate change and (human) security (threat multiplier): HESP 8**
  - **Impacts of climate change on conflicts & resource conflicts**
- **Sustainability transition & sustainable Peace (HESP 10)**

# 5.9. Climate Change & Sustainability Transition

- The emerging **scientific debate on 'sustainability transition' addresses the many** scientific, societal, economic, political, and cultural **needs to reduce GHG emissions**.
- These **cannot be achieved** simply by legally binding *quantitative emission limitation and reduction obligations* (QELROs), as in the framework of the **Kyoto Protocol (1997**).
- These have so far failed to achieve their proclaimed aims during past two decades because of a lack of political will and capability to implement these legal obligations and policy declarations.
- **A continuation of the prevailing world view and 'business-as-usual' mindset may lead to**
  - **'dangerous' (+4 °C world) or even**
  - **'catastrophic' (4-6° world) climate changes and**
  - major human catastrophes during this century if global temperature should rises by 4-6 °C above the pre-industrial average by end of 21st century.

# 5.10. EU GHG Reduction Goals 2020

The EU also adopted in 2008 a decision to aim by 2020 at a 20/20/20 target:

- A reduction in EU greenhouse gas emissions of at least 20% below 1990 levels
- **20% of EU energy consumption to come from renewable resources**
- **A 20% reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency.**

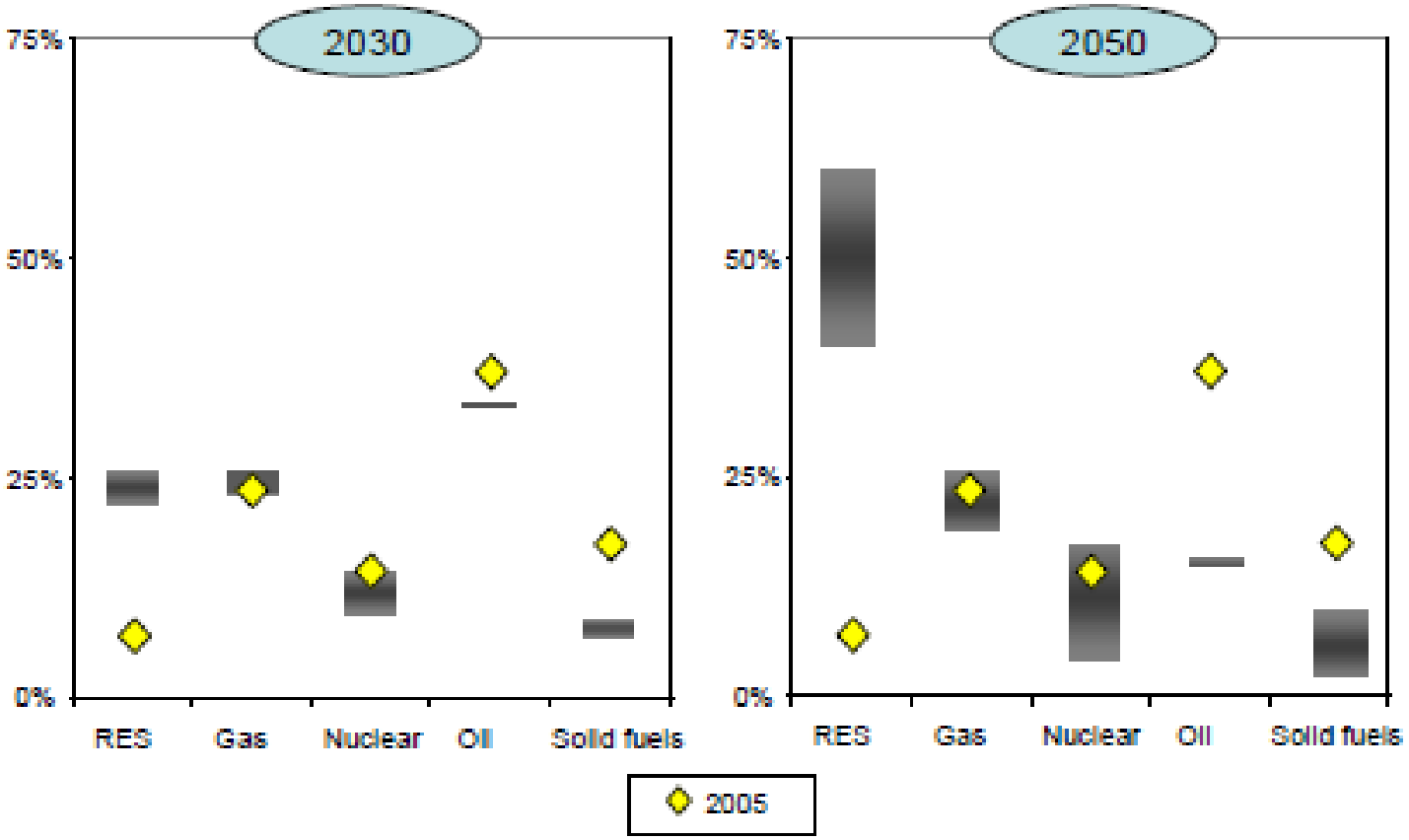
10–11 December 2009, before COP 15 in Copenhagen European Council offered to increase its emissions reduction to 30% if other major emitting countries would commit to significant reductions under a global climate agreement.

# 5.11. EU-27 Reduction Goal for 2050

- On 15 December 2011 the European Commission (2011) released its ***Energy Roadmap 2050***, according to which:
- The EU is committed to reducing greenhouse gas emissions to **80-95% below 1990 levels by 2050 in the context of necessary reductions by developed countries as a group.** The Commission analysed the implications of this in its **'Roadmap for moving to a competitive low-carbon economy in 2050'.**
- **The 'Roadmap to a Single European Transport Area' focused on solutions for the transport sector and on creating a Single European Transport Area**.
- In this Energy Roadmap 2050 the Commission explores the challenges posed by delivering the EU's decarbonization objective while at the same time ensuring security of energy supply and competitiveness. It responds to a request from the European Council.
- **This requires a sustainable transition in the energy sector.**

# 5.12. EU Decarbonization Scenarios – 2030 and 2050 (comp, with 2005 in %)

**Graph 1: EU Decarbonisation scenarios - 2030 and 2050 range of fuel shares in primary energy consumption compared with 2005 outcome (in %)**



# 5.13. International Energy Agency (2013) on Thailand‘s Emissions (1990-2010)

**IEA ($CO_2$ Emissions from Fuel Combustion, 2012 (3/2013).**

**1)**GHG emissions (sec. approach) 1990-2010: **World:+44.4%**

- **Malaysia: +272%,** Vietnam: +658%, China: +223.5%; **Thailand: +208.7%,** Singapore: 114.1% , **Asia: +160.4%**

- **Thailand 1990: 80.5; 2000: 158.1; 2010: 248.5 mio. tons of CO2**

**2) Total primary energy supply (Mio. ton, oil equivalents)**

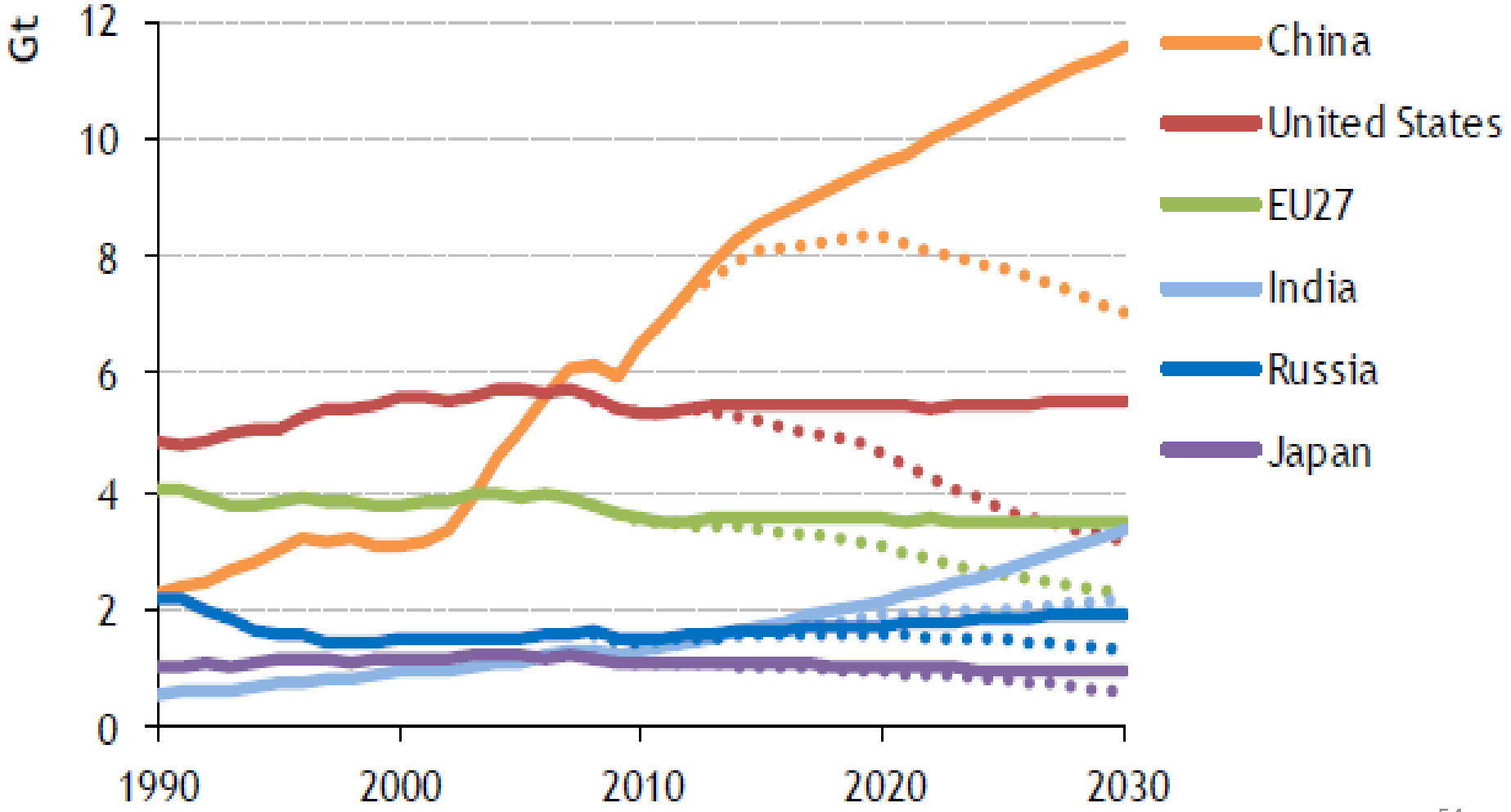
Malaysia: +237.1%, Vietnam: +231.5%, China: +183.3%; **Thailand: 180,0+%,** Singapore: 184.3% , **Asia: 115.3+%**

**3) Per capita emission by sector in 2010 (**kg CO 2 / capita**):**

**Total CO2 Emissions from fuel combustion:** 6 514, Vietnam: 1 501, China: 5 395; **Thailand: 3 596,** Singapore: 12 395 , **Asia: 1 494**

**Transportation**: Malaysia: 1494, Vietnam: 348, China: 382; **Thailand: 801,** Singapore: 1580, **Asia: 237**

# 5.14. Energy-related CO2 Emissions for EU27, US, Japan, Russia, China & India (1990-2030)



# 5.15. Internat. Energy Agency, 2011, Global GHG Emissions (1970-2050)

Figure 7.5. **Global GHG emission pathways: Baseline and mitigation cases to 2050 compared to 2100 stabilisation pathways**

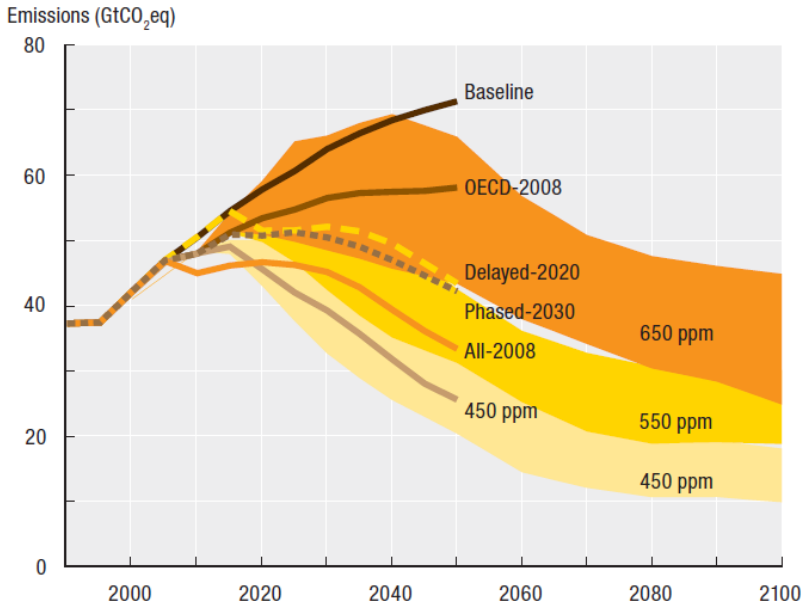
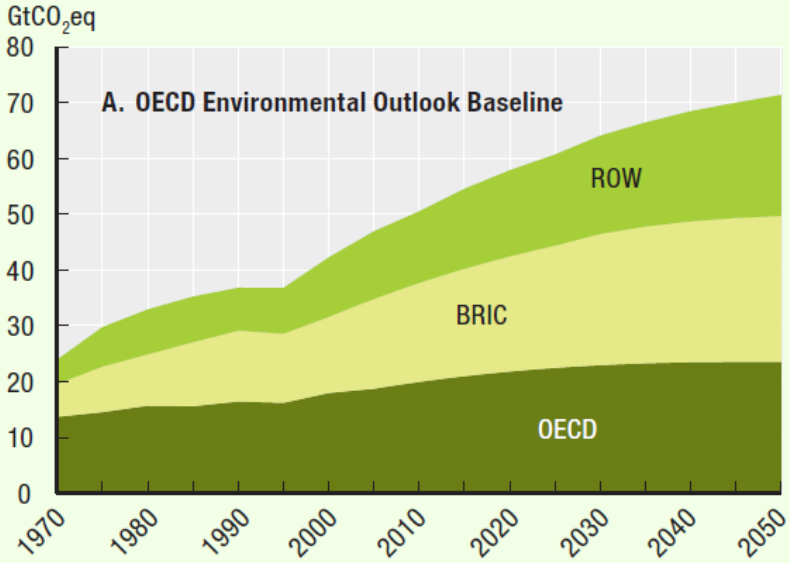
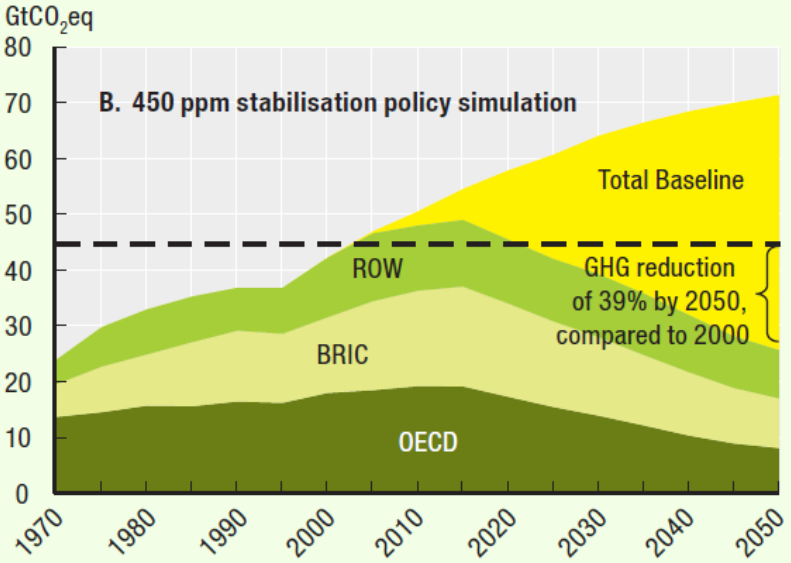



Figure 0.2. **Total greenhouse gas emissions (by region), 1970-2050**




StatLink http://dx.doi.org/10.1787/258472880870

# 5.16. Tropical Cyclones: Threat to Megacities

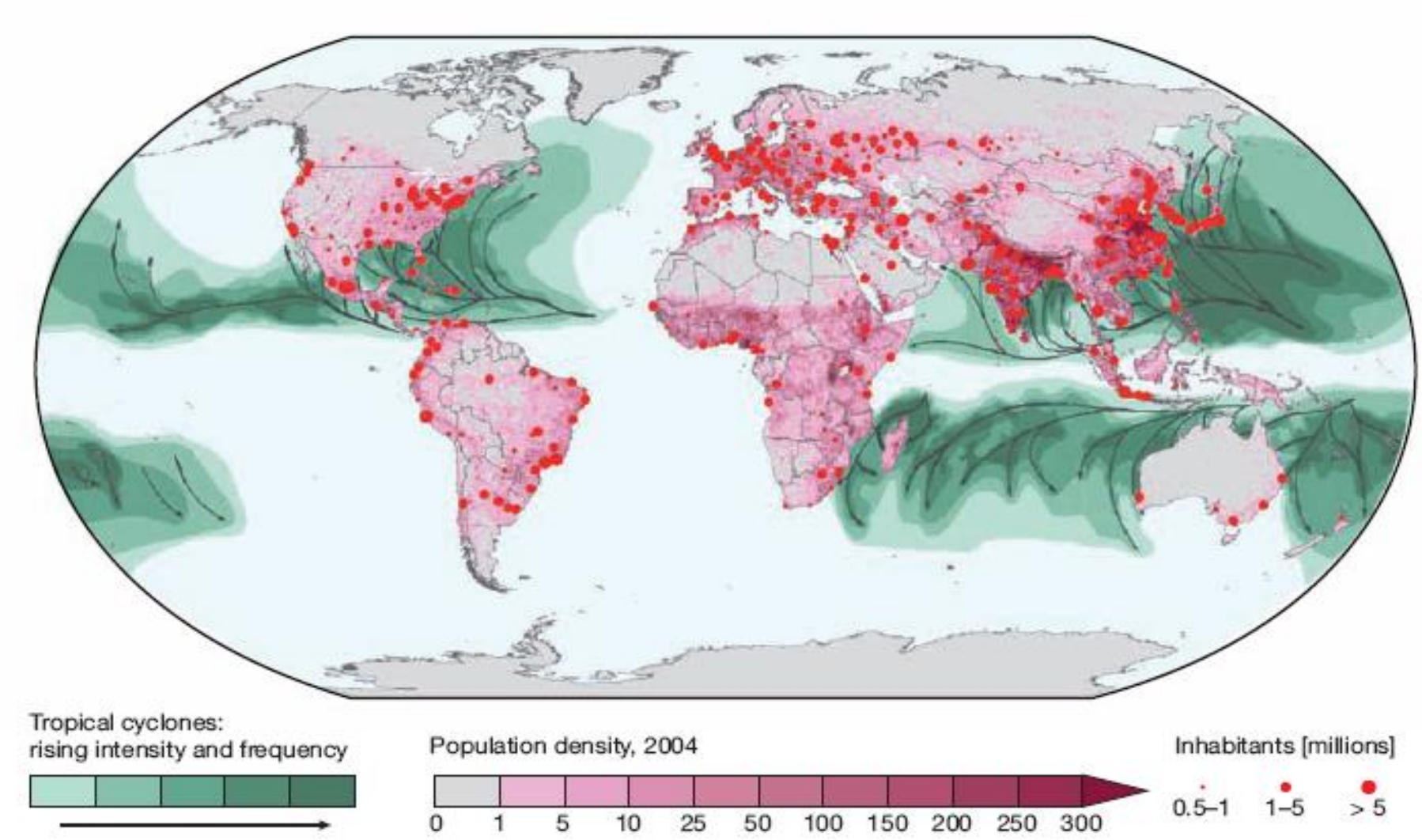



**Figure 6.4-1**
Tropical cyclone threat to urban agglomerations.
Cartography: Cassel-Gintz, 2006.
Source: WBGU

# 5.17.Two Policy Debates & Scientific Discourses

**Climate change & (inter)national and human security (globalm, national, local)**

- **What will be the security effects for ASEAN region and Thailand by 2050 & 2100?**
- **Sea Level rise in Vietnam of 1 metre exposing 23% of poulation -> migration pressure (internal, external)**
- **What will be the economic effects of more frequent big floods as of 2011 and droughts for Thailand in this century?**

**Climate change & sustainable development (sustainability transition**

**← Business as usual: dangerous & catastrophic climate change**

**←Severe security implications**

- **Response: Adaptation, Mitigation, Resilience Building**
- **Focus on cause: GHG emissions (burning of coal, oil, gas)**
- **Address: strategies for gradual decarbonization of economy**
- **Goal of sustainable development & of strategies for sustainabiltiy transition**

# 6. Emergence of the Research on Sustainability Transition

**US National Academy of Science (NAS) Report of 1999:**

**Sustainability transition' research has evolved since 2004:**

- Clark, Crutzen, Schellnhuber: 'Science for Global Sustainability' (2004).
- **Dutch *Knowledge Network on Systems Innovation &Transition***
  - complex systems analysis,
  - socio-technological and a governance perspective".
- Relies on research that has evolved since 1990s when "innovation & technology scholars … started to address environmental innovation and sustainability transitions more explicitly:
  - *technological innovation systems approach* (TIS) and
  - *multi-level perspective* (MLP) approaches has contributed.
- '***Sustainability Transitions Research Network*' (STRN, 2009/2010),**
- 'Routledge Studies in Sustainability Transitions' (2010),
- Journal '*Environmental Innovation and Sustainability Transitions*' (2011)
- **WBGU Report on a 'Social Contract for Sustainability' (2011)**

# 6.1. KSI definition & STRN goals

- **Dutch *Knowledge Network on Systems Innovation &Transition (KSI)***
  - Sustainability transitions are one of the great challenges of 21st century. Both scientists and politicians agree on the fact that our system is in need of fundamental transformation.
  - After WW II the Western world realized in a few decades a welfare state with prosperity for most people. By1970 a growing number of groups pointed to social and environmental risks which have come along with that progress.
  - Food crises, climate crises, financial and economic crises **increased the sense of urgency.** It is certain that **sustainable development will require a set of deep structural changes of modern societies**. Such processes of change are called transitions and take time, lots of time.
- ***Sustainability Transitions Research Network (STRN)***
  - to provide a **meeting place** for the international and multi-disciplinary community of scholars working in the field of sustainability transitions;
  - to **deepen the scientific understanding** of sustainability transitions through a program of networking, research coordination and synthesis activities;
  - to be a **leading resource for practitioners** such as actors in the arenas of policy making, civil society, and business who are working to advance societies into more sustainable directions.

# 6.2. **Sustainability Transitions Research Network**

- STRN is a wholly independent research-driven network governed by a steering group composed of leading researchers in the field. Membership of the STRN is open to anyone who is interested in research on sustainability transitions. The network aims to provide a space where researchers can engage in a vibrant intellectual exchange on the challenges of sustainability and find help and support in accessing resources, research topics and audiences for their work.
- STRN works to improve **scientific understanding of sustainability transitions through a program of networking, research coordination and synthesis activities** organized around **eight research themes** (see the network's ***research agenda***) that together define the research and policy challenges that the network is currently engaged with. The network promotes an active, energetic and well connected research community with an associated international journal (***Environmental Innovation and Societal Transitions***).
- STRN coordinates scientific capacity within the network towards the production of foresight reports on strategic sustainability policy questions. The ambition of the network is to support the development of a sustainability transitions research community internationally, and provide an independent, authoritative and credible source of analysis and insight into the dynamics and governance of sustainability transitions.
- This website provides further information about people, projects, upcomin

# 6.3. STRN Mission Statement: Research Priorities

1) To deepen the empirical basis for sustainability transitions research, deepening our answers to the questions – what are transitions and how can we steer them?
2) To move from concepts to theory, implying a deepening of the set of concepts already developed rather than the developing of many more concepts.
3) To explore transition processes occurring across multiple regions and outside of Europe.
4) To take the transitions approach into new problem domains such as health, education, and social security and the welfare state.

A variety of (highly institutionalised) processes tend to perpetuate existing systems:

- the knowledge, capabilities and employment of various actors relevant to the maintenance of existing systems;
- the technical infrastructures and institutions (that have developed over time to service those systems);
- the economies of scale and markets of incumbent systems;
- the social significance of these systems, and their links to political power;
- the mutually reliant clusters of technologies used by these systems; and,

# 6.4. STRN Mission Statement: Research Priorities

## *2.1. Understanding transitions*

**This theme focuses on the theoretical concepts and frameworks that can be applied to the analysis of sustainability transitions. In particular it focuses on synthesizing perspectives and approaches that can help to frame the study of transitions.**

## *2.2. Governance, power and politics*

**Research that focuses on improving our understanding of how purposeful governance processes can actively engage with and shape sustainability transitions; with a focus on the politics that are involved and the ways in which power plays out.**

## *2.3. Implementation strategies for managing transitions*

**Research focused on assessing the impact and effectiveness of instruments that aim to influence sustainability transitions in practice. And, building on lessons learnt, research that focuses on the design and testing of a next generation of instruments for managing transition processes.**

## *2.4. Civil society, culture and social movements in transitions*

**This theme addresses the role of civil society, culture and social movements in the initiation and acceleration of sustainability transitions.**

# 6.5. STRN Mission Statement: Research Priorities

## *2.5. The role of firms and industries in transitions*

**This theme addresses the role of firms and industries in developing markets that can help to initiate and enable sustainability transitions.**

## *2.6. Sustainable Consumption: Transitions in practice and everyday life*

**This theme focuses on the importance of consumption patterns in research on sustainability transitions, highlighting the need for a debate about what exactly sustainable consumption might entail and study of the ways in which sustainability transitions are played out in changes to everyday life, consumption and practices.**

## *2.7 The geography of transitions*

**Until now transition theory has paid too little attention to the spatiality of transitions - Why do transitions occur in one place and not in another? What is the role of cities and regions in transition processes?**

## *2.8. Modelling transitions*

**Research on the modelling of transitions is aiming to reproduce social complexity in formal mathematical models drawing upon the science of complex systems and evolutionary economics. The goal is to develop a capacity to undertake formal analysis of transition policies and management.**

# 6.6. Two Parallel Discourses

- The parallel discourse on '**sustainability transition'** addresses both the causes and impacts of GEC and GCC by facing & coping with both and **avoiding the projected societal consequences of dangerous or catastrophic climate change** and of possible tipping points in the climate system.
- From this perspective the goal of 'sustainable development' and the perspective on **'sustainability transition' refer to a much wider research agenda than the relatively narrow focus on environmental and technological innovations that is a primary focus of many researchers in the STRN.**
- Process of '**transition' refers to multiple long-term evolutionary and revolutionary transformative changes**.
- These must be distinguished since they have **different transformative results.** We may address them with four hypotheses:

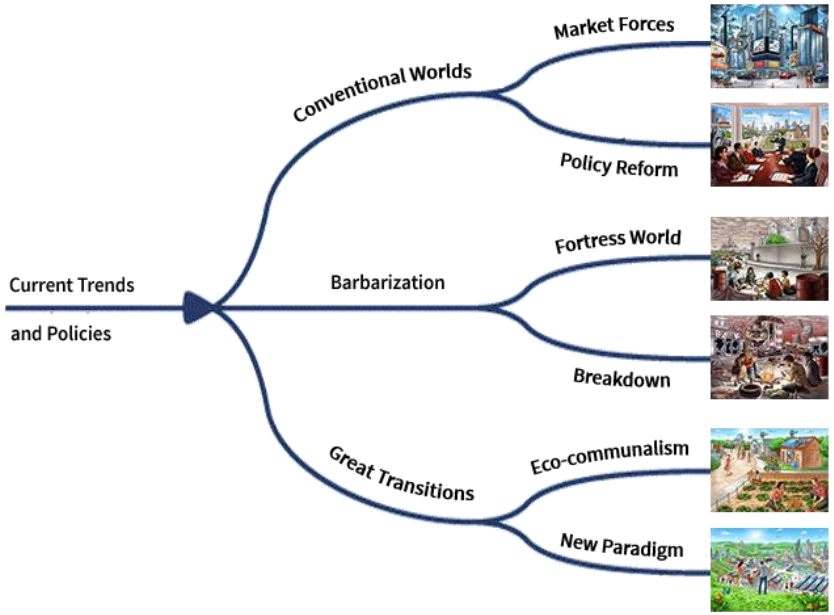
# 6.7. Research Approach and a Process: Sustainability Transition

- In their introduction to **"transitions to sustainable development", Grin, Rotmans, Schot** (2010: 2) used a definition by **Meadowcroft** (2000: 73), where **sustainable development aims at**
  - **"promoting human well-being, meeting the basic needs of the poor and protecting the welfare of future generations (intra- and intergenerational justice),**
  - **preserving environmental sources and global life-support systems (respecting limits, integrating economics and environment in decision-making, and**
  - **encouraging popular participation in development processes".**

# 6.8. Sustainability Transition: Origins and Conceptual Evolution since the 1970s

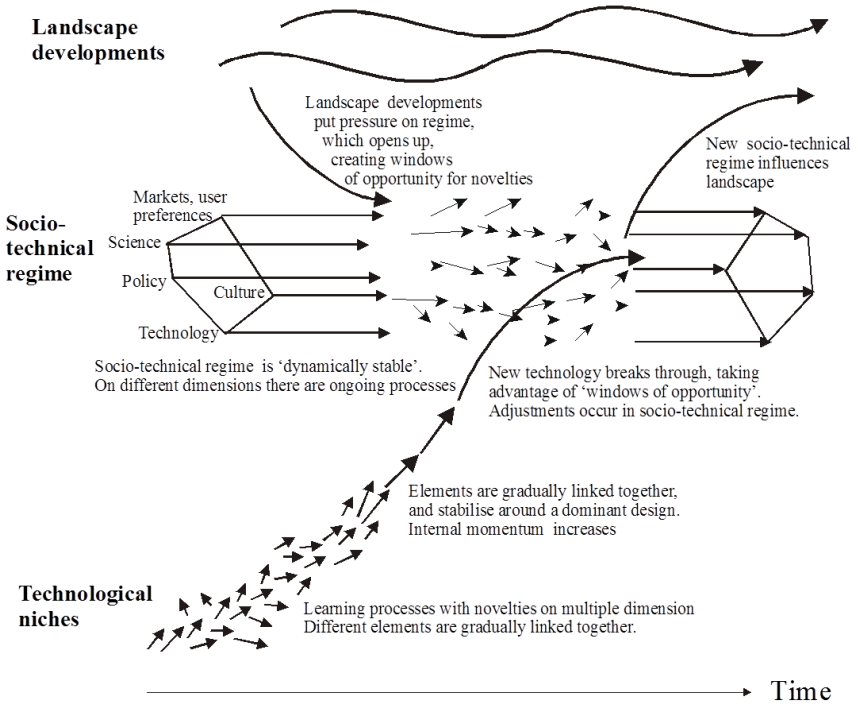
- Debate on 'sustainability transition' emerged first in the US in the 1970s and was taken up in a report by the **US Academy of Science (NRC 1999)** that focused on:
  - processes of a long-term system transformation necessary to contain & reduce effects of the dominant *business-as-usual* paradigm and to reduce GHG emissions through both *multilateral* quantitative emission reduction obligations & *unilateral* transformations.
- From 2005, a specific 'sustainability transition' research paradigm emerged from the ***Dutch Knowledge Network on Systems Innovation and Transition*** **(KSI)**
- At Amsterdam Conference in 2009 ***Sustainability Transition Research Network*** **(STRN)** was founded.

# 6.9. Two visions on sustainability transitions




Tellus Institute, since 1976 (Paul Raskin):
*Great Transition Initiative* (GTI)
coordinates a global network … [and] spreads the message that a future of enriched lives, global solidarity, and a healthy planet is possible if the citizens of the world join in a vast cultural and political mobilization for change. … It builds on the ground-breaking work of the international *Global Scenario Group*.

*Dutch Knowledge Network on Systems Innovation and Transition (*KSI) combined "three perspectives on transitions to a sustainable society: complexity theory, innovation theory, and governance theory".




**Dutch** Multilevel perspective on transitions. Geels and Schot (2010: 25), Geels (2002: 1263)

# 6.10. Approach of the US Tellus Institute

- In 2014, Paul Raskin, Tellus President, distinguished 3 global models:
  - ***Conventional Worlds*** **(business-as-usual),** a model which assumes structural continuity of present trends and actors,
  - ***Barbarization*** **(worst case), which** assumes "a deluge of instability swamps society's adaptive capacity, leading to a general global crisis and the erosion of civilized norms", and
  - ***Great Transitions*****, that imagines "how** the imperatives and opportunities of the Planetary Phase might advance more enlightened aspirations", envisioning the new values of "human solidarity, quality-of-life, and an ecological sensibility" instead of "individualism, consumerism, and domination of nature", and aiming for "institutions that support democratic global governance, well-being for all, and environmental sustainability".
- Raskin argued that at present: "Great Transition precursors announce themselves … in a rising cosmopolitan consciousness, civil society campaigns, and expanding subcultures seeking more responsible and fulfilling lifestyles." But while the technological feasibility may be easier, changing the cultural and political assumptions is more difficult. He claimed that "the Planetary Phase, by unravelling old patterns and mindsets and urging new ones, opens opportunities for creative social transformation" by fostering "the idea of global citizenship", which "carries both psychological and juridical meanings". But he cautioned that "intergovernmental institutions, transnational corporations, and big civil society organizations are unlikely candidates for the role of change agent", and hoped that "the natural change agent for a Great Transition would be a vast and inclusive movement of global citizens".
- The **Great Transition Scenario** distinguishes two pathways: "**Ecocommunalism" and "New Paradigm".**
  - First incorporates "**the green vision of bio-regionalism**, localism, face-to-face democracy, small technology, and economic autarky … [with the] emergence of a patchwork of self-sustaining communities from our increasingly interdependent world seems implausible",
  - **GTI embraces the "New Sustainability Paradigm**", which "sees globalization not only as a threat but also an opportunity to construct a planetary civilization rather than rely on the incremental forms of Conventional Worlds or retreat into localism. It envisions the ascendance **of new categories of consciousness—global citizenship, humanity-as-whole, the wider web of life, and the well-being of future generations—alongside democratic institutions of global governance".**

# 6.11. Dutch Approach since 2005

- A totally different approach to sustainability transition emerged from a large research project by the ***Dutch Knowledge Network on Systems Innovation and Transition (*KSI) in the Netherlands, in which eighty-five researchers participated (2005–2010**). Grin, Rotmans and Schot (2010) combined "three perspectives on transitions to a sustainable society: complexity theory, innovation theory, and governance theory". The authors
  - seek to understand **transitions dynamics**, and how and to what extent they may be influenced. … They do so from the conviction that only through drastic **system innovations and transitions** it becomes possible to **bring about a turn to a sustainable society to satisfy their own needs**, as inevitable for solving a number of structural problems on our planet, such as the environment, the climate, the food supply, and the social and economic crisis.
  - Our world has to overcome the **undesirable side effects of the ongoing 'modernization transition', which began around 1750.**
  - However, the **transition to sustainability has to compete with other developments**, and it is uncertain which development will gain the upper hand.
  - In ***Transitions to Sustainable Development*** **the authors … closely address the need for transitions, as well as their dynamics and design** (Grin/Rotmans/Schot 2010).

# 6.12. Sustainability Transition Research Network (STRN) since 2009

**STRN focuses on sustainability problems in energy, transport, water and food sectors from different scientific perspectives on the ways**

- in which society could combine economic and social development with the reduction of its pressure on the environment. A shared idea among these scholars is that due to the specific characteristics of the sustainability problems (ambiguous, complex) incremental change in prevailing systems will not suffice. There is a need for transformative change at the systems level, including major changes in production, consumption that were conceptualized as 'sustainability transitions'.

**STRN defined transitions research as a "new approach to sustainable development"**

**The STRN defined its mission as coordinating its scientific capacity "towards the production of foresight reports on strategic sustainability policy questions, … to support the development of a sustainability transitions research community internationally, and provide an independent, authoritative and credible source of analysis and insight into the dynamics and governance of sustainability transitions".**

# 6.13. German Scientific Advisory Report on a 'Social Contract for Sustainability

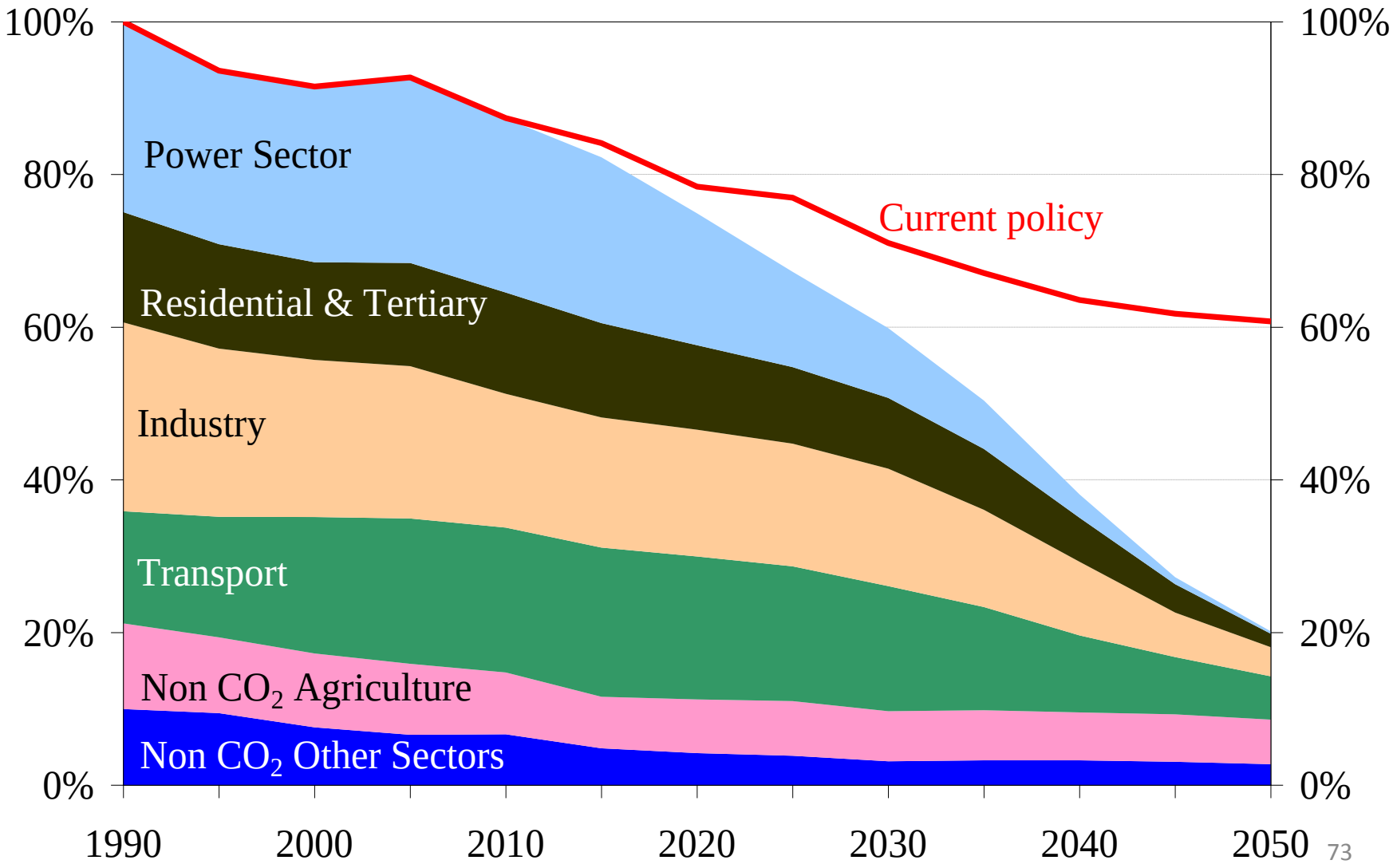
**Research focus of KSI & STRN influenced a policy report by the *German Advisory Council on Global Change* (WBGU 2011) on a 'Social Contract for Sustainability' (2011). It argued that the transformation to a low-carbon society requires that we**

- not just accelerate the pace of innovation; we must also cease to obstruct it. … We must also take into account the external costs of high-carbon (fossil energy-based) economic growth to set price signals, and thereby to provide incentives for low-carbon enterprises. Climate protection is … a vital fundamental condition for sustainable development on a global level.
- The WBGU report stated that "… a low-carbon transformation can only be successful if it is a common goal, pursued simultaneously in many of the world's regions" (WBGU 2011). It discussed (2011: 5) the global "remodelling of economy and society towards sustainability as a 'Great Transformation'. Production, consumption patterns and lifestyles in all of the three key transformation fields must be changed in such a way that global greenhouse gas emissions are reduced to an absolute minimum over the coming decades, and low carbon societies can develop."
- The transformation towards a climate-friendly society requires that many existing change agents lead to a "concurrence of multiple change" which "can trigger historic waves and comprehensive transformations".

# 6.14. Policy Debates on Green Growth and Decarbonization

- **UNEP (2011, 2014), OECD, the EU** and several governments have promoted an alternative vision and outlined **alternative policies for a global green deal, green growth, and a decoupling of economic growth from energy consumption**.
- These policy proposals were partly taken up by the **European Commission and the European Council** in its longer-term goals and policy papers on climate change, its energy (EU 2011), resource and transport policies (EU 2011a), and in its "**Roadmap for moving to a competitive low carbon economy in 2050**" **(EU 2011b).**
- **In this Roadmap the European Commission addressed the goal "of reducing greenhouse gas emissions by 80–95 per cent by 2050 compared to 1990". Based on these goals, the EU's Roadmap outlined milestones with "policy challenges, investment needs and opportunities in different sectors".**

# 6.15. EU's "Roadmap for moving to a competitive low carbon economy in 2050



# 6.16. Towards a New Research Paradigm in the Social Sciences

- While the policy debate since the publication of the Brundtland Report (1987) has partly triggered funding for new scientific institutions and research projects, the scientific debate has since moved much further from developing an approach to zero growth, to a reduction of the overuse of nature and the recuperation of ecosystem services that are essential for humans and nature.
- While natural scientists (Clark/Crutzen/ Schellnhuber 2004) e called for a 'second Copernican revolution in science' and the development of a new scientific world view and a new sustainability paradigm, in social sciences several approaches to 'sustainability research' exist:
  - the **'sociotechnical' approach of sociologists and historians** who examine technical innovations (inventions, breakthroughs and setbacks) in their specific national political, economic and societal contexts with the aim of drawing generalizable *lessons from past long-term transformative innovation processes* for the necessary transition to sustainable development;
  - the **'empirical approach' of *policy analysis*** that observes and assesses ongoing processes of sustainability transition, i.e. of discussion, planning, steering and implementation of processes of energy transition or change ("*Energiewende*");
  - '***discourse analysis***', that reviews and interprets scientific discourses, and the societal and political debates of multiple actors;
  - '***constraint analysis***', that analyses systemic (mindset), technical (laws of physics, status of innovation), ideological (e.g. cornucopian, Hobbesian), and interest-driven (lobbies of affected industries and trade unions) obstacles to strategies and policies aiming at sustainability transition.

# 6.17. We Must be Part of the Solution! Knowledge and Innovation Matter!

**Social scientists must**

- address causal linkages
- analyse many deadlokcs obstacles, interests that prevent proactive action
- Economic & social development paths & life style changes

**Natural scientists (engineers)**

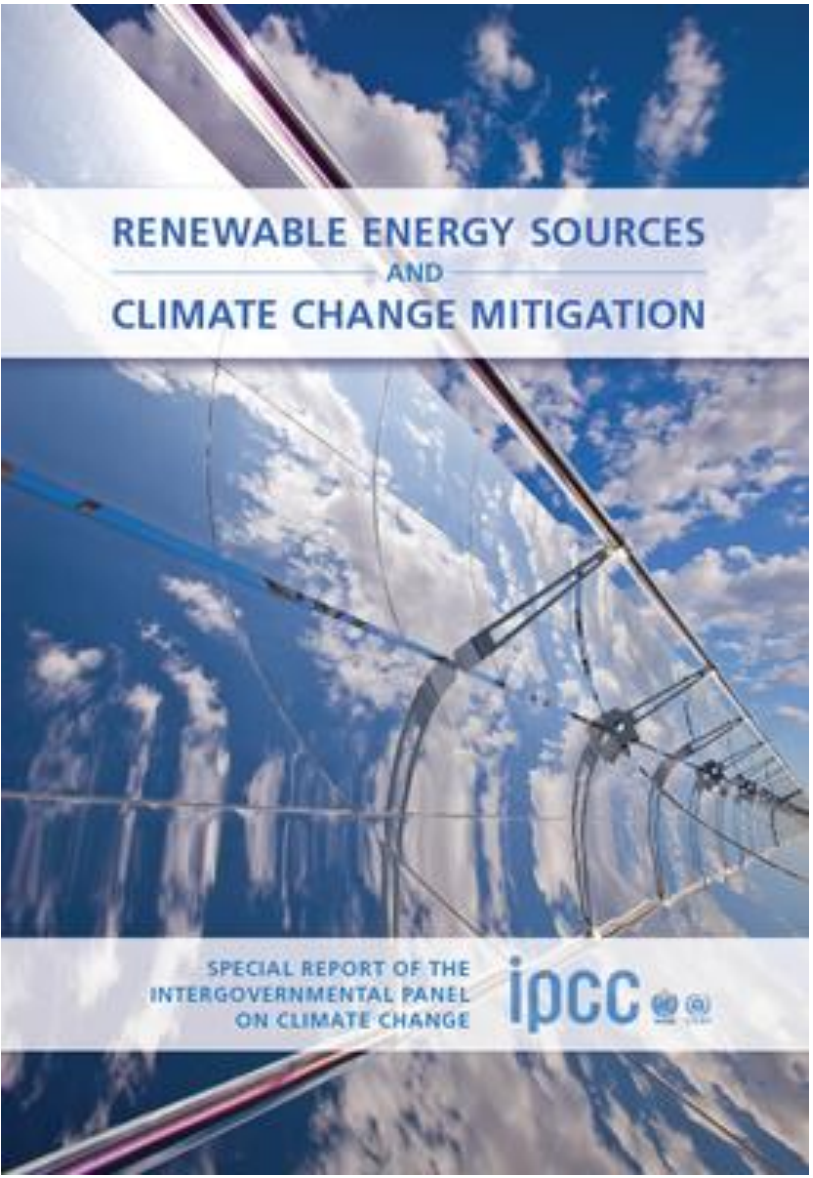
- Basic & applied research
- Energy resources efficiency

**Jointly we must develop:**

- Strategies for systems innovation & sutainability transition
- This requires multi-, inter- and transdisciplibary discussion, research and MA, PhD programmes

- **Sustainability:**
  - **Peace with nature (sustainable peace)**
  - **intergenerational**
- **Global Equity:**
  - **Historical: responsibility of industrialized countries**
  - **Now: also threshold countries**
- **Social Justice:**
  - **Transition to sustainability no technocratic (techn., econ.,pol.)**
  - **But a social process where environmental & societal impacts must be included & considered**
  - **Cooperation across disciplines (horizontal coordination in government & organizations matter**
  - **Universities: major contribution**

# 7.1. IPCC SRREN Report (2011)

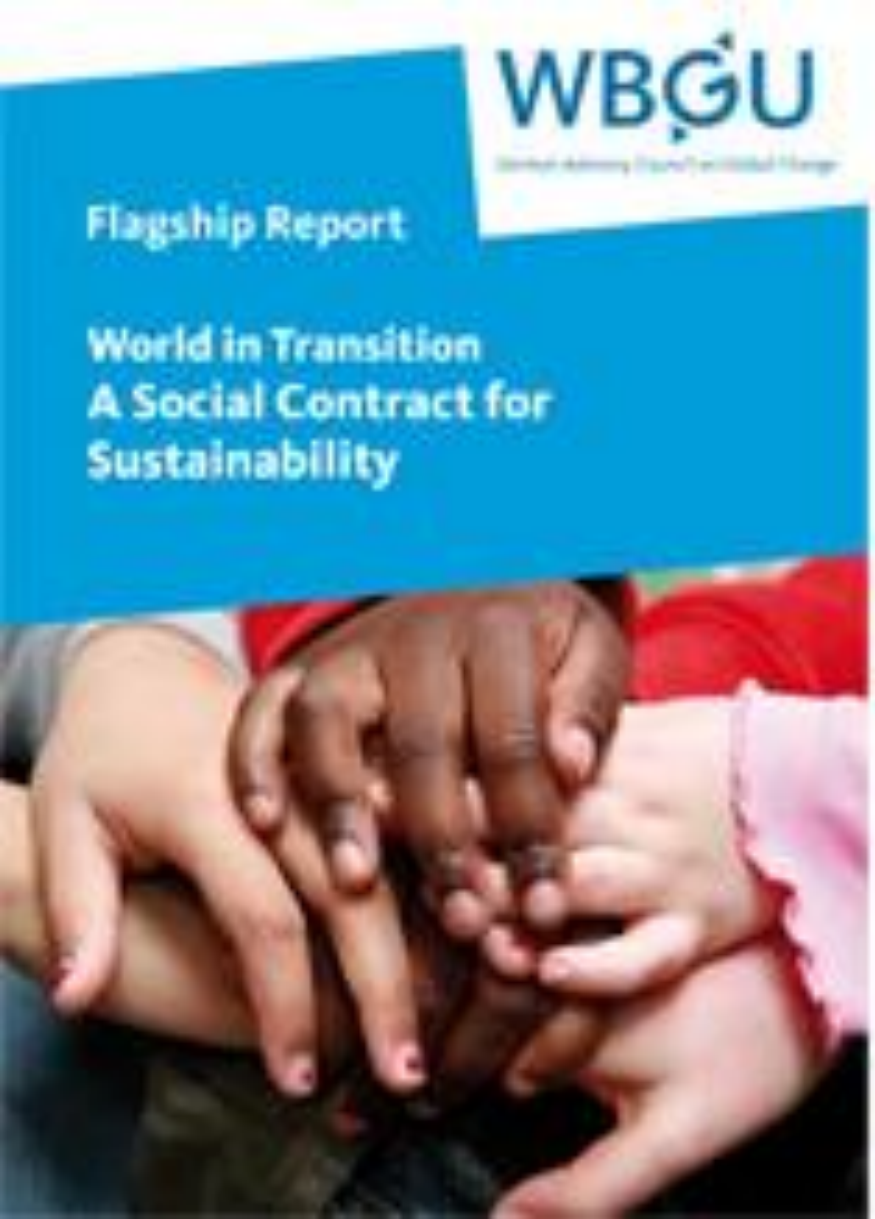



- **IPCC's (2011) Special Report on Renewable Energy Sources and Climate Change Mitigation (SRREN)**
- IPCC, 2011: **IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation. Prepared by Working Group III of the Intergovernmental Panel on Climate Change** [O. Edenhofer, R. Pichs-Madruga, Y. Sokona, K. Seyboth, P. Matschoss, S. Kadner, T. Zwickel, P. Eickemeier, G. Hansen, S. Schlömer, C. von Stechow (eds)]. Cambridge Univ. Press, Cambridge- New York, 1075 pp.
- WBGU's (2011: 119) assessment,
  - **"the sustainable potential of renewable energies is fundamentally sufficient to provide the world with energy".**

# 7.2. IPCC SRREN Report (2011)

- **According to IPCC's Summary for Policymakers (2011: 15):**
  - **"There are multiple pathways for increasing the shares of RE across all end-use sectors."**
  - **This applies specifically to the transport, building, and agricultural sectors and requires long-term integration efforts including investment in enabling infrastructure; modification of institutional and governance frameworks; attention to social aspects, markets and planning; and capacity building in anticipation of RE growth.**
  - Furthermore, integration of less mature technologies, including biofuels produced through new processes (also called advanced biofuels or next-generation biofuels), **fuels generated from solar energy, solar cooling, ocean energy technologies, fuel cells and electric vehicles, will require continuing investments in research, development and demonstration (RD&D), capacity building and other supporting measures.**

# 7.3. ST of other Economic Sectors

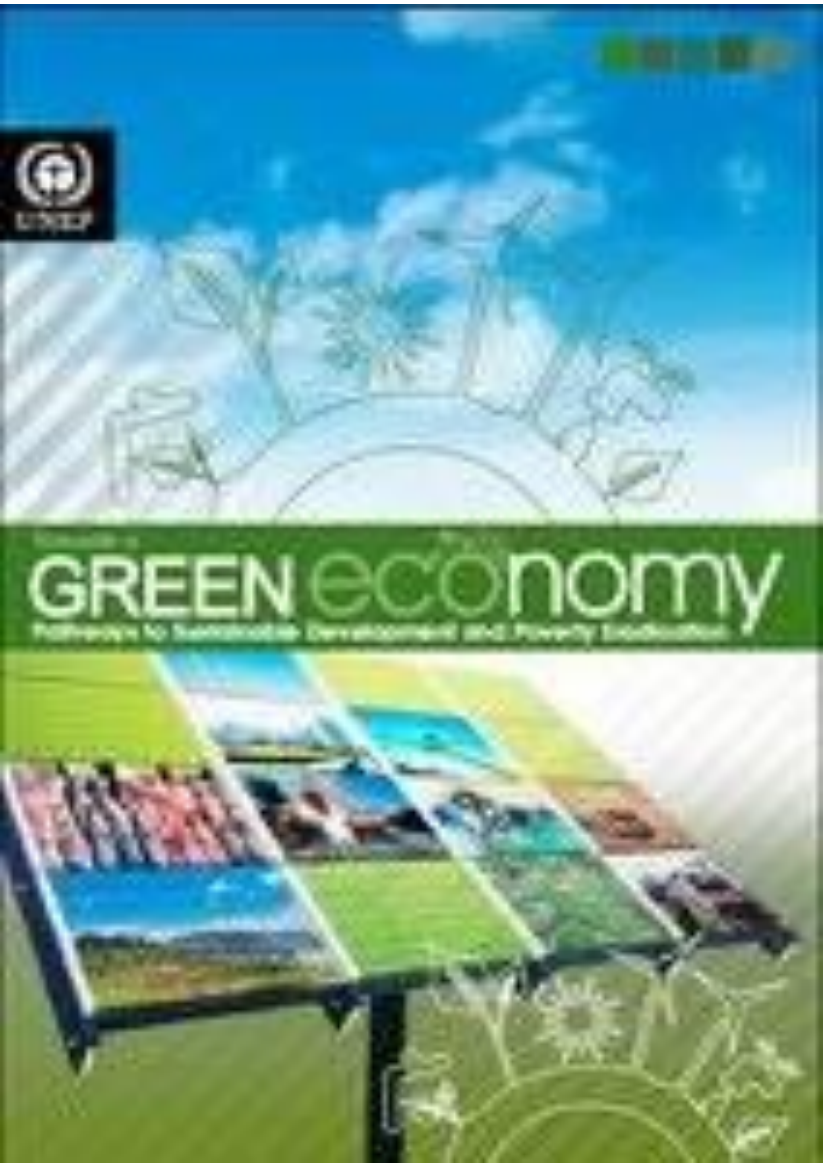



- Besides the fundamental transformation of the energy sector, WBGU Report (2011) proposed **an intensification of policies of sustainable production and consumption and major initiatives in buildings, living, and land use planning, in mobility and communication, and in food;**
- these will require both **climate-compatible agricultural management (supply site) and a change in dietary habits (demand site)**.

# 7.4. ST of other Economic Sectors

- Initiating & intensifying the move towards a low-carbon society and economy requires major investments & new and additional financial resources, such as **phasing out fossil energy and agricultural subsidies, taxation of international transport and international financial transactions, and development assistance and financing via the carbon market**.
- Besides the **decarbonization of world economy**, "**overcoming energy poverty**" and "to provide universal access to modern, clean and safe energy in the form of electricity or gaseous energy carriers by 2030" together present the second major challenge for a sustainable energy transition.

# 7.5. UNEP‘s Green Growth Report




- **Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication**
- The Green Economy Report is compiled by UNEP’s Green Economy Initiative in collaboration with economists and experts worldwide. It demonstrates that the greening of economies is not generally a drag on growth but rather a new engine of growth; that it is a net generator of decent jobs, and that it is also a vital strategy for the elimination of persistent poverty. The report also seeks to motivate policy makers to create the enabling conditions for increased investments in a transition to a green economy. **Download the Full Report (631 p. - 43MB)**
- **http://www.unep.org/greeneconomy/greeneconomyreport/tabid/29846/default.aspx**

# 7.6. OECD Reports


## Green Growth and Sustainable Development Forum:

- **OECD Green Growth Studies Series**

**http://www.oecd-ilibrary.org/environment/oecd-green-growth-studies_22229523**

OECD Green Growth Strategy aims to provide concrete recommendations & measurement tools, incl. indicators, to support countries' efforts to achieve economic growth & development, while ensuring that natural assets continue to provide the resources & environmental services on which well-being relies. The strategy proposes a flexible policy framework that can be tailored to different country circumstances and stages of development.

- **How to unlock investment in sup-port of green growth?(5-6.12.2013)**

**http://www.oecd.org/greengrowth/gg-sd-2013.htm**

# 7.7. Sustainable Transformation of Cities




- Initiating **sustainable transformation in cities** with the highest energy growth potential can become a major force of innovation and investment in new infrastructure. This **requires new governance actors** (Corfee-Morlot et al. 2009) who can reduce traffic by a “spatial integration of urban functions”, thus “achieving a high quality of life for inhabitants”.

  Further, **“energy infrastructure integration** (CHP technology, heating & cooling systems, smartgrids, electromobility, etc.) can benefit considerably from the spatial density” (WBGU 2011).

  While **“land-use systems cannot become completely emissions-free”,** nevertheless “a significant contribution from land use” is needed, including “stopping deforestation and switching to sustainable forest management, as well as the promotion of climate-friendly agriculture and dietary habits” (WBGU 2011:173).

# 8. Need for Transformative Social Science for Sustainability Transition

Oswald Spring and Brauch (2011) argued

- **We must overcome the prevailing business-as usual (BAU) mindset of policymakers**
- We must **challenge the dominant worldviews in science**. We need a new scientific revolution towards sustainability
- We **have rethink about the American & Western ways of life:** plenty & waste economy -> move towards a sufficiency economy (vision of the King of Thailand).
- We have to **rethink forms of governance and democracy that reinforce BAU** (USA, Canada, Japan, Australia etc.)

# 8.1. Addressing Obstacles to ST: Overcoming Old Mindsets & World Views

- Oswald Spring and Brauch (2011) argued that in the Anthropocene humankind is confronted with opposite ideal-type visions:
  - **Business-as-usual in a Hobbesian world where economic and strategic interests and behaviour prevail, leading to a major crisis for humankind in inter-state relations that will destroy the Earth** as the habitat for humans and ecosystems and put the survival of the vulnerable at risk (see the 'market first' and 'security first' scenarios of UNEP 2007).
  - **The need for a transformation of global cultural, environmental, economic** (productive and consumptive patterns), and **political** (with regard to human and interstate) **relation**s (see the 'sustainability first' scenario of UNEP 2007).

# 8.2. Alternative Visions & Strategies

- **Both visions refer to totally different strategies for coping with GEC:**
  - In the first vision of **business-as-usual, Cornucopian perspectives predominate** that suggest primarily market mechanisms, technical fixes, and the defence of economic, strategic and national interests by adaptation strategies that are in the interests of OECD countries.
  - In the alternative vision of a **comprehensive transformation, a sustainable perspective** has to be implemented and developed into effective new strategies and policies with different goals and using different means, based on global equity and social justice.

# 8.3. Consequences of Both Visions

- The consequences of both opposing scientific visions and the competing policy perspectives are:
  - **The vision of business-as-usual** with minimal reactive adaptation and mitigation strategies will most likely increase the probability of a '**dangerous climate change' or catastrophic GEC** with both linear and chaotic changes in the climate system and their sociopolitical consequences. This represents a high-risk approach.
  - To avoid these consequences the **alternative vision and sustainability perspective requires a change in culture (thinking on the human-nature interface), world views (thinking on systems of rule, e.g. democracy vs. autocracy, and on domestic priorities and policies, as well as on interstate relations in the world), mindsets** (strategic perspectives of policymakers), and **new forms of national and global governance.**

# 8.4 Alternative Vision

- This alternative vision refers to the need for a "**new paradigm for global sustainability"** and for a **"transition to [a] much more sustainable global society" aimed at peace, freedom, material well-being, and environmental health**.
- **Changes in technology and management systems** alone will not be sufficient, but "**significant changes in governance, institutions and value systems**" are needed, resulting in a fourth major transformation following "the stone age, early civilization and the modern era".
- These **alternative strategies should be "more integrated, more long-term in outlook, more attuned to the natural dynamics of the Earth System and more visionary".**
- These many changes suggested by natural scientists require a '**Fourth Sustainability Revolution**'.

# 8.5. Three Obstacles

## Results of Business as Usual: The Climate Paradox

- I argue that Canada, USA, Japan and rapidly industrializing threshold countries (G-20), who account for more than eighty per cent of GHG emissions, have faced a climate paradox due to their inability or lack of political will to implement their legal commitments or policy declarations. However, the different performance of the climate laggards and the of new climate change leaders show that it is not the 'system of rule') but rather the different political cultures in Europe and in North America that have influenced different policy performance.

## Neo-Malthusian Dead End: Securitization to Militarization

- Hobbesian pessimists, concerned about the national security implications of global environmental and climate change that are being interpreted by the dominant realist policy mindset, have used this argument to adjust their force structure and military means to be able to cope with these major challenges. From this, primarily US-focused, national security perspective on climate change, the securitization of the impacts of climate change as a force multiplier may result in militarization.

## The Cornucopian Dead End of Geo-engineering

- From the opposite 'Cornucopian' perspective, the solution to the challenges posed by global environmental and climate change may be technical fixes that have been offered by those who call for macro-scale projects of geo-engineering.

# 8.6 Towards a Sustainable Transition with Sustainable Peace

- The prevailing **policy mindset** that favoured policy solutions based on 'business as usual" resulted in a **climate paradox** and in a comprehensive paralysis of global multilateral environmental governance, at Copenhagen (2009), Cancun (2010), Durban (2012), Rio de Janeiro (2012) and Warsaw (2013).
- The **narrow neo-Malthusian national security perspective** on the security implications of climate change may result in **militarization**, while the **Cornucopian perspective believes that market mechanisms & technical fixes could cope with the impacts of anthropogenic climate change**.

# 9. Sustainability Transition in the Energy Sector

## Six Greenhouse Gases:

**$CO_2$ - Carbon dioxide**
$CH_4$ - Methane
$N_2O$ - Nitrous oxide
PFCs - Perfluorocarbons
HFCs - Hydrofluorocarbons
$SF_6$ - Sulphur hexafluoride

## Major Sectors as Producers of CO2:

- **Energy**
- Transportation (mobility)
- Industry (production)
- Agriculture (food production)
- Housing (warming, air conditioning)

# 9.1 Sustainability Transition: Four Actors

- **Four Key actors: Case of (Renewable) Energy**
  - **Government:**
    - **Setting the Legal Framework,**
    - **Developing and adopting the Development Path and Priorities and**
    - **Resource Allocation for Research, Development, initial subsidies**
  - **International Governmental Organizations: UNEP, OECD, ADB,**
  - **Regional Governmental Organizations: EU and ASEAN**
    - **Global and regional agenda setting: research, publications, debate**
  - **Economic Sector:**
    - **Government Incentives: Innovation & New Products**
  - **Society: Awareness and readiness to act**
    - **Must have options for choice: e.g. public transportation, electric car etc.**
  - **Knowledge: for present & next generation: initiate innovation**
    - **Knowledge Creation (Research)**
    - **Dissemination (Education)**

# 9.2 Top-down vs. Bottom-Up Supply-side vs. Demand-side

- **Top-down:** Governments, International organization
  - Action by governments are necessary but not sufficient
  - Governments: legal framework & economic incentives
  - Economic interests: often business as usual (money)
  - International gov. organizations: awareness, framework
- **Bottom-Up:** People (society, knowledge)
  - Public awareness, societal support, political pressure
- **Supply-Side: alternative services & goods**
  - **Economic Sector: Industry in niches (renewables)**
  - **Energy sector:** more energy efficient products (bulbs)
  - Hybrid cars, electricity cars (electricity from renewables)
- **Demand-Side: Public acceptance of change**
  - Awareness & willingness to pay more
  - Government: Tax incentives, time limited subsidies

# 9.3 Legal Basis for Renewables in Germany

- **1991: Electricity Feed-in Law** (Chancellor Kohl) legal basis for wind industry to feed into the grid at a higher than market price (subsidized by energy consumers), primarily for wind power
- **2000: Act Granting Priority to Renewable Energy Sources (EEG)** (Chanc. Schröder): operators of plants generating electricity from renewable energy sources are entitled to a fixed compensation for electricity fed into the grid from grid operator (included geothermal energy)**.**
- **100,000 Roof Programme (PV)**
- **2004:** Reduction for subsidies for wind power**,** increased subsidies for photovoltaic solar energy
- **2009: (**Chanc. Merkel) goal to increase RE 30% of electricity generation by 2020 and for solar thermal (heating systems), degression of subsidies for PV
- **2011:** reduction of subsidies for PV by 9-13%.
- **2013: Liberals made high electricity prices a campaign issues: did not return to the parliament**
- **New big coalition: Christian Democrats (CDU) and Social Democrats (SPD): goal 40% for renewables in electricity by 2020 (very ambitious goal)**

# 9.4. Economic Instrument: “Feed in Tariffs”

- Certificates of renewable energy (environmental attributes)
- Incentives based on production
- Incentives based on capacity
- Policy of fixed prices
- Incentives based on real costs of renewable energy
- Tariffs of RE
- Costs (in real time per site; long-term projections for enterprises
- Fiscal credits for investments
- Fiscal credits for production

# 9.5. Politics: High Consensus on Climate Change and Renewables

- **Despite many disputes on details, there was a high level of support for climate change goals and renewable energy since 1990**
- Chancellor **Kohl** (1983-1997): cons., liberal
- Chancellor **Schröder** (1997-2005): left, green
- Chancellor **Merkel** (2005-2009): conservative, left
- Chancellor **Merkel** (2009-2013): conservative, liberal
- Chancellor **Merkel (2013-?):** conservative, left
- **Major dispute on nuclear energy (1997-2011)**
  - **Schröder for moving out of nuclear energy by 2020**
  - **Merkel** extended running time for reactors to 2030s.
  - **Part of profits of electricity companies for renewables!**
  - **After Fukushima: Ethics committee (end of nuclear energy by 2022)**

# 9.6. Implementing GHG Reduction Goals

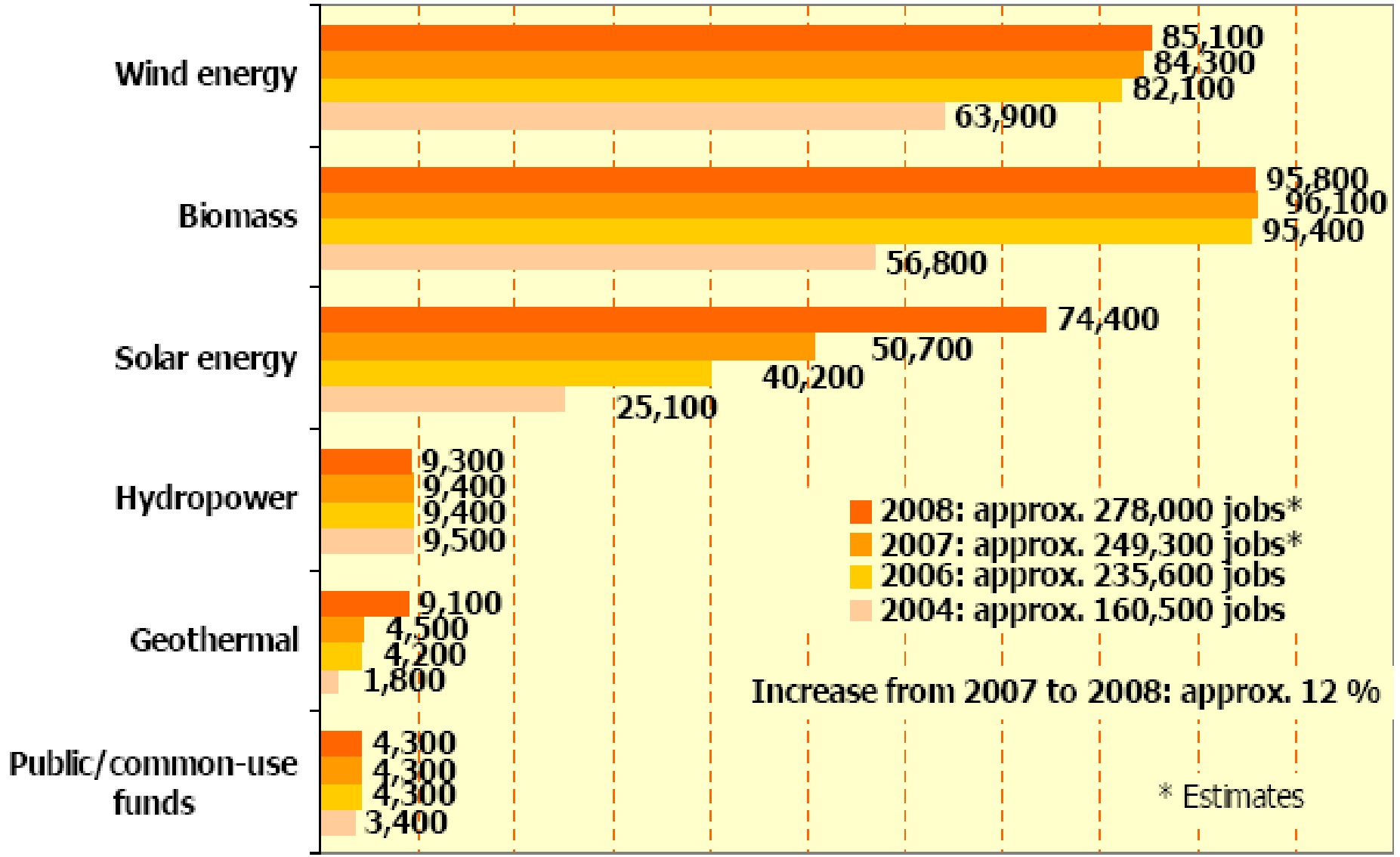
- Preparation: Parliamentary Commission on Climate Change (1987-1990, 1991-1994)
- Pioneer: Environment Ministry: Töpfer/Merkel
- Initial goal: -25% by 2005, later by 2010 (1990)
- COP 1 (1995) in Berlin: Berlin Mandate
- COP 3 (1997) in Kyoto: -5,1% (2008-12) (1990)
  - Legal obligation: -8% until 2012 based on GHG in 1990

EU goals (solidarity principle): Germany – 21%

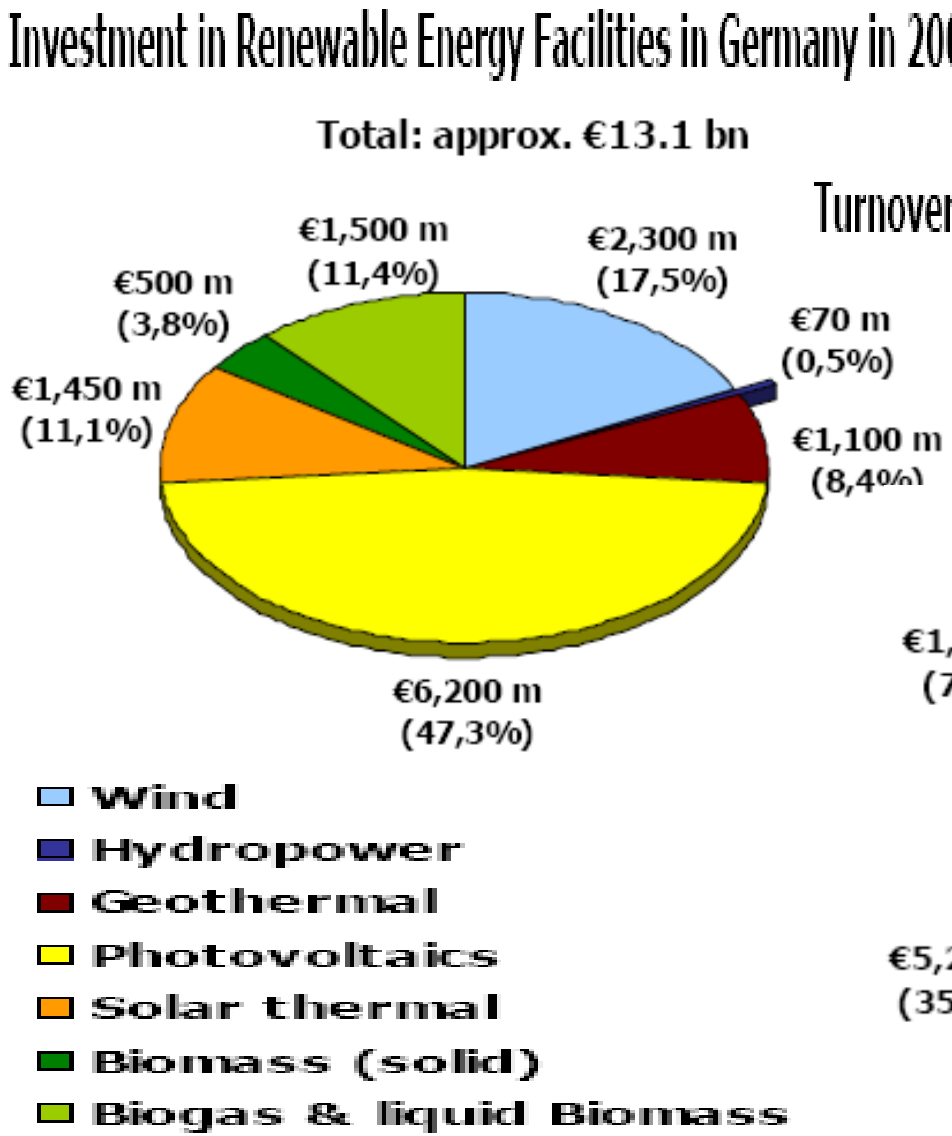
By 2007 (a reduction of 20% was achieved)

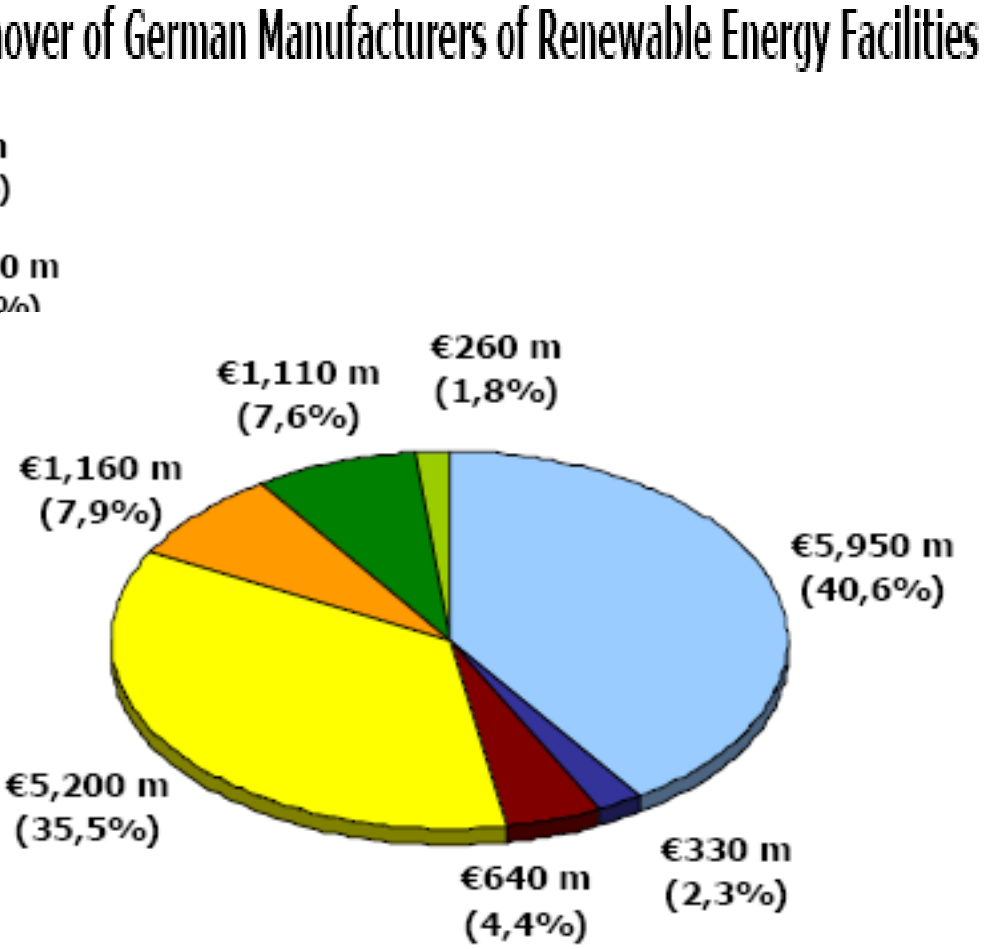
By 2011 (a reduction of 27% (EEA Rep., March 2013)

# 9.7. Development of Jobs (2004-2008)



# 9.8. Investment and Turnover (2008)



# 9.9. Renewables in Germany (2013)

- **Share of electricity produced from renewable energy has increased from 6.3 % of national total in 2000 to 25 % in first half 2012.**
- **In 2011 20.5% (123.5 TWh) of Germany's electricity supply (603 TWh) was produced from renewables, more than 2010 contribution of gas-fired power plants.**
- **In 2010, investments 26 billion € in Germany's renewable energies sector.**
- Germany " world's first major renewable energy economy".
- More than **21,607 wind turbines** are located in the German federal area and the country has plans to build more wind turbines. In 2011, Germany's fed.government is working on a new plan for increasing **renewable energy commercialization**, with a particular focus on **offshore wind farms**.[ A major challenge is the development of sufficient network capacities for transmitting the power generated in the North Sea to the large industrial consumers in southern Germany.
- **According to official figures, some 370,000 people in Germany were employed in the renewable energy sector in 2010, especially in small and medium sized companies. This is an increase of around 8 % compared to 2009 (around 339,500 jobs), and well over twice the number of jobs in 2004 (160,500). About two-thirds of these jobs are attributed to the Renewable Energy Sources**

# 9.10. German Renewable Energy Targets

- Since the passage of Directive on Electricity Production from Renewable Energy Sources in 1997, Germany and the other states of the European Union have been working towards a **target of 12% renewable electricity by 2010**. Germany passed this target early in **2007 when the renewable energy share in electricity consumption in Germany reached 14%.**

September 2010 German government announced these new energy targets:

- **Renewable electricity** - 35% (2020), 50% ( 2030,) 65% (2040), 80% (2050)
- **Renewable energy** - 18% (2020), 30% (2030), and 60% (2050)
- **Energy efficiency** - Cutting total energy consumption by 20% from 2008 by 2020 and 50% less by 2050

Total electricity consumption - 10% below 2008 level by 2020 and 25% by 2050

- The German Government reports that in 2011 renewable energy (mainly wind turbines and biomass plants) generated more than 123 TWh (billion kilowatt-hours) of electricity, providing nearly **20% of the 603 TWh of electricity supplied.**
- In 2012, all renewable energy accounted for 21.9% of electricity, with wind turbines and photovoltaic providing 11.9% of the total.[

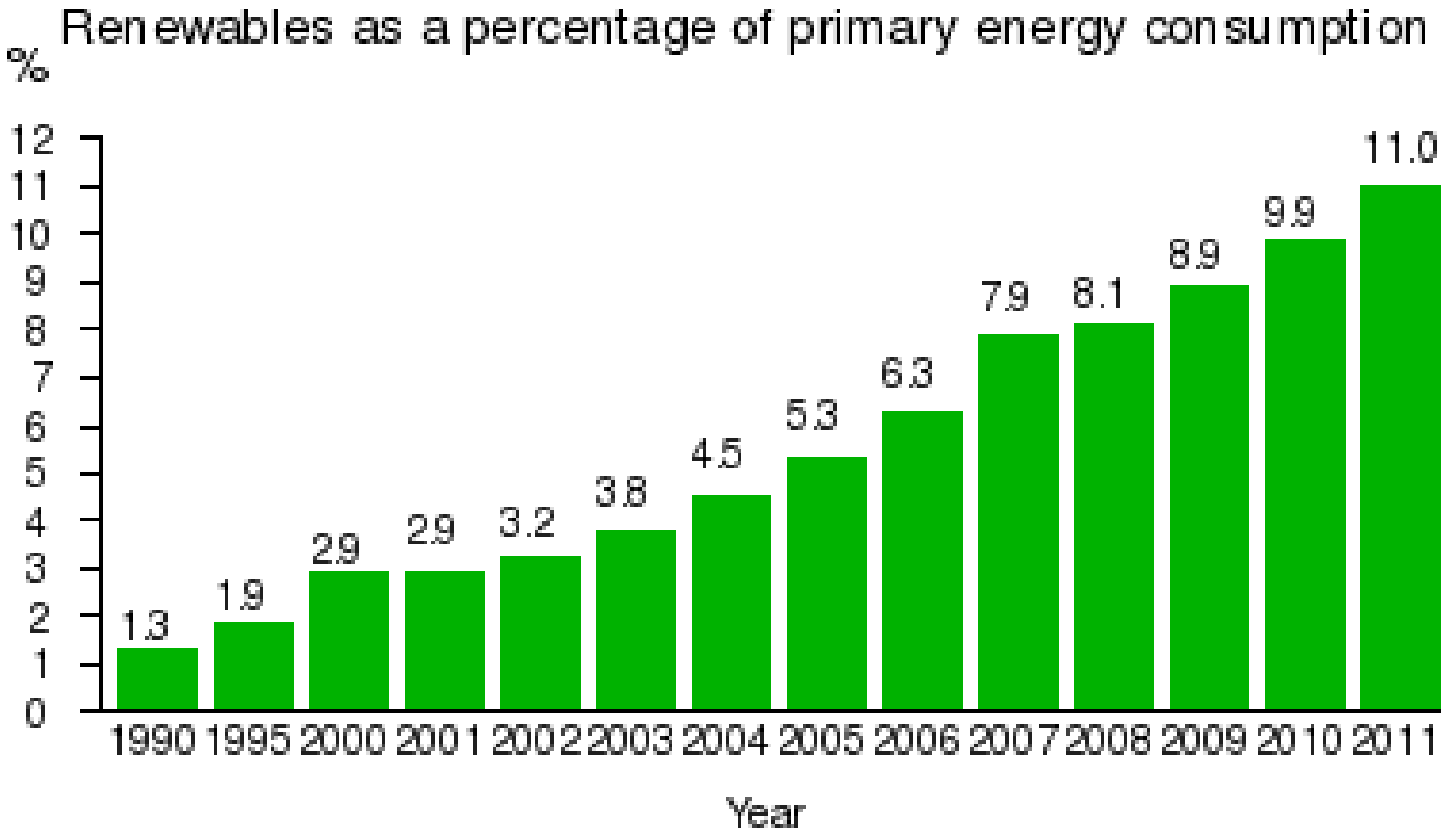
# 9.11. German Renewable Energy Policy

- Renewable energy benefited from Left/Green coalition (1998- 2005).
- **Renewable Energy Sources Act** (**2000**) promotes renewables energy by feed-in tariffs that grid operators must pay for renewable energy fed into the power grid. People who produce renewable energy can sell their 'product' at fixed prices for a period of 20 or 15 years. This has created a surge in the production of renewable energy.
- For the 2005–2010 period the **Federal Government** set aside nearly **800 million € for scientific research in the country**. That research will be earmarked for policies of long-term development. Additionally, in **2001 a law was passed requiring the closing of all nuclear power plants within a period of 32 years**. The shutdown time was extended to 2040 by a new government in 2010. **After the Fukushima incident, the law was abrogated and the end of nuclear energy was set to 2022**.
- The German energy policy is framed within the European Union, and the March 2007 European Council in Brussels approved a mandatory energy plan that requires a 20% reduction of carbon dioxide emissions before the year 2020 and the consumption of renewable energies to be 20% of total EU consumption (compared to 7% in 2006).[ The accord indirectly acknowledged the role of nuclear energy — which is not commonly regarded as renewable, but emissions-free — in the reduction of the emission of greenhouse gasses, allowing each member state to decide whether or not to use nuclear generated electricity.[
- Also a compromise was reached to achieve a minimum quota of 10% Biofuels in the total consumption of gasoline and diesel in transport in 2020.

# 9.12. Energy Transition Goals

- "Energy transition" designates a significant change in energy policy: a reorientation of policy from demand to supply and a shift from centralized to distributed generation (e.g. producing heat and power in very small cogeneration units), which should replace overproduction and avoidable energy consumption with energy-saving measures and increased efficiency.
- key policy document outlining the *Energiewende* was published by the German government in September 2010, some six months before the Fukushima nuclear accident.[1] Legislative support was passed in 2011. Important aspects include:
  - greenhouse gas reductions: 80–95% reduction by 2050
  - renewable energy targets: 60% share by 2050 (renewables broadly defined as hydro, solar and wind power)
  - energy efficiency: electricity efficiency up by 50% by 2050
  - an associated research and development drive
- The policy has resulted in a huge expansion of renewables  wehre Germany's share increased from around 5% in 1999 to 22.9% in 2012, reaching close to the OECD average of 18% usage of renewables. Energy co-operatives were created, efforts were made to decentralize control and profits. Large energy companies have a disproportionately small share of renewables market. Nuclear power plants were closed, and existing 9 plants will  close earlier than planned for, in 2022.
- In May 2013, the International Energy Agency commended Germany for its commitment to developing a comprehensive energy transition strategy, ambitious renewable energy goals and plans to increase efficient energy use and supported this approach. Scale of Germany's energy policy ambitions, coupled with the large size and energy intensity of its economy, and its central location in Europe's energy system, further policy measures need to be developed if the country's ambitious energy transition, is to maintain a balance between sustainability, affordability and competitiveness. [1]
- To date, **German consumers have absorbed the costs**, but the IEA says that the debate over the social and economic impacts of the new approach has become more prominent as the share of renewable energy has continued to grow alongside rising electricity prices.
- The **transition to a low-carbon energy sector requires public acceptance**, and, therefore, retail **electricity prices** must remain at an affordable level. Presently, German electricity prices are among the highest in Europe, despite relatively low wholesale prices.. At the same time, the IEA said that the new energy policy is based on long-term investment decisions, and a strong policy consensus in Germany in favour of large-scale renewable energy commercialisation exists.

# 9.13. Renewables as % of primary energy consumption in Germany



# 9.14. CDU/SPD Coalition Contract (2013)

- **Both parties agree that climate change remains a major policy goal**
- **Goal to reduce national GHG by at least 40% by 2020**
- **Within the EU they will support the goal of a 40% GHG reduction by 2030 as part of: GHG emission reduction, icnrease of reneables, efficiency improvements.**
- **In Germany the goal is to reduce GHG emissions by 80-95% by 2050.**
- Goal for expansion of renewables in Germany within a legally binding agreement is : 40-45 % by 2025, 55-60 % by 2035.
- Annually there will be a monitoring of achievements of goals, expansion of the network & affordability for the people.
- Until 2022 Germany will move out of nuclear energy.
- On the EU level Germany will support an energy transition.

# 10. Climate Policy & Energy Transition Goals in EU & Global Capacity Wind, Solar

- Energy transition is fully under way
- Leading country: has been Germany since 1995
  - Wind power until 2007 (highest installed capacity): China, USA, Germany, Spain
  - Solar photovotaic energy 2012: Germany, China, US
  - Concentrated solar power (CSP): Spain, USA
  - Geothermal: negat. implications, local earthquakes
  - Biomass & Biofuel: competition with food production and environmental impacts (small, dust)
- Introduction is due to interaction Top-down (supply) & Bottom-up (Demand)

# 10.1. European Union: Climate Change Goals and Commitments until 2020

- **Achievements of Kyoto Goals of EU countries according to internal division**
- **EU Climate Policy Goals for 2020:** (2013ff.)
  - 20 % GHG reductions by 2020 (by 30% if other countries make major commitments)
  - **20 % increase in energy efficiency**
  - **20 % share of renewables**
- EU Green Paper on Renewables
- EU Union for the Mediterranean: Solar Plan

# 10.2. EU Renewables Policy Goals for a Sustainable Energy Policy by 2020

**New Energy Strategy Focuses on Five Priorities:**

1. **Achieving an energy-efficient Europe (4 key actions)**
   - **1: Tapping biggest energy-saving potential (buildings, transport)**
   - **2: Reinforcing industrial competitiveness by making industry more efficient**
   - **3: Reinforcing efficiency in energy supply**
   - **4: Making the most of National Energy Efficiency Action Plans**
2. Building a truly pan-European integrated energy market;
3. Empowering consumers, highest level of safety and security;
4. Extending Europe's leadership in energy technology/innovation;
5. Strengthening the external dimension of the EU energy market.

**International and interregional Policies:**

- **Barcelona Process (Union for the Mediterranean)**
- **Cooperative Projects (Research, Development)**

# 10.3. Global Development of Renewables

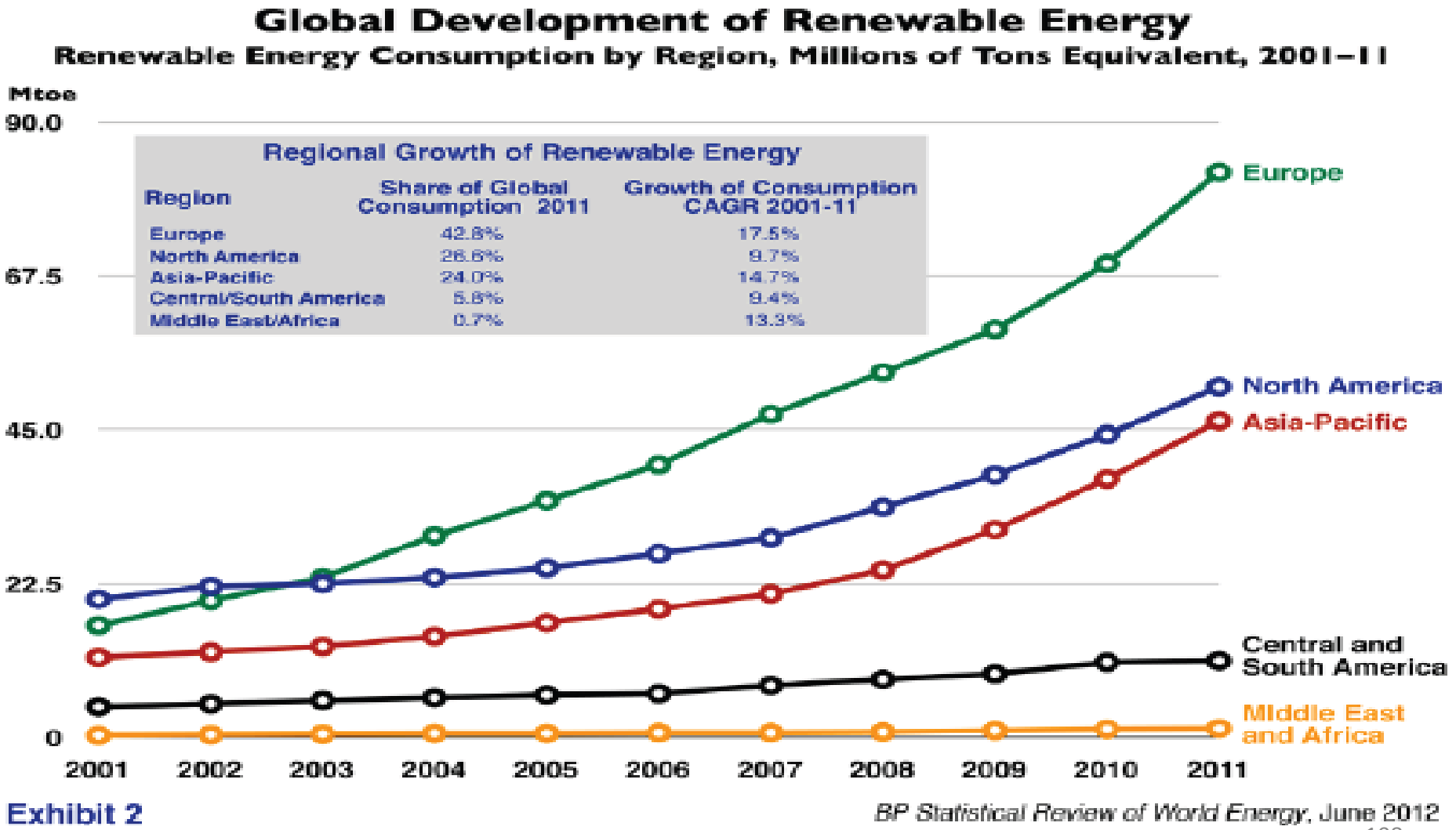
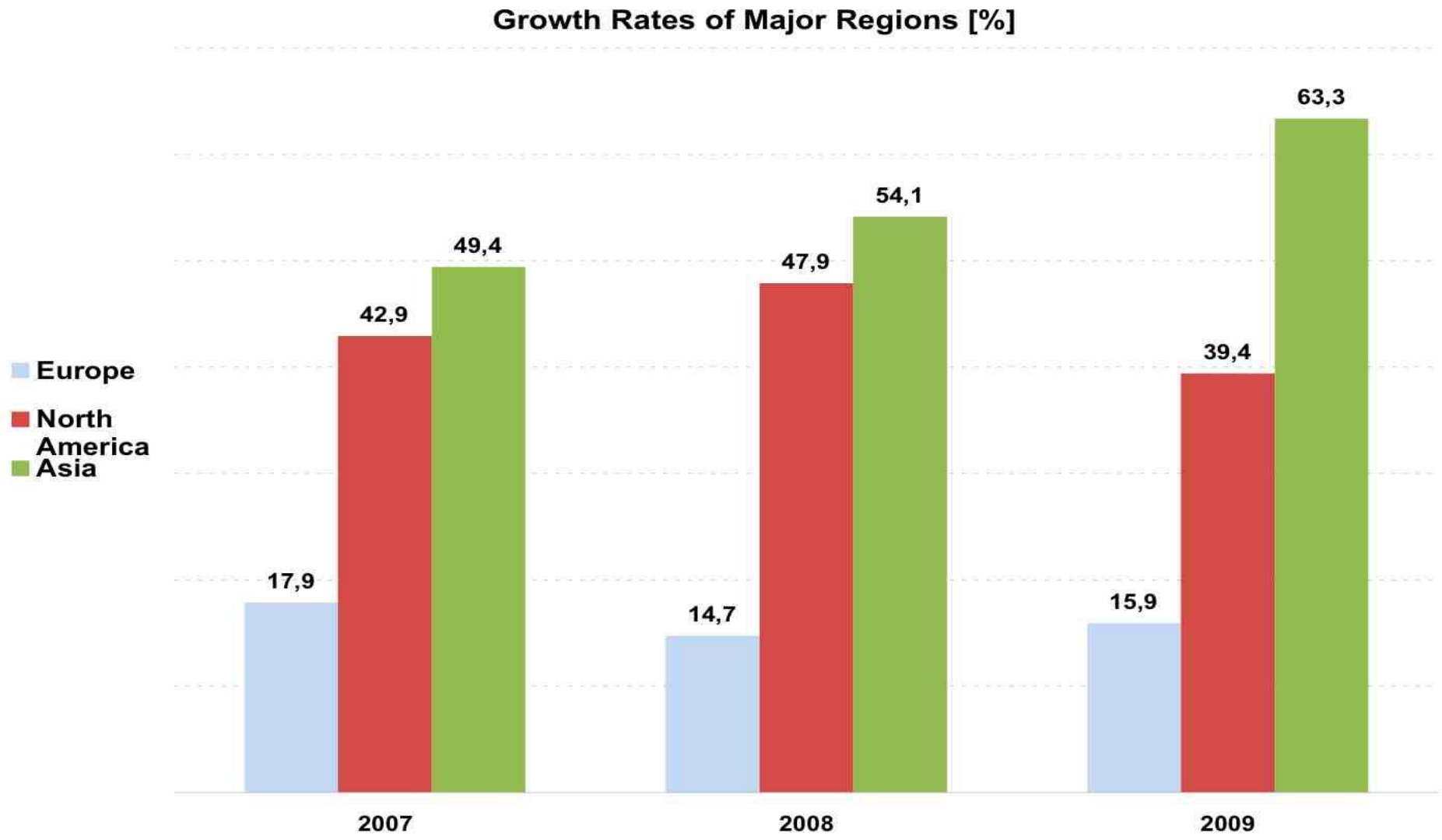



Exhibit 2

*BP Statistical Review of World Energy*, June 2012

# 10.4. Growth Rates of Regions

**Source:** World Wind Energy Report 2009 (10 March 2010)



# 10.4. Renewable Energy Investments

## Source: David Bartlett, Economic Advisor, RSM (BP)

### Leading Recipients of Clean Energy Investments

Billion USD, 2012

| Rank | Country | Amount | Change from 2011 |
|---|---|---|---|
| # 1 | China | $ 65.1 | + 20.3% |
| # 2 | United States | 35.6 | – 37.3% |
| # 3 | Germany | 22.8 | – 27.2% |
| # 4 | Japan | 16.3 | + 75.3% |
| # 5 | Italy | 14.7 | – 51.2% |
| # 6 | United Kingdom | 8.3 | – 17.0% |
| # 7 | India | 6.9 | – 44.8% |
| # 8 | South Africa | 5.5 | + 18,233% |
| # 9 | Brazil | 5.3 | – 32.1% |

# 10.5. Leading Clean Energy Investments

## Source: David Bartlett, Economic Advisor, RSM

### Growth of Clean Energy Investments

Leading Countries

| Rank | Country | Growth Rate 2007–11 |
|---|---|---|
| # 1 | South Africa | 226% |
| # 2 | Japan | 46% |
| # 3 | Italy | 35% |
| # 4 | China | 35% |
| # 5 | Turkey | 26% |

### Types of Clean Energy Investments

Billion USD, 2012

| Technology | Amount | Change from 2011 |
|---|---|---|
| Solar | $ 126.0 | – 16.0% |
| Wind | 72.7 | – 14.5% |
| Biofuels | 2.6 | – 47.0% |
| Other | 13.5 | – 32.5% |

- Geothermal
- Marine
- Small Hydro
- Waste-to-Energy

# 10.6. Global Leaders in Renewables

## Source: David Bartlett, Economic Advisor, RSM (BP)

### Total Installed Capacity
**Gigawatts, 2012**

| | | |
|---|---|---|
| # 1 | China | 152 GW |
| # 2 | United States | 133 GW |
| # 3 | Germany | 71 GW |
| # 4 | Spain | 34 GW |
| # 5 | Italy | 31 GW |
| # 6 | India | 30 GW |
| # 7 | Japan | 27 GW |
| # 8 | Brazil | 16 GW |
| # 9 | United Kingdom | 15 GW |
| #10 | France | 14 GW |

### Installed Solar Capacity
**Megawatts, 2011**

| | | |
|---|---|---|
| # 1 | Germany | 24,820 MW |
| # 2 | Italy | 12,782 MW |
| # 3 | Japan | 4,914 MW |
| # 4 | United States | 4,389 MW |
| # 5 | Spain | 4,270 MW |
| # 6 | China | 3,000 MW |
| # 7 | France | 2,576 MW |
| # 8 | Czech Republic | 1,959 MW |
| # 9 | Belgium | 1,820 MW |
| #10 | Australia | 1,345 MW |

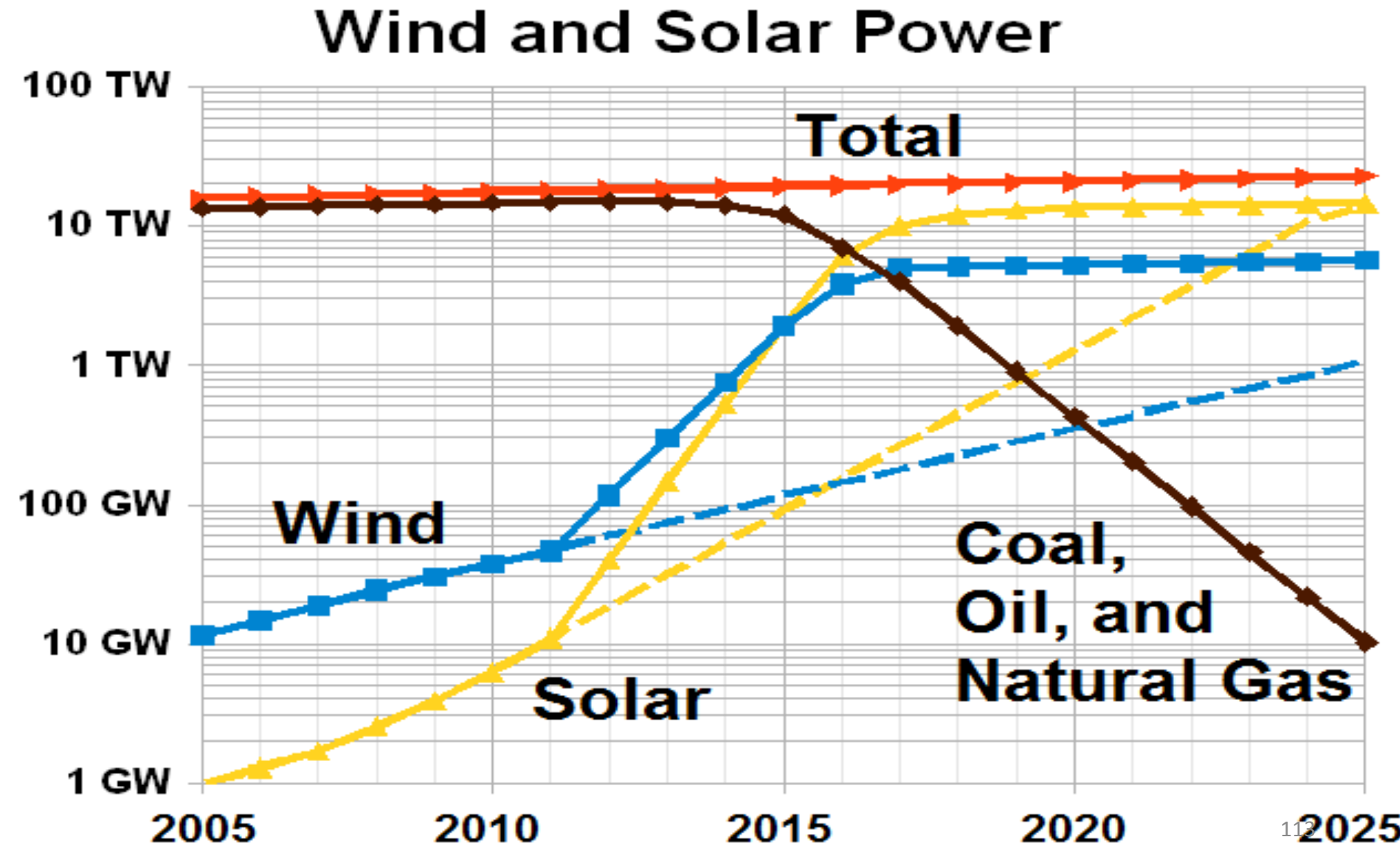
### Installed Wind Capacity
**Megawatts, 2011**

| | | |
|---|---|---|
| # 1 | China | 62,412 MW |
| # 2 | United States | 47,084 MW |
| # 3 | Germany | 29,075 MW |
| # 4 | Spain | 21,726 MW |
| # 5 | India | 16,078 MW |
| # 6 | France | 6,836 MW |
| # 7 | Italy | 6,743 MW |
| # 8 | United Kingdom | 6,470 MW |
| # 9 | Canada | 5,278 MW |
| #10 | Portugal | 4,214 MW |

### Biofuels Production
**Thousand Tons of Oil Equivalent, 2011**

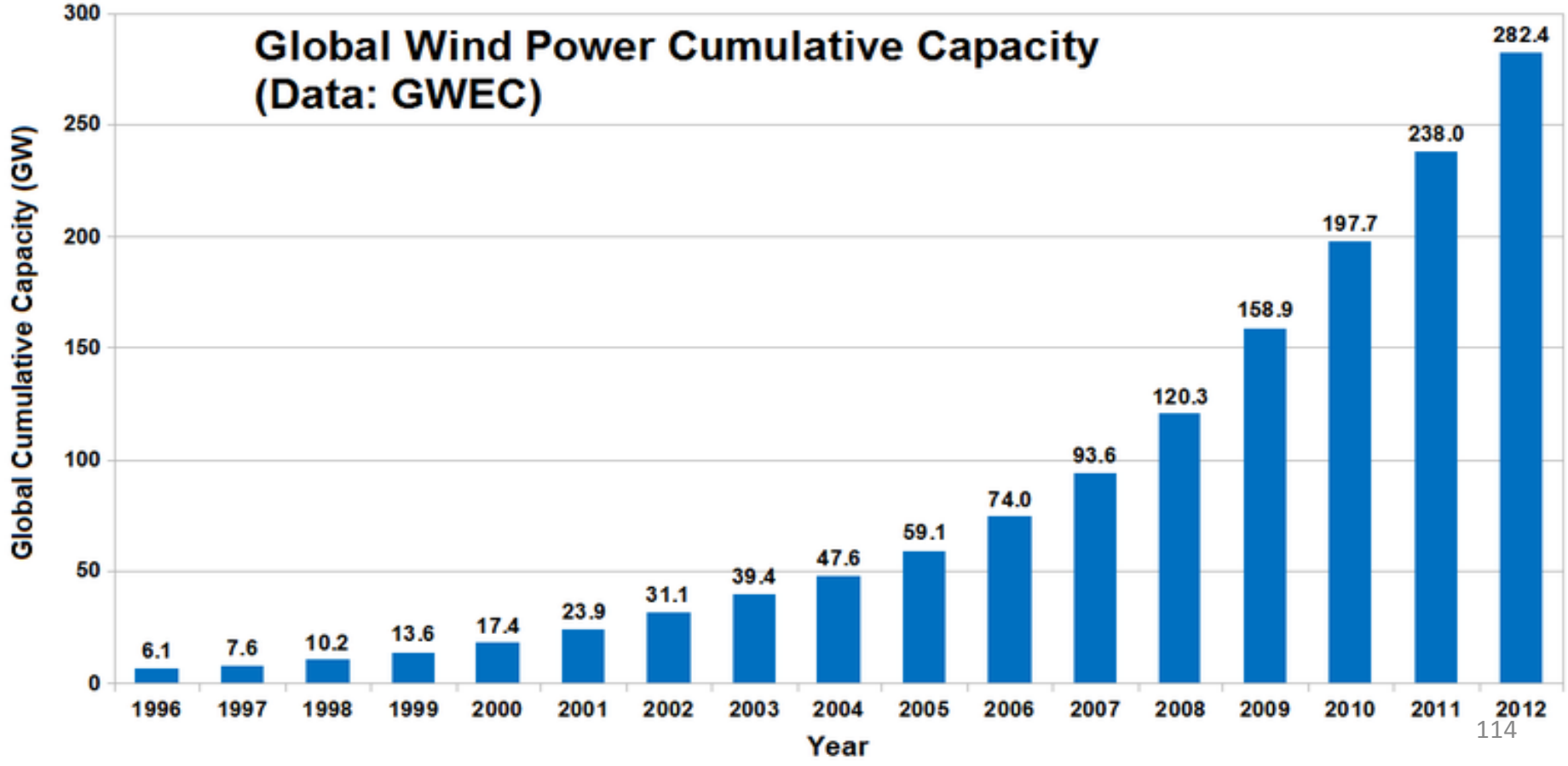
| | | |
|---|---|---|
| # 1 | United States | 28,251 TOE |
| # 2 | Brazil | 13,196 TOE |
| # 3 | Germany | 2,839 TOE |
| # 4 | Argentina | 2,233 TOE |
| # 5 | France | 1,720 TOE |
| # 6 | China | 1,149 TOE |
| # 7 | Canada | 961 TOE |
| # 8 | Thailand | 915 TOE |
| # 9 | Spain | 772 TOE |
| #10 | Belgium | 503 TOE |

# 10.7. A Projection of Fossil, Wind & Solar Power



# 10.8. Global Wind Power Capacity

- Until 1997: USA was in the lead; until 1993: Denmark was in the lead in Europe, from 1997-2007: Germany in the lead, 2008-2009: USA & since 2010 China had highest installed capacity of wind power



# 10.9. Solar Energy: Germany, USA; China

- **2012: Germany (32,5), Italy (16,9), China (8,0), USA (7,7), Papan (6.7) PV peak power capacity in GW**
- **Concentrated Solar Power (CSP):** -2009: US in lead, since 2010: Spain; 2011: global: 1707, Spain: 1102, USA: 517 MWp (Algeria, Morocco, Egypt, Italy)
- **Germany** is world's top PV installer, PV capacity of 25 GW (2011). German PV industry installed 7.5 GW in 2011, solar PV provided 18 TW·h of electri-city in 2011, about 3% of total electricity. Some market analysts expect this could reach 25 percent by 2050.

# 10.10. What triggered energy transition?

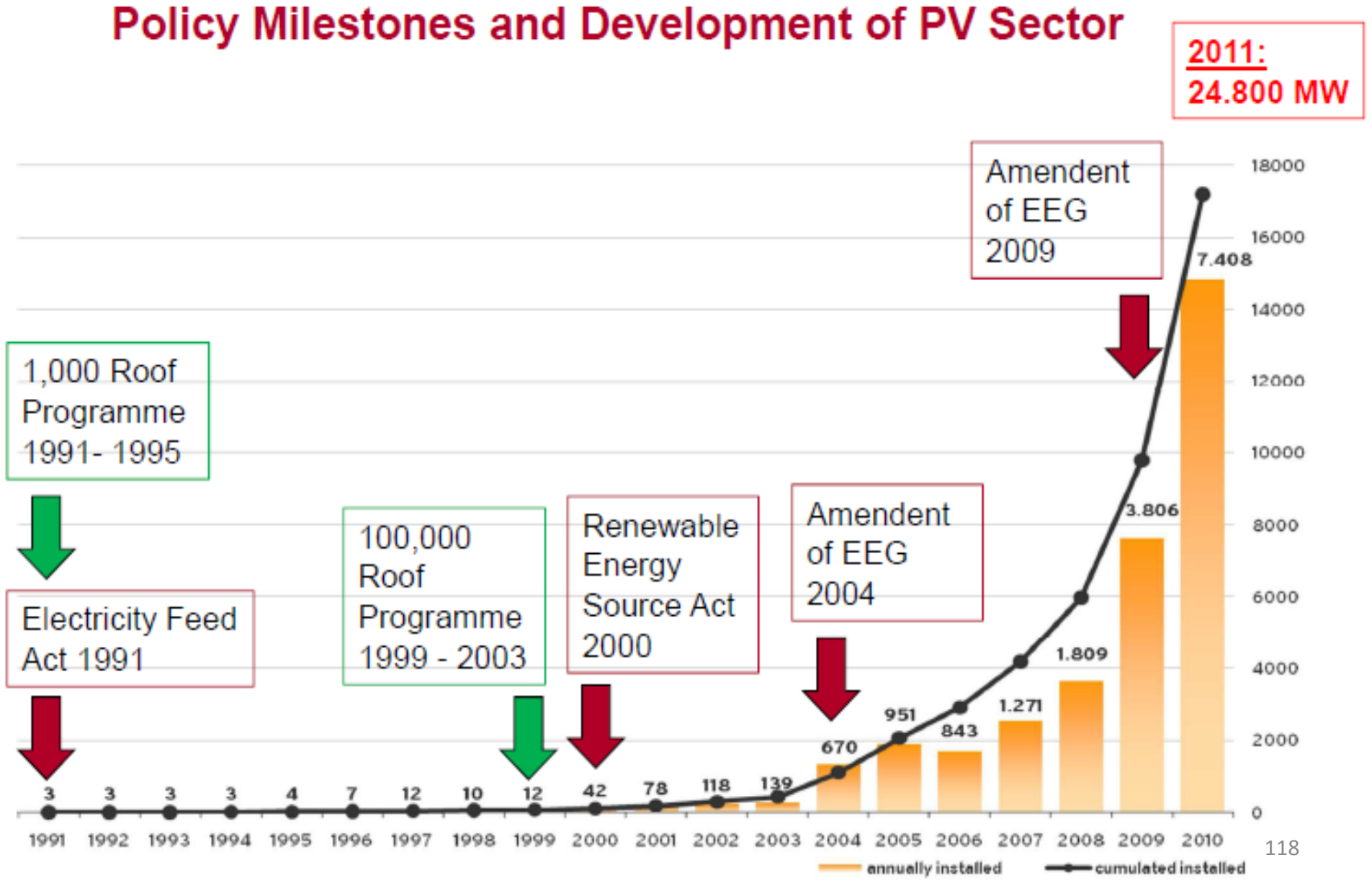
- USA: President Carter‘s Project Interdependence was a response to OPEC‘s oil shocks 1973, 1979
- Response to popular vote against nuclear energy: Denmark (Windpower) & Austria (Wood, Biomass)
- Brazil: potential of hydropower for electricity and ethanol
- **Which factors contributed to energy transition in Germany?**
  - **Bottom-up:** Broad social & political protest of social movements & NGOs against construction of nuclear reactors: prior (1978) & after Chernobyl (1986)
  - Es**tablishment of the Green Party in 1980, election to state parliament in Hessen (1982) and to Fed. Parl. (1983**) representing peace and enviornmental movements
  - **Bottom-up:** Renewable Energy (Wind power): Small scale industruy: Enercon (Wibben, renewable energy research community)
  - Initiative of the German Federal Parliament: Awareness raising
  - **Top-Down:** Environment Ministry: since 1988 (Klaus Töpfer, Angela Merkel): goal of 25-30% of GHG emissions reduction by 2012)
  - **Concern on loosing voters:** greening of the party system: upgrading of environmental goals in order not to loose voters to the green
  - **German Reunification (1990)**: Collapse of the Economy in East Germany. Modernization of Energy, and production sector to EU, West German standards

# 10.11. Strategic Role: of Electricity Feed-in Law

- **Sustainable Energy Transition** requires both decentralized (bottom-up) and centralized (top-down) policy initiatives
- **Electricity Feed-in Law**
  - challenged the energy supply monopoly of big energy electric power companies (RWE, EON et al.)
  - Feed-in: implies a decentralized system of supply where small energy suppliers (wind mill owners) could supply power without going through a broker (nobody had to give a permission)
  - Law offered a stable investment climate: for (public) banks and small investers
  - Important role of city local owned power distribution companies
  - This created a framework for small- and medium sized businesses (personal and family owned companies, like Aloys Wobben, ENERCON), since 1.10.2012 transferred to **Aloys-Wobben-Foundation**
  - Publicly owned Federal bank **(KfW)** played a key role together with local banks to obtain credits both for windmills or solar PV, or solar thermal panels on roof tops.
- **From a 1.000 to a 100.000 roof programme**:
- Eurosolar, Hermann Scheer modelled after a Japanese initiative (spread the demand to many house owners across the country, local banks managed federal credit programme at reduced interest rate.

# 10.12. Milestones of German PV Sector Development

## Source: Eichelbrönner/Spitzley, GIZ (2012)



# 11. Theoretical Approaches to Sustainability Transition Focus on the Supply Side

## Review two theory-guided approaches:

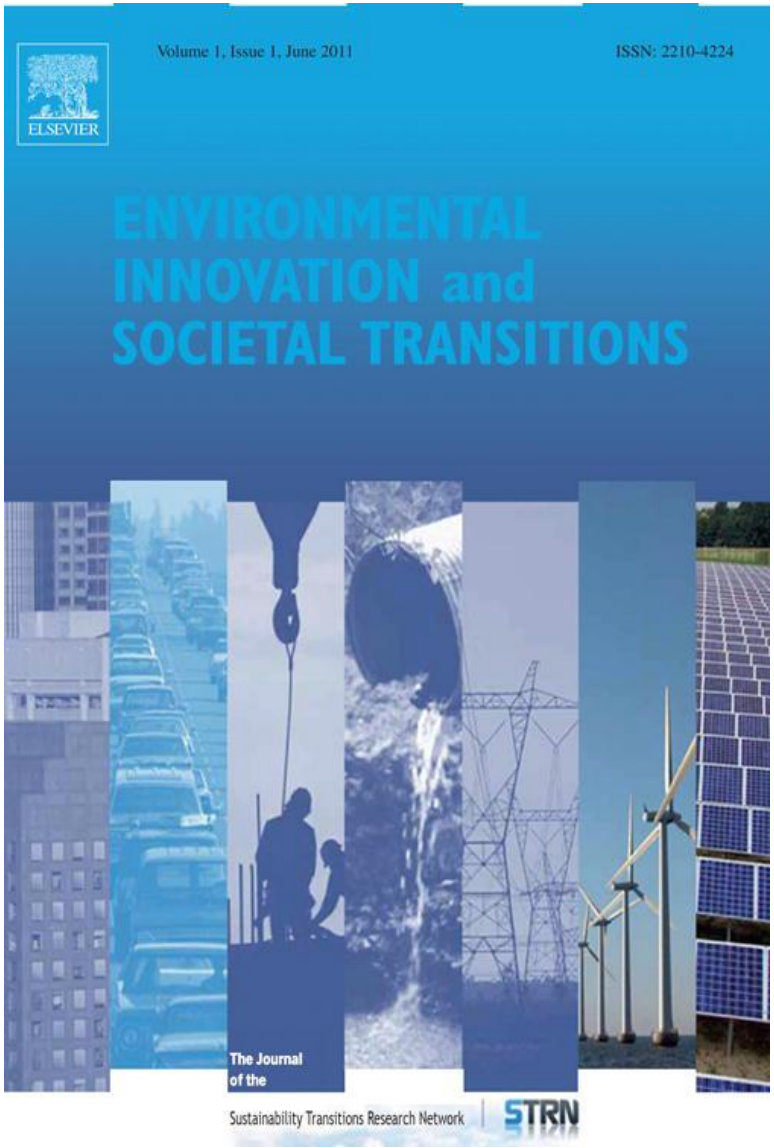
- **Dutch Knowledge Network Network on Systems Innovation and Transition (KSI) & Routledge Studies in Sustainability Transitions:**
  - **Vol. 1: Transitions to Sustainable Development: New Directions in the Study of Long Term Transformative Change by John Grin, Jan Rotmans, Johan Schot**
  - **Vol. 2: Automobility in Transition? A Socio-Technical Analysis of Sustainable Transport Ed. F. W. Geels, R. Kemp, G. Dudley, G. Lyons**
  - **Vol. 3: Food Practices in Transition - Changing Food Consumption, Retail and Production in the Age of Reflexive Modernity Ed. by G.Spaargaren, P. Oosterveer, A.Loeber**
  - **Vol. 4: Governing the Energy Transition - Reality, Illusion or Necessity?** Ed. by **Geert Verbong, Derk Loorbach**
- **German Advisory Council on Global Change (WBGU) Reports**
  - **Towards Sustainable Energy Systems (2003)**
  - **Security Risk climate Change (2007)**
  - **World in Transition: Future Bioenergy and Sustainable Land Use (2008)**
  - **A Social Contract for Sustainability (2011)**

# 11.1. Theoretical approach of KSI: vol. 1: by John Grin, Jan Rotmans, Johan Schot


- Transitions to Sustainable Development: New Directions in the Study of Long Term Transformative Change
- Two central questions:
  - How may we understand transitions?
  - How may we influence transitions into a desired direction, i.e. sustainable development
- Structure of the book
  1. Dynamics of Transition: Socio-Technical Perspective (F. Geels, J. Schot)
  2. Towards a Better Understanding of Transitions and their Governance: A systemic and Reflexive Approach (Rotmans, Loorbach)
  3. Understanding Transitions from a Governance Perspective (J. Grin)

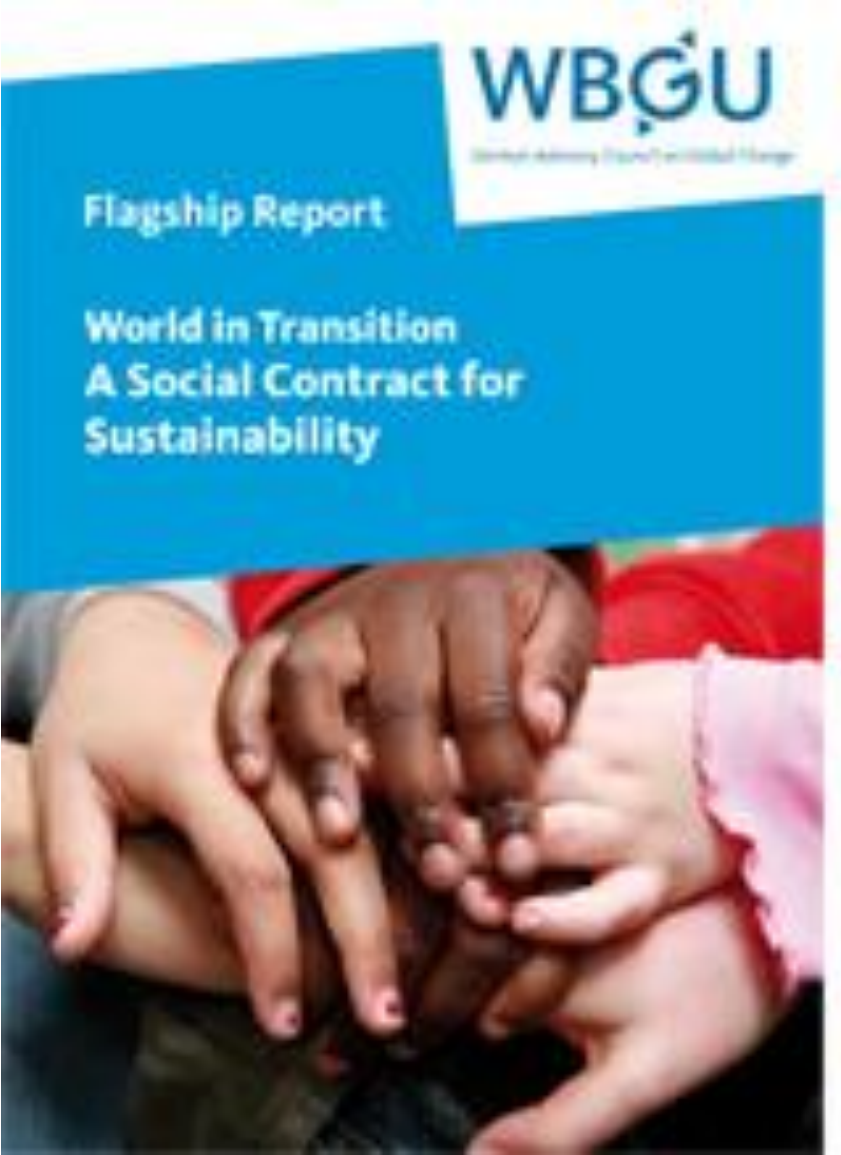
  Conclusions (J. Grin, J. Rotmans, J. Schot)

# 11.2. Environmental Innovation and Sustainability Transitions Journal




- offers a platform **for reporting studies of innovations and socio-economic transitions** to enhance an environmentally sustainable economy and thus solve structural resource scarcity and environmental problems, notably related to fossil energy use and climate change.
- **This involves attention for technological, organizational, economic, institutional & political innovations** as well as economy-wide & sector changes, such as in the areas of energy, transport, agriculture and water management.”. The journal focuses on “social, economic, behavioral-psycholo-gical & political barriers and opportunities as well as their complex interaction.

# 11.3. WBGU Report on a ‘Social Contract for Sustainability’ (2011)




**argued that the transformation to a low-carbon society requires us**

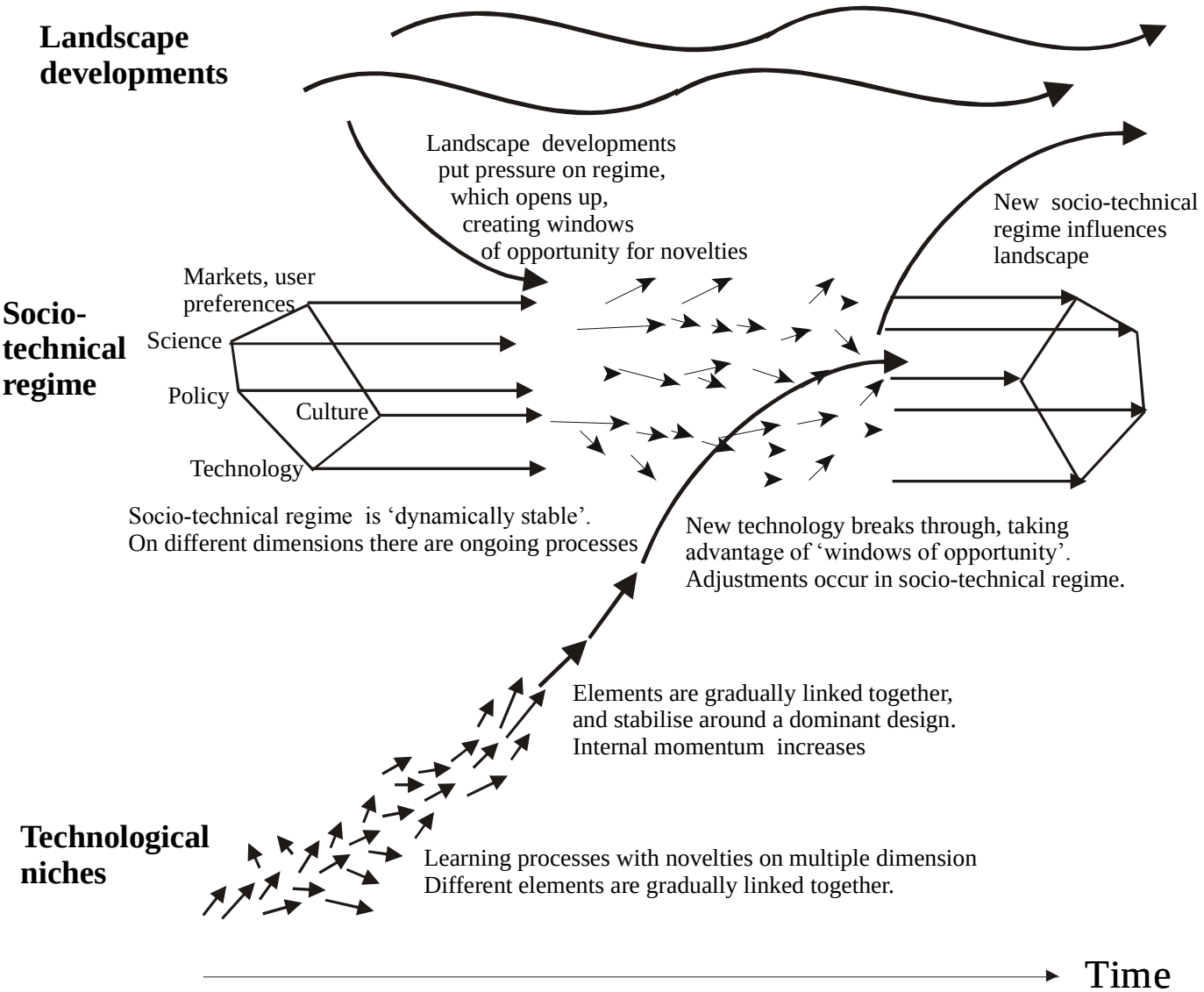
- not just [to] **accelerate the pace of innovation**; we must also **cease to obstruct** it. …
- Adequate **investment dynamics towards a sustainable global economy** can only develop if subsidies for fossil energy carriers, currently in the region of high three-digit billion figures worldwide, are abolished.
- We must consider **external costs of high-carbon (fossil energy-based) economic growth** to set price signals, and thereby to provide **incentives for low-carbon enterprises**. Climate protection is, without a doubt, a vital fundamental condition for sustainable development on a global level. …
- **Sustainable development means more than climate protection, though, as the natural life-support systems also include many other natural resources, such as fertile soil and biological diversity.**

# 11.4. What are transitions?

- **F. W. Geels, J. Schot: Definition of transitions**

1. **Transitions are co-evolution processes that require multiple changes in socio-technical systems or configurations**. Transitions involve both technical innovations (new knowledge, science, industries) and their use (selection & adoption) application domains. Use by consumers (markets), societal embedding of new technologies (markets, infrastrcuture, cutlural symbols).
2. **Transitions are multi-actor processes**, involving interactions between social groups**. Scientific communities, policymakers, social movements and special interest groups**
3. **Transitions are radical shifts from one system or configuration** to another. (radical. Scope of change not speed), may be sudden: creative destruction and can be slow to proceed step-by step.
4. **Transitions are long-term processes (40-50 years), while breakthroughs may be fast (10 years),** innovative journays of new socio-technical systems gradually emerge are much longer (20-30 years).
5. **Transitions are macroscopic**: level of analysis: „organized fields“

# 11.5. Multi-Level Perspective on Transitions: Socio-technical Approach of F. Geels




## Relies on:

- Contextual history = historiography +STS
- Evolutionary theory
- (social theory)

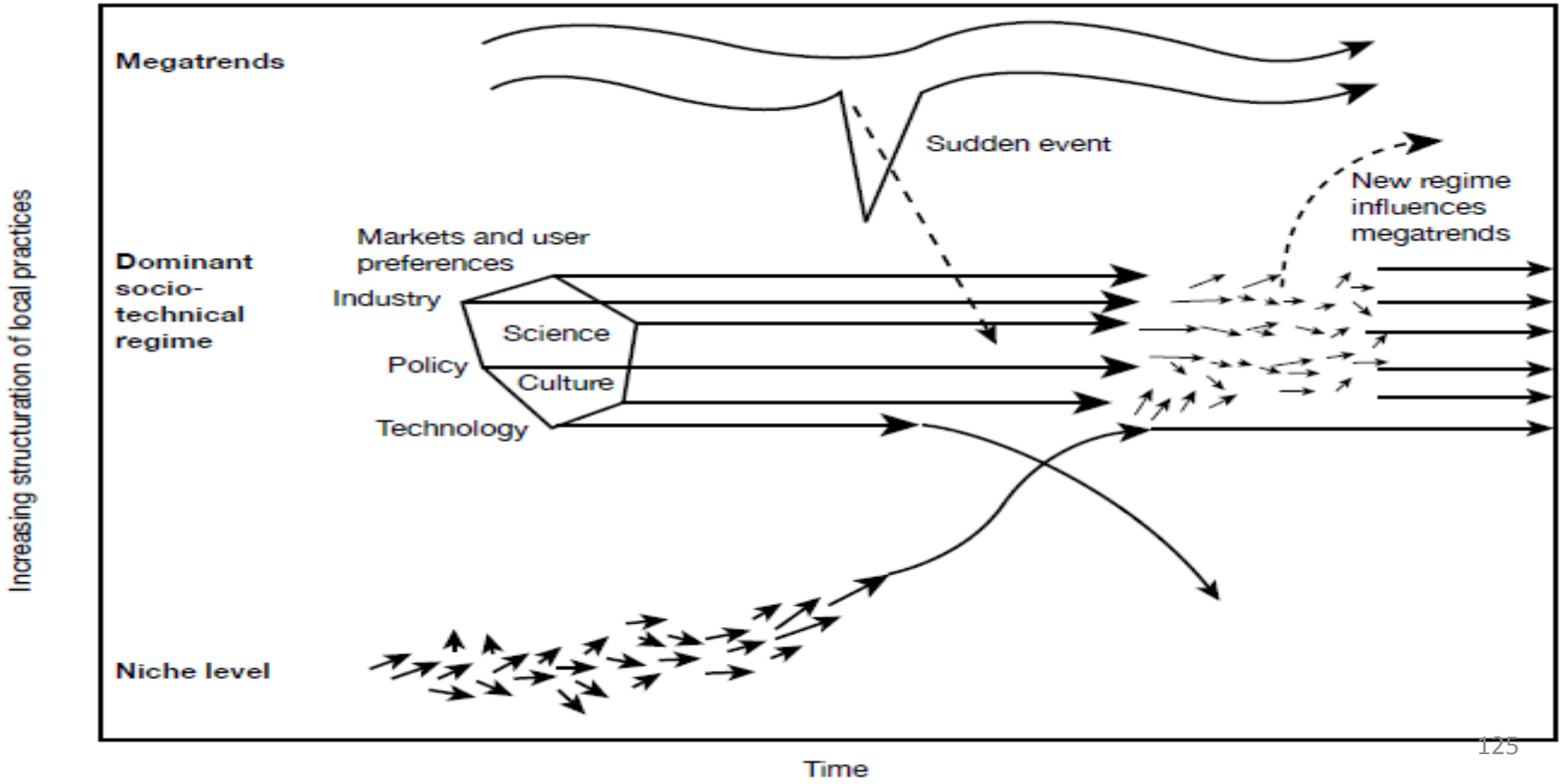
## Three Levels:

- **Socio-technical landscape (exogen.)** present system (structures, interests, worldview) stable. E.g. market economy high carbon footprint
- **Socio-technical regime** (political realm: sciene-policy-technology-market)
- **Niche innovations** (knowledge, inven-tions, innovations)

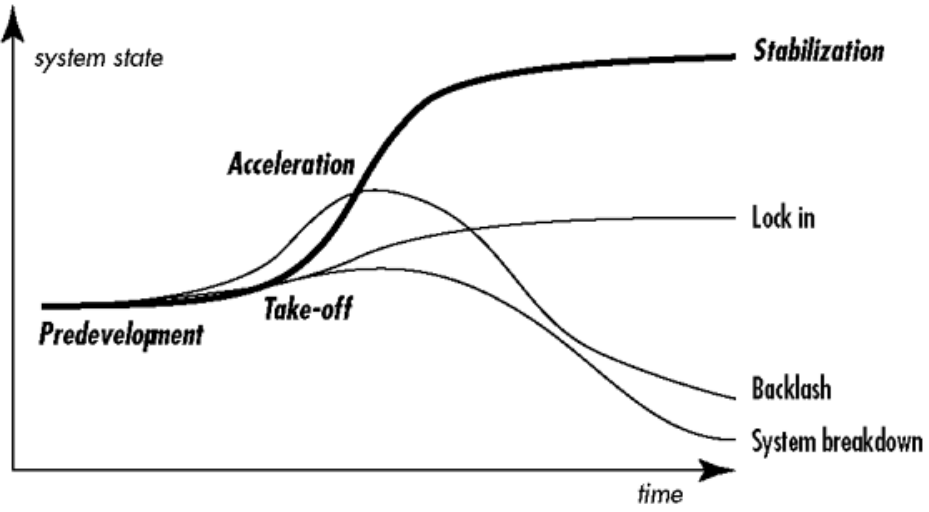
**Dynamic multilevel interaction**

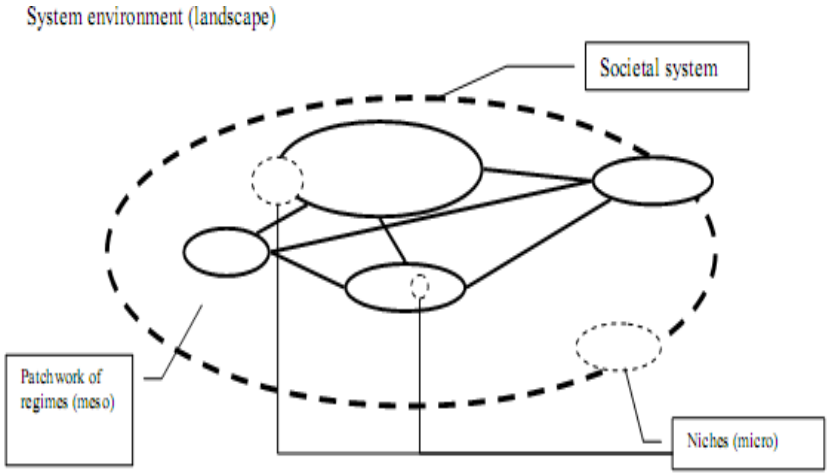
# 11.6. WBGU‘s Adaptation of KSI Model (Geels)

- **WBGU added Megatrends:**
  - **Earth System:** climate, biodiversity, land degradation, water, raw materials
  - **Human System:** development, democratization, energy, urbanization, food



# 11.7. Complexity Theory Approach (J. Grin's interpretation)

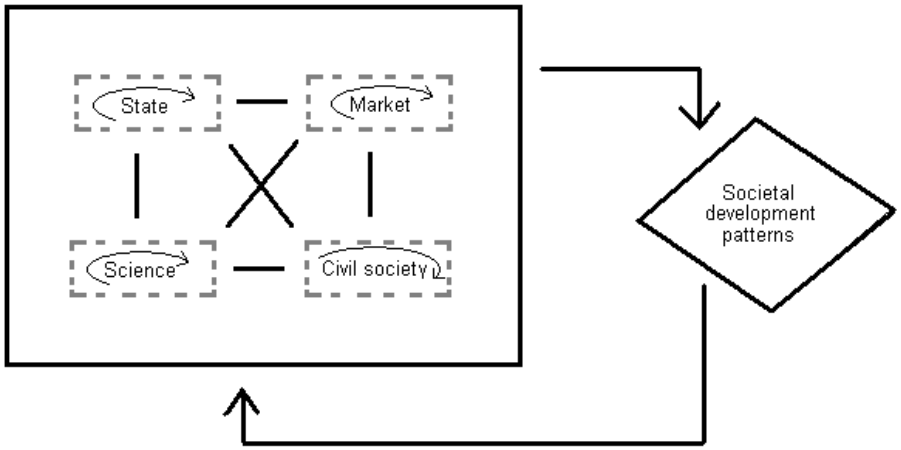


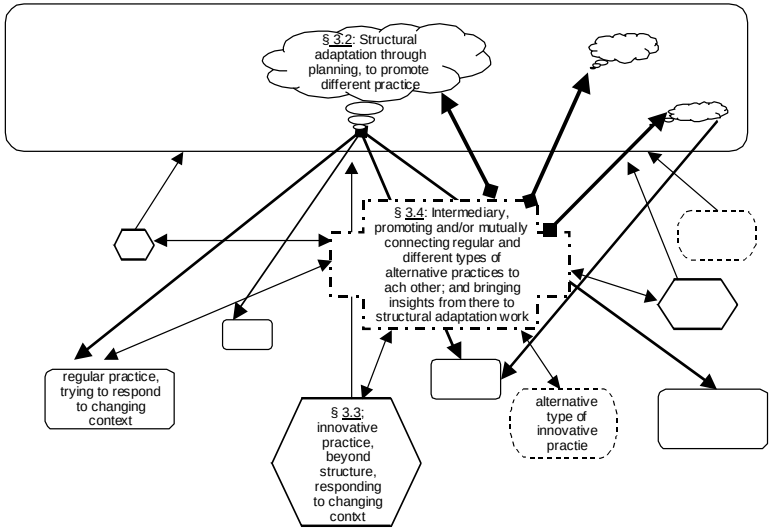




- **Objectives**
  - Understanding of systemic transition mechanisms
  - Typology of transition pathways
- **Relies on**
  - Complex adaptive systems theory
  - Integrated assessment
  - Evolutionary theory

# 11.8. Reflexive governance approach

## J. Grin's approach, influenced by Giddens, Beck




- **Objectives**
  - Understanding transition dynamics in the real world
  - Understanding reflexive agency involved, incl. politics (legitimacy power, trust aspects)
- **Relies on**
  - Political science
  - Modernization theory
  - Structuration theory
  - (STS)

# 11.9. Towards Energy Transition (J. Grin)

- **Energy has a dual character**
  - A domain in and of itself
  - Servant of other societal domains
    - Multitude of practices, regimes involved
    - Interaction between lifeworld and systems of provision quintessential
- **Sociotechnical and complexity approaches:**
  - Typology of transition pathways
    - i.e. different routes along which changes at the three levels may reinforce each other
    - May start with niche, or regime changes
  - Causal mechanisms of transition dyn., flows & cycles (complexity)
  - Phenomenology transition dyn. middle-range theories (sociotech.)
- **On the above typology:**
  - Pathways derived from historical studies: what have globalization and emancipation of civil society meant for the mechanisms?
  - Relating complex dynamics more clearly to everyday experience
  - Further integrate both perspectives
- **More insight in multi-domain transition dynamics**

# 11.10. Strategic niche management (SNM)
## [sociotechnical approach & transition management ]

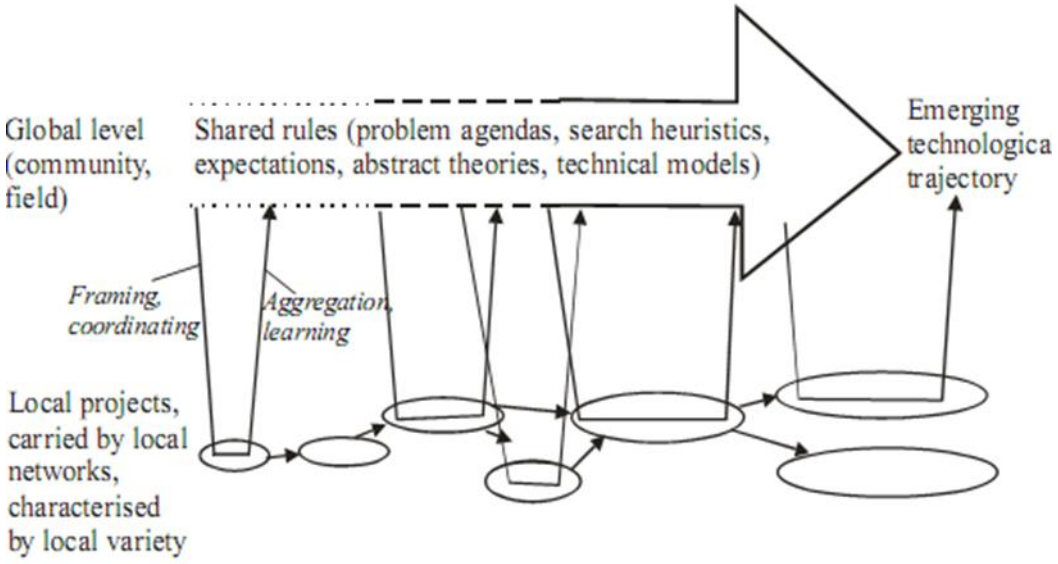
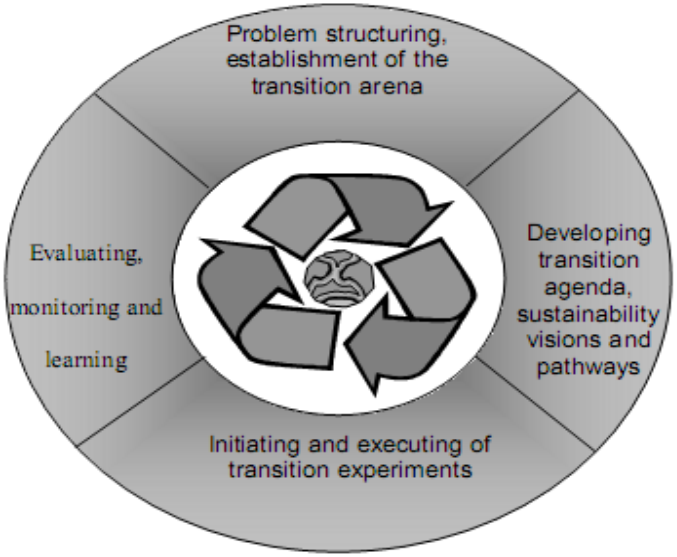



*Figure 5.3. Emerging technical trajectory carried by local projects (Geels and Raven, op cit. Ref.33, p. 379)*

- Interactions between local experiments and global niches: not self-evident, not linear




- Requires steering at different levels
- Politics needs be better accounted fo

**Three TM story lines** (Smith/Kern, 2009):

- Steering society towards SD
- … through experimentation
- with main actors' co-operation

- discursively presented as in line with liberalisation
- … and institutionally organized with many incumbent actors in key roles

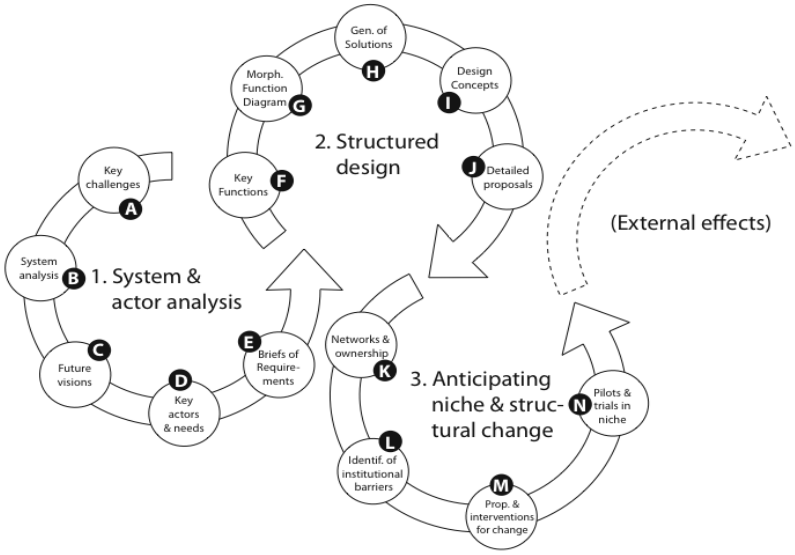
# 11.11. Transition Management in Energy Sector

- **Transition Management:** issues for further research
- Issues:
  - Further understanding of powering and legitimization in TM networks
  - TM and social movements
  - Comparative studies > role of political structure and culture
  - TM and transnationalization
  - How to do visioning
  - Defining unit of analysis
    - Cf. Grin et al (2010) Concluding chapter
    - Spaeth & Rohracher, Research Policy, vol. 39(4), 2010

- **Reflexive governance (1): Grin: rationale, power, institutional loci, role of objects in reflexive design of niches**
- **Rationale:**
  - Deal with resistance & inertia in niche projects, rooted in incumbent regime…
  - … by identifying 'guilty' regime factors…
  - … and designing strategies for regime change
    - Grin, *Poiesis & Praxis*, 2004
    - Grin et al, *Int J. Foresight Innov Pol.*, 2004
- **Power:**
  - Rooted in incumbent regime
  - Enscribe novel regime elements in objects
    - Grin, paper 4S Annual Conference - 2009
- **Institutional loci**
  - Legitimization at interfaces with established practices
  - Nurture diversity; promote connections
    - Hendriks&Grin, *J. Env Pol. Planning*, 2007
    - Grin, paper 4S Annual Conference - 2010

# 11.12. Reflexive designs: (2):

## ⬇ Bram Bos – documented experiences, towards a systematic method



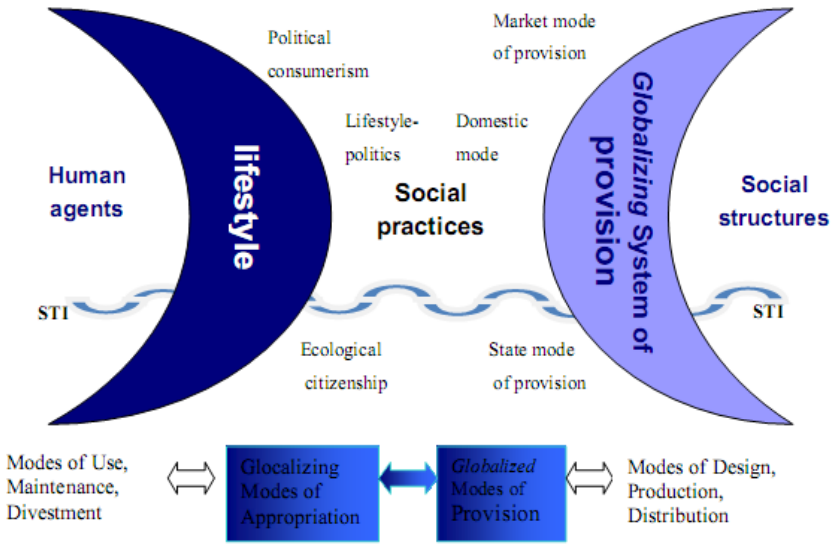

- Bos & Grin, *Science, Technology and Human Values, 33 (4): 480–507.*
- Bos (2009), *Social Epistemology*, 22 (1): 29–50.
- Bos et al. (2009), *Outlook on Agriculture,* Vol 38**,** No 2, pp 137-145

**Reflexive governance  reflexive plan-ning – lessons from Amsterdam Port**

- Enza Lissandrello:
  - Emirbayer & Miche (< Bourdieu): reflexivity = re-ordering temporal dimensions of agency in practices
    - from: past experience > expectations > current action > future
    - To: future vision > re-evaluate past experience, re-define expectations > current action > different future
  - Then planning become a matter of proper designing institutional setting and method.
    - Lissandrello & Grin (2011). *Planning Theory and Practice*, vol. 12 (no. 2)

# 11.13. Social Practice Approach (Grin)

**Figure 4.** Globalizing modes of provision and the appropriation of socio-technical innovations (STI) within social practices.




## Objectives

Add to structuration theory the role of objects and infra
Synthesize with MLP

## Relies on

Structuration theory, especially Giddens + Warde, Reckwitz, Schatzki)
Reflexive modernization, globalization theory (MLP)

## Outcomes

- **Conceptual scheme on**
  - practices between lifestyle and SoP
  - Idealtypes of citizen-consumers
- **Empirical studies food, home maintenance, tourism**
  - Differences between housing (supply-led) and food (more understanding of meaning of food consumers) markets
  - Idealtypes differ in appropriation
  - Role of transnationalization
- **'Holistic' study of agrofood system**
  - (discursive) power of consumers; dynamic and ambiguous roles retail; role physical infrastructure; transnationalization

## Issues for further study

- Further development of connection to MLP
- Studies with > 1 SoP (e.g. housing + energy)
- More (comparative: < transnationalization!) empirical studies

# 11.14. Innovation System Approach (Grin)

## Marko Hekkert, Simona Negro, Ruud Smits,Stefan Kuhlman

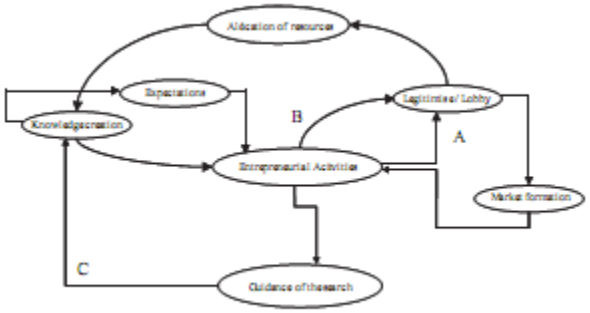


Fig. 2. Three typical motors of change.

**IS literature: IS fulfill 7 functions**

- Stimulate learning,
- Manage interfaces in networks,
- Provide resources,
- Develop knowledge…
- Systemic instruments
- (intermediary organizations)
- may fill gaps

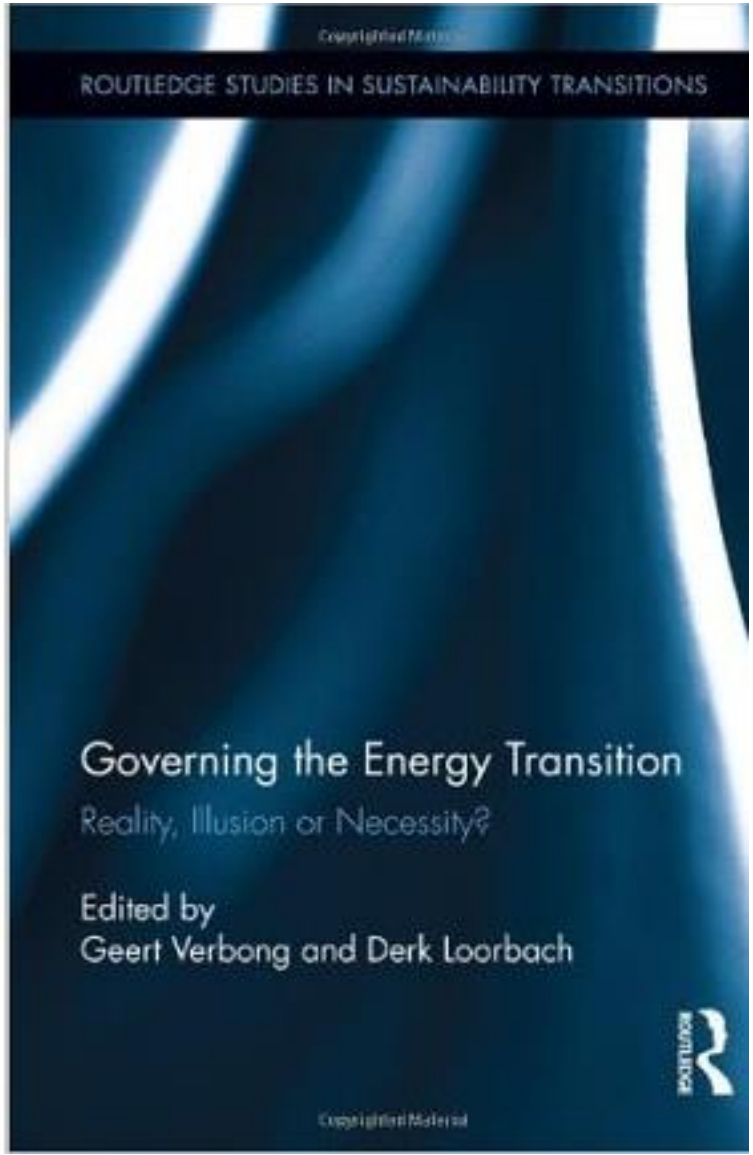
## Outcomes

- Application to a wide range of energy cases
- Functions matter
- Functions interact
- There are patterns around ‘motors’ for transition: knowledge-legitimacy; resources-rule creation

## Issues for further study

- role of power in systemic instruments
- Power strategies of incumbents and niche players
- Relations between changes in IS and pressure towards sustainable development

# 11.15. Governing Energy Transitions



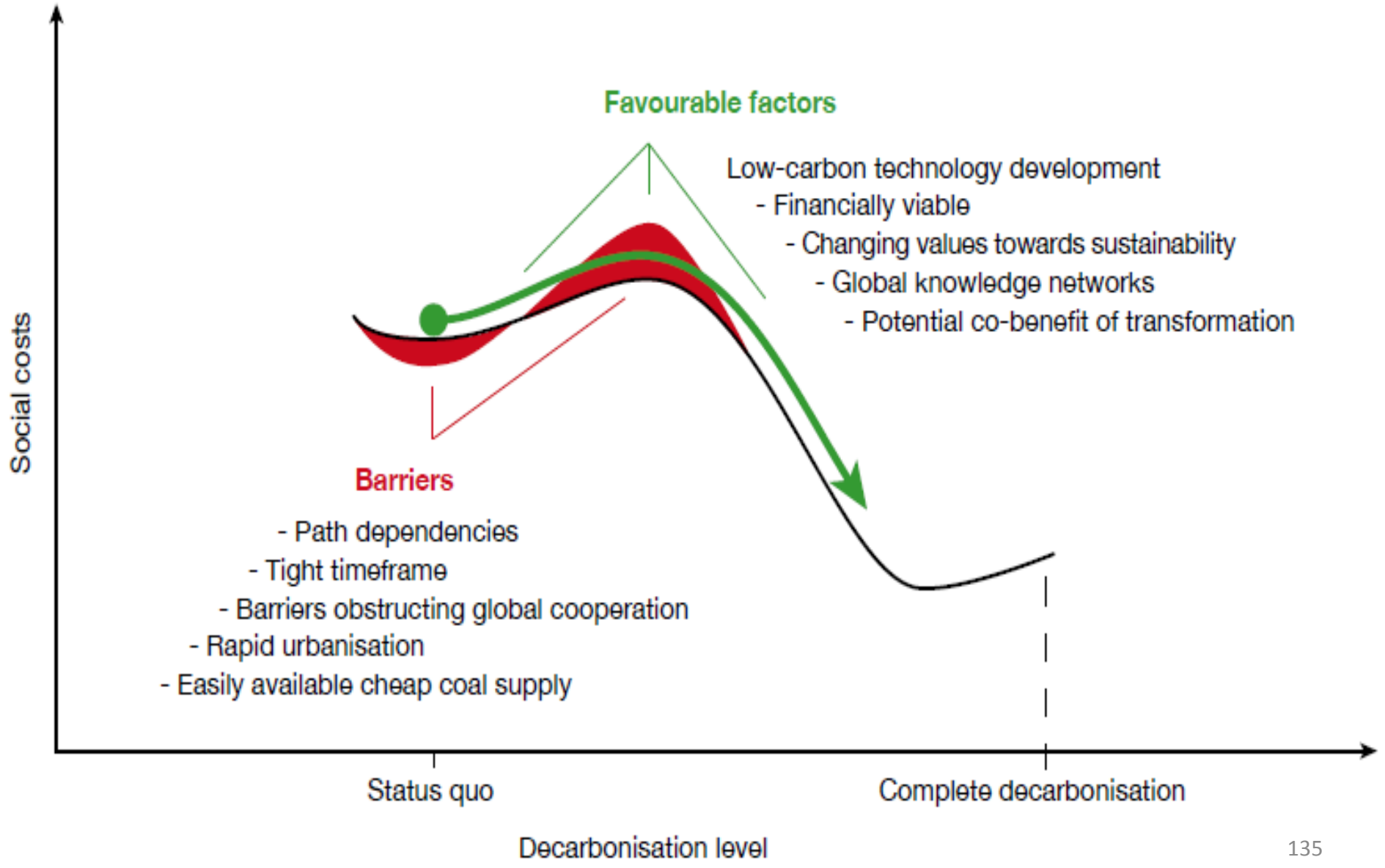

## John Grin's Assessment:

- **EU's energy policies** are varied & diverse, but overall tend to stabilize current regimes in e.g. electricity production and distribution.
- **Supply security, climate change and internal market policies are major drivers** that in general reinforce current strategies, patterns of investment and power relationships within the regime.
- Policies in fields such as **innovation and renewable energy** have gained increasing clout & contribute (often at member state level rather than the EU level) to challen-ging, if not destabilizing, the regime
- **Still an open question whether a low carbon energy transition is really contingent on a regime destabilization.**

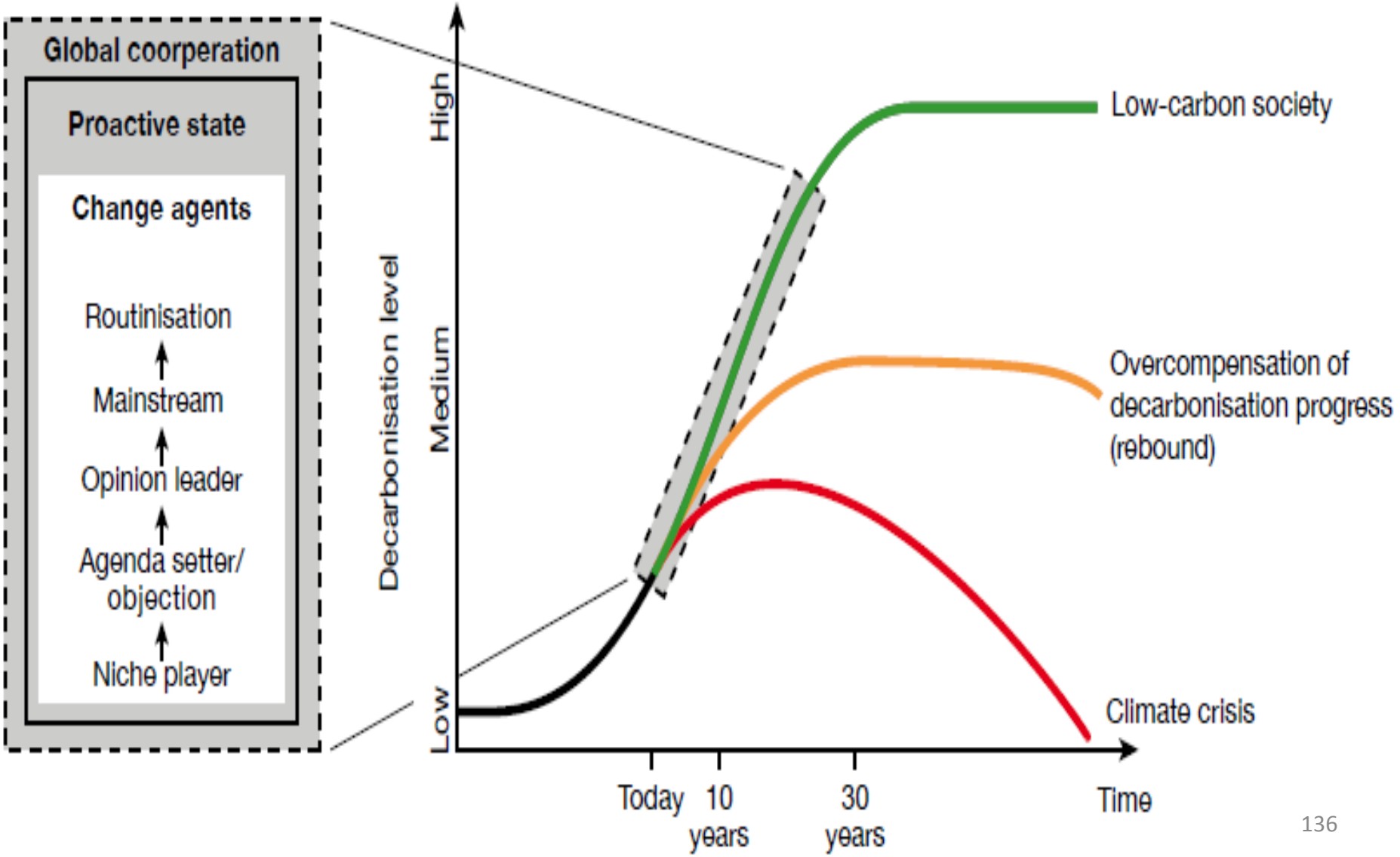
## Issues for further research:

- **How may innovations within and outside the regime start to reinforce each other**
- **How could a diverse, secure future energy system combine different options?**
- **How to better align user practices and supply system?**

# 11.16. WBGU Focus is Wider



# 11.17. WBGU: Transformation to a Low-carbon Society: Temporal Dynamics & Action Levels

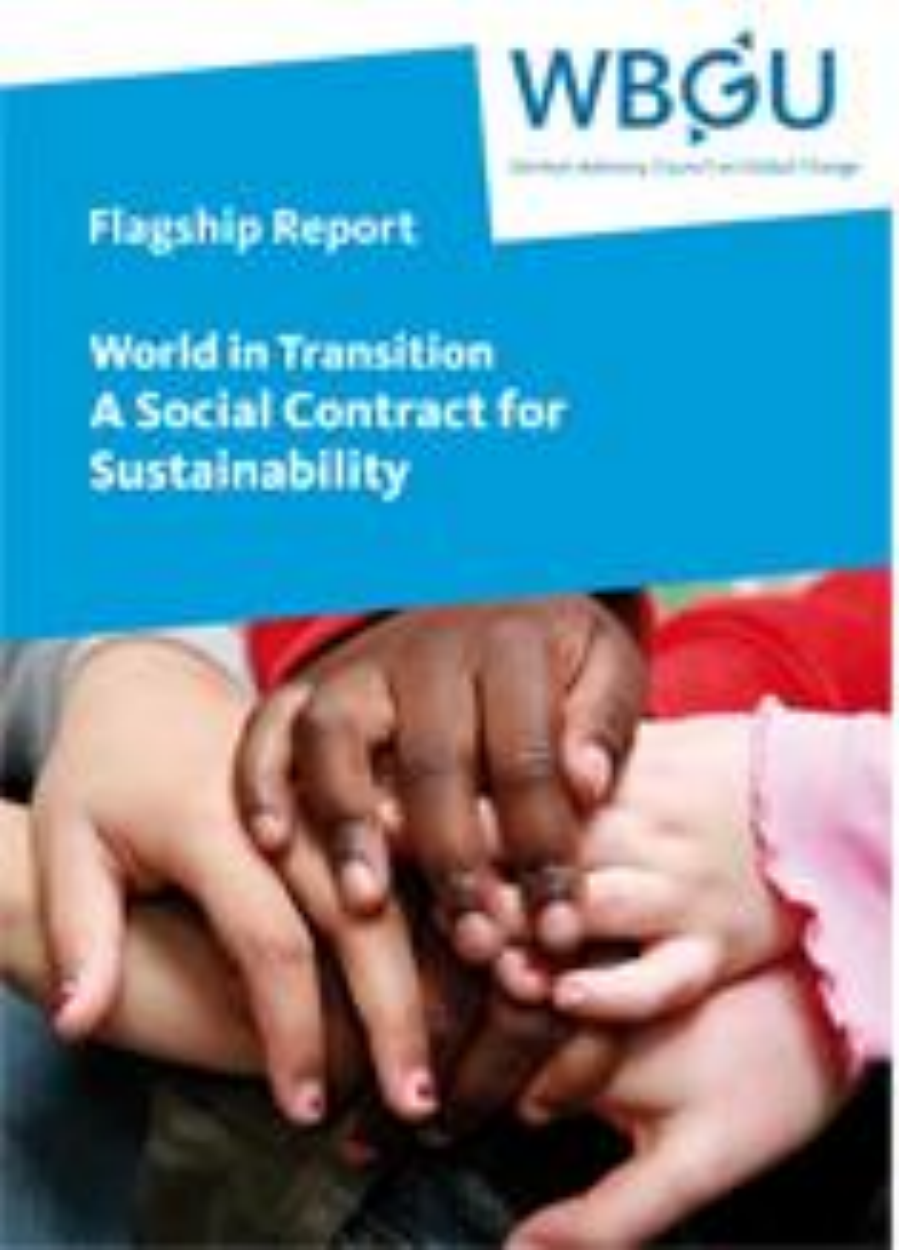


# 11.18. Theoretical Approaches to Demand Side Anthropology, Social Psychology, Sociology, Religion

**We are the threat, the victims and may be the solution!**

- **We as consumers have a different carbon footprint (2011):**
  - **American (16.9),** S.Korean (11.8), **Japanese (9.3), German (9.1) Chinese (5.9), Thai (2005: 5.6),** Brazilian (2.1), Indian (1.4) tons
- **Are the people aware of the linkage: beteween energy consumption and greenhouse gas effects -> disasters?**
- **Focus: human values, attitudes, preferences, behvaviour as consumers & voters**
- **The analysis of the demand side of sustainabiltiy transition requires the insights of scholars from many disciplines: anthropology, social psychology, sociology, religion**

# 11.18. WBGU: Global Transformation of Values




**Ch. 2: Global Transformation of Values has already begun**

2.1 Values & Value Change

2.2 Changing Values & Environmental Consciousness

- Postmaterialist values?
- Attitude to Environment & sustainability in countries & world religions
- Openness to innovation

2.3 GDP: Changing Values

2.4 Gap between Attitutes and Values

- No Longterm orientation
- Path Dependency

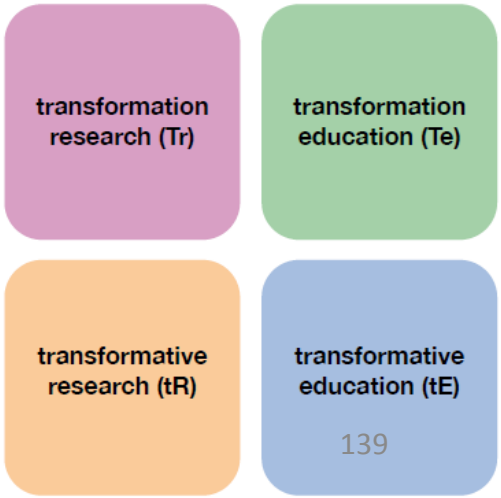
2.5 Share Global Transformation vision

# 11.19. Knowledge Society in Transformation Process: Recommendations for Research and Education

- **Transformation is a societal search process supported by experts**. With politics, economy, society, research & education are tasked with developing **visions for a low-carbon society**, different **development paths, developing sustainable technological & social innovations**.
- **Social framework for participation to be strengthened**.
- **Education should enable people** to develop an awareness, to learn systemic thinking, & act responsibly. Promoting research & education is a key task for the modern, proactive state, to support integration of the scientific expert community into the social contract.

## Transform. Pillars of Knowledge Society

- **Transformation Research**
- **Transformative Research**
- **Transformation Education**
- **Transformative Education**



# 11.20 Transformation Research (WBGU)

**Establishment of a new scientific discipline, 'transformation research' (Tr),**

- **address future challenge** of transformation realisation.
- **explore transitory processes** to come to conclusions on factors and causal relations of transformation processes.
- **analyse observed past transformative moments**.,
  - e.g integration of the steam engine into the mechanisation of cotton processing around 1785. This led to a rapid rise in textile production efficiency, which in turn led to a rise in demand for raw materials, thus (co-)triggering the Industrial Revolution.
  - It was embedded in a complex causal network of further factors and historically evolved framework conditions. This equally applies to transformations at another level, for example the normatively motivated abolition of slavery.
- **Transformation research** should draw conclusions for **transformation to sustainability** based on understanding of **decisive dynamics of such processes**, their **conditions and interdependencies**.
- **learn how to anticipate acceleration moments** to create relevant favourable framework conditions.
- **A challenge for transformation research is creation of a network of social, natural & engineering sciences to understand the interaction between society, the Earth system, and technological development.**

# 11.21. Transformative Research (WBGU)

**Transformative research: research that advances transformation.**

- **Transformative research supports transformation processes with innovations in key sectors, e.g. consumer research, needed for new business models, e.g. shared use of resource-intensive infrastructure, & research for technological innovations like efficiency technologies.**
- Transformative research can have a wider transformative impact if, as of a certain development stage, **development activities for low-carbon innovations are embedded in a systemic context,** impact on climate and sustainability, reflect conditions for transformative impact.
- **This applies to development of new investment models for energy efficient technologies**.
- **Their intercultural transferability should be considered at an early stage, attention should be paid to measures against rebound effects and potential path dependencies.**
- Transformative research encompasses a spectrum that reaches from discipline-based to system-based research. application-oriented exploration of highly-efficient storage technologies can have a transformative impact as an interdisciplinary project for development and implementation of **SuperSmart Grids.**
- Exchange of information between both types of research leads to 'cross-fertilisation', with society, the economy, & politics, offer **transformation** ring the best possible support to transformation. Absolutely crucial is a **higher level of science communication, including the targeted utilisation of the new media.**
- **Wide range of opportunities for interactive, participative shaping of the social dialogue. In this context, the education sector must also take on more responsibility**.
- **For knowledge communication, education provides foundations for each individual's knowledge-based self-concept, creating the social preconditions needed for transformation. Transformation research should be linked closely to transformation education.**

# 11.22. Transformation Education (WBGU)

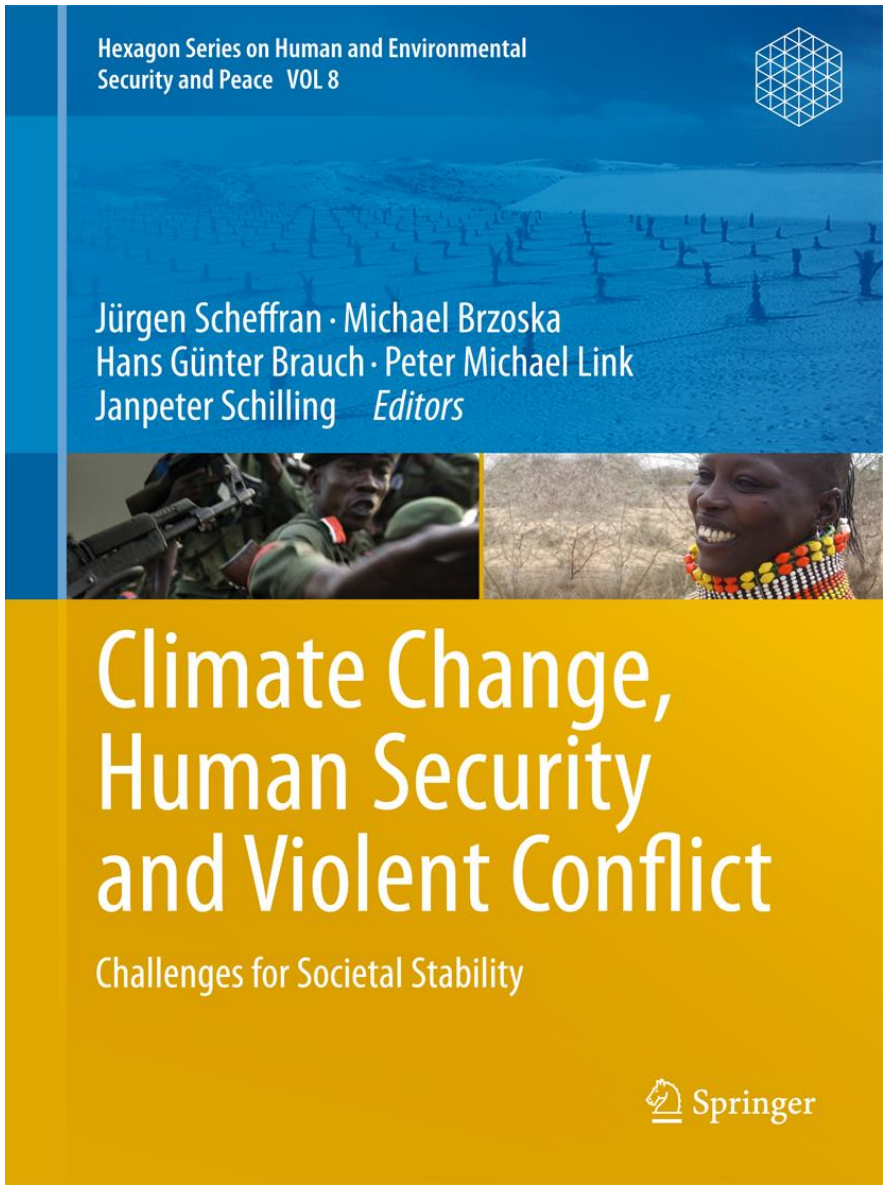
- **Transformation education makes scientific findings of transformation research available to society.**
- **'Education for participation', it critically reflects on the requisite basic requirements – like a thorough understanding of pressure to act, & a global sense of responsibility – & generates a systemic awareness of the different action paths.**
- Communication of knowledge at interface of engineering, social & Earth system sciences. Suitable narratives of change should be fed into everyday discourse through creative forms of knowledge communication.
- Focus on change agents, awareness of preconditions for transformation can be firmly ensconced in education. Change can only be imagined through a dynamic view of the world.
- **Educational institutes should increasingly teach sustainability-oriented knowledge, and the skills necessary for lifelong learning and systemic thinking**. This also includes a better understanding of the **scientific research process**, its possibilities, and its limits.

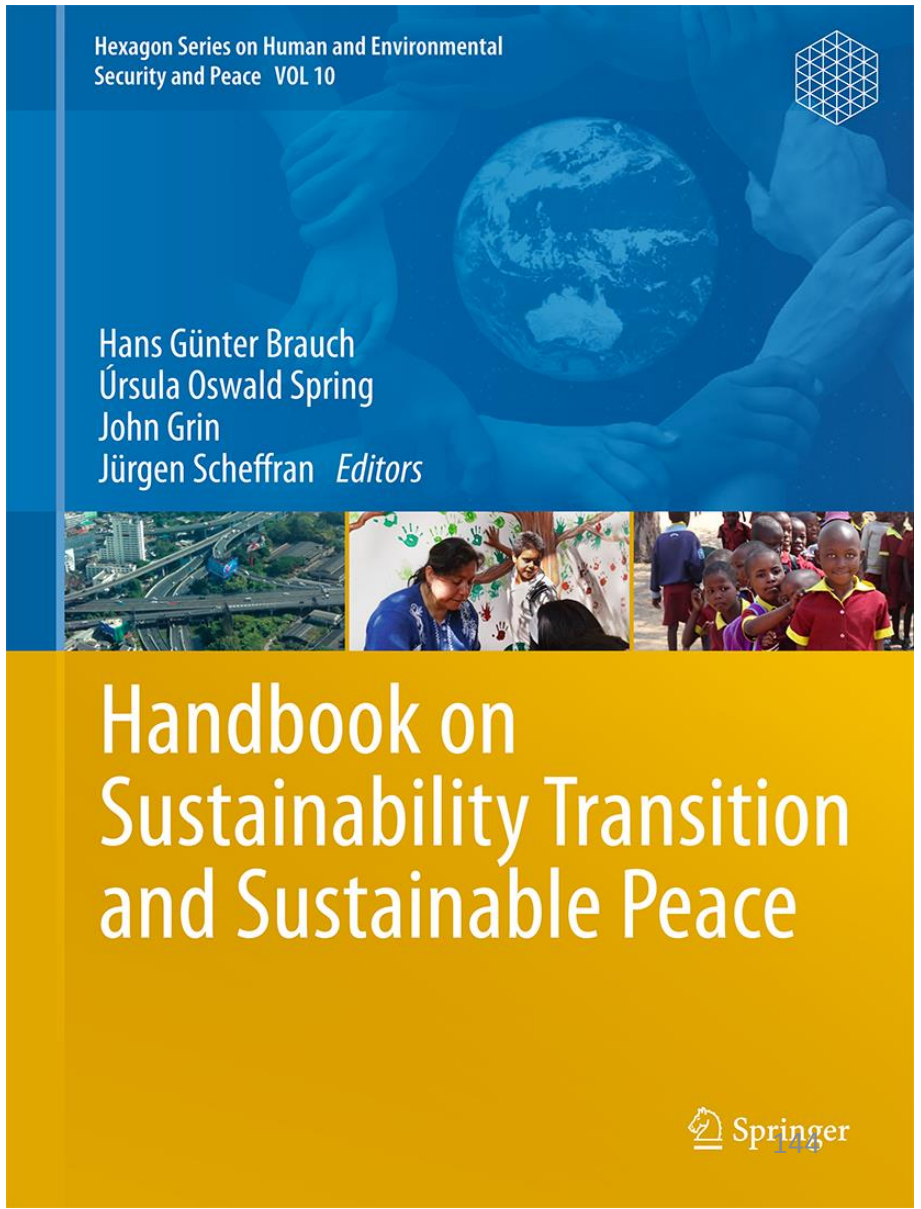
# 11.23. Universities Major Part of Solution:
## Cooperation: Sharing of Knowledge & Technology

**Knowledge is Free & Scientific Cooperation Matters**

- **The King's sufficiency economy theory offers framework.**
- **Codevelopment and Sharing of Knowledge**
  - **Exchanges are crucial for global learning and friendships**
  - **Send your experts and students to best schools, research centres**
- **Awareness Raising for Policymakers, Media and People**
  - **President of Chulalongkorn University has encouraged all of us**
- **Multidisciplinary Research is needed:**
  - **Cluster Approach: for Natural, Engineerung &Social Sciences**
  - **Sustainable Social Development for Social Justice**
- **Task of Transformative Social Science and Education to Advance the goal of sustainable Development and to inspire strategies & policies of transition to that goal**

# 12. New Literature



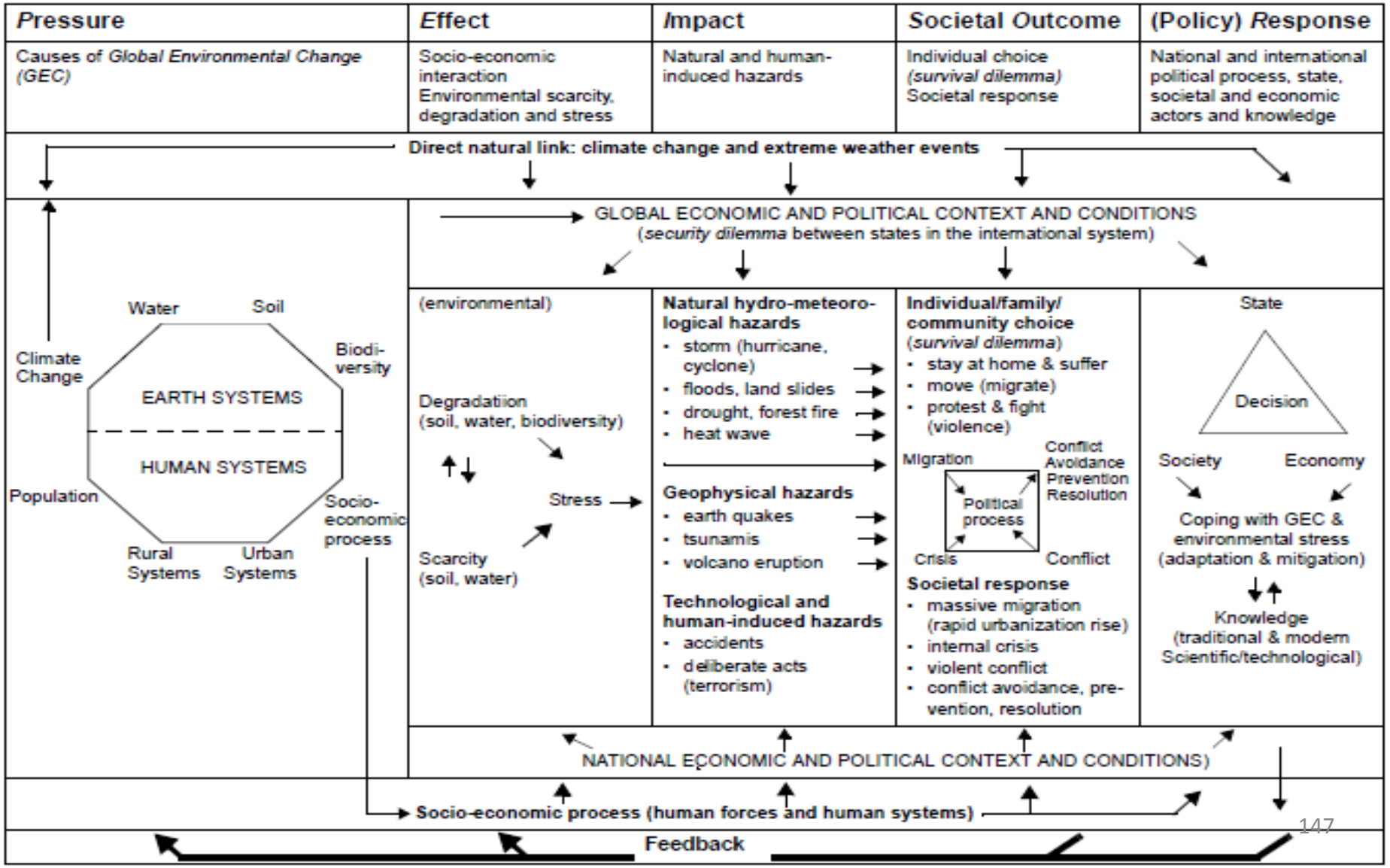
# 12.1. Goal of the Handbook

- **Oswald Spring and Brauch (2011)** argued that in the Anthropocene humankind faces two alternative visions and policy strategies:
  - ***Business-as-usual* (BAU) in a Hobbesian world**. Here economic and strategic interests and actions dominate and may lead to a major crisis for humankind, inter-state relations and nature.
  - The need for a ***transformation*** in **cultural, environmental, economic and political relations**
- **Scheffran, Brzoska, Brauch et al. (2012) examined possible consequences of the *first* alternative and showed, by addressing climate change as a 'threat multiplier**', that in the case of **no action it might lead to "dangerous climate change"** (UNFCCC 1992).
- This volume deals **'sustainability transition' that may serve as a sustainable alternative and avoid the negative consequences of climate change for human, national and international security.**
- Both visions address different coping strategies for this century for *global environmental change* (GEC) and climate change:
  - In **first vision, *cornucopian perspectives* or *business-as-usual*** suggest technical fixes and defence of economic, strategic & national interests, with the adaptation and mitigation strategies that are affordable for industrialized countries.
  - In the **alternative vision of a comprehensive transformation of the global economy,** *Politik*, society and culture, a *sustainable perspective* requires effective new strategies and policies.
  - **Their goal should be decarbonization, dematerialization, reduction of the water and environmental footprint, and global cooperation and solidarity. These would contribute to a sustainable peace with more global equity and social justice.**
- **The consequences of both scientific visions and policy perspectives are:**
  - The **first vision**—with minimal reactive adaptation and mitigation strategies—would increase the probability of dangerous global changes in the environment, water, food and climate, and there would be linear and chaotic changes in the earth system.
  - The **sustainability perspective requires** a change in ***culture*** (thinking on the human–nature interface), ***world views*** (thinking on systems of rule, e.g. democracy vs autocracy, on domestic priorities and policies, and on inter-state relations in the world), ***mindsets*** (the strategic perspectives of policymakers), and new forms of national and global sustainable ***governance***.

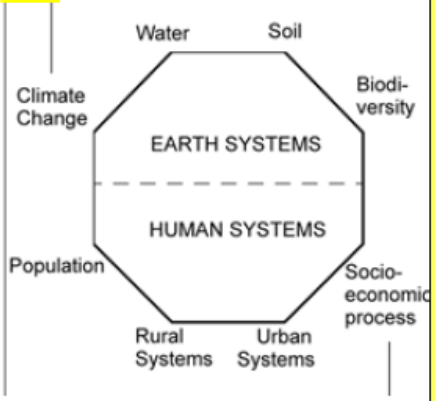
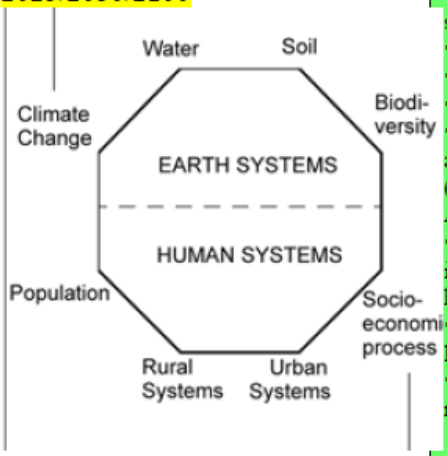
# 12.12. Goal & Structure of the Handbook on Sustainability Transition & Sustainable Peace

- **Build on success of security handbook with 3 vol. 270 chap., in 4 years about 530.000 chapter downloads**
- **Modern technology: digital printing**
  - **Publication on demand**
  - **Digital printing allows coloured illustrations in printed books.**
- **2 tools for rapid and wide global scientific distribution:**
  - **Ebook chapters my be downloaded free of charge by faculty & students in universities in more than 4000 universities globally that subscribe to the relevant Springer Nature book package (Handbook)**
  - **Printed versions of the Ebook: Mycopy for 25 $/€ in these universities**
  - **Open access books (Maja Göpel)**
  - **Boookmetric data are updated monthly and are publicly accessible**
  - **Free access in selective African countries after a year: e.g. on a book on Burkina Faso, Ivery Goast and Ghana: in these three countries.**

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



# 12.14. 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)----------↓ | | | | | | |

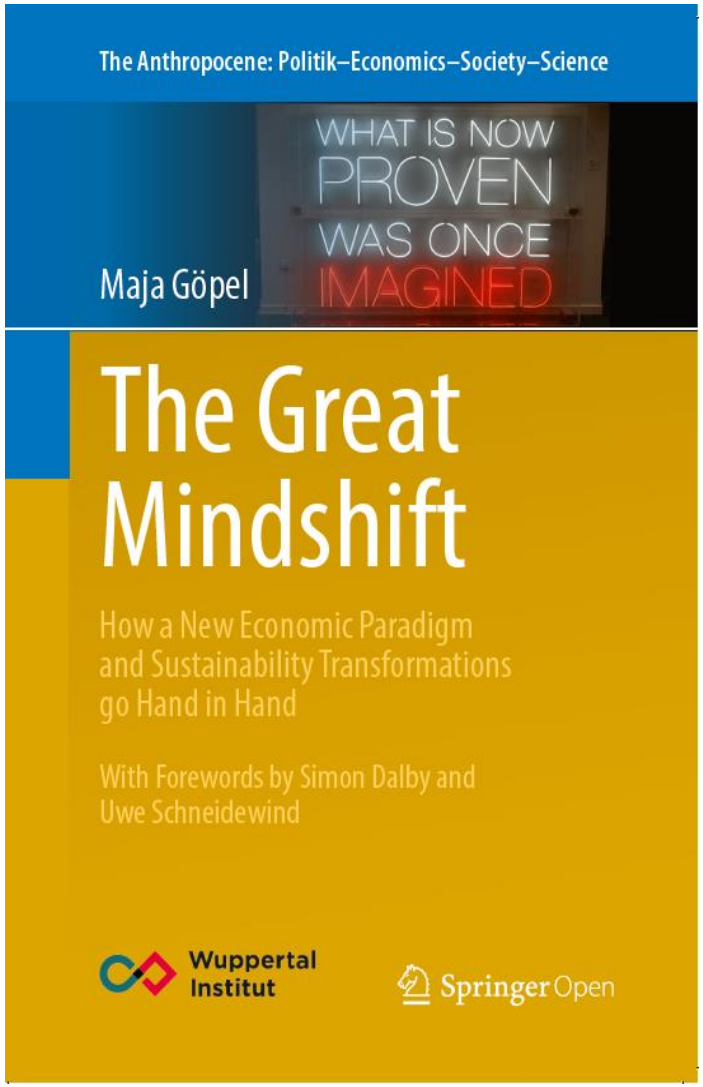
# 12.15. Structure of the Handbook

## *Handbook on Sustainability Transition and Sustainable Peace examines in 10 parts:*

1. moving towards **sustainability transition**;
2. aiming for **sustainable peace**;
3. meeting the **challenges of the twenty-first century**: demographic imbalances, temperature rise and the climate–conflict nexus;
4. initiating **research on global environmental change**, the limits to growth, and the decoupling of growth and resource needs;
5. developing **theoretical approaches to sustainability and transitions**;
6. analysing **national debates about sustainability in North America**;
7. preparing **transitions towards a sustainable economy and society, production and consumption and urbanization**;
8. **examining sustainability transitions in the water, food and health sectors** from Latin American and European perspectives;
9. preparing sustainability transitions in the **energy sector**; and
10. relying on **international, regional and national governance** for strategies and policies leading towards sustainability transition.

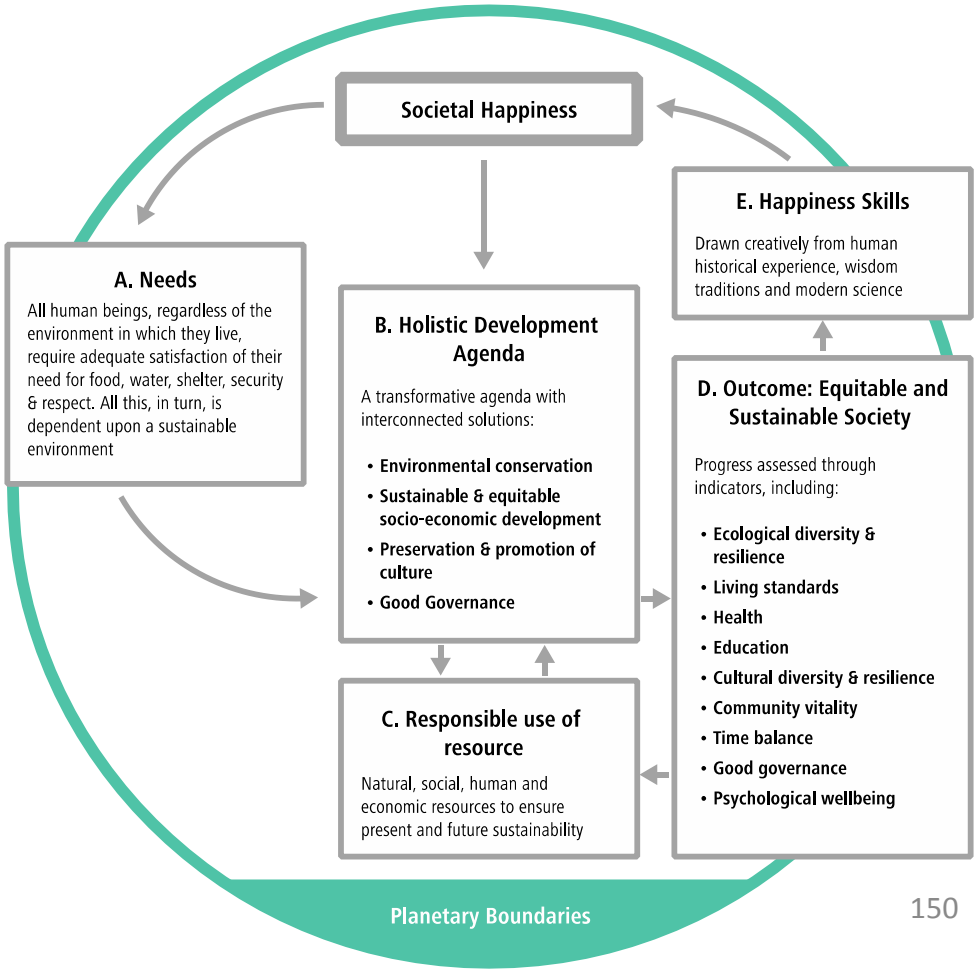
**60 authors from 18 countries in 5 continents (40% women)**

# 12.16. APESS 2: Maja Göpel: The Great Mindshift: How a New Economic Paradigm and Sustainability Transformations go Hand in Hand



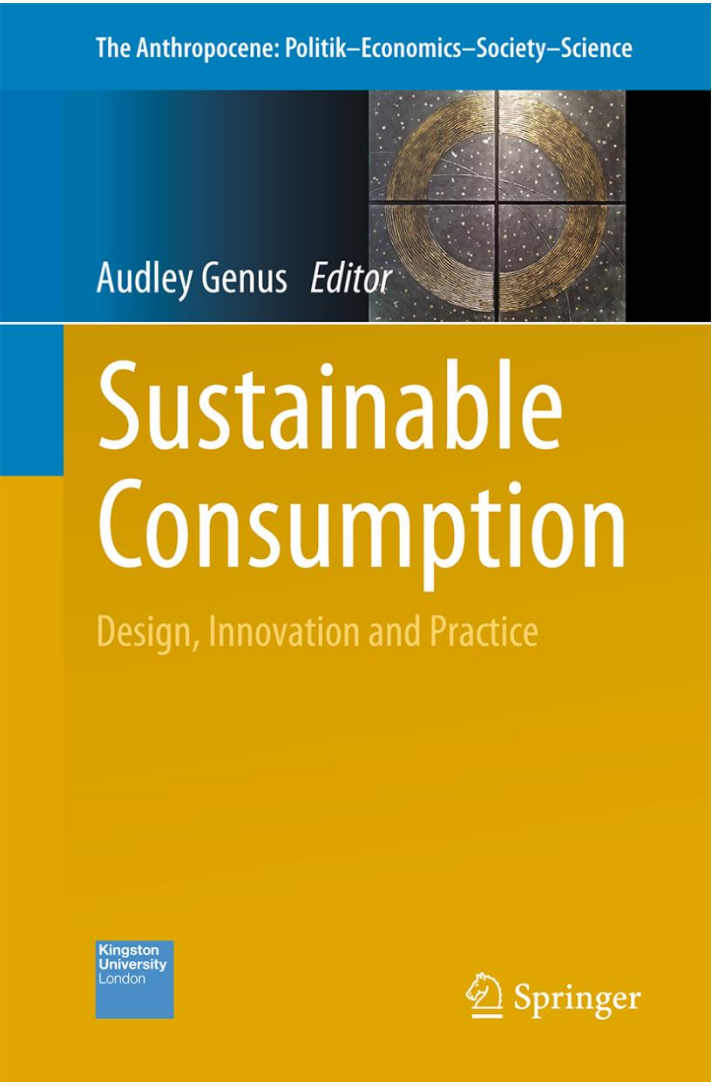

**Recoupling Economic Systems.**

Imaginaries of future sustainability paradigm

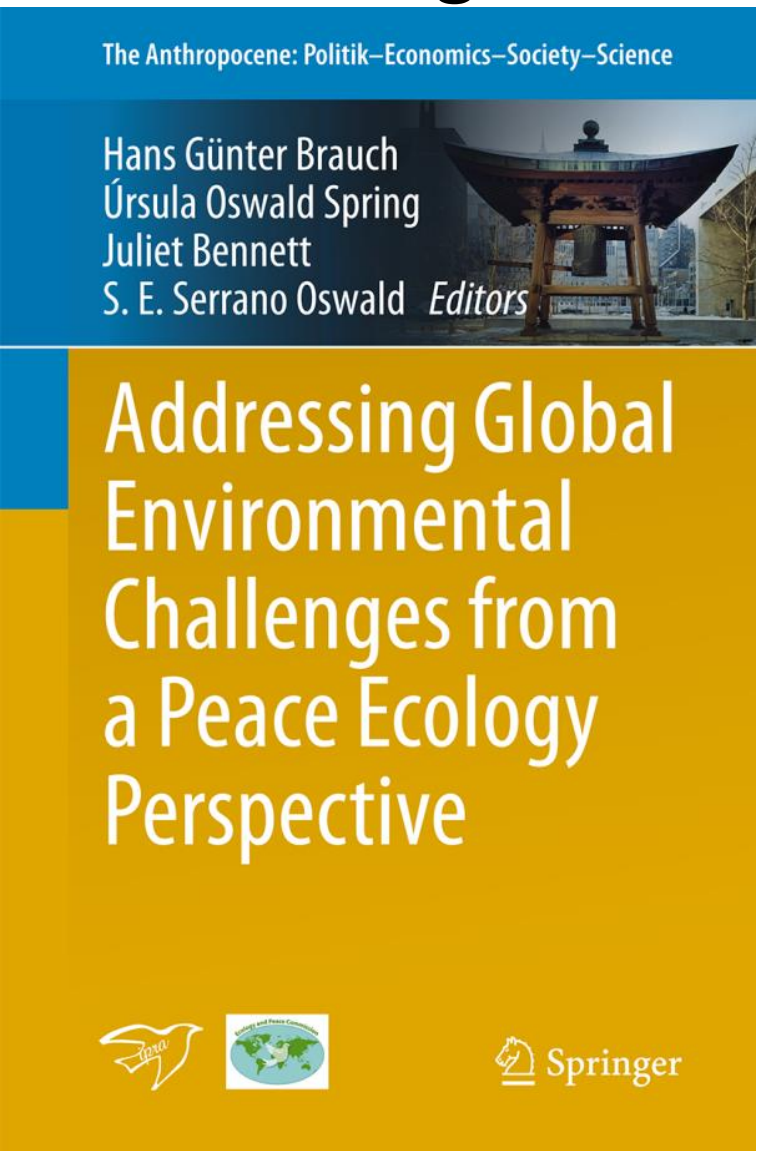


# 12.17. APESS 3: Audley Genus (Ed.): Sustainable Consumption:

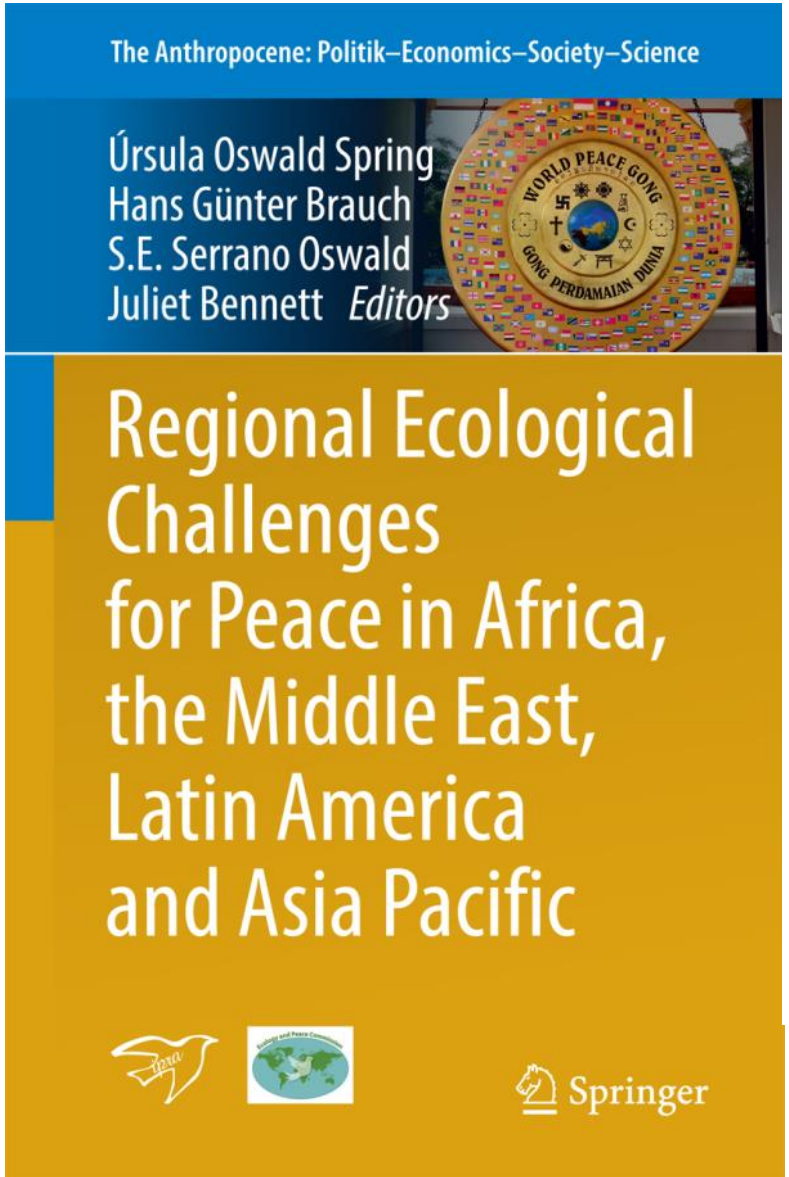
## Design, Innovation and Practice



# 12.18. APESS 04: Brauch, Oswald Spring, Bennett, Serrano Oswald (Eds.): Addressing Global Environm. Challenges from a Peace Ecology Perspective



# 12.19. APESS 05: Oswald Spring, Brauch, Serrano Oswald, Bennett (Eds.): Regional Ecological Challenges for Peace in Africa, the Middle East, Latin America and Asia Pacific



# Contact Details

- **Hans Günter Brauch**, Dr., PD (Adj. Prof.), Free University of Berlin (ret.); chairman of Peace Research and European Security Studies (AFES-PRESS); editor of five English language book series published by SpringerNature; works on peace, security and environment.
  - Websites: <http://www.afes-press.de/> & <http://www.afes-press-books.de/>
  - Email addresses: <brauch@afes-press.de>
- **Hexagon-Series: <http://www.afes-press-books.de/html/hexagon.htm>**
  - **< http://www.springer.com/series/8090?detailsPage=titles >**
- **APESS-Series: <http://www.afes-press-books.de/html/APESS.htm>**
  - **< http://www.springer.com/series/15232?detailsPage=titles >**
- **ESDP Series: <http://www.afes-press-books.de/html/SpringerBriefs_ESDP.htm>**
  - **< http://www.springer.com/series/10357?detailsPage=titles**
- **PSP: <http://www.afes-press-books.de/html/SpringerBriefs_PSP.htm>**
  - < http://www.springer.com/series/10970?detailsPage=titles >
- **PAHSEP: < http://www.afes-press-books.de/html/PAHSEP.htm>**
  - **< http://www.springer.com/series/15230?detailsPage=titles >**

# Thank you
# for your attention
# and patience.

Text for download at:
http://www.afes-press.de/html/download_hgb.html

Contact: <brauch@onlinehome.de>