How to project climate extremes that really matter? – A transdisciplinary approach for new narratives of climate extreme impacts in the Future Earth context

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Context and Motivation

The financial commitments to support adaptation inscribed in the Paris Agreement provide a much needed opportunity to kick-off adaptation action in vulnerable countries. Failing to adapt to climate related extreme impacts may undermine sustainable development prospects of those countries. Currently available assessments of scientific information, however, often fall short to address stakeholder needs and thereby fail to guide adaptation action. Changing patterns of climate extremes call for prompt context-specific impact and adaptation assessments and prediction, yet information on hazard and context is not readily available from existing analyses. In areas of data and information scarcity, scientific guidance is needed to develop novel approaches on how to predict and adapt to climate related extreme impact events. Guiding adaptation for such events is inherently case-specific and calls for cross-fertilization between scientific disciplines and local stakeholders.

Key research questions

- How to co-design adaptation to climate related extreme impact events in vulnerable countries?
- How can existing data be used to construct decision relevant information on climate related extreme impact events? How do multiple characteristics of (sequences of) weather events lead to extreme impacts?
- How can novel approaches to aid science-based adaptation in data-scarce regions be developed?
- What are critical thresholds related to patterns of (multiple) extreme events that require transformational change in environmental and societal systems?

Expected methodologies and disciplines involved

Methods:

- Co-design setup to identify the (i) multiple characteristics of (sequences of) weather events and (ii) conditions on the ground that lead to extreme impacts with highest adaptation relevance (at the local scale)
- Attribution of extreme impacts to various - socio-economic, climatic and environmental - drivers
- Assessment of climate analogues for such events in climate projections and integration of knowledge from climate modeling, numerical weather forecasting and climate impacts modeling across different sectors
- (Sub)seasonal forecasting of impacts by coupling weather projections with impact models (continuous confrontation of forecasts with observations as an ongoing experiment to improve models)
- Design of narrative approaches to cope with uncertainty in climate projections

Data:

- Enhanced monitoring (in particular in data scarce regions) and collection of context-specific data to identify and analyze extreme impact events and their socio-economic, climatic and environmental drivers
- Integrate and collect data along common metrics within Future Earth
- Build portfolios of future weather extremes connected to climate projections (weather projections nudged with projected future boundary conditions)

Disciplines involved: Case-specific transdisciplinary consortia of scientists and practitioners; including for example: adaptation practitioners, climate (impact) scientists and meteorologists, data analysists, social scientists, engineers, and communication experts

Stakeholders involvement

The case specific selection of stakeholders could include:

- Practitioners (engineering, infrastructure, health, energy, water, and agriculture amongst others)
- Representatives of civil society/organizations including industry
- National and regional adaptation focal points (to facilitate accessibility of climate funds)
- All levels of government
- Data owners (climatological and societal)

Stakeholders are key for setting the scene and defining the problem. Explicit upfront incorporation and continuous mutual updating is essential for framing the problem setting and adjusting the project during its execution (co-design and co-production). Data owners are essential to integrate all available knowledge.

Relevant scale / region

Context dependent (local to regional) scale determined by adaptation relevance. Applicable in all regions with a special focus on vulnerable countries to enhance their adaptive capacity to climate related extreme impacts.

Expected societal impact

Benefits:

- Promote an enhance capacity for science-based adaptation to extreme impact events
- Focus on strongest impact events and integration of stakeholders allows for most efficient adaptation action and incorporation of this information in national and regional scenario building
- Narratives and co-design facilitate communication and thus understanding and implementation of results (stakeholders take ownership)
- Adaptation-relevant output based on the best available knowledge provides basis for improved access to adaptation funds through the UNFCCC and other international frameworks
- Create/improve integrated early warning systems for disasters in vulnerable countries
- Integration of emergency response and climate change adaptation

Integration into existing initiatives and/or networks:

- National climate focal points and climate change research centers (e.g. African Climate Policy Centre, Carib. Climate Change Community Centre, South-Pacific Regional Environmental Program)
- National meteorological services and national adaptation programs