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Governance and everyday adaptations? Examining the disconnect between planned and autonomous adaptation through justice outcomes

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ABSTRACT. Much of the current attention in research has focused on planned adaptation, i.e., public policy, but this overlooks the fact that human and societal responses to changes in the climate are ubiquitous. Thus, autonomous adaptation, the so-called everyday adaptation, continues to be largely unaccounted for. This obscures the understanding to what extent autonomous and planned adaptation are synergistic or conflicting, resulting in maladaptive, unjust, and unequal outcomes. We approach adaptation as a commons issue and integrate existing frameworks and concepts to show how planned and autonomous adaptation can be understood together to break down the dichotomy. This integrated approach, combined with a focus on the outcome of actions through the dimensions of climate justice, can support understanding of the actions and institutions that support equality and justice. We draw on examples from recent studies on everyday adaptations by farmers and urban dwellers in light of the framework.

Key Words: *agriculture; autonomous adaptation; institutions; justice; urban*

INTRODUCTION

Adaptation to climate change is inevitable, but who adapts continues to be a largely unknown question. Much of adaptation scholarship has focused on planned adaptation, i.e., governed adaptation that includes the strategies, plans, and measures of national or municipal authorities with limited focus on outcomes so far. This framing ignores the fact that human and “ungoverned” societal responses to changes in the climate are ubiquitous. Autonomous adaptation, the so-called everyday adaptations, need to be understood on their own and in relation to planned adaptation. This enables the analysis of synergies and conflicts between autonomous and planned adaptation and their outcomes.

Current understanding of autonomous adaptation has emerged on two separate tracks. First, there are contributions from a common pool resource theoretical perspective (Bisaro and Hinkel 2016, Barreteau et al. 2020), or institutional economics (Roggero et al. 2018). These contributions shed light on the complexity of everyday adaptation situations embedded in different systems (e.g., social-ecological). Second, empirically autonomous adaptation has been predominantly studied within sectors and regions where actors’ actions are directly impacted by climate change, such as agriculture (Anh Tran 2020, Xu et al. 2020), coastal fisheries (Pecl et al. 2019, Ogier et al. 2020), and urban areas (Turek-Hankins et al. 2021). In their review of adaptation action literature related to extreme heat, Turek-Hankins et al. (2021) discuss autonomous adaptation pointing to individual autonomous adaptation as the most common combination of actors and implementation. The main interest in these studies is to identify what motivations actors have and what types of strategies and everyday adaptation practices they pursue. Thus far, only a few studies examine the role of historical and cultural elements in adaptation and how they shape the adaptation taking place (Shackleton et al. 2015, Adamson et al. 2018). In addition, the role of autonomous adaptation is highlighted in the case study literature on community-based adaptation, predominantly in situations where planned

adaptation is absent because of governance failures (Spires et al. 2014).

The question of adaptation outcomes is not only linked to accounting for autonomous adaptation, but also to considerations of justice (Shi et al. 2016, Holland 2017, Chu and Cannon 2021, Yang et al. 2021). Interactions between planned and autonomous adaptation have differentiated impacts on the adaptation outcome for different groups, e.g., through restrictions placed on autonomous adaptation by planned adaptation (Mersha and van Laerhoven 2018). Alongside issues related to distributive justice, previous research on adaptation and justice highlights the fact that questions regarding procedural justice, namely related to process and agency, have been insufficiently addressed (Malloy and Ashcraft 2020:2). This is supported by research focused on cities in the Global South (Bulkeley et al. 2013). Fitzgibbons and Mitchell (2019) examine 31 city level strategies and find that inequality and justice are inconsistently addressed across the strategies, and that some strategies even include measures that may contribute to further inequity. This tension between local level institutions and vulnerable groups in decision-making processes has also been shown by others (Shackleton et al. 2015, Bordner et al. 2020, Omukuti 2020). The low level of engagement with vulnerable groups in regard to their autonomous actions, the little influence they have over the adaptation decision (McManus et al. 2014), and overlooking root causes of vulnerability have likely made the situation worse (Mersha and van Laerhoven 2018). Thus, although both autonomous and planned adaptation may lead to outcomes that are less equitable, just, or fair, addressing these processes together could help to address their shortcomings (Harlan et al. 2019, Rahman and Hickey 2019).

We consider adaptation as a commons issue to explore how the dichotomy between planned and autonomous adaptation can be approached. Integrating the concept of justice into an existing framework of adaptation action helps to illustrate how the institutional settings within that adaptation action condition its

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outcomes. More specifically, we show how existing institutional forces influence autonomous and behavioral responses and impact the interaction between autonomous and planned adaptation. This integrated approach, combined with dimensions of climate justice, distributional, procedural, and recognition justice principles, can support the understanding of how institutions and actions support the emergence of equality and justice. This means exploring how impacts of climate change and vulnerabilities are distributed, who participates in decision making related to adaptation, whose rights are recognized, and who is impacted by the adaptation actions. We use existing, peer-reviewed literature with purposive sampling^[1] (Robinson 2014) to show examples from recent studies and empirical material on everyday adaptations by farmers and urban dwellers.

DISMANTLING THE DISCONNECT BETWEEN PLANNED AND AUTONOMOUS ADAPTATION - A COMMONS FRAMEWORK

The disconnect

The five previous Intergovernmental Panel on Climate Change (IPCC) reports have almost exclusively focused on defining and documenting planned adaptation in the changing climate conditions (IPCC 2007, 2014). Adaptation has been defined as action resulting from a deliberate policy decision, that is further framed as a result or awareness of already, or soon to be, implemented adaptation. The definition has changed over time and has shifted from drivers, i.e., response is triggered by other drivers than climate as defined in the Third Assessment Report (IPCC 2001), to a term covering independent anticipatory and reactive adaptive practices, as well as behaviors and risk reduction practices by people and the private sector (Wamsler and Brink 2014). In general, adaptation research predominantly focuses on drivers of behaviors that have private benefits (Wilson et al. 2020). In their review of behavioral adaptation, Wilson et al. (2020) state that studies examining behaviors with collective benefits or exploring the moderating role of social factors on affective and cognitive cues are currently absent from the literature.

Autonomous and planned adaptation can interact with each other in a complementary or counteractive way. Autonomous adaptation can be thought to both compensate for lower levels of planned adaptation, but it can also hamper planned adaptation compliance (Wamsler and Brink 2014:75). Research on insurance provides evidence of the potential dual effect (e.g., incentivizing risk mitigation or maladaptation) of autonomous adaptation (O'Hare et al. 2016, EC 2018). Also, planned adaptation influences the extent of autonomous adaptation, though there is limited insight in the literature (Singh et al. 2021). Existing studies have approached it from the perspective of impact of policies on behavior change (Boeckmann and Rohn 2014, Jacob et al. 2019). Low levels of autonomous adaptation can either reflect a high dependence on planned adaptation or insufficient planned adaptation. For example, Buelow and Cradock-Henry (2018) show how implementation of economic incentives and a disconnect from the social context can fail to trigger changes in farming behavior. Wamsler and Brink (2014:85) link autonomous adaptation with a general level of confidence in authorities, more specific institutional support for adaptation, as well as patterns of social behavior. As institutional forces influence autonomous

behavioral responses and impact the interaction between autonomous and planned adaptation, (and thus the outcome cycle), it makes sense to consider both together.

Considering planned adaptation as the “sole” adaptation activity in isolation of other factors that affect decision making of actors and organizations has resulted in a somewhat simplistic theoretical underpinning for adaptation. What is missing from the literature are analytical approaches that can account for the complexity of social situations, relationships with other actors in those situations, and the context embeddedness of these situations. We approach the disconnect with a focus on the adaptation action situations that are located in between the planned and autonomous adaptation measures, i.e., where planned adaptation is a part of the complex context, and the outcomes of adaptation feed back to the decision making on adaptation.

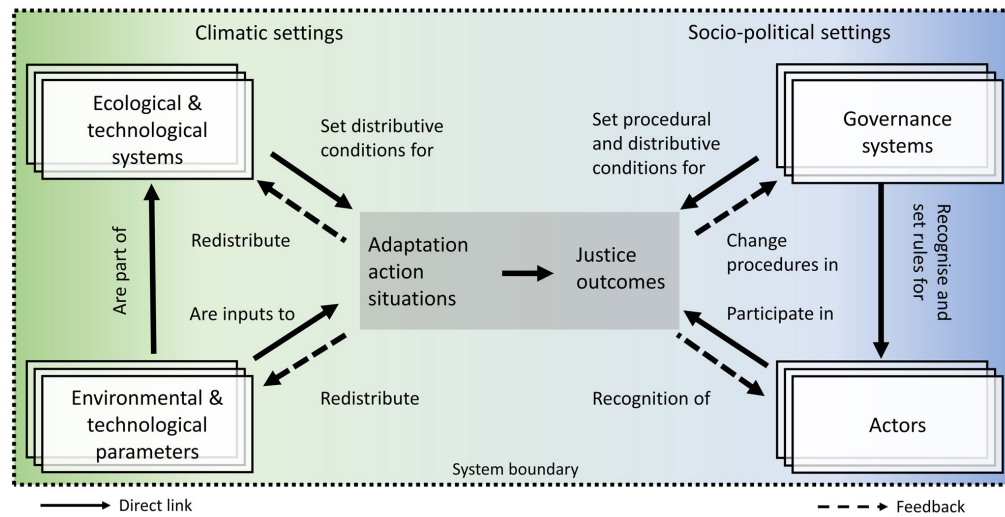
Adaptation as a commons issue

Our overall systemic framework development draws on the theory of Institutional Analysis and Development (Ostrom 2005) and critical institutional analysis (Cleaver and Whaley 2018). The purpose of institutional theory is to identify how institutions structure human behavior by identifying action arenas, as units of analysis, that structure the interactions of participants affected by a number of exogenous variables (Ostrom 2005). These exogenous variables include the natural world, but also community attributes and both formal and informal institutions, that structure society. Thus, institutional theory is ideally poised to examine autonomous adaptation, as the approach's focus is on explaining how self-organization of actors, emergence of social norms, and external policy process all contribute to the management of common pool resources (Ostrom 2009).

In fact, existing applications of institutional analysis development framework have demonstrated their ability to account for the multitude of autonomous adaptation actions (Bisaro and Hinkel 2016, Barreteau et al. 2020), and show how adaptation can be framed as a commons issue. Importantly, Bisaro and Hinkel (2016) characterize three types of processes that affect emergence of adaptation governance through action situations. There are (i) internal processes that involve actors generating institutions by establishing rules, (ii) social norms that may emerge spontaneously in society, or (iii) bureaucratic and legislative policy processes that may generate institutions. The participants of the action situation are linked to each other through the exogenous variables, in this case climate change, adaptation policy, and community attributes.

Although these current applications of the institutional theory do shed light on the adaptation action situation, their focus is on explaining the emergence of institutions, factors that affect it, and those engaged in the situation, i.e., provisioners and beneficiaries (Bisaro and Hinkel 2016). What they pay less attention to, however, is the focus on the outcomes and their further analysis of the dynamics involved. For example, when presenting the framework, Ostrom (2005:13–14) acknowledges the role that outcomes have in influencing the exogenous variables but suggests keeping the exogenous variables fixed for the sake of simplicity. Also, Barreteau et al. (2020:1) state that “[F]or the sake of clarity we stick to characterizing the processes rather than the outcome.”

Fig. 1. Just adaptation action situation framework (adapted from McGinnis and Ostrom 2014).



To further complement these frameworks, our approach focuses on the justice outcomes by acknowledging adaptation actions and outcomes as a continuous process that can be understood as changes in the institutional statements and as changes in the biophysical conditions of the adaptation action situation. On the one hand, this can mean that the outcome of an adaptation action situation changes the institutional rules that further guide behavior. For example, after a flood, for which there was no preparation, the rules may be changed to encourage people to prepare their own properties for future events. On the other hand, an institutional statement may direct the building of a flood wall, which changes the biophysical conditions of the area, thus resulting in different types and different extents of adaptation actions by the actors. Thus, to complement the existing framework, we propose (Fig. 1) to capture the emergence, practice, and outcomes of adaptation, both planned and autonomous, which are dynamically reinforced.

Although documenting outcomes in this way allows one to examine institutional change, it is not sufficient on its own to understand the complexity associated with outcomes of adaptation actions. In fact, the issue of outcomes of action situations has been addressed in critical institutional theory, which considers that a focus on the dynamics of institutional formation also allows them to explain the variability of outcomes, and the ways that power and meaning shape them (Cleaver and Whaley 2018). In particular, Cleaver and Whaley (2018) consider the outcomes that institutions produce from a social justice perspective.

Indeed, considerations of justice have emerged recently, demonstrating injustices related to the experienced climate hazards and decision making in adaptation (Shi et al. 2016, Yang et al. 2021). Individuals with limited opportunities or resources are more likely to be more affected by climate change and, thus, it is the responsibility of society as a whole (Juhola 2019) to ensure that resources are equitably allocated amongst its members and that all have a say in how it is done (Shi et al. 2016). Although much of this debate initially emerged in the global arena (Heffron

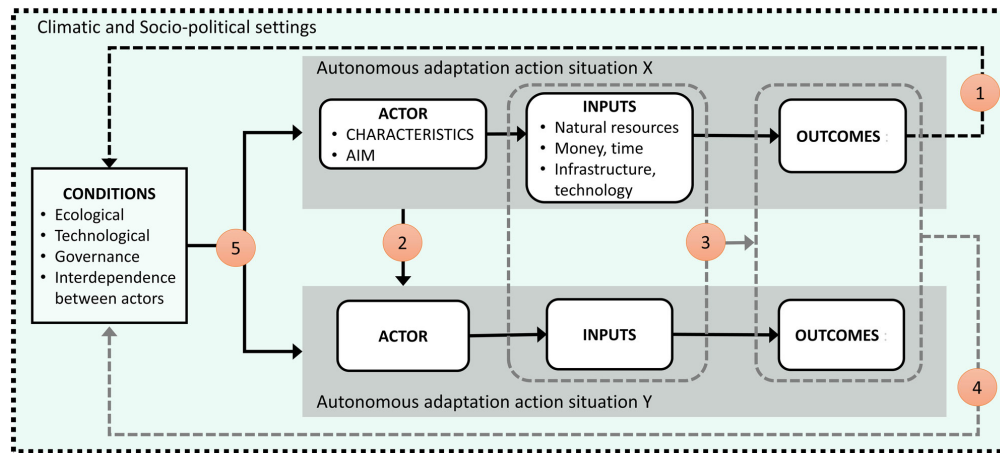
and McCauley 2017), local concerns have become more evident (Hughes and Hoffmann 2020), including agendas for climate change ethics and justice (Byskov et al. 2021), social dimensions of urban adaptation in terms of equity and justice (Shi et al. 2016, Holland 2017), and equitable resilience (Matin et al. 2018). In addition, sectoral research, e.g., agriculture related to injustice and inequity, has also extended to adaptation related issues (Shackleton et al. 2015).

Most often in literature, justice in relation to adaptation is divided into three or four dimensions (Holland 2017, Hughes and Hoffmann 2020). Distributive justice is understood as a fair and equal distribution of environmental goods to all members, and for adaptation this means identifying how vulnerability is distributed, as well as the benefits of adaptation. Procedural justice pays attention to the fairness and transparency of the rules and procedures related to decision making related to adaptation, including participation and engagement in the process. Third, justice as recognition acknowledges the plural needs of different groups in society from the beginning, accepting that cultural and institutional norms and practices can provide unequal representation (Hughes and Hoffman 2020). In terms of adaptation, this means considering historical injustices, which may be addressed through redistributive justice, i.e., adaptation measures that correct for these.

The just adaptation action framework

Our objective was to expand the existing theoretical understanding of the dynamics of adaptation outcomes from the social justice perspective by using institutional theory. Autonomous adaptation was an instance of social interaction, embedded in the framework that assesses both the governance, i.e., planned adaptation, in which the action takes place, as well as the actors, and their involved values, goals, and objectives. Justice outcomes then refer not only to distributional aspects (i.e., who experienced climate impacts or the co-benefits of actions), but also to procedural ones, (e.g., who was engaged in formal and informal institutions regarding adaptation).

Fig. 2. Mechanisms of interdependencies (1–5) in autonomous adaptation situations leading to justice outcomes are illustrated with solid (direct causal link) and dotted (feed-back loop) black arrows (one way) and grey arrows and boxes (two way). (1) One-way distributional interdependence. (2) One-way procedural interdependence. (3) Two-way procedural interdependence. (4) Two-way distributional interdependence. (5) One-way recognitional/procedural interdependence.



In the just adaptation action framework, (Fig. 1; adapted from McGinnis and Ostrom 2014), the changing climate and the social setting form the boundary conditions for the environmental parameters that constitute the ecosystem, and for the technological parameters that constitute the human made systems (physical infrastructure), where the conditions for adaptation action situations materialize on a local scale. Adaptation governance systems set the rules for different groups of actors that participate in these actions, which are also mediated by the social, economic, and political settings. It is in these adaptation action situations that the three dimensions of justice in adaptation, distributive, procedural, and recognition are constituted through the interactions and outcomes, and are mediated by both biophysical and socio-political processes, and thus require a systemic approach, which also acknowledges the role of actors. The ecological system sets the distributive conditions for adaptation justice, whereas the governance system sets the procedural and distributive conditions, through which actors are further included or excluded as part of the adaptation action situations.

The just adaptation action framework also allows one to examine the adaptation action situations (Bisaro and Hinkel 2016), that are the center of the framework (Fig. 1). In the framework, the adaptation action is self-organization that includes the interaction between different actors and is understood as autonomous adaptation. The external policy processes related to the governance systems are considered planned adaptation. In Table 1, we define a number of attributes that are present and create the adaptation action situation that can be used to identify and analyze individual adaptation action situations and examine their justice outcomes.

Based on Bisaro and Hinkel (2016), we also agree that the adaptation action situation is composed of different types of interdependencies between adaptation providers and beneficiaries.

We argue that the three dimensions of justice are constituted in adaptation action situations through the interactions between the adaptation provisioners and the beneficiaries: (i) distributive justice, refers to the re/distribution of vulnerability and benefits via different interdependence relations described by Bisaro and Hinkel (2016; one/two way, supply/demand side dominance, additive/threshold provision), (ii) procedural justice in terms of exclusion or underrepresentation of groups in adaptation decision making develops through one way interdependence between “upstream” and “downstream” actors or contradicting interest groups regarding the common pool resources (CPR) use, and (iii) justice as recognition, including adaptation measures that correct for historical injustices or acknowledge the rights of future generations, accounts for one way interdependence.

Table 1. Components for analyzing adaptation action situations.

Component	Guiding question
Actor	Who is the actor engaged in an action situation?
Characteristics	What are the characteristics of the actor that affects the nature of the aim and action (inputs)?
Aim	What does the adaptation action aim to accomplish?
Action	What is the action?
Conditions	What are the conditions of the adaptation action situation?
Outcome	What is the outcome of the action?

Figure 2 illustrates the mechanisms of interdependencies in adaptation action leading to justice outcomes. We applied the key attributes of Figure 1 and Table 1 with regard to the interdependence conditions and mechanisms in terms of one-way (Fig. 2, black arrows) and two-way (Fig. 2, gray arrows) interdependence mechanisms. Justice outcomes in this illustration situate to the mechanisms and they can be both negative and positive. Figure 2 further shows the (1) one-way distributional interdependence, e.g., the outcomes of a single action add to or

Table 2. The components of an adaptation action situation, their dimensions in autonomous adaptation, and examples from two contexts.

Component	Autonomous adaptation dimension	Farm-scale examples	Urban examples
Actors	Individual or an entity undertaking adaptation	(1) Farmers, (2) public/private resource users organization, e.g., farmers' autonomous water user associations, (3) landowners	(1) Private property owner or manager (resident, business owner, building, or housing association), (2) private property user (renter, individual business, or organization), (3) civil/public organizations, (4) municipality/local administration
Characteristics	Sufficient interest and capability to provide adaptation measure	(1–3) Financial resources and know-how/knowledge to implement measures, (1) health, perceptions (e.g., capacity, efficacy)	(1–4) Knowledge/awareness of problem/solutions, perceptions, financial resources, (3–4) leadership, political leanings
Aim	Reducing risks, seizing opportunities	(1–3) Vulnerability/risk reduction, increase of adaptive capacity, transformative change	(1–4) Vulnerability/risk reduction, increase of coping/adaptive capacity
Action	Adaptation measures (mobilizing inputs)	(1–2) Individual/collective adjustments on farming practices/conditions, new practices, and investments, (2) resource use policies, regulation, monitoring, sanctioning, (3) land-contract rules	(1) Individual/collective purchases of solutions, (1–2) individual adjustments in behavior/practice or location; adaptive capacity building, e.g., (3) local initiatives, (4) strategic policies and plans
Conditions	(i) Expectation and/or experience of changing ecological, technological, governance conditions (e.g., climate, policy, social norm) to everyday practices (ii) Expectation of other actors to participate or self-organization for the joint adaptation actions (i.e., interdependence between the actors)	(i) (1–3) Unprecedented weather extremes and changing bio-geo-physical conditions (e.g., increase in pest invasions, drought spells, mean temperature changes), changing policies (e.g., stricter climate and agri-environmental policies), changing social norms (e.g., discourse on pesticides, organic agriculture, animal production, agricultural subsidies, food prize); (ii) (1–3) expectation of public support for private investment, e.g., municipal support for water management investments, (3) expectation of good farming practices	(1–4) Physical circumstances of the built environment and infrastructure and the surrounding urban ecosystem (e.g., what types of green space solutions are feasible). (i) Expectation/experience of unprecedented weather extremes and changing conditions; changing policies (e.g., financial incentives for certain solutions or legislation/rules); (ii) (1–3) expectation of actions from authorities, (2) property owner, (3) local interest, (4) local activity, changing social norms (e.g., political acceptance)
Outcomes	Change in/introduction of new practices/conditions	Change farming practices to secure production conditions and productivity (1 and 3) of a farm and (1–3) in the community through, for example, maintaining good production conditions (e.g., soil quality) and productivity of a common pool resource (CPR; e.g., biodiversity), reducing scarce/climate impact sensitive CPR use (e.g., groundwater), avoiding negative outcomes.	Creating practices or conditions that allow coping; to not cause further environmental harm, e.g., (4) low carbon solution; to maintain good living conditions, e.g., (1–4) aesthetic, quiet, affordable, low maintenance local well-being; fairness and equitability and collective benefit.

create changes in environmental conditions, (2) one-way procedural interdependence, e.g., downstream actor's capabilities depend on the upstream actions, (3) two-way procedural interdependence, e.g., joint input provision is needed to enable joint adaptation for shared aims (supply side), (4) two-way distributional interdependence, e.g., different actors and actions are needed to reduce scarce or climate impact sensitive common pool resource use (demand side); to maintain productivity of common pool resources (supply side), and (5) one-way recognitional/procedural interdependence, e.g., conditions for different actors differ due to historical inequality.

EXAMPLES ILLUSTRATING THE FRAMEWORK

We discuss the framework in two contexts, agricultural and urban adaptation, with a focus on contextualizing them as adaptation action situations with a range of potential justice outcomes. The

examples are based on existing literature and existing case study material. We first embedded the just adaptation action framework (Fig. 1) in the agricultural or urban context, then discussed the components of the adaptation action situation, and summarized them in Table 2. This enables us to discuss the interdependence mechanisms leading to justice outcomes in the two contexts (Fig. 2).

Farm-scale

Ecological and technological conditions

The conditions for adaptation action situations materialize at farm-scale in local ecosystems that often have relatively clear spatial boundaries (e.g., field, pasture, greenhouse, garden), and ownership/responsibility for the assets. There are also environmental parameters (e.g., soil and water quality, level of

biodiversity), embedded in larger ecosystems, that have less clear boundaries, ownership, and assigned responsibility. This leads to interdependencies in the adaptation situations from the perspective of the ecological system, because the productivity of a field plot is dependent, for example, on the level of biodiversity in the larger ecological area, which can be altered both via the climatic conditions (e.g., through enabling invasive species) and available or accessible technologies, and the joint provision of biodiversity protection measures in an agricultural area (Juhola et al. 2017, Käyhkö et al. 2020). The justice outcomes of adaptation action situations are thus mediated by biophysical processes and technological development via the (providing) actors' capability to maintain, conserve, or reduce the use of a common pool resource such as biodiversity, groundwater, or soil (Crane 2014, Balasubramanya and Stifel 2020, Asare-Nuamah et al. 2021).

Governance conditions

Adaptation governance systems set rules for farmers that result in independent responsibility to adapt based on the wider governance context and administrative traditions. These rules are also mediated by the socio-political and economic settings (e.g., biodiversity conservation policies, global food prices), which in the case of farm-scale adaptation situations relate to the farmers' adaptation motivations and capabilities (Käyhkö 2019). Adaptation motivation may stem from experiences of, and knowledge about, climate risks, but it is influenced also by non-climatic factors such as characteristics of the farmer (e.g., perceived adaptive capacity), market fluctuations, and regulation (Mase and Prokopy 2014, Käyhkö 2019, Dobler-Morales et al. 2021, Talanow et al. 2021). A less capable or motivated farmer may not be able to provide interdependent joint adaptation measures, such as the aforementioned biodiversity protection or water body maintenance (Käyhkö 2019). Moreover, although motivated and seemingly capable of adapting, farmers' mental models of climate change and the necessary changes in farming practices do not necessarily meet (Findlater et al. 2018). Lack of evidence-based economic or political support undermines the opportunities for hitting the target in autonomous adaptation (Findlater et al. 2018, Dobler-Morales et al. 2021). Agricultural stakeholder engagement in international and national adaptation decision making has been superficial and the needs of marginal communities such as small-scale farmers have not been heard. The result is the reproduction of inequalities (Sova et al. 2015, Falzon 2021) illustrating the procedural justice mechanism. For instance, governmental agri-environmental programs for adaptation, such as water infrastructure programs, have been important for creating resources for farm-scale adaptation, and some cases have shown that the success factor in terms of justice outcomes has been linked to flexible top-down, bottom-up governance mode (Hurlbert 2014). The justice outcomes of the adaptation action situations are thus mediated by socio-political processes that create unequal opportunities for farmers to undertake adaptation measures both in terms of the ability to take autonomous adaptation measures, but also to become engaged in planned adaptation.

Adaptation action situation

The farm-scale adaptation action situation consists of the actor (i.e., the farmer(s), farm workers, families in an area) that are capable, resourced, and interested to provide different adaptation

measures to maintaining or enhancing, first, the productivity in their own farm and, second, the usability of common pool resources (for the local farming community), or public goods (for the larger community including future generations). Actions cover a range of measures from incremental risk reduction, such as adjustment of field work practices, to larger investments to increase adaptive capacity in the long term (e.g., water management systems), and to transform the production or business structure, (e.g., from conventional to organic or community supported agriculture; Käyhkö et al. 2020).

The inevitable condition for adaptation action situations to initiate is a perception of a climate risk, or other climate related drivers such as change in climate policy (e.g., new regulation), or discourse (e.g., new strategy in farmers association), influenced by institutional as well as affective and cognitive factors (Shackleton et al. 2015, Findlater et al. 2018, Wilson et al. 2020). The characteristics of actors determine the nature of their actions, that is, how the farming practices or conditions are changed in a way that enables production or livelihood as climate change proceeds. For an individual farmer, this may even involve the option of giving up farming (Käyhkö et al. 2020, Dobler-Morales et al. 2021). In another example, a farmer who has the capacity and economic resources to implement challenging and expensive measures, such as shaping fields or building underground drainage, may aim to change the field production conditions with these measures in expectation of an increase in precipitation (sum, extremes) in sensitive production phases (sowing, harvesting) to enhance the production conditions (i.e., access to the fields with machinery and top-soil erosion management; Käyhkö et al. 2020, Wiréhn et al. 2020). Although this example emphasizes the independence of the farmer, the outcomes have several interdependencies that condition and are conditioned by justice outcomes. First, the topsoil is a common pool resource; second, the top-soil management involves a water body contamination risk; third, the shaping of the fields is a service that benefits farmers of the same field plot in the future (Neset et al. 2019a, Wiréhn et al. 2020). Taking these interdependencies into consideration in autonomous adaptation requires either addressing the expectations of other actors or active self-organization to manage common pool resources. An example of this is the decision of a farmer to make an investment in drainage for a farm, being dependent on the expectation that surrounding farms support the same efforts on adjacent fields to ensure the positive outcome of the adaptation measure, or that the regional administration would not plan for flooding adjacent fields to avoid flooding of urban or road infrastructure (Neset et al. 2019b). Such necessary community-based natural resource management practices are more common in regions where farmers are used to dealing with scarce natural resources, but have sufficient capacities to jointly self-organize (e.g., farmers' autonomous water user associations in Spain; Villamayor-Tomas et al. 2020).

Justice outcomes and interdependencies

The different types of interdependencies between the providers and the beneficiaries result in different types of adaptation action situation conditions and justice outcomes. The "distributional justice outcomes" in agriculture can result, for example, from the joint provision of biodiversity protection (two-way distributional interdependence), or topsoil and water management measures of

a single farmer that affects everyone in an agricultural area (one-way distributional interdependence). Pest control, for example, is a measure that requires joint effort in an ecological area (two-way distributional interdependence), whereas conventional and organic farmers have different pest management practices, and their co-existence becomes impossible in the event of changes in wind conditions in the case where pesticides spread accidentally to organic fields and create a problematic “procedural justice outcome” because the organic farmer is not included in the adaptation decision making (one-way procedural interdependence; Neset et al. 2019a). Issues of procedural justice related to maladaptation have also been identified in a Spanish region, where extensive irrigation policy aimed at reducing vulnerability has in fact shifted vulnerability to small-scale farmers (two-way procedural interdependence; Albizua et al. 2019). In addition, current practices involving potential maladaptive outcomes that will harm not only the most vulnerable agricultural actors (Asare-Nuamah et al. 2021, Dobler-Morales et al. 2021) but also future generations (one-way recognitional interdependence; Antwi-Agyei et al. 2018) raise “recognitional justice outcomes” as a concern.

Urban scale

Ecological and technological conditions

In the urban context, the conditions for adaptation action situations materialize in similar situations as in the agriculture case, though some marked differences can be seen. The city scale can be considered a boundary that is affected by external forces, such as peri-urban and regional land use, climate change, and socio-economic trends. Within the urban ecosystem, there are spatial boundaries at variable scales (e.g., district, neighborhood, block, and property-scale). Urban areas are a mix of various communal infrastructure, buildings, and urban landscapes. Ownership and responsibility for the assets are context dependent but delineated somewhat clearly in each case (e.g., municipal responsibility for stormwater management). Similar to the agro-ecosystem, the environmental parameters (e.g., air, soil and water quality, level of urban biodiversity) are embedded in larger ecosystems for which ownership and responsibility are less clear. As in the agro-ecosystem, the interdependencies in the urban ecosystem manifest where climatic and socio-political (e.g., population growth and densification) settings, and ecological (e.g., coastal or inland) and technological conditions (e.g., above and below-ground communal infrastructure) can limit the existence and flourishing of flora and fauna across different parts of the urban ecosystem. The justice outcomes of adaptation actions are then further mediated and distributed by ecological processes, particularly in terms of the unequal implementation/distribution of green infrastructure, that can provide nature-based adaptation solutions, across a city. As the ecosystem services and benefits that green infrastructure delivers contribute to human well-being in numerous ways (Millennium Ecosystem Assessment 2005), unequal distribution to urban nature has further societal ramifications (Nutsford et al. 2013, Rigolon et al. 2018).

Governance conditions

In the urban context, adaptation governance sets the rules for action and is shaped by the existing wider rules. The urban governance system sets the distributional and procedural rules for actors and recognizes the actors that are included in the planned

adaptation in the urban context (Reckien et al. 2018). These rules that directly affect procedural justice also change, depending on the contextual circumstances. Planned adaptation can call for more inclusive practices to address the recognition-based justice concerns (or vice versa). This alters the rules and results in more (or less) just outcomes in terms of procedural considerations. Socio-political processes, e.g., electoral politics, land-tenure (Eakin et al. 2017), actors’ level of education, or employment and capacities, resources, and interests to engage with planned adaptation processes (Turek-Hankins et al. 2021) also affect the justice outcomes. Altering the outcomes requires engaging with the root causes of vulnerability, such as access to education and livelihood opportunities (UNISDR 2013). So far, urban adaptation planning has been criticized for a technocratic and managerial approach that overlooks questions of equity and justice (Shi et al. 2016, Meerow and Newell 2019, Chu and Cannon 2021). However, Chu and Cannon (2021) find that some cities have started to pay attention to this shortcoming.

Adaptation action situation

An urban autonomous adaptation action could be initiated by a private property owner (or property users: schools or neighborhood organizations, building/housing associations). Similarly to the agricultural example, this depends on the characteristics of the actors (Turek-Hankins et al. 2021). For example, to address the effect of urban heat islands, property owners have multiple choices across various scales and types of technologies (Jay et al. 2021), including the individual or collective installation of blinds, air conditioning systems or fans, insulation, solar shading (traditional or with solar panels/solar canopy), choice of building materials, or the implementation of nature-based solutions. Property owners can also utilize other cooler public spaces, or temporarily move their place of residence to other cooler locations, rather than invest in measures on their own property. Depending on the broader infrastructure available, which may relate to planned adaptation actions (Harlan et al. 2019), property owners may also be able to access district cooling. In contrast with owners, property users’ range of choices may be more limited and dependent on the owners’ actions. Autonomous adaptations also include several behavior related actions, such as staying out of the sun, drinking fluids, working less, etc. As in the case of Phoenix, Arizona, USA (Harlan et al. 2019), the choice of solution depends strongly on the resources, capacity, perceptions of the various solutions, the interest, and capabilities of the property/building owner and/or user, but also on the physical circumstances of the built environment and infrastructure and the surrounding urban ecosystem (e.g., what types of green space solutions are feasible). The governance system also conditions the solutions available, facilitated by awareness raising of, and financial incentives for, certain solutions, or legislation/rules by the city that might restrict or enable landscaping or specific interventions.

The aim of the adaptation action is to provide adequate conditions to residents in response to experienced and/or expected increased urban heat. The expectation of other urban actors to implement nature-based solutions also on their properties can also be explored here as an interdependent condition (two-way interdependence). For instance, a solution of a network of green spaces or a green corridor, which could have a larger than the sum effect on not only the urban heat island effect, but also biodiversity

and social impacts. There could also be a social movement with a community-based organization involved helping to coordinate various groups of actors or a research project that is building awareness of certain solutions. A larger collective purchase of individual cooling technologies, or the collective decision to connect to central cooling, could reduce prices, and make individual investments more affordable or accessible. Neighbors can also support each other in implementing behavioral adaptations, such as helping more vulnerable neighbors with their grocery shopping or checking up on each other during extreme heat situations. This could also be strengthened through local awareness-raising campaigns or organized networks.

Justice outcomes and interdependencies

The different types of interdependencies within the adaptation action situation system allow for varying justice outcomes. The desired outcome of the adaptation action is strongly dependent on the intervention, but also on access and use issues, whether the solutions serve a larger group of people rather than just those that are the property owners/users (Klein et al. 2017). If a solution benefits a larger group, considering who is included in the group enables strategic solutions that can address the shortcomings of autonomous adaptation (Harlan et al. 2019), or correct for or curtail them through planned solutions. For example, structures supporting cooling should be situated in neighborhoods that lack resources for autonomous solutions. If planning lacks “recognition,” the city may end up doing exactly the opposite (Harlan et al. 2019). In terms of “distributional justice outcomes,” these interventions can decrease vulnerabilities of, e.g., the elderly or low-income residents who may live in lower quality housing and may also experience exposure to heat at work. Although some solutions generate multiple benefits, such as biodiversity of green spaces or shade-providing landscaping elements, other solutions generate increased energy demand or costs for others (one/two-way distributional interdependence). For “procedural justice,” the inclusion of marginalized groups in planning is scarce, but examples of inclusive planning by property owners exist, such as urban gardening initiatives, or other investments into technological or landscaping solutions that were not possible without a joint provision of inputs (two-way procedural interdependence). However, in cases where the aims of the initiatives do not include specific social impacts, the inclusion is often limited to those with higher capabilities to engage but who may not be among those most affected by the situation (one-way procedural interdependence). Finally, “justice as recognition” is likely to differ significantly depending on the adaptation choice, e.g., investments in disadvantaged neighborhoods (where in some countries, might have a higher level of renters than owners), initiatives by schools, or community-based organizations. In such cases, there may be more dependence on certain types of actors to initiate adaptation activities because of differentiated capabilities, resources, etc. (one-way recognitional interdependence).

DISCUSSION AND CONCLUSION

We integrated the justice concept into an existing framework that focuses on the dynamics of adaptation action situations and outcomes. By breaking down the dichotomy between planned and autonomous adaptation, and viewing adaptation through the lens of the everyday, it was possible to capture the way in which adaptation unfolds beyond planned adaptation and is

conditioned by existing institutions. The examples of farm-scale and urban autonomous adaptation illustrated several potential and experienced social justice outcomes of adaptation action situations, depending on the type of adaptation goods that were produced: public good or common pool resources. Considering adaptation in this way showed the one-way interdependence of adaptation action situations, where one actor’s adaptation could provide benefits for others, and two-way interdependence where all actors need to contribute to adaptation to create benefits for everyone (Bisaro and Hinkel 2016).

Our examples from agriculture and the urban sector illustrated how the process of autonomous adaptation for desired outcomes was linked to several interdependencies in a way that inevitably involved justice outcomes, both positive and negative. By systematically assessing the interdependencies of autonomous adaptation, it was possible to identify the different areas of governance where the adaptation situations were linked and where attention on the justice outcomes was needed. The potentially harmful justice outcomes, such as shifting vulnerability to already marginalized communities, or to future generations, needs to be better acknowledged in adaptation research, planning, and decision making.

Conceptualizing adaptation as action situations also helped to advance the thinking on everyday adaptation and embedded it in the broader context that is analyzed. The action situations could be thought of as those everyday practices that adaptation becomes part of, and through which it is manifested. In our examples, everyday adaptation was shown to involve dilemmas that highlight the role of motivations, capabilities, and resources of the actors. By deconstructing the complex and dynamic everyday adaptation situation this way, it allowed an assessment of necessary support from communities and through planned adaptation.

In addition, understanding everyday adaptation through the action situation provided novel perspectives on the wider institutional and cultural context of the social-ecological system, and facilitated the analysis of how everyday adaptation was hindered or enabled by formal or informal institutions, or by biophysical conditions. There were many empirical examples that show how planned adaptation in fact increased vulnerability of some groups or individuals, and how planned adaptation could have maladaptive outcomes. This opened up the possibility to analyze how everyday adaptation was undermined or supported by planned adaptation for different individuals and communities, and how that affected their ability and resources to decrease their vulnerability or exposure to climate hazards.

By extending the framework toward examination of outcomes, it was possible to explore the linkages between planned adaptation, autonomous adaptation, and dimensions of justice. As both examples showed, planned adaptation created the institutional framework for autonomous adaptation, thereby mediating justice outcomes. Our extension of the framework also helped to pinpoint adaptation actions through which these injustices might become rectified by identifying maladaptive actions that resulted in unjust outcomes and consider ways to avoid them. Such considerations could be made during the planning process and evaluated as to what kind of autonomous adaptation was supported/restricted by the proposed planned adaptation actions.

For instance, the expectation of others to take part in the common pool resource management could be incentivized by making the actions visible (increasing public pressure), furthermore, regulation was usually needed to incentivize the actors who could afford but were not motivated to, produce public goods (Bisaro and Hinkel 2016).

Finally, the framework has the potential to contribute to the understanding of the extent that autonomous adaptation interplays with planned adaptation. Autonomous, everyday adaptation has the potential to contribute or undermine planned adaptation and the current tracking efforts thus only partially capture the extent that adaptation is meeting its desired goals. Furthermore, although the goals of planned adaptation can be widely desirable and seen as legitimate, they can also be considered as undesirable and oppressive by some groups in society (Eriksen et al. 2021), that may lead to efforts that counter planned adaptation. Thus, further empirical efforts are needed to test the framework, and others like it, to assess how they perform in explaining adaptation action situations and their institutional context, and to develop further diagnostic tools for adaptation planning.

[¹] According to Robinson (2014), purposive sampling is a sampling design that is not intended to offer a representative sample but rather to focus on particular phenomena and/or processes, and we use this method here to illustrate how the framework can extend to analysis of outcomes in published literature.

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