Overview

Climate change puts social-ecological systems under immense pressure. Renewable resources are a focal point of these pressures, both because they are directly linked to climate effects, and because of the incentives to overuse common-pool property. At the same time, these resources are often vital, particularly in developing countries. Still, we lack a sufficient understanding of the dynamic two-way relationship between the natural and the social system that is necessary to successfully build resilient futures (see Figure 1). Our research sets out to open a new perspective on cooperation in social-ecological systems, thereby helping to find solutions for specific applied problems, at the same time as contributing to economics at large.

The description of our work is organized along methodological and topical lines. For each of the following three sections, we give a brief overview of the fundamental questions that are addressed, and highlight a few key projects. The numbers and abbreviations in squared brackets correspond to the journal publications, submissions, or project titles listed below.

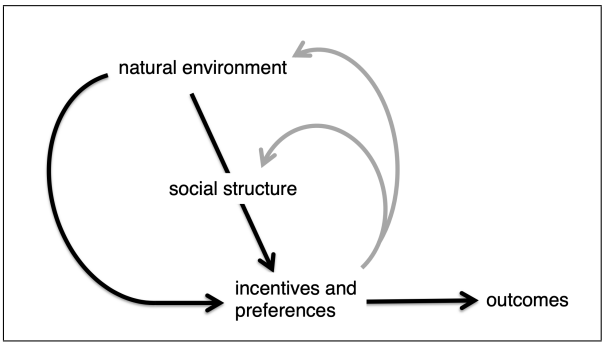

Figure 1: Conceptual sketch of research agenda

Theory and Tipping Points

Many dynamic systems exhibit tipping points – they fundamentally change their character once a critical value is crossed – with the climate system being the most prominent example. The location of the point at which a regime shift occurs is typically unknown. In a series of papers [1–3], we study how the threat of a regime shift affects non-cooperative and socially optimal resource use.

In the *EWS* project [4], we connect to a question that is discussed in the natural sciences, namely the possibility to receive an "early warning signal" about a tipping point. Instead of asking whether early warning signals exist, we ask how early warning signals would affect optimal management. We show that the possibility to receive informative signals gives an incentive to experiment. Counterintuitively, the presence of early warning signals can thus make dynamic management more risky. The theoretical model that we currently develop lays the foundation for several applications, including game-theoretic analyses and simulations that are based on real world systems with tipping point dynamics.

The next project does not look at the effect of a regime shift that is yet to come, but at adaptation to a regime shift that has already occurred. A regime shift may occur exogenously, or it may be caused by the agents themselves (occur endogenously). We designed an economic experiment that analyzes whether subjects react differently depending on what caused the regime shift. We find that human decision makers change behavior in a way that is uniquely attuned to the endogenous, social, cause of adverse events. This shift in behavior reduces the probability of an adverse event by 38.5% and increases expected payouts by 59%. The first manuscript [5] is submitted, and in a follow-up experiment [6], we specifically look at the issue of attribution.

While mankind can hopefully still avoid to cross a tipping point in the climate system, my theoretical and experimental studies all emphasize an effect of climate change that is already very real: It is essentially irreversible (on human time scales). Hence, it is crucial to obtain a better understanding of which policy measures are likely to reduce exposure and increase resilience and adaptive capacity to the effects of climate change.

Empirical Applications

In several empirical projects, we study the relationship between risk exposure and risk preferences, which are tightly interlinked in social-ecological systems. Climate change makes natural resources inherently volatile, but at the same time, these resource systems provide adaptive insurance. In a submitted project [7], we utilize regulatory differences in Chilean fisheries which imply that some resource users are free to adjust efforts to their needs, while others are restricted by quotas and cannot use harvesting to smooth consumption. Conducting a field survey, we find that resource users with restricted quotas indeed express a stronger need for precautionary savings, despite the fact that they experience less variation in harvests. Our study highlights that policies that aim at stabilizing resource productivity through restrictive quotas need to account for the existing adaptive capacity to avoid unintended welfare losses.

In another project [8], we address the question whether exposure to a more risky natural environment may shape risk preferences. We combine the data from three field trips to Tanzania, two field trips to Chile, and an online survey among Norwegian fishers with large administrative microdata. Our approach fills an important gap in the literature, which has provided evidence on the malleability and context-dependence of economic preferences using global datasets on the one-hand, and specific case studies on the other hand.

In two further projects, we use the big dataset of Norwegian landing tickets (in total about 17 million observations). In follow-up work of [9], we match this data with a spatial oceanographic model at daily resolution. A number of high-profile papers assume that fishers follow fish when predicting the effects of climate change. With our data and model in hand, we can answer whether this is indeed the case. In another project, we analyze whether the ecolabel of the Marine Stewardship Council has an effect on producer prices. While the question appears straightforward, it has not been adequately answered to date. This project is in the beginning phase and will most likely be the first of a series of papers that more closely study the strategic interactions between producers and labeling organizations, seeking a better understanding of how consumer-based policies can be a part of the toolkit for sustainability.

Experiments on Social Norms

Two factors characterize the social structure of natural resource systems, especially in developing countries. First, enforcement mechanisms rely on social norms, a shared understanding of what ought to be done in a given situation. Second, harvesting decisions are almost always taken by groups.

The first factor means that policies that try to affect social norms are a promising (and sometimes the only) tool to improve governance. I study how decisions are affected by the provision of information about what others have done (descriptive social norm). In one project [10], we look at risk preferences. In another project [11], we look at a social dilemma. Indeed, the latter study is the first experiment to test the effects of a norm-nudge in a controlled setting with resource users in the field (fishers at Lake Victoria, Tanzania). We find that providing social information has a clear effect on norms of cooperation, but only when group members have the opportunity to give feedback. Moreover, our experiment can document the moderating role of social proximity.

The second factor, that decisions are taken on the group level, means that we need to understand how the fact that actors are organized as groups affects decisions. Tying into a growing literature, we use an m-turk experiment in [12] to study whether groups react differently to scarcity than individuals. We find that this is the case: groups discipline resource use under scarcity.

Finally, the project [13] brings the two factors together and asks how norm-based interventions affect outcomes when decisions are taken by groups. While a large literature documents the effectiveness of norm-nudges on individuals, it is not known whether norm-nudges affect groups. Polices that rely on activating social norms to change behavior are particularly relevant for environmental policies. In fact, combating climate change is arguably the greatest challenge of mankind, and we can only be successful when, next to formal regulations, there is a true "mindset shift" for sustainability.

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