Governance of Climate Tipping Points

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Governance of climate tipping points does not exist yet.

AGENDA

1. The rationale
2. General principles and logics
3. Actors, venues, and approaches
4. Social tipping points?

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1. The Rationale

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Climate Tipping Points

Critical thresholds in major Earth system components ("tipping elements") beyond which a small perturbation can cause a qualitative change in the future state of a system.

Figure B2.3: The geographical distribution of global and regional tipping elements. Source: Potsdam Center for Climate Impact Research (PIK), based on Armstrong McKay et al., Science (2022).

Source: Potsdam Climate Impact Research Institute
Defining Tipping Points

**Alternative stable states**: The system in question undergoes a fundamental restructuring – a qualitative or identity change – from one stable state to another.

**Nonlinearity**: Beyond a threshold, the change process unfolds rapidly compared to a general background speed of the system.

**Positive feedback**: Self-amplifying feedback dynamics serve as main drivers of the change process, that is, the mechanism generating nonlinear behavior.

**Limited reversibility**: Many tipping processes are irreversible or hard to return to their initial conditions on human time scales.

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**Reason(s) for Concern?**

“The latest IPCC models projected a cluster of abrupt shifts between 1.5°C and 2°C, several of which involve sea ice.”

(Lenton et. al. 2019)
Exceeding 1.5°C global warming could trigger multiple climate tipping points

David I. Armstrong McKay*, Arie Staal, Jesse F. Abrams, Ricarda Winkelmann, Boris Sakschewski, Sina Loriani, Ingo Fetzer, Sarah E. Cornell, Johan Rockström, Timothy M. Lenton*
The RATIONALE for a conversation about governance

“Current global warming of ~1.1°C above preindustrial temperatures already lies within the lower end of some tipping point uncertainty ranges. Several tipping points may be triggered in the Paris Agreement range of 1.5 to <2°C global warming, with many more likely at the 2 to 3°C of warming expected on current policy trajectories. This strengthens the evidence base for urgent action to mitigate climate change and to develop improved tipping point risk assessment, early warning capability, and adaptation strategies.”

(Armstrong-McKay et. al., 2022)
Does this make a difference for climate change governance?

How?

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2. General Principles and Logics
General Principles?

- Ontological shift towards complex-systems thinking, adaptive management, agility
- Anticipatory governance; lengthen relevant time horizons; monitoring & early warning
- (Catastrophic) Risk management; precaution and prevention as core logic?
- Consider implications of cascading potential
- Attend to novel scales and scale interactions

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Tipping Element Diversity

• Each Climate Tipping Point is **different**: type of system, geographic extent, threshold temperature, other causal factors, time frame of tipping process, kinds of social impacts, role for cascades.

• So far, they are treated as a single type/category of problem/climate change effect

• Each could have **different implications for governance** (e.g., goal of prevention or adaptation), each could elicit different levels of concern, require different policies to prevent or address impacts, ...
Temporality: Distinguish 3 Phases

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Temporality: Distinguish 3 Phases

1. Anticipation & Prevention
   - Knowledge building & monitoring for early warnings,
   - Actor formation and venue selection,
   - Impact anticipation, risk assessments,
   - Goal setting
   - The Prevention window

2. Impact Management
   - Experiencing impacts
   - Adapting to continuing change
   - Dealing with losses
   - Work of governance institutions

3. Stabilization
   - Stabilizing the new normal

Years - Decades
Decades - Millennia
?
The Coral Reefs

- Mass bleachings in different locations
- Local changes with partial recovery

- More frequent bleaching and death of reefs
- Effects on fisheries, tourism, livelihoods, culture
- Migration, poverty, economic change

Stabilizing the new social and ecological organization independent of coral reefs
3. Actors, Venues and Approaches

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Actors and Scales (1)

GLOBAL SCALE?
- UNFCCC and the Paris Agreement
- Other multilateral institutions, including financial institutions
- The transnational private sector, esp. finance, banking and insurance
- Transnational NGOs, civil society

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Autors and Scales (2)

CONTINENTAL AND REGIONAL SCALES, corresponding to specific tipping points,

- Examples
  - The Arctic – Arctic Council
  - The Amazon – Amazon Cooperation Treaty Organization,
  - The Atlantic (e.g., AMOC) - ?
  - The Tropics (e.g., the coral reefs) - ?
- Need for novel actors and coalitions?

NATIONAL GOVERNMENTS, e.g., National Adaptation Plans and related institutions

LOCAL and community-scale actors

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ANTICIPATION and Prevention (1)

- Learning, knowledge c-production and meaning making → political interest formation
- Risk assessment with long time horizons
- Actor formation and governance venue selection
- Agenda setting
- Policy goal selection – prevention vs. impact management, preventing all vs. some – prioritizing the prevention of which one(s) – what if prevention is no longer an option for some? – actor specific capacities and limitations

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Anticipation and PREVENTION (2)

- Prevention as **MITIGATION**/emission reductions is key, but too narrow!
  - Global temperature goal – need for reassessment?
  - Mitigation pathways – fewer options?
  - Overshoot – how high and how long?
  - Negative emissions and (other) geoengineering
- Prevention as managing the **MULTIPLE CAUSES** of tipping
  - Amazon: temperature + deforestation + degradation
  - Coral Reefs: ocean temperature + ocean acidity + pollution

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Extended Data Fig. 1 panel d

Overshoot scenario:
- $T_{\text{Peak}} = 4.0 \degree \text{C}$
- $T_{\text{Conv}} = 1.5 \degree \text{C}$
- $t_{\text{Conv}} = 200 \text{ yrs}$
Impact Management

- Changing assessments of well understood, general climate change risks (e.g., additional temperature increase, rate increase in sea-level rise, ...) → revise adaptation plans?
- Changes in vulnerability assessments – what, who, where, when?
- Nature of risk: loss/transformation of biomes, permanence → higher relevance of loss and damage?
- Novel, not yet considered impacts and risks?

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Knowledge Generation between Science, Policy and Society (in Phase 1)

Knowledge to support decision-making (science-policy interface)

Knowledge to inform public debate, policy support, behavior change

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Challenges for Learning, Meaning Making and Risk Perceptions

- General challenges of science-policy interactions related to climate change apply to tipping points; some are amplified
- Issues of elevated concern in the context of climate tipping points are
  - Lack of observability/experience
  - Uncertainty
  - Temporalities, esp. non-linearity and long time horizons
  - Emotions, doom, and fatalism

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Tipping Points and the Science-Policy Interface

- Major role of science-policy relations in phase 1 (anticipation and prevention) → creating scientific knowledge and political meaning related to tipping points
- Limited knowledge about climate tipping points among climate negotiation participants up to 2018 (Milkoreit 2015, 2019)

Table 13.1 Levels of knowledge about climate tipping points among participating delegates, NGOs and scientists

<table>
<thead>
<tr>
<th></th>
<th>Delegates</th>
<th>Scientists</th>
<th>NGOs</th>
<th>Others</th>
<th>All</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>“I don’t know,” no</td>
<td>78</td>
<td>6</td>
<td>16</td>
<td>11</td>
<td>112</td>
<td>62</td>
</tr>
<tr>
<td>response OR wrong</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some knowledge</td>
<td>21</td>
<td>10</td>
<td>11</td>
<td>6</td>
<td>44</td>
<td>26</td>
</tr>
<tr>
<td>Detailed knowledge</td>
<td>13</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>22</td>
<td>12</td>
</tr>
<tr>
<td>TOTAL</td>
<td>112</td>
<td>21</td>
<td>30</td>
<td>18</td>
<td>181</td>
<td>100</td>
</tr>
</tbody>
</table>

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1. **Science and urgency**

1. *Welcomes* the contributions of Working Groups II² and III³ to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change;

2. *Recognizes* the importance of the best available science for effective climate action and policymaking;

3. *Takes note* of the 2022 adaptation gap⁴ and emissions gap⁵ reports of the United Nations Environment Programme, and recent global and regional reports of the World Meteorological Organization on the state of the climate;⁶

4. *Reiterates* that the impacts of climate change will be much lower at the temperature increase of 1.5 °C compared with 2 °C⁷ and *resolves* to pursue further efforts to limit the temperature increase to 1.5 °C;

5. *Recognizes* the impact of climate change on the cryosphere and the need for further understanding of these impacts, including of tipping points;
(In)Forming Risk Perceptions & National Interests

- Concern about tipping points is limited and unevenly distributed among actors (“That’s an issue for the IPCC.”)
- Temporal distancing!
- Framing climate risks as events that will occur outside political and social timeframes that are perceived as relevant (Jones et al., 2017)
- Concern/risk perceptions can change (increase) after engaging in a serious game (van Beek et al. 2022)
Imagining a Tipping Point?

Importance of novel, multi-sensorial, story-based, science-policy engagement processes that can support systems thinking, future imagination, and anticipatory governance

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Science and Society

- Tipping points as a mobilizer of public policy support/opportunity for public communication related to climate change?
- No difference in concern when faced with the possibility of abrupt climate change (Bellamy & Hulme, 2011),
- “The results of the study indicate that the type of climate change portrayal [linear vs. non-linear] did not affect perceptions of risk or other social-cognitive variables such as efficacy beliefs.” (Formanski et al., 2022)

2021 survey in the G20 countries:

73% across the G20 agreed that the Earth is close to ‘tipping points’ due to human activities
The novel, unexpected, ...

Things we have not even considered/fail to imagine?

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Questions for a Social Science Research Agenda

Who are/should be key governance actors?

What are the appropriate scales of action?

What measures should be taken to avoid or adapt to the cascading impacts of CTPs?

What capacities and institutions are needed?

What will be economic impacts at the level of the firm, industry, economy, or supply chain?

What are implications for business strategy, financial planning, and investments?

How can public understanding and risk perceptions be fostered?

How will tipping dynamics interact with transformation/decarbonization efforts around the world?
4. Social Tipping Points?
“What are the social tipping elements that could initiate a socially and economically disruptive transformation leading to a complete decarbonization by 2050?”

(Otto et al., 2020)
"Just as Tipping Points are part of the greatest threat we face – the same logic may also provide the solution. At the University of Exeter, we have identified a variety of Positive Tipping Points in human societies that can propel rapid decarbonisation. This concept could unlock the stalemate – the sense that there's nothing we can do about climate change."

**Professor Tim Lenton**  
Director of the Global Systems Institute
How to tip a social system (towards decarbonization)?

Social tipping as deliberate, actor-driven change that offers solutions to climate change = anticipatory governance instrument?

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Social Tipping – A New Tool for Climate Governance?

- Social tipping and mitigation/decarbonization
- Social tipping and adaptation
- Negative social tipping?
  - Adaptation limits
  - Migration
  - Supply chains
  - Cultural identities

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Key Messages

1. There is no governance for CTPs yet – it is time to engage in CTP governance!
2. CTP governance is *anticipatory*, managing long time horizons, requiring future imagination.
3. CTP governance should be *multi-scale*, incl. the scale of the tipping element(s), and consider CTP *diversity*.
4. The *science-policy interface* plays a major role in the first phase of CTP governance – co-production of meaning and political interests.
5. The *prevention window* for all CTPs is *now*, and it might be closing for some CTPs within a decade.

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Thank you!

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