HS 15390  Climate Change Impacts for International, European, National & Human Security: Causal, Discourse, Scenario and Empirical Analyses of Hotspots

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Seminar Plan (21.-23.2.1011)

Monday 21.2.2011, 8.00-18.00: Framing the debate: 4 schools/approaches
2. 8.00-10.00: Four key positions: dramatizers, opponents, sceptics, empiricists
3. 10.00-12.00: Causal analyses: Models of interactions between the earth and human system
4. 13.00-14.30: Discourse analyses in international organizations: UN, EU, NATO, OSCE
5. 14.45-16.15: Discourse analyses of selected countries: USA, Germany or UK and India
6. 16.30-18.00: Scenario analyses: Studies of the EU Commission and US Nat. Int. Council (CIA)

Tuesday 22.2.2011., 8.00-18.00: Empirical analyses
7. 8.00-10.00: Empirical analyses: different approaches for the Holocene and Anthropocene
8. 22.02., 10.00-12.00: Holocene: Collapse of high civilizations in Egypt, China and Mesoamerica
9. 22.02., 13.00-14.30: Climatic causes of massive ‘Völkerwanderung’ and of revolutions
10. 22.02., 14.45-16.15: Cases of extreme societal impacts of climate change in Anthropocene
11. 16.30-18.00: WBGU’s four conflict constellations for analysing future climate change impacts

Wednesday 23.2., 8.00-18.00: Regional climate change impacts & hotspots
12. 8.00-10.00: Climate change impacts for small island developing countries (SIDS)
13. 23.02., 10.00-12.00: Climate change impacts for Mediterranean, Middle East and North Africa
14. 23.02., 13.00-14.30: Climate change impacts for Sub-Saharan Africa (Sahel, Eastern and Southern Africa)
15. 23.02., 14.45-16.15: Climate change impacts for Central, South, South East or East Asia
16. 23.02., 16.30-18.00: Climate change impacts for Mexico, Central America and the Caribbean
Contents

1. Climate change & security: emerging debate
2. Reconceptualization of Security
3. Climate Change and International Security
   - Climate Change: a Security Danger/Concern
   - Climate Change and National Security
   - Climate Change and Human Security
   - Climate Change and International Security
4. PEISOR model on nature human interactions and for the analysis of climate change and conflicts as new security danger
1. Climate Change and Security – an emerging policy and scientific debate

- **Climate change**: natural variability vs. anthropogenic change
  - A topic of the natural sciences (earth systems science & climatology)
  - Global warming in atmosphere: precondition of life on earth
  - Sea-level rise and temperature increase
  - Natural variability: warm and cold periods: migration and conflicts
  - Anthropogenic climate change: burning of hydrocarbons
  - Climate observations (1860-2008) and projections (2050-2100)

- **Security**: discourse in the social sciences
  - A basic concept and a policy field:
  - Reconceptualization of security since 1990: contextual change
    - End of the cold war, globalization and global environmental change
  - Conceptual Innovation:
    - Risk society (Beck), social constructivism, theory of securitization

- **Three stages**: climate change as a socio-political issue
1.1. Impacts of Climate Variability: Holocene (12,000 years b.p. to 1750 AD)

During Holocene era both climate pessima (cold periods) and changes in precipitation patterns and long periods of drought were major triggers for several phases of massive people’s movements:

End of Roman Empire: massive people’s movements: 1st phase, 300-500 AD, Germanic, Turkish & other peoples.
1.2. Anthropocene

- It ... is more than appropriate to emphasize the central role of humankind in the environment by using the term ‘Anthropocene’ for the current geological epoch. The impact of current human activities is projected to last and even expand over long periods. ... Because of past and future anthropogenic emissions of CO2, climate will depart significantly from natural behaviour over the next 50,000 years....

- To assign a more specific date to the onset of the ‘Anthropocene’ we propose the latter part of the 18th century, when the global effects of human activities became clearly noticeable,, which show the beginning of a growth in the atmospheric concentrations of several ‘greenhouse gases’, in particular CO2 and CH4. Such a starting date also coincides with James Watt’s invention of the steam engine in 1784.

Paul Crutzen,
Nobel Laureate for Chemistry
Max Planck Institute for Chemistry
Department of Atmospheric Chemistry
1.1. Paul C. Crutzen: Foreword
From the Holocene
to the Anthropocene

• During 4.5 billion years of Earth history, after a long string of biological processes, only a million years ago, a single species ‘homo sapiens’ evolved, which grew increasingly capable of influencing the geology of our planet.

• **Holocene:** Since the end of the glacial period (10,000-12,000 years ago), high civilizations emerged.

• **Anthropocene:** Since 1780 humankind increased GHG concentration in the atmosphere from 278 ppm to more than 380 ppm today.
1.3. Anthropogenic Climate Change in the Anthropocene Era (1750 to present)

- GHG concentration in the atmosphere
  - 1/3: 1750-1958: 279 to 315 ppm

Temperature Increases & Sea Level Rise

Climate Change Impacts: Temperature & Sea level Rise

- Global average temperature rise in 20th century: + 0.6°C
- Projected temperature rise:
  - TAR (1990-2100): +1.4-5.8°C
  - AR4 (07): +1.1-6.4 (1.8-4)°C

Sea level Rise:

- 20th cent.: +0.1-0.2 metres
- TAR: 21st century: 9-88 cm
- AR4 (2000-2100): 18-59 cm
1.5. Global and Regional Change in Temperature (IPCC 2007, WG 1, AR4, p. 11)
1.6. Anthropogenic Climate Change in the Anthropocene (1900-2100)

- **Three Regimes for Temperature Increase**
  - +2°C: certain: EU Stabilization goal (decision in Copenhagen COP 15)
  - +4°C: probable, without immediate Stabilization Measures
  - +6°C: possible (business as usual) (catastrophe scenario)
1.7. Emissions: Responsibility of Industrial States (Tons of CO2 Emissions/Capita in Energy Sector only, 2002)

United States of America: 20
Russia: 11
Japan: 10
European Union (25): 9
World: 4
China: 3
Brazil: 2
India: 1

Source: World Resources Institute, CAIT
1.8. Projection: Stabilization at 550 ppm

Source: IPPC
1.9. Stabilization and Temperature Increase

Stabilisation and Commitment to Warming

Eventual temperature change (relative to pre-industrial)

- 5% stabilization at 400 ppm CO$_2$e
- 95% stabilization at 2°C
- 450 ppm CO$_2$e
- 550 ppm CO$_2$e
- 650 ppm CO$_2$e
- 750 ppm CO$_2$e

0°C, 1°C, 2°C, 3°C, 4°C, 5°C
### Projected Impacts of Climate Change

<table>
<thead>
<tr>
<th>Global temperature change (relative to pre-industrial)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°C</td>
</tr>
<tr>
<td>:-----:</td>
</tr>
<tr>
<td><strong>Food</strong></td>
</tr>
<tr>
<td><strong>Water</strong></td>
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<tr>
<td><strong>Ecosystems</strong></td>
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<tr>
<td><strong>Extreme Weather Events</strong></td>
</tr>
<tr>
<td><strong>Risk of Abrupt and Major Irreversible Changes</strong></td>
</tr>
</tbody>
</table>
1.11. Projected Increase of Sea Level Rise (IPCC chair, Pachauri, 2008)

<table>
<thead>
<tr>
<th>Stabilization level (ppm CO₂-eq)</th>
<th>Global mean temp. increase (°C)</th>
<th>Year CO₂ needs to peak</th>
<th>Global sea level rise above pre-industrial from thermal expansion (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>445 – 490</td>
<td>2.0 – 2.4</td>
<td>2000 – 2015</td>
<td>0.4 – 1.4</td>
</tr>
<tr>
<td>490 – 535</td>
<td>2.4 – 2.8</td>
<td>2000 – 2020</td>
<td>0.5 – 1.7</td>
</tr>
<tr>
<td>535 – 590</td>
<td>2.8 – 3.2</td>
<td>2010 – 2030</td>
<td>0.6 – 1.9</td>
</tr>
<tr>
<td>590 – 710</td>
<td>3.2 – 4.0</td>
<td>2020 – 2060</td>
<td>0.6 – 2.4</td>
</tr>
</tbody>
</table>
1.12. Projections and model consistency of relative changes in runoff by end of 21st century
2. Reconceptualizing Security:

• **Basic Assumption & Guiding Question:**
  – Did global and regional political contextual changes trigger a reconceptualizing of security?

• **What did change? Contextual factors:**
  – End of the Cold War: 9 November 1989 or 11 Sept. 2001
  – Process of globalization (1945, globalized in 1990)
  – Shift from ‘Holocene‘ to ‘Anthropocene‘

• **Which were the conceptual innovations?**
  – Theoretical: social constructivism & Beck: risk society
  – Widening, deepening & sectorialization of security
2.1. Which Conceptual Innovations?

  - *Widening*: from 2 to 5 security dimensions
  - *Deepening*: from national to human security
  - *Sectorialization*: energy, food, health, water security

- **Globalization: Econ. crises & social vulnerability**
  - New actors: terrorists vs organized crime
  - Crises, Globalization & Complex Emergencies: poverty: high economic and social vulnerability

- **Does Global Environmental Change & natural hazards pose new security dangers?**
  - Global Environmental Change: pressure & cause
  - Impact: Water-related natural hazards: & societal outcome (victims): migration & conflicts depend on social vulnerability
2.2. Objective, Subjective, Intersubjective Security

• Wolfers (1962) pointed to two sides of the security concept: “Security, in an objective sense, measures the absence of threats to acquired values, in a subjective sense, the absence of fear that such values will be attacked”.

• **Objective security dangers:** absence of threats

• **Subjective security concerns:** perception of absence of fear

• From a constructivist approach in international relations ‘security’ is the outcome of a process of social & political interaction where social values & norms, collective identities & cultural traditions are essential. Security: *intersubjective* or “what actors make of it”.

• **Copenhagen school** security as a “speech act”, “where a securitizing actor designates a threat to a specified reference object and declares an existential threat implying a right to use extraordinary means to fend it off”.

• Such a process of “securitization” is successful when the construction of an “existential threat” by a policy maker is socially accepted and where “survival” against existential threats is crucial.
2.3. Copenhagen School: Securitization

- **Securitization**: discursive & political process through which an intersubjective understanding is constructed within a political community to treat something as an existential threat to a valued referent object, and to enable a call for urgent and exceptional measures to deal with the threat.
- ‘**Referent object**’ (that is threatened and holds a general claim on ‘having to survive’, e.g. state, environment or liberal values),
- ‘**Securitizing actor**’ (who makes the claim – speech act – of pointing to an existential threat to referent object thereby legitimizing extraordinary measures, but not necessarily to be carried out by the actor),
- ‘**Audience**’ (have to be convinced in order for the speech act to be successful in the sense of opening the door to extraordinary measures).
- It is not up to analysts to settle the ‘what is security?’ question – widening or narrowing– but more usefully one can study this as an open, empirical, political and historical question.
- Who manages to securitize what under what conditions & how?
- What are the effects of this? How does the politics of a given issue change when it shifts from being a normal political issue to becoming ascribed the urgency, priority and drama of ‘a matter of security’.
2.4. Security Perception: Worldviews and Mind-sets

- Perceptions of security dangers (concerns) depend on worldviews of analyst & mind-set of policy-maker.
- Mind-set (Ken Booth): have often distorted perception of new challenges: include ethnocentrism, realism, ideological fundamentalism, strategic reductionism
  - Booth: Mind-sets freeze international relations into crude images, portray its processes as mechanistic responses of power and characterize other nations as stereotypes.
  - Old Cold War mind-sets have survived global turn of 1989/1990
- 3 worldviews are distinguished by the English school:
  - Hobbesian pessimism (realism): power
  - Kantian optimism (idealism) international law & human rights
  - Grotian pragmatism: multilateralism, cooperation is vital.
- 3 ideal type perspectives in other cultures & traditions:
  - Power matters: Sunzi, Thukydides, Machiavelli, Hobbes,
  - Ideas matter: Kant, W. Wilson
  - Cooperation matters: Confucius, Grotius
2.5. From International & National to four Pillars of Human Security

- **Alliance Security**: NATO (1949-), WP (1955-2001)
- **Common Security** (Palme Report 1982)
- **Environmental Security** (Brundtland 1987)
- **Cooperative Security**: Brookings Institution (1990’s)
- **Human Security**: UNDP (1994): 4 pillars of HS
  - Freedom from fear: humanitarian law agenda (Norway, Canada)
  - Freedom from want: development agenda (Japan & developing c.)
  - Freedom to live in dignity: democratic governance, human rights
  - Freedom from hazard impacts: natural hazard & disaster agenda
2.6. Widening of Security Concepts: Towards Environmental Security

4 trends in reconceptualisation of security since 1990:
- **Widening** (dimensions, sectors), **Deepening** (levels, actors)
- **Sectorialisation** (energy, food, health),
- **Shrinking** (WMD, terrorists)

## Dimensions & Levels of a Wide Security Concept

<table>
<thead>
<tr>
<th>Security dimension</th>
<th>Level of interaction</th>
<th>Military</th>
<th>Political</th>
<th>Economic</th>
<th>Environmental</th>
<th>Societal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Societal/Community</td>
<td>shrinking</td>
<td></td>
<td></td>
<td>Energy se.</td>
<td></td>
<td>Food, health</td>
</tr>
<tr>
<td>National</td>
<td></td>
<td>shrinking</td>
<td></td>
<td>Water security</td>
<td></td>
<td>Food, health</td>
</tr>
<tr>
<td>International</td>
<td>Regional</td>
<td></td>
<td></td>
<td>Water security</td>
<td></td>
<td>Water security</td>
</tr>
<tr>
<td>Global/Planetary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GEC</td>
<td></td>
</tr>
</tbody>
</table>
## 2.7. Environmental & Human Security

### Expanded Security Concepts (Møller, ‘03; Oswald ‘01)

<table>
<thead>
<tr>
<th>Label</th>
<th>Reference object</th>
<th>Value at risk</th>
<th>Source(s) of threat</th>
</tr>
</thead>
<tbody>
<tr>
<td>National security</td>
<td>The State</td>
<td>Territ. integrity</td>
<td>State, substate actors</td>
</tr>
<tr>
<td>Societal security</td>
<td>Societal groups</td>
<td>Nation. identity</td>
<td>Nations, migrants</td>
</tr>
<tr>
<td>Environmental sec.</td>
<td>Ecosystem</td>
<td>Sustainability</td>
<td>Humankind</td>
</tr>
<tr>
<td>Gender security (Oswald Spring)</td>
<td>Gender relations, indigenous people, minorities</td>
<td>Equality, identity, solidarity</td>
<td>Patriarchy, totalitarian institutions (governments, churches, elites) intoler.</td>
</tr>
</tbody>
</table>

### Human security
- **Referent:** individuals and humankind. [Human Security Network](#)
- **Values at risk:** survival of human beings and their quality of life.
- **Major source of threat:** nature (global environmental change), globalisation, nation state with its ability to cope with this dual challenge.

### Environmental Security
- **Referent:** Ecosystem; **Value at risk is sustainability.**
- **Major challenges:** global environmental change & humankind,
3. Climate Change as a Security Issue

- What is the linkage between both?
  - A key problem of global environmental change
  - A key area of international relations

- Securitizing climate change:
  - GECHS (1999),
  - Brauch for BMU (2002),
  - U.S. DoD (2004), CAN (15 April 2007)
  - UNSC (17 April 2007),
  - CC as international, national and human security

- UNFCCC & IPCC: epistemic community as a securitizing actor major concern in Europe
3.1. Global Environmental Change (GEC)

GEC poses a threat, challenge, vulnerabilities and risks for human security and survival.
3.2. Global Environmental Change

- Since 1970/80s: ‘global environmental change’ (GEC)
  new topic in natural & social sciences: scientization
- Since 1988 politicization with policy efforts on:
  - Climate Change: 1988: issue of G7; 1990: UN GA mandate;
  - Desertification: UNCCD (1994)
- Since 2000: GEC as security issues: securitization
  - Since 2000: The Hague: water security
  - Since 2002: climate change as security threat/risk
  - Since 2003: NATO: Desertification as a security issue
  - Since 2009: UNCCD: Soil security
3.3. Climate Change as an Issue of International Politics and Security

Objective: climate change has influenced history for millennia

Subjective: perception of climate change as a political issue
– 1896: Arrhenius hypothesis: energy & climate change
– Climate Change became an issue of IR since 1988

Intersubjective: what policy actors make of it
– 1988: Reagan Admin. put CC on agenda of G-7
– 1990: IPCC set up by UN General Assembly
– 1992: Rio Earth Summit: UNFCC signed
– 1997: Kyoto protocol approved (-5.1% by '08)
– 2007: Bali Road Map to COP 15: Copenhagen

Intersubjective: Securitization of climate change
3.4. Securitization of Global Environmental & Climate Change

- 3-fold debate & discourse on Climate Change
  - Theory: Securitization by O. Waever (Copenhagen.)
  - International Security
    - British, German and European debate (2001-2002)
    - goal: Strategy of conflict prevention through pro-aktive action: Environment-, development- & economic policy
  - National Security: (since 2003/2004) especially in USA
    - 2007: new military missions for Pentagon
  - Human Security:
    - GECHS Project of IHDP: social vulnerability of poor and marginalized people, workshop in 2005: (1999-2009)
3.5. Discourse 1: Climate Change & Internat. Security

- **BMU-Report 2002: Climate change and conflicts**
  - Goal: Agenda setting for IPCC
    - Coalition: Germany, Great Britain, Finland, Mexico
    - Focus: Small Island states, Bangladesh, Mexico, Egypt, MMR
  - OECD-Case studies: Bangladesh, Egypt, Tanzania, Nepal, Fiji

- **WBGU-Report 2008: Security Risk Climate Change**
  - State-centred security concept
  - 4 Conflict scenarios:
    - Climate-induced degradation of drinking water
    - Climate-induced reduction of food production
    - Climate-induced increase of storm and floods, drought and famine
    - Climate-induced migration
3.6. Climate Change as a Problem of International Security

**UNSC debate (17.4.2007)**
- UK Foreign minister: **52 States participated** (instead 15 UNSC)
  - **For the Debate:** UN-SG, Ban Ki-moon, UK, all EU-states, Alliance of small Island States
  - **Sceptical:** Russia, USA, **Opposed:** China, Group of 77 (Pakistan)

**June 2009: UN-GA resolution: SIDS: report by SC**
- Response of some 30 states: PSIDS
- 11 September 2009: Report by SC: pointed to five channels: climate change and security:
  - (a) **Vulnerability:** Climate change threatens food security and human health, and increases human exposure to extreme events.
  - (b) **Development:** If climate change results in slowing down or reversing the development process, this will exacerbate vulnerability and could undermine the capacity of states to maintain stability.
  - (c) **Coping and security:** Migration, competition over natural resources and other coping responses of households and communities faced with climate-related threats could increase the risk of domestic conflict as well as have international repercussions.
  - (d) **Statelessness:** There are implications for rights, security, and sovereignty of the loss of statehood because of the disappearance of territory.
  - (e) **International conflict:** There may be implications for international cooperation from CC impact on shared or undemarcated international resources
Threat multipliers and threat minimizers: the five channels

- Climate Change → Impacts
  - Vulnerable
    - Weak Adaptive Capacity
      - Development
        - Uncoordinated Coping
          - Food Security
          - Water Security
          - Human Health
          - Etc.
  - Stateless
    - Resource Scarcity or Resource Abundance
      - Threat Multiplier

Possible Security Threats
- Community
- National
- Regional
- International

Sustainable Development
- Adaptation
- Economic Development
- Governance
- Capacity Building
- Mitigation
- Conflict Prevention

Source: United Nations Secretariat, based on submissions of Member States and relevant organizations.
Climate change ... as a threat multiplier of existing trends, tensions and Instability, that overburdens fragile and conflict prone states and regions

Seven international security threats from climate change:

1) Resource conflicts (Water, soil, food);  
2) Economic damage and risks for coastal cities;  
3) Loss of territory and border conflicts;  
4) Environmentally-induced migration;  
5) Situations of fragility and radicalization  
6) Tensions on energy supply  
7) Pressure on international politics

Regions, where these threats become manifest

- Africa, Middle East, South Asia; Central Asia, Latin America, Arctic.

Central challenge: Environmental Migration


Roadmap Process: DG External Relations not DG Environment
3.9. Discourse 2: Climate Change & National Security: USA

Climate changes as a threat for US national security ➔ Reactive search for military answers and for new military missions of the Pentagon

- **Pentagon study** of Schwartz/Randall: (October 2003, February 2004)
- **Gilman, Randall, Schwartz**: Effects of climate change: System vulnerability of possible effects up to 2050 medium scenario of temperature increase
- **March 2007: Strategic Studies Institute**: Colloquium on “global climate change: National Implications for Security”
- **March 2007**: Senators Durbin (D-IL)/Hagel (R-NE): Law on intelligence assessments on climate change impacts on national security
- **November 2007**, *Center for Strategic and Intern. Studies* (CSIS); *Centre for a New American Security* (CNAS): *The Age of Consequences: The Foreign Policy and National Security Implications of Global Climate Change*
US National Security Strategy 2010

- **The danger from climate change is real, urgent, and severe.** The change wrought by a warming planet will lead to new conflicts over refugees and resources; **new suffering from drought and famine; catastrophic natural disasters;** and the degradation of land across the globe. The United States will therefore confront climate change based upon clear guidance from the science, and in cooperation with all nations—for there is no effective solution to climate change that does not depend upon all nations taking responsibility for their own actions and for the planet we will leave behind.

- **Home:** Our effort begins with the steps that we are taking at home. We will stimulate our energy economy at home, reinvigorate the U.S. domestic nuclear industry, increase our efficiency standards, invest in renewable energy, and provide the incentives that make clean energy the profitable kind of energy. This will allow us to make deep cuts in emissions—in the range of 17 percent by 2020 and more than 80 percent by 2050. This will depend in part upon comprehensive legislation and its effective implementation.

- **Abroad:** Regionally, we will build on efforts in Asia, the Americas, and Africa to forge new **clean energy partnerships.** Globally, we will seek to implement and build on the Copenhagen Accord, and ensure a response to climate change that draws upon decisive action by all nations. **Our goal is an effective, international effort in which all major economies commit to ambitious national action to reduce their emissions,** nations meet their commitments in a transparent manner, and the necessary financing is mobilized so that developing countries can adapt to climate change, mitigate its impacts, conserve forests, and invest in clean energy technologies. We will pursue this global cooperation through multiple avenues, with a focus on advancing cooperation that works. We accept the principle...
3.11. Discourse 3: Climate Change & Human Security

- **IHDP-GECHS** (Global env. change & human security)
  - Synthesis conference: Research (1999-2009) in Oslo
- **Greek Presidency of the HSN (2007/2008)**
  - Conference in May 2008 in Athens: Final declaration
  - Impact of climate change on vulnerable groups: women, children, environmental migrants in developing countries
  - Policy paper: Climate change, human security and development
  - 3rd pillar of human security: “freedom from hazard impact”
- **Policy Memorandum 15 April 2007: for UN SC debate**
  - Wisner, Brauch, Oswald Spring u.a.
- **Friends of Human Security: Japan & Mexico: June 2009**
- **Debate in UN General Assembly**
  - May 2007: human security: climate change as a threat
  - June 2009: Resolution on climate migration: international peace & security
Climate Change & Security: Challenges for a New Peace and Security Policy in the Anthropocene

• New security challenges require new security & peace policy for the Anthropocene
• We are the threat! Impossible to fight war against oneself
  – threat: our fossil energy consumption and way of life
  – solution: GHG reduction by 2050: -50% (global), -80% ICs
    • Electricity, heating, transportation, industry
    • Increase in energy efficiency and renewable energy
  – Global responsibility and global action
  – Proactive vs. reactive Policy and Crisis Management
    • Reactive: Welt financial crisis: no price is too high
    • Proactive: climate change: we cannot afford drastic measures
    • Short term horizon: political & economic action
4. Towards the PEISOR Model

- **PEISOR**: Result of pressure and response models and of debates on environmental security and on natural hazards.

The PEISOR model combines five stages:

- **P** (*pressure*) refers to 6-8 drivers of global environmental change
- **E to the effects** of the linear, non-linear or chaotic interactions within the ‘hexagon’ on environmental scarcity, degradation, and stress;
- **I to extreme or fatal impacts** of human-induced and climate-related natural hazards (storms, flash floods, flooding, landslides, drought);
- **SO to societal outcomes**: internal displacement, migration, urbanization, crises, conflicts, state failure, and
- **R to response by society**, business community, state where both traditional & modern technological knowledge can make a difference.

**Hazards cannot be prevented**, their **impact** in terms of deaths, affected people, economic & insured damages can be reduced by policies & measures that link protection with empowerment of the people to become more resilient.
4.1. Global Environmental Change & Impacts: PEISOR Model

<table>
<thead>
<tr>
<th>Pressure</th>
<th>Effect</th>
<th>Impact</th>
<th>Societal Outcome</th>
<th>(Policy) Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Causes of Global Environmental Change (GEC)</td>
<td>Socio-economic interaction, Environmental scarcity, degradation and stress</td>
<td>Natural and human-induced hazards</td>
<td>Individual choice (survival dilemma)</td>
<td>Societal response</td>
</tr>
</tbody>
</table>

Direct natural link: climate change and extreme weather events

GLOBAL ECONOMIC AND POLITICAL CONTEXT AND CONDITIONS (security dilemma between states in the international system)

EARTH SYSTEMS

Water
Soil
Biodiversity
Climate Change
Population
Rural Systems
Urban Systems
HUMAN SYSTEMS
Socio-economic process

Degradation (soil, water, biodiversity)

Stress

Natural hydro-meteorological hazards
- storm (hurricane, cyclone)
- floods, land slides
- drought, forest fire
- heat wave

Geophysical hazards
- earth quakes
- tsunami
- volcano eruption

Technological and human-induced hazards
- accidents
- deliberate acts (terrorism)

Individual/family/community choice (survival dilemma)
- stay at home & suffer
- move (migrate)
- protest & fight (violence)

Migration

Conflict Avoidance
Prevention
Resolution

Political process

Crisis
Conflict

Societal response
- massive migration (rapid urbanization rise)
- internal crisis
- violent conflict
- conflict avoidance, prevention, resolution

State

Decision

Society
Economy

Coping with GEC & environmental stress (adaptation & mitigation)

Knowledge (traditional & modern Scientific/technological)

NATIONAL ECONOMIC AND POLITICAL CONTEXT AND CONDITIONS

Socio-economic process (human forces and human systems)

Feedback
Schematic framework of anthropogenic climate change drivers, impacts and responses (IPCC)

**Earth System factors**
- Climate change
- Soil
- Water
- Biodiversity

**Human System factors**
- Population change
- Rural systems
- Urban systems
- Socio-economic cultural processes
Pressure: Interactions of GEC

Desertification
Land Degradation & Drought

- Reduced primary production & nutrient cycling
- Droughts
- Land degradation
- Soil erosion
- Compaction of soils
- Water erosion

CLIMATE CHANGE
Global temperature increase
Climate variability
- Reduced carbon reserves & increased CO₂
- Extreme weather events
- Increase of social vulnerability, poverty
- Sea level rise
- Pollution
- Rainfall variability

Aquifer depletion
Poor irrigation
Watershed degradation
Accumulation of toxic substances in water & soil

BIODIVERSITY LOSS
- Decreased land & soil organism species diversity
- Mining activities
- Land use change
- Reduced soil conservation
- Fauna loss
- Plant diseases & resistance
- Change in community structure & ethnic diversity
- Migration
- Urbanization
- Slums
- Forest fires
- Land slides
- Hydro meteorological disasters

WATER STRESS
Gender vulnerability & survival strategies
### Effect & Impact

<table>
<thead>
<tr>
<th>Effect</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socio-economic interaction</td>
<td>Natural and human-induced hazards</td>
</tr>
<tr>
<td>Environmental scarcity, degradation and stress</td>
<td></td>
</tr>
</tbody>
</table>

#### Direct natural link: climate change and extreme weather

- **Effect:** Environmental security debate of 1990s
  - Toronto school
  - Swiss school (ENCOP):
    - Soil scarcity > degradation > environmental stress

- **Impact:** climate change -> extreme weather events
  - Hydrometeorological hazards
    - Drought (wind erosion)
    - Heatwaves
    - Forest fires
    - Storms (hurricanes)
    - Flash floods & landslides (wind & water erosion)
Impact: Human-Induced Natural Hazards

Drought, Famine and Societal Outcomes

Much knowledge on these factors:

- Drought, migration, crises, conflicts

Lack of knowledge on linkages among fatal outcomes

- Drought & drought-ind. migration
- Famine & environm.-ind. migration
- Conflicts & conflict-induced migration

Lack of knowledge on societal consequences: crises/conflicts

- Domestic/international crises/conflicts
- Environmentally or war-induced migration as a cause or consequence of crises and conflicts

**267 Events**

- Geological events
  - Earthquake/Tsunami, Volcano: 6%
  - Weather-related events
    - Storm: 29%
    - Floods: 40%
    - Extreme temperatures: 25%

**1,75 Million Dead**

- Earthquake/Tsunami, Volcano: 7%
- Storm: 36%
- Floods: 55%
- Extreme temperatures: 2%

**Economic damage: 1.400 billion US$**

- Earthquake/Tsunami, Volcano: 6%
- Storm: 31%
- Floods: 38%
- Extreme temperatures: 5%

**Insured damage: 340 billion US$**

- Earthquake/Tsunami, Volcano: 11%
- Storm: 79%
- Floods: 5%
- Extreme temperatures: 5%

*in Werten von 2005

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Reported Death of Natural Hazards globally

Affected persons of Natural Hazards globally (1974-2003): 5 076 494 541 persons

## Most severe droughts (1900-2008)

<table>
<thead>
<tr>
<th>Country</th>
<th>Date</th>
<th>Killed</th>
<th>Country</th>
<th>Date</th>
<th>Affected (million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China P R.</td>
<td>1928</td>
<td>3,000,000</td>
<td>India</td>
<td>1982</td>
<td>300</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>1943</td>
<td>1,900,000</td>
<td>India</td>
<td>2002</td>
<td>300</td>
</tr>
<tr>
<td>India</td>
<td>1942</td>
<td>1,500,000</td>
<td>India</td>
<td>1972</td>
<td>200</td>
</tr>
<tr>
<td>India</td>
<td>1965</td>
<td>1,500,000</td>
<td>India</td>
<td>1965</td>
<td>100</td>
</tr>
<tr>
<td>India</td>
<td>1900</td>
<td>1,250,000</td>
<td>India</td>
<td>Jun 82</td>
<td>100</td>
</tr>
<tr>
<td>Sov. Union</td>
<td>1921</td>
<td>1,200,000</td>
<td>China P. R.</td>
<td>Jun 94</td>
<td>82</td>
</tr>
<tr>
<td>China P R.</td>
<td>1920</td>
<td>500,000</td>
<td>China P. R.</td>
<td>April 2002</td>
<td>60</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>May 83</td>
<td>300,000</td>
<td>India</td>
<td>April 2000</td>
<td>50</td>
</tr>
<tr>
<td>Sudan</td>
<td>April 83</td>
<td>150,000</td>
<td>China P. R.</td>
<td>June 1988</td>
<td>49</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>Dec 73</td>
<td>100,000</td>
<td>China P. R.</td>
<td>Jan. 2003</td>
<td>48</td>
</tr>
</tbody>
</table>

**Source:** EM-DAT: The OFDA/CRED International Disaster Database, at: <www.em-dat.net> (created on 5 January 2009)
SO: Societal Outcomes

- Individual level (choice)
  - Human security perspect.
  - Survival dilemma of humans

- State/society level
  - Hunger, famine
  - Migration to urban slums
  - Rural-rural migration
  - Transborder migration
    - Seasonal (labour, nomads)
    - Permanent
  - Crises: domestic
  - Conflicts:
    - Peaceful protests
    - Violent clashes
  - Complex emergencies
Global Hunger Index 1990 & 2008


Source: IFPRI, 2008
UNREST OVER FOOD

This map records some of the worst recent violence — where people died or large numbers protested — wholly or partly in response to rising food prices. Other, lesser outbreaks occurred in West Africa. Even Wal-Mart in the United States rationed rice and Italian consumers protested over the price of pasta.

MAURITANIA

EGYPT
Apr 2008: 2 die in major bread riots; army is ordered to start baking bread.

HAITI

MOROCCO
300 injured in bread protests.

MEXICO
Jan 2007: 75,000 protest against a 400% rise in tortilla prices.

HONDURAS
Apr 2008: Thousands of activists, students and farmers block highways and rally against high food prices and free trade.

HAITI
Apr 2008: 1,000 march; many with empty rice sacks.

SENEGAL
Feb 2008: Riots leave 24 dead.

GUINEA
Jan 2007: 130 killed in 18-day national strike.

CAMEROON
Dec 2007: Tanks called in, 4 killed, in 5-day riots over wheat prices.

YEMEN
May 2008: 10 oz of 1,000s protest at doubling of food prices; 2 killed.

SOMALIA
May 2008: 10 oz of 1,000s protest at doubling of food prices; 2 killed.

MOZAMBIQUE
Feb 2007: 6 killed in food and fuel protests.

BANGLADESH
Apr 2008: 20,000 textile workers riot over wages and food prices.

INDONESIA
Jan 2008: 3,000 rally in Jakarta to demand action on soybean price, which doubled in a year.

Global net migration

Migration currents

Source: <http://www.economist.com/images/20080105/CSR900.gif>
WBGU-study: Climate 'Hotspots':
Four Conflict Scenarios

- Mediterranean
  - Water
  - Food product.
  - Migration
- South, Central and East Asia
  - Water
  - Food product.
  - Migration
  - Cyclone
- Latin America & Caribbean
  - Wasser
  - Water
  - Food product.
  - Migration
  - Hurricanes
Environmental conflicts (1980-2006)

Source: WBGU (2008: 32)
R: Policy Response to DLDD Dangers

• How? Responsive vs. proactive action
  – **Response**: cost of non-action (Stern R.)
  – **Proactive**: anticipatory knowledge, learning, action

• What? Addressing causes (pressure)
  – **Earth system**: environmental quartett
  – **Human**: productive/consumptive behaviour

• Responding to Effects & Impacts
  – Environmental stress
  – Climate-related natural hazards

• Dealing with Societal Outcomes
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