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Introduction to the special issue on adapting institutions to climate change

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Abstract. This article introduces the special issue on climate adaptation and institutions. Economic accounts of climate adaptation have stressed its collective action nature and the limitations of standard economic approaches to the matter. Governance accounts, on their part, have shown that adaptation does not always happen when it is expected. Against this background, institutional economics has the potential to shed light on those societal processes and collective mechanisms leading to and shaping adaptation (or the absence of it). The selection of articles contributing to this special issue shows that climate adaptation can indeed be explored successfully through institutional economics, and that doing so fits well within the institutional economics agenda. Some recommendations for future research are provided at the end.

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1. Background and rationale

This special issue was envisioned for the first time at the 2013 European Climate Change Adaptation (ECCA) conference in Hamburg, Germany, after a conference session on institutional analysis and climate adaptation. In the years that followed, a longer conversation took place across various scientific events in Europe and North America, exploring the potential of institutional economics to advance our present understanding of climate adaptation. Three main considerations motivated the process.

First, standard economic accounts of climate adaptation have pointed at problems connected with public goods, moral hazard and adverse selection, leading to both market and government failure (e.g. IPCC 2014; Mendelsohn 2006; Osberghaus *et al.* 2010), limiting the ability of market processes to address the challenges posed by climate change (Scrieciu *et al.* 2013; Surminski 2013), and challenging the applicability of those policy instruments in the economist's toolbox (Fankhauser and Soare 2013; Heuson *et al.* 2012). This, alone, is a clear call for an institutional economics approach to adaptation, as institutional economics transcends the market–state dichotomy (Ostrom 1990).

A second motivation for an institutional economics analysis of climate adaptation lies in the findings of governance scholars, who stress the ubiquitous and multi-faceted character of "barriers to adaptation" (Biesbroek *et al.* 2013; Eisenack *et al.* 2014). Expectations of a swift and straightforward adaptation to the changing climate may be essentially misplaced, since those rules shaping political, social and economic interactions – that is, institutions (North 1991) – often stand in the way. As a result, institutions and collective action have featured early on in the study of how individuals and society deal with the end of a stationary climate (Adger 2003; Miller *et al.* 1997), and prominently so.

Third, a large body of institutional economics analyses addressing climate adaptation is missing. Institutional economics is concerned with those rules around which social interaction is structured, focusing on how such rules come about and how they change (Hodgson 1998, 2006). Change, however, has hardly ever been addressed in the context of a changing climate. Only recently have scholars started to address the question of whether climate change is amenable to, and poses, new questions for institutional economics (e.g. Araral 2013; Berman *et al.* 2012; Libecap 2011; Marshall 2013). So far, sophisticated and critical applications of institutional economics knowledge aimed at answering climate adaptation questions (e.g. Eisenack 2016; Roggero 2015) have been few and far between. In other words, there's a gap to fill.

In summary, in the face of a clear demand for insights on the institutional economics of climate adaptation, supply has been short thus far. Appearing in the *Journal of Institutional Economics*, this special issue is a first attempt at engaging the institutional economics audience in order to fill the gap between said demand and supply. However, we believe, institutional economists will

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only respond to our invitation if: (1) climate adaptation presents puzzles that institutional economics can solve; and (2) solving such puzzles fits well within, and possibly advances, the institutional economics agenda. Addressing these two points is the aim of the present text.

This introduction is structured as follows: the next section sets out by laying down a basic understanding of climate adaptation, highlighting the core traits of its institutional dimension as they emerge from the adaptation literature. It then proceeds to link key issues in climate adaptation to the institutional economics scholarship, with particular reference to the institutional change literature. Some suggestions for future research provide a conclusion.

2. Overview of the literature

Climate change, adaptation, and institutions

Weather conditions in any particular place and time encompass a set of physical parameters such as temperature, precipitation, humidity, wind, and air pressure. The climate represents variations of these parameters over time –at present, as cyclical intra-annual variations (e.g. the seasons) around a rather stable overall pattern. In short, the weather may change from day to day and from week to week, but overall the climate is stable or "stationary" in any given geographical region. Climate change research addresses the end of such a stationary character of the climate (Smit *et al.* 2000).

Geological records across the eras show that climate has changed significantly due to various natural causes. But today, anthropogenic climate change is caused by greenhouse gas emissions into the atmosphere, mostly due to the human use of fossil fuels – arguably the single most important enabling factor for the industrial revolution (Kander *et al.* 2017; Mertzanis 2018). Mitigating climate change implies limiting and prospectively phasing out fossil fuels. As of today, though, too much greenhouse gases have been released into the atmosphere for it to remain stationary. The climate *has* already changed and *will* change further in the future (IPCC 2014).

Against this background, climate change adaptation describes all individual and societal actions aimed at adjusting to the experienced or expected climate change impacts (Eisenack and Stecker 2012; Smit and Wandel 2006). These encompass physical measures, such as flood-walls to avoid inundations and irrigation systems to make up for shorter rainfall. The technical and infrastructural dimension of climate adaptation does not exhaust the set of potential and necessary adjustments to different climatic conditions, for two reasons. First, physical measures won't always be able to fully off-set the impacts of a changing climate (Dow *et al.* 2013; Felgenhauer 2015) thus a change in practices and habits will be required. Second, technical and infrastructural solutions are themselves embedded in a broader network of human habits and

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practices: implementing infrastructural solutions therefore requires adjustments in human habits and practices (Adger *et al.* 2009).

Against this state of affairs, adaptation scholars have framed the societal dimension of adapting to climate change by borrowing heavily from the literature on common-pool resources and socio-ecological systems (Adger *et al.* 2005; Dietz *et al.* 2003; Folke *et al.* 2005; Ostrom 2007), arguably in light of the existing links between the respective scientific communities (Janssen *et al.* 2006). Scholars have been particularly successful in highlighting the collective action nature of adaptation (Adger 2003; Bisaro and Hinkel 2016), and raising the question of suitable institutional designs for it (Huntjens *et al.* 2012). By doing so, scholars have highlighted the challenges of bringing about adaptation: a large body of literature on barriers to adaptation (Eisenack *et al.* 2014; Moser and Ekstrom 2010) shows that adaptation may well not come about even when it is expected – and that for explicitly institutional reasons (Oberlack 2016).

Institutional economics in the context of climate adaptation

In light of the above, advancing our present understanding of the institutional economics of climate adaptation consists in unravelling collective action in complex social dilemmas, exploring present and alternative institutional designs, and unlocking social and institutional barriers to change – all that in a context of changing biophysical conditions, and with implications spanning across long time frames. Doing so may be rewarding for the institutional economist for two main reasons: (1) biophysical conditions have been comparatively understudied; and (2) it fits well with the research agenda on institutional change.

Concerning the first point, it's important to recall that institutional economics, as a branch of economics, has a primary interest in explaining differentials in economic growth (Hodgson 1998; Langlois 2017). It does so as a function of institutional determinants such as property rights (Acemoglu *et al.* 2005; North and Thomas 1977), legal systems (Buchanan *et al.* 2014), mental models (Denzau and North 1994), or cultural traits (Bowles 1998; Hodgson 1998). Consideration of the biophysical underpinnings of such determinants was not part of the original research agenda of institutional economics. It emerged only later, arguably as a by-product of the study of public goods (Coase 1960; Hardin 1968; Olson 1965). Indeed, the path-breaking work of Ostrom (1990) starts precisely as a critique of Hardin's (1968) analysis of common-pool resources – and represents a milestone in the institutional study of socio-ecological systems.

At the interface between the biophysical world and institutions, three lines of inquiry can be distinguished: institutional ecological economics (Paavola and Adger 2005); nature-related transactions; and the study of common-pool resources, which later evolved into the study of socio-ecological systems. Concerning the first of the three lines, Vatn (2005) stresses the ecological interdependencies between environmental resources, and the "radical uncertainty" surrounding them. These considerations are however linked to

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institutions only with respect to how human, economic activities deal with their biophysical underpinnings. No implications are drawn about how institutions themselves are shaped by the biophysical world in which they are embedded.

By blending elements of agricultural and transaction costs economics, the line of research on nature-related transactions makes a step forward in these respects. Stressing the distinction between managing man-made, engineered systems (as for industry), and steering biological processes (agriculture), Hagedorn (2008) points to the different requirements for the corresponding institutional arrangements. Progress has been made concerning the key biophysical attributes of such systems (Thiel *et al.* 2012; Thiel *et al.* 2016), and how these match with particular institutional arrangements. Little is known, though, about how such attributes shape those mechanisms behind institutional performance, and affect institutional change. On this topic, the contribution to this issue by Roggero and Thiel (2017) proposes some steps forward.

Lastly, the study of common-pool resources bears the legacy of the standard economics approach to public goods, prescribing specific institutional arrangements (individual property rights) on the basis of resource characteristics (rivalry and excludability). Common-pool resource scholars have successfully challenged such prescriptions. Addressing common property and common management regimes, they have shown the importance of context-specificity, which does include biophysical conditions. Efforts to go beyond rivalry and excludability (e.g. Constanza *et al.* 2001; Schlager *et al.* 1994) have been made through the diverse applications of the Ostrom Social-Ecological Systems framework (Hinkel *et al.* 2015), but so far no accepted and theoretically underpinned set of variables has been found to hold across diverse applications (Vogt *et al.* 2015).

As the above makes it clear, much has still to be done in order to achieve a solid understanding of how change in biophysical conditions triggers change in institutions. In the context of climate change, catching up in these respects may be rewarding. Outside the realm of "institutions (strictly) as equilibria" (see Hindriks and Guala 2015 and Aoki 2017 for an overview), institutional reasoning has a teleological dimension: institutions fulfill certain purposes (Bromley 2006). Most of these purposes arguably come about in the physical world and may thus be predicated upon particular climatic conditions, which are due to change. Climate change can thus reveal to what extent particular institutions are still able to perform satisfactorily under changed circumstances, and which ones instead will collapse (Young 2010).

Concerning the second point – how climate change may further the institutional economics agenda – the emphasis the adaptation literature puts on barriers to adaptation recalls several themes within the institutional change literature. More specifically, scholars have gone to great lengths to isolate and classify barriers to adaptation (Lehmann *et al.* 2013, Oberlack 2016), but these are either reported, or postulated whenever expected adaptations do

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not come about. There is thus a lack of insight on those mechanisms causing adaptation processes to halt and/or not to deliver (Biesbroek *et al.* 2013). On their part, institutional economics scholars have explored many such mechanisms, unravelling the role that, for example, vested interests (Acemoglu *et al.* 2005; Aoki 2017; Sherer and Lee 2002), unintended effects (Sherer 2017; Rutherford 1984), cognition (Blyth 2001; Buchanan *et al.* 2014; Fox-Wolfgramm *et al.* 1998) and institutional interplay (Hall and Thelen 2009; Pohlner 2016) can have in the persistence of suboptimal arrangements.

Particularly worthwhile mentioning in these respects is the case of incremental change. Incremental change is still an open question even within the institutional scholarship (Beland 2007; Fox-Wolfram *et al.* 1998). Particularly challenging about it is that it lies exactly at the conceptual boundary between stability and change, casting doubts on whether it represents continuity with past arrangements (as opposed to change), or whether it should be regarded as a specific instance of change (as opposed to stability of past arrangements). Most crucially, it may cause change to be overlooked or underestimated (Streek and Thelen 2005).

In these respects, exploring adaptation to climate change may provide institutional economists with a suitable context in which to explore and further refine the very meaning of change. Two aspects seem particularly promising. First, barriers to adaptation may in certain instances prove to be instances of incremental change, where adaptation is overlooked because of expectations of transformative change. Second, climate change impacts manifest themselves both in incremental and abrupt ways, raising questions about what sort of adaptation is necessary under what circumstances (Kates *et al.* 2012).

3. Overview of the contributions to the special issue

Considerations about vested interests, unintended effects, cognition, institutional interplay, incremental change, and biophysical conditions all feature, in different combinations, among the contributions to the present special issue. Not surprisingly, most analyses take a comparative approach, with about half of them engaging in mid-*N* explorations and putting thus a strong emphasis on variation among arrangements and their contextual underpinnings. The link to socio-ecological systems and the study of the commons is also evident, with both the Institutional Analysis and Development framework and the Social-Ecological Systems framework featuring at the center of two respective analyses, and a further two analyses centering on cooperation and transaction costs.

Roggero *et al.* (2017) address the intersection between the adaptation literature and that on common-pool resources. They explore the adaptation literature through the lens of the IAD framework, performing a systematic literature review of IPCC-referenced articles. They thus assess the consideration that adaptation scholars give to different aspects of institutional analysis. Results

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show a strong focus on collective choice and on adaptation by public actors, with an emphasis on the rules in use, social interactions and, to a lesser extent, attributes of the community. Research gaps emerge instead concerning operational and constitutional choice, private adaptation, physical interactions and biophysical conditions.

Bergsma (2017) examines the role of experts in the introduction of spatial planning considerations for dealing with floods. Central to her analysis is the paradigm shift taking place in the realm of river basin management, moving away from an understanding of total safety from floods, and toward the acknowledgement that floods do happen even against the best infrastructure. Such a change in understanding of the role and capabilities of flood protection infrastructure leads to flood risk arrangements that have profound distributional implications. In this context, the analysis links the features of such arrangements to the role of expert knowledge, mediated by institutional and political circumstances. It does so with reference to flood protection in the US and in the Netherlands, providing an explanation of the stark differences in arrangements that can be observed between the two cases.

Gawel *et al.* (2016) take a Public Choice perspective in order to address barriers to efficient public climate adaptation. By doing so, they link the presence of suboptimal arrangements to the vested interests of specific actors. Specifically, they distinguish various dimensions of public adaptation and investigate how the self-interest of voters, pressure groups, bureaucrats and politicians may affect adaptation decisions, diverging from a theoretical efficient public adaptation. They then illustrate their findings with reference to public responses to major flood disasters in Germany, showing how these reflect the incentive structure of concerned stakeholders and their political interaction.

Villamayor-Tomas (2017) addresses the cooperative responses to disturbances in a selection of irrigation associations in Spain. Relying on transaction costs and collective action theories, the article links the different, mainly physical attributes of the disturbances to the cooperative dimension of the responses by the irrigation associations. The analysis is based on the coding of association records, performing a mid-*N* qualitative comparative analysis. Surprisingly, the results show that two alternative pathways are sufficient for the emergence of cooperation responses, one that is congruent with transaction costs theory and the other supporting relational theory. Most importantly, though, the analysis shows that specific combinations of physical characteristics of the disturbance at stake lead to different collective responses.

Oberlack and Eisenack (2017) raise the question of how barriers to adaptation arise, and address it through a collective action perspective. Focusing on "archetypes" of barriers in collective action processes, they search for evidence of mechanisms causing resistance to change and suboptimal arrangements to persist. They do so through a meta-analysis of 26 selected case studies of adaptation in the realm of water governance and river basin management.

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The reappearing patterns they identify cover issues connected with institutional interplay, uncertainty and vested interests, relating specifically to coordination gaps, path dependencies, zero-sum games, uncertainties and competing priorities. Results show that the challenges maintaining collective action under climate change arise from the attributes of the actors and from pre-existing institutions, rather than the biophysical characteristics of the adaptation measures at stake.

Roggero and Thiel (2017) explore collective action within local administrations addressing adaptation to climate change. The authors focus here on differentiating the type of institutional change observed as a function of pre-existing arrangements. Based on transaction costs economics, they unravel the role of so-called integrative and segregative institutions in the way different functional branches within an administration respond to climate change collectively rather than independently. Through a comparative analysis of 19 climate sensitive local administrations in Germany, they show how integrative institutions lead to incremental change, adjusting existing arrangements in order to accommodate adaptation. Under segregative institutions, however, administrations show a more transformative type of institutional change, conditional however to past experiences of extreme weather events.

4. Looking ahead: directions for future research

The different articles contributing to this special issue show how institutional economics can be applied successfully to climate adaptation settings. They also show a good fit between the research agenda of institutional economics, linking the performance and change of given institutions to e.g. vested interests, cognition, interplay, and transaction costs, and the type of problems addressed in a climate adaptation setting. Yet again, the selected articles are little more than a showcase for the institutional economics of climate adaptation, and they are far from exhausting the matter.

There are large research gaps at the crossroads between adaptation and institutional economics, and this issue is no exception to that – it barely features private adaptation and operational choice, for instance. Furthermore, there's a broad range of topics worth addressing that haven't been included in this special issue. These are: the effects of climate change on property rights; a characterization and mapping of structural diversity among collective action dilemmas in climate adaptation; and an exploration of the potential contribution of evolutionary institutional economics. Let us briefly sketch these topics individually.

Property rights are a crucial element in the workings of institutions, which indeed can be understood as distributions of entitlements and obligations among actors. Climate impacts have no understanding of property rights, though, and both Gawel *et al.* (2016) and Bergsma (2017) have shown the distributive implications of adapting to climate change. In a world where the (re)distributive implications of adaptation are the norm and not the exception, what happens to

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property rights? Historically, securing property rights has been a key stepping stone in advancing economic output (Acemoglu *et al.* 2005). Institutions such as insurance and the pooling of resources have a long history of dealing with hazards and hedging property rights against uncertainty, and are indeed being investigated as a form of adaptation against climate change. They raise the question whether, as incremental solutions, they will suffice, or whether different forms of property rights are going to emerge that are resilient against a changing climate and the corresponding adaptations.

It is clear that adaptation particularly at higher scales has a collective action dimension. Prospectively, the matter will move away from the question whether collective action does or does not take place and toward the specificities of collective action arrangements to be expected. Roggero and Thiel (2017) provide a first attempt at that. Further advancements, though, will require a characterization of the different social dilemmas linked with climate adaptation. Villamayor-Tomas (2017) and Oberlack and Eisenack (2017) are already moving a few steps in that direction, following the direction shown by Bisaro and Hinkel (2016).

Finally, a promising avenue for the advancement of our present knowledge of institutional change processes lies in the cross-fertilization between institutional and evolutionary economics. Although inspired by biological processes, evolutionary theory will not make up for the present lack of biophysical awareness in the institutional scholarship. Rather, it envisions a theory of institutional change based on variation, retention and diffusion: the mechanisms at the core of generalized Darwinism (Blyth *et al.* 2011; Ostrom and Basurto 2011). Much of the debate there revolves around the role of intelligence, volition, and (we could add) planned behavior as a source of variation and tinkering (Beinhocker 2011; Hodgson and Stoelhorst 2014). From the point of view of this special issue, important extensions may be made in terms of climate change, where variation induced by sentient agents (actors!) may be able to anticipate those changes in the fitness function potentially induced by climate change.

In summary, the aim of this special issue is to establish a constructive and fruitful line of intellectual exchange between adaptation scholars and institutional economists. As this introduction has shown, climate adaptation can indeed be explored through institutional economics thinking. Doing so fits well within the general agenda of institutional economics. It may even lead to a deeper and more nuanced understanding of the role (changing) biophysical conditions and their change have for those societal mechanisms that institutional economics is concerned with.

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