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Embedding Justice Considerations in Climate Resilience

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ABSTRACT

This article contributes to recent work on justice in resilience-based projects for climate adaptation. At present, the model commonly used for guiding normative reflection in this domain is the tripartite model of justice, whereby justice is seen as comprising distributive, procedural and recognitional aspects. After discussing some conceptual problems and practical shortcomings of this model, we propose an alternative model with six forms of justice or kinds of justice demands: distributive, procedural, intergenerational, restorative and retributive justice, and justice in system outcomes. We also illustrate some advantages of this model with respect to representative accounts of the tripartite model.

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Resilience; climate adaptation; distributive justice; procedural justice; justice demands

1. Introduction

While resilience now is the 'philosophy' that informs most climate adaptation efforts, climate resilience approaches[1] have also been much criticized for their justice shortcomings (Fitzgibbons & Mitchell, 2019; Joseph, 2013; Meerow et al., 2019; Olsson et al., 2015; Shi et al., 2016; Walker & Cooper, 2011). At present, many justice frameworks for climate resilience consider justice as tripartite (distributive, procedural and recognitional). Yet, extant accounts of these three aspects of justice feature significant overlaps and ambiguities, and they ignore other aspects of justice that are important for resilience building. This lack of clarity about which justice issues matter, and why they matter, undermines the ability of the tripartite model to offer normative guidance in climate resilience initiatives.

In this paper we argue against the tripartite view of justice and defend an alternative model of justice that, in our view, is more apt for guiding discussions and policy in this domain. Our model features six different kinds of demands, or what we call forms of justice: distributive, procedural, intergenerational, restorative and retributive justice, and justice in system outcomes. This model has two main advantages over its rival. On the one hand, it offers a detailed and comprehensive account of justice concerns and demands in relation to climate resilience, which covers some demands that the tripartite model ignores or conceptualizes poorly, and clarifies how these demands differ or are connected. On the other

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hand, the model is responsive to pervasive and specific justice shortcomings of climate resilience approaches and, to some extent, it can inform the choice of concrete justice theories with which such shortcomings could be best addressed.

We proceed as follows. First, to prompt discussion, we review features of resilience approaches to adaptation and some common criticisms directed against them (2). Then we explain the tripartite model of justice (3) and highlight some conceptual problems and research gaps in representative accounts of that model, which have to do mainly with lack of clarity and with the exclusion of certain justice demands (4). Next we present our six-dimensional model, explaining how it overcomes some of the limitations of the tripartite model and why it is a better basis for guiding justice work in the climate resilience domain (5). The last two sections showcase the responsiveness of the model to the specific justice challenges raised by climate resilience efforts. First, we apply the model to detecting potential alignments and misalignments between climate resilience and justice (6). We conclude by using this diagnosis for recommending Táíwò's constructive theory of reparations as a suitable basis for assigning duties and rights and shaping responsibility arrangements in climate resilience efforts (7).

2. Justice Issues in Climate Resilience

Critical studies on resilience illustrate that justice insights are pertinent at least in four junctures of resilience practice: defining resilience (2.1), selecting its determinants (2.2), targeting and priority setting (2.3), and governance (2.4).

2.1. Defining Resilience

In general, resilience is considered an ability to respond well to stresses or shocks. However, definitions of resilience count by the hundreds (Doorn, 2017; Meerow & Stults, 2016), and they have motivated criticism on various grounds. Table 1 picks a sample of ten influential definitions. By analyzing this table, we will show that resilience concepts differ at least in two aspects, and explain the significance of these differences from a justice standpoint.

First, definitions vary in the kind of entity that resilience applies to. Concepts of resilience as a system property (3–5, 7–9), often traced to the work of ecologist Holling (1973, 1978), are widely critiqued for ignoring individuals and social justice (Pelling, 2010). Others, following work on psychological resilience, treat resilience as a property of individuals or communities (def. 2, 6). Such psychological views are contested for having inspired policy where resilience is framed as a matter of local or individual responsibility, and so as a justification for inaction at other governance levels (Joseph, 2013). Finally, there are hybrid views, such as that espoused by the *100 Resilient Cities* program (def. 10). Hybrid views have also been criticized, however, for depoliticizing resilience building by presenting it as a politically neutral project where everyone wins (Shi et al., 2016).

Definitions also vary in how they characterize resilient outcomes, and so, in the goals of resilience building. While many authors identify resilience with quick or efficient 'recovery' toward pre-disaster ways of functioning (defs. 1, 7, 9), this view is also often critiqued for its pro-status quo, conservative overtones. Holling (1973) famously proposed a more dynamic concept, 'ecological resilience' (def. 3). Ecologically-resilient systems, in essence, are those that

Table 1. Resilience definitions.

#	Definition	Source (Author/s)	Resilience of (unit)	Outcomes			
				Efficient recovery	Functional persistence	Adapt-ation	Other
1	'Speed of return of variables toward their equilibrium following a perturbation'	Ecology (Pimm, 1984)	System or Individuals	X			
2	Capacity to (i) sustain competence and (ii) develop normally under stress and to (iii) recover from trauma	Psychology (Thorén, 2014)	Individuals		X		
3	'Ability to absorb change and disturbance and still maintain the same relationships between populations or state variables'	Ecology (Holling, 1973)	System		X	X	
4	'Ability . . . to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt naturally to stress and change'	Climate Change stud. (IPCC, 2007, p. 37)	System (social or ecological)		X	X	
5	'Capacity . . . to absorb disturbance, reorganize, maintain essentially the same functions and feedbacks over time and continue to develop along a particular trajectory'.	Sustainability stud. (Elmqvist et al., 2019)	System (social or ecological)		X	X	
6	'Ability to show a positive trajectory of functioning and adaptation after an initial disturbance'	Disaster Risk stud. (Norris et al., 2008)	System and Individuals (commu-nity)		X	X	
7	'Ability . . . to anticipate, reduce, accommodate, or recover from the effects of a hazardous event or trend in a timely and efficient manner'	Climate Change stud. (IPCC, 2014, p. 1108)	System (social or ecological)	X	X		
8	'[Ability] to absorb and utilize (or even benefit from) change'.	Sustainability stud. (Holling, 1978)	System (social or ecological)		X		Benefit from change
9	'Ability . . . to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity'	Urban Planning (Meerow et al., 2016, p. 45)	System (city)	X	X	X	Transfo-rmation (long term resilience)
10	'Capacity of individuals, communities, and systems to adapt, survive, and grow in the face of stress and shocks, and even transform when conditions require it'.	Resilience practice (Rockefeller Foundation, & Arup, 2016)	System and Individuals (city)		X	X	Grow Transform

avoid a dramatic loss of functioning during disasters, while successfully adapting to new situations and ways of functioning in their aftermath (or, in other words: systems that recover, but not by returning to the pre-disaster state, and not necessarily quickly or efficiently). Holling's ecological resilience was hugely influential (defs. 4–6), but is also criticized as conservative: successful adaptations 'maintain essentially the same functions' (def. 5) through new means, but need not carry improvements, and might result in long term degradation.[2] For these reasons, resilience practitioners are increasingly embracing a third approach that is often labeled 'transformative' (Meerow et al., 2016), where resilience results in persistence, adaptation, plus some additional dividend, such as benefiting from change (def. 8), long-term persistence (def. 9), or even economic growth (def. 10).[3] Yet, some complain about vagueness in the normative aspects of these views (Elmqvist et al., 2019; Strunz, 2012).

2.2. Determinants of Resilience

While most definitions specify the outcomes of resilience, few detail the mechanisms that enable those outcomes (Strunz, 2012). Yet, choosing such *determinants* of resilience is a basic need for resilience building, which most resilience theorists and practitioners address at some point (Ahern, 2012; Brunetta et al., 2019; Cañizares et al., 2021; Pickett et al., 2004; Tanner et al., 2009; Wardekker et al., 2010). As we show next, this choice is also significant for justice.

Table 2 compares influential accounts from three representative fields of resilience practice: socio-ecological systems (SES) research, urban resilience and community resilience. As can be seen, these lists of resilience determinants are quite similar. For example, for all three, resilience resides both in qualities of a focal system (respectively ecosystems, urban systems and community assets) and in qualities of the human organizations that manage or control that focal system. Also, qualities like diversity, redundancy or flexible governance feature in most accounts, and they are uniformly viewed as positive or desirable.[4]

Yet, there are also notable divergences between these accounts, some of which are problematic. For example, compare the SES account with the urban resilience account. While socio-ecological resilience and sustainability are not synonymous (Redman, 2014), the former is at least often regarded as a condition for the latter (Arrow et al., 1995). In contrast, urban resilience focuses much on the resilience of infrastructures, with troubling

Table 2. Determinants of resilience.

Quality relative to	Sources		
	Stockholm Resilience Centre (Simonsen et al., 2015)	Rockefeller Foundation's 100 Resilient Cities (Rockefeller Foundation, & Arup, 2016)	(Norris et al., 2008)
Focal system	• Maintain diversity and redundancy • Manage connectivity • Manage slow variables and feedbacks	• Robust • Redundant • Integrated (city systems)	• Robustness • Redundancy • Rapidity of mobilization
Governance system	• Foster complex adaptive systems thinking • Encourage learning • Broaden participation • Promote polycentric governance	• Flexibility • Resourceful • Reflective • Inclusive • Integrated (info feedbacks)	• Flexibility • Learning • Participation • Resourcefulness

ecological implications. According to Elmqvist et al. (2019), for instance, building redundant infrastructures may make adaptation safer, but it also undermines sustainability. Another problematic difference is that, while the SES account sees *connectivity* or *slow variables* as ambivalent (i.e. not as determinants of resilience, but as crucial factors to manage in building resilience), the other two accounts only list positive qualities, and indeed they appraise connectivity positively.[5] Such shifts and contradictions therefore suggest that some of the original nuance of resilience thinking may have gotten lost in its institutionalization. Again, they also raise the concern that powerful actors may be using resilience as a label that seemingly encompasses everything that seems good or politically acceptable.

2.3. Targeting and Priority Setting

Now we turn to examining some problems involved in specifying the targets and the disturbances of interest for climate adaptation strategies – the oft-mentioned question of 'resilience of *what* to *what*?' (Carpenter et al., 2001; Meerow et al., 2016).

Many resilience building initiatives frame resilience as a response to climate disturbances. Nonetheless, scholars distinguish between *general* and *specific* resilience approaches (concerned with broad or narrow sets of disturbances, respectively) and between evolutionary and ecological ones (focused on long-term responses to slow-onset stresses, or shorter-term responses to shocks). According to Meerow et al. (2016), practitioners and policy-makers normally favor general evolutionary approaches, but, in practice, policies and plans are often inconsistent with this vision. Elsewhere, for example, Meerow et al. (2019) note that many resilience plans of U.S. cities in the *100 Resilient Cities* program are explicitly committed to green growth; indeed, as we saw, the program's definition of resilience follows this pattern (Table 1–10), despite its potentially negative implications for climate mitigation and sustainability.

As regards the main foci of interventions, at present, these are developing countries (Brown, 2012, 2015) and large global cities (Caprotti et al., 2017). While this focus is justifiable on scientific and practical grounds (Denton et al., 2014; Revi, 2014; Wamsler et al., 2013), particularly the current makeup of the urban resilience agenda has raised many concerns. For example, a recent study on global adaptation networks argues that low-resource cities face serious difficulties due to lacking national and international regulations for resilience programs (Shi et al., 2016). Similarly, Fitzgibbons and Mitchell (2019) find that participation in these networks is typically voluntary and that it carries a host of benefits; but also that it is subject to demanding selection mechanisms which favor cities that already have some resilience. The authors conclude that these networks are unjust because they exclude vulnerable cities and reinforce the advantages of wealthy ones (Fitzgibbons & Mitchell, 2019)).

2.4. Governance

Also important are questions about who governs resilience building and how. Here, again, we focus on urban resilience programs.[6] Many of these programs are governed by transnational governance networks formed by public-private and intercity coalitions, where the mayors of global cities and actors like the Rockefeller Foundation have prominent roles[7] (Bulkeley & Betsill, 2013; Shi et al., 2016). These networks have been

praised as opportunities for sharing and integrating lessons for successful adaptation (Gordon, 2019; UNISDR, 2012; Wamsler et al., 2013) but, as one could expect, they have also been subjected to critique.

Shi et al. (2016), for example, note that resilience programs have thus far had limited success in mainstreaming adaptation in urban governance: oftentimes, only a couple of city departments have active roles in these programs and citizen participation is limited or nil. Another major line of critique finds that global resilience networks further the neoliberal privatizing trend by turning state agencies from direct providers of aid to mere coordinating agents alongside donors and private contractors (Gotham, 2012). State retrenchment is troubling here, critics argue, because the wealthier global cities use resilience plans for gradually disconnecting from regional and national infrastructures and economies, and creating select corridors of elite areas with upgraded and self-managed infrastructures (Anguelovski et al., 2016; Hodson & Marvin, 2009). This process is said to further undermine regional and national infrastructures, thereby imposing more risks on the cities that do not participate in global networks because they lack the needed resources (Hodson & Marvin, 2009).

3. The Tripartite Model of Justice

Despite the abundance of critical work on climate resilience, only a small subset of this work offers discussions on what counts as (in)justice in resilience projects and programs, or how these could be made more just. To date, most scholars follow Paavola and Adger (2002) in recognizing that justice in adaptation would require just adaptation outcomes (*distributive justice*) and just or fair adaptation processes and decisions (*procedural justice*). Recently, however, Schlosberg's (2012) tripartite model of justice, which also features *recognitional justice*, has gained ground (Coggins et al., 2021). Next, we review how these three concepts are understood within representative frameworks in the field, focusing on those points that are of more direct interest to this article.

The most substantive discussion on *distributive justice* comes from Paavola and Adger (2002), for whom distributive justice concerns 'how the beneficial and adverse effects [of climate change and adaptation projects] are distributed across groups of people' (Paavola & Adger, 2002, p. 5). These authors distinguish four possible foundations of distributive justice: theories are monistic or pluralistic, depending on whether they emphasize one supreme principle or good, or more; and they are consequentialist, if they focus on outcomes, or deontological, if they view justice as a 'matter of following just principles or rules' (Paavola & Adger, 2002, p. 7). The authors do not dedicate much attention to deontological theories, however. They mention rights-based theories as examples, but dismiss them as too rigid (i.e. international negotiations often require compromises) and hard to operationalize (e.g. rights to the absence of danger are hard to define due to problems in deciding what counts as *danger*). Among consequentialist theories, they mention utilitarianism as a monistic form of consequentialism, noting the utilitarian singular aim of maximizing social welfare. After noting the relevance of these ideas for the economic efficiency of adaptation initiatives, however, the authors state their preference for pluralistic consequentialist theories, because in adaptation, they argue, we must consider '[o]ther important concerns such as security, avoidance of danger, and the survival of non-human species' (Paavola & Adger, 2002, 5). They add that, ultimately,

distributive justice seeks to alleviate the situation of those most vulnerable to climate change, and that an ideal principle for allocating assistance on these grounds is Rawls' *maximin* rule -consisting in maximizing the situation of those worst-off, or those most vulnerable (Paavola & Adger, 2006, p. 605).

Besides Rawls' theory of justice, Sen's capability approach is another theory that is mentioned in many other frameworks (Bulkeley et al., 2014; Coggins et al., 2021). Hughes (2013) discusses these two theories in some detail, presenting them as paradigms of two distinct approaches to distributive justice: those oriented to ends and those oriented to means. In terms of this distinction, which comes from Sen (1992), the capability approach is ends-oriented because it aims directly at improving the individuals' capabilities to achieve the functionings they value; and Rawls' theory is means-oriented because its goal is rather instrumental to those ends (namely, to design institutions that can allocate certain primary goods fairly). Hughes (2013) concludes that both approaches offer valuable insights, which can be reconciled by taking income and assets as indicators of vulnerability and distributive justice. Recent work indicates a preference for the capability approach as a suitable theory for underpinning adaptation policies (Brackel, 2021; Kronlid, 2014; Schlosberg, 2012).

Procedural justice, in turn, is understood as a concern with the legitimacy (Paavola & Adger, 2002) or the fairness (Hughes, 2013) of adaptation processes and decisions. According to Paavola and Adger (2002), procedural justice is crucial in adaptation strategies, where, in contrast to mitigation, efforts are very locally-specific, and so, involving citizens is essential for their success. Most authors indeed present procedural justice as a matter of enhancing the political agency of citizens by including them in adaptation strategies, although there are competing ideas of what *inclusion* should mean in this regard. For example, for Hughes (2013), citizens should be allowed to elect representatives. Shi et al. (2016) complain that citizen involvement is often limited to trivial tasks, such as monitoring or fact-finding, and they demand a more active role of citizens in steering adaptation trajectories, especially in planning decisions about targeting and priority-setting. Meerow et al. (2019) are most ambitious in calling for equitable participation in various areas of resilience building, including the problem of negotiating or defining resilience.

As noted, many recent frameworks also consider *recognitional justice* (Bulkeley et al., 2014; Hughes, 2013; Meerow et al., 2019; Schlosberg, 2012). This move is often justified in relation to certain asymmetries between climate mitigation and adaptation[8] (especially as regards the local nature of adaptation) and to the fact that many procedural and distributive injustices result from cultural discrimination and other structural injustices, which commonly affect minority groups in any given location (Bulkeley et al., 2014). Thus, for example, recognition has been defined as a form of justice that involves acknowledging historical and structural forms of oppression or respecting group diversity and cultural differences (Meerow et al., 2019). Others frame recognition as a need for engaging minorities in interventions, or as the need to include culturally-specific values or knowledge within initiatives (Hughes, 2013). In this way, proponents of recognitional justice claim that, by adequately recognizing communities, we can leverage their role in adaptation, and especially the role of the most vulnerable communities (Schlosberg, 2012).

Further, proponents of recognitional justice place much emphasis on how injustices can entrench and reinforce one another, resulting in 'mechanisms of injustice' that prevent successful adaptation. For example, Hughes (2013) defines *thick injustice* as

a phenomenon whereby (distributively unjust) past development decisions and resource allocations result in contemporary (distributive) injustices. She also mentions the *political economy of poverty*, where a poor representation and access to decision making (procedural injustice) reinforces exclusion and disadvantage (procedural and distributive injustice). Finally, she describes *technocracy* as a form of governance based on information and knowledge tools that, despite their supposed neutrality, misrecognize cultural diversity. See Bulkeley et al. (2014) and Meerow et al. (2019) for similar considerations.

4. Needs for Justice in Climate Resilience

While the frameworks reviewed above have managed to initiate debates on justice in adaptation, we think that more groundwork on justice is needed. Particularly, we argue that distributive justice has to be more carefully conceptualized (4.1), that ideas of procedural justice should be broadened (4.2), that recognition is not an independent form of justice (4.3), and that, partly due to its faulty conceptual basis, the tripartite model of justice risks ignoring or misconceptualizing justice issues with much importance in adaptation (4.4).

4.1. Distributive Justice

One problem of the frameworks reviewed is that they do not account for the variety of available approaches to distributive justice, in part because they do not clearly distinguish between two key decisions involved in operationalizing distributive justice. First, one needs to decide what counts as good or bad outcomes of actions and decisions: what Sen (1991) calls the informational basis of evaluative judgments – or the *evaluative basis*. Second, one must choose a *distributive rule*: that is, a desirable pattern of distributions. Note that these two decisions are, or at least can be, independently made. For example, while the capability approach uses capabilities and functionings as its evaluative basis, the approach is compatible with many possible distributive rules (Robeyns, 2017). This example illustrates that a failure to distinguish between these two decisions may hinder or simplify the debate on what approach to distributive justice is more suitable.[9]

Further, available frameworks offer little guidance on these two issues. In relation to distributive rules, Paavola and Adger propose a maximin rule, but they are an exception:[10] other articles advocating a focus on the most vulnerable (Byskov et al., 2021; Hughes, 2013) remain vague about distributive rules, and Meerow et al. (2019) talk about ensuring 'distributive equity', but do not clarify what they mean by *equity*. Discussions on the evaluative basis of distributive justice are also scarce. For example, Hughes (2013) considers the strengths of Rawls' and Sen's theories but does not review some familiar objections to them, and her idea of combining the insights of these theories within a singular 'income and assets' approach is at least controversial, since Rawls' and Sen's theories are more often viewed as rivals than as complementary (Robeyns, 2017; Schlosberg, 2012; Sen, 1987). This example illustrates a more general problem in the field, namely, limited recognition of the fact that any justice theory will highlight some issues to the detriment of others (Cañizares et al., forthcoming).

Paavola and Adger's characterization of utilitarianism as a distributive theory is similarly problematic. At first glance, utilitarianism might seem a theory of distributive justice because

it tells us what is good (utility) and how to distribute it (i.e. so that average utility is maximized). Yet, utilitarians are not concerned with how utility is '*distributed across different people*' (Paavola & Adger, 2002; italics are ours): any distribution is considered optimal if it maximizes average utility, even if many people are seriously harmed (Hansson, 2003). Thus, while utilitarian ideas may be legitimate and useful in adaptation, they are not aligned with goals of distributive justice. Likewise, goals like security or the survival of non-human species, which Paavola and Adger consider as goals of distributive justice, do not express how impacts or outcomes affect different people, or at least not primarily and straightforwardly. So, they are not distributive goals according to the authors' own definition. These examples again demonstrate a need for conceptualizing distributive justice more carefully.

4.2. Procedural Justice

In our view, ideas of procedural justice should be broadened in three ways. First, most authors in the field refer to the *political* conditions of agency, or to ensuring that certain civil rights inform adaptation initiatives[11]. While these demands are undoubtedly relevant, they ignore the *epistemic* conditions of agency, that is, those related to knowledge, skills and their exercise. These conditions are equally important because their absence or deficit can undermine the ability of individuals to rationally consent, dissent or otherwise further their own interests within adaptation efforts. Thus, besides broadening participation, adaptation strategies should try to guarantee 'epistemic justice' (Byskov, 2021). In practice, this would mean avoiding views of resilience (or principles for setting priorities, etc.) that are vague, obscure or disrespectful of cognitive and cultural diversity.[12]

Second, most frameworks regard procedural issues as matters of balancing power and of questions over 'who does what?', and yet, ultimately, their demands focus only on (including) the excluded or the powerless. In our view, procedural justice should also cover questions about the adequate roles and responsibilities of the powerful in adaptation action, not least because demands of assigning special responsibilities to the powerful (e.g. obligations to inform in a timely and accurate manner) seem complementary to demands of inclusion (e.g. rights to information, etc.).

Third, procedural demands are, at present, typically limited to planning and governance decisions, whereas they should cover all important decisions at stake. Even Meerow et al. (2019), who add a demand for 'negotiating resilience', still leave out resilience determinants as an area for public choice. This is problematic, since these decisions are justice-sensitive (cf. section 2.2) and eschewing public scrutiny here may add fuel to the fire of 'resilience as a depoliticizing concept', for instance by creating the impression that, once the goals or targets of resilience are decided, how to achieve them (its determinants) becomes a job of resilience experts. Existing frameworks also ignore the possibility of designing justice frameworks with procedural methods, for example, in decisions like selecting the more adequate evaluative basis or distributive rule.[13]

4.3. Recognition

Despite these objections, we believe that distributive and procedural justice are aptly regarded as distinct forms of justice. Here is why. In the frameworks examined, procedural justice is framed as a form of justice that deals with fairness in adaptation decisions. In

turn, distributive justice is portrayed as a concern with the differential effects of these decisions on people. In our view, then, these two ideas are more or less well defined, relevant for the domain and also independent from one another.

The case with recognition is different, however. For instance, insofar as recognition is meant to entail respect for the geographic and cultural differences across groups of people (Schlosberg, 2012), many distributive theories already include it.[14] Other recognitional demands express a call for including minorities, or culturally-specific knowledge and values, within initiatives (Hughes, 2013). Yet these points express procedural demands about the conditions of political and epistemic agency, respectively. Finally, recognition is also said to require an acknowledgment that present injustices often result from structural and historical forms of oppression (Bulkeley et al., 2014; Hughes, 2013; Meerow et al., 2019; Schlosberg, 2012). While this concern for past oppression, or past harms, seems *prima facie* distinct from procedural and distributive ideas, below we will see that it is more often (and better) captured with the idea of *restorative justice*.

We remain agnostic about the general value of recognition as a justice perspective. However, the above remarks show that its conceptualization in climate resilience research shifts between various ambiguous meanings, which moreover are encompassed by other concepts of justice. Thus, in our view, there is little to gain by informing adaptation efforts with this idea.

4.4. Conceptual Problems with the Dual and Tripartite Models of Justice

Notwithstanding the obvious urgency in finding a justice theory that is fit for guiding decisions in adaptation initiatives and policy, here we argue that a preliminary reflection on the varieties of justice is even more pressing. As we saw, the various justice theories tend to focus more on some issues and less on others. This means that, before finding an appropriate justice response to the challenges of adaptation, we should make sure that the right questions are being asked.

We fear that the dual and tripartite models of justice are not adequate for guiding this reflection. One reason is that many justice issues relevant to adaptation are not covered by these models. Many adaptation scholars identify sustainability as a goal, for instance, but few mention intergenerational justice, the idea that usually captures the implications of (un) sustainability for justice. Also, despite the wealth of work on reparations and restorative injustice, we find these issues are typically dissolved into recognitional justice, if they are mentioned at all. Recall, too, the ideas that Paavola and Adger mention as distributive goals: average utility, security and protection of non-human species. While most authors ignore such goals, they may be just as crucial as Paavola and Adger think. Yet, if – as we argued- they are not distributive goals, then what are they? These remarks suggest that some justice concerns are at present neglected or at least misconceptualized in this field.

Relatedly, more work is needed on what makes justice concerns singular and worth addressing. Above, we dismissed recognitional perspectives because they lack something that distributive and procedural justice have: precise definitions, relevance to our field and conceptual independence. Note that, while these qualities seem necessary features of a form of justice, they are obviously not sufficient. For example, the albedo effect, a measure of the ability of surfaces to reflect sunlight (Stephens et al., 2015), is relevant

to justice in adaptation, conceptually independent from distributive justice, and precisely definable; still, treating it as a form of justice would be preposterous. So, if we agree on the idea that justice encompasses a variety of concerns and demands, more groundwork is needed on how to distinguish those concerns and demands.

In short, one important step in embedding justice considerations in climate resilience consists in elucidating which justice issues matter in the application of resilience to adaptation efforts, and why they matter. The dual and tripartite models of justice are the tools commonly used for guiding normative reflection in this regard, but, as we have shown, their usefulness is limited.

5. An Alternative Model of Justice

This section proposes an alternative model of justice. First we introduce the six forms of justice of the model (5.1), and then we discuss some of the general features and advantages of the model (5.2).

5.1. Six Forms of Justice

Besides distributive and procedural justice, the following four forms of justice can be shown to have potential relevance for climate resilience: intergenerational justice, justice in system outcomes, restorative justice and retributive justice.

Although we already said much about distributive and procedural justice, we want to delimit these concepts further in relation to the appropriate societal level for their use. In climate mitigation, distributive and procedural justice have been mostly directed toward finding an appropriate balance between nation states regarding their needs and responsibilities, respectively (Bulkeley et al., 2014). In adaptation, justice between nations is not irrelevant, but it may mask critical differences at lower scales, given that climate impacts and adaptation efforts are highly localized (Füssel, 2010; IPCC, 2014; Revi, 2014). Consequently, adaptation scholars usually frame distributive and procedural justice as pertaining primarily to individuals or communities (Bulkeley et al., 2014; Paavola & Adger, 2002, 2006), and we align with this approach.

Now let us consider two concepts that, in our view, must be distinguished from distributive justice: intergenerational justice and justice in system outcomes. *Intergenerational justice* considers what a generation owes to future generations (Klinsky & Dowlatabadi, 2009). Many authors consider it the province of distributive justice, where we would also have intra-generational issues, relative to what is owed to living people (ibid). Instead, we propose distributive justice should be limited to intergenerational issues, and intergenerational justice seen as a different form of justice. One reason motivating this distinction is that in distributive justice we deal with the short-term effects and risks of actions and decisions; in contrast, intergenerational justice is more appropriately framed as uncertainty about long-term effects (both in terms of what these effects will be, and in terms of how we value them). Another reason is that intergenerational justice deals with duties toward abstract groups of people (generations),[15] rather than toward concrete individuals and communities, as distributive justice does.

In turn, *justice in system outcomes* emphasizes a need for efficacy in realizing (socially) desirable outcomes and avoiding undesirable ones. This idea complements distributive and intergenerational justice by recognizing that we have reasons to care for near-term outcomes (not intergenerational) that do not directly affect concrete people (not distributive). For example, as noted, although utilitarianism does not cover the goals of distributive justice, even its more narrowly welfarist interpretations have some economic and moral significance. In addition, utilitarianism can also be framed more broadly as the idea that actions are just if they maximize happiness, including the happiness of non-human sentient beings (Singer, 1977). Thus, utilitarianism can capture demands of animal welfare, which are difficult to conceptualize from a distributive standpoint (Paavola & Adger, 2002; cf. above) and which are, due to this difficulty, often ignored (Klinsky & Dowlatabadi, 2009). Goals like the conservation of national heritage and sacred places (Adger et al., 2011), as well as demands about the effectiveness of adaptation efforts (Posner & Weisbach, 2010) are in a similar situation: while their value is widely recognized, these goals are not straightforwardly distributive or intergenerational. One way of taking these goals into consideration while avoiding the noted dilemmas is by framing them as just system outcomes.

Also popular in climate and environmental justice, though not in adaptation, are two forms of justice aimed at correcting harms, offenses or wrongdoing: restorative and retributive justice.

Restorative justice[16] addresses past harms from the standpoint of victims. It dwells on the idea that people have a right not to be harmed and, so, that victims are owed reparation (Byskov et al., 2021). There are many theories of reparations (Táíwò, 2022): for example, harm-based theories demand economic compensations determined by the extent of the harm; repair-based theories seek to repair the relations between offendants and victims through statements of apology or acknowledgment, reconciliation efforts, etc.; and constructive views focus on the effects that enduring forms of oppression have on the descendants of victims, thus framing reparations in relation to present injustices and needs. As can be seen, restorative justice encompasses many of the demands considered by proponents of recognitional justice, and even some in addition to those.

Finally, *retributive justice* addresses harms and wrongdoing from the standpoint of offendants, by demanding that anyone responsible for some wrongdoing is sanctioned or punished (Okereke, 2010). This notion is conceptually linked with restorative and procedural justice. If the wrongdoing considered inflicts a harm on some victim(s), restorative and retributive justice are two sides of one coin, since duties of reparation are assigned to offendant(s) on retributive grounds. Retributive justice is also complementary to procedural justice in the following way: the idea of fair process seems to imply that assigning a responsibility or duty entails an obligation to meet it (procedural justice), such that failure to do so counts as wrongdoing and deserves retribution, even if it does not directly result in personal harms. This understanding of retributive justice, associated with demands of accountability, liability, etc., is the basis of all legal systems (Perry, 2005).

5.2. Clearing the Ground for Justice Work in Climate Resilience

We now consider how this model improves on extant alternatives. To facilitate discussion, we refer the readers to Table 3, which synthesizes the main features of the six forms of justice; and to Figure 1, which visualizes their relations.

Table 3. Forms of justice, bases of justice and justice criteria (key concepts in bold).

	Bases of justice			
Forms of justice	Temporal focus	Normative level	Central normative concern	Justice criteria for process/decision X
System outcomes	Future (near)	System	Value (V) (±)	**V** realized/avoided
Distributive	Future (near)	Individual-community (IC)	Distribution of Impacts (I) (±)	**I** satisfies (**distributive rule**)
Inter-generational	Future (distant)	?	V, Future Options (FO)	X secures **acceptable** level of **V**, keeps **FO open**
Procedural	Present	IC	Agency of IC (A), Responsibilities (Rs)	**A** is respected/enhanced, **Rs** are fairly balanced
Restorative	Past	IC	Victims of Wrongdoing (VW)	**VW** is/are given adequate **reparation**
Retributive	Past- Present	IC	Offendants -agents of wrongdoing (O)	**O** is/are adequately **sanctioned**

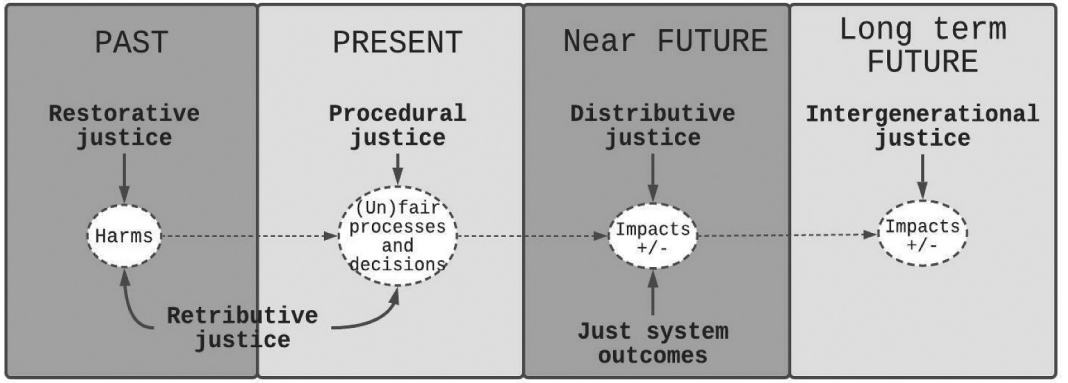

Figure 1. Forms of justice: empirical dependencies (dotted arrows) and conceptual dependencies (solid arrows).

Consider first the justice criteria in Table 3. These criteria are statements expressing how a process or decision of interest (X) can be (un)just in the six senses examined. As can be seen, the criteria are relatively precise and clearly independent from one another, which was something we missed on most accounts of the tripartite model. This mutual independence is partly explained by the fact that our forms of justice vary in at least one of the aspects that we call *bases of justice* (Table 3): that is, they differ either on their *central normative concerns* (e.g. in relation to wrongdoing, retributive justice deals with offendants and restorative justice with victims), their *temporal focus* (e.g. procedural vs. distributive justice), or the *normative level* where they operate (e.g. distributive vs. intergenerational). Moreover, given that the meaning of the six forms of justice is, in essence, determined by their different bases of justice, these bases are a satisfactory answer to the question of what it takes to be a form of justice, which is poorly addressed by other models.

In addition, our model is more multifaceted than its alternatives: for example, it picks up normative concerns as varied as responsibility or agency (procedural justice), concerns for the vulnerability of present and future persons and for other societal values (distributive, intergenerational and system outcomes, respectively) as well as for correcting wrongdoing (restorative, retributive). This feature has some advantages. On the one hand, taken together, the forms of justice are representative of key traditions of normative thought. Consequentialism seems linked with future-looking forms of justice (distributive, intergenerational, system outcomes). Then, deontology and rights perspectives focus on actions rather than on their outcomes, respectively from the standpoint of agents and victims.[17] Accordingly, deontological thinking fits with retributive justice (which deals with the duties of offendants), the language of rights dominates in reparations, and procedural justice combines both perspectives in covering responsibility issues and demands of minimal agency.[18]

On the other hand, the model adds value to debates in adaptation research by capturing important notions of justice that are ignored or oddly characterized in this domain. For example, we showed how Paavola and Adger (2002) had to resort to distributive justice to represent animal welfare, whereas the notion of just system outcomes offers a more adequate lens for it. Also, Meerow et al. (2019) discuss racial or gender injustice as part of recognitional justice, whereas they are better viewed as complex forms of injustice with procedural, distributive and restorative ramifications. How such justice concerns are precisely embedded in the climate resilience context will ultimately depend on the theories of justice we choose for addressing those issues. Still, at least *prima facie*, the model expands the basis of stakeholders and of normative reasons that matter and should be considered in climate resilience initiatives. For example, the need to care about animal welfare, biodiversity or cultural heritage would probably get us to 'sit at the table' some collectives that would otherwise be commonly excluded from, or overlooked in, adaptation planning. Similarly, the need to care for issues of epistemic justice posits definite grounds for negotiating the interpretation and use of policy tools and evidence pertaining to adaptation, including the design of resilience approaches themselves. The model also opens up the range of measures that might be required for addressing restorative justice in any specific context: from the mere verbal recognition of historical discrimination, for example, to the need for compensating discriminated collectives and/or their descendents or for leveraging their role in adaptation initiatives.

Further, our model also sheds light on the conceptual and empirical relations between the six forms of justice, as is illustrated in Figure 1. Some conceptual dependencies were noted above: for example, the complementarities between restorative and retributive justice, on the one hand, and between procedural and retributive justice, on the other. By empirical relations we refer to what Hughes (2013) calls mechanisms of injustice: the idea that the multiple facets of (in)justice may reinforce one another over time. For example: if unaddressed, past harms can undermine agency and even result in the exclusion of people from decision-making processes (procedural injustice). In turn, unfair processes tend to misrepresent vulnerabilities and needs (distributive), often with long-term repercussions (intergenerational) (Hughes, 2013; Paavola & Adger, 2002, 2006).

Thus, in summary, we believe that our model is more comprehensive and better grounded than its alternatives in climate resilience research. Next, in dialogue with the insights from resilience research reviewed in section 2, we show how the model is also particularly suited for informing justice work in this domain.

6. Opportunities and Challenges for Justice Work in Climate Resilience

Looking back at section 2, now we can see that resilience approaches include some goals that our model recognizes as demands of justice. For example, all system views of resilience can now be conceived as notions of just system outcomes, since they frame resilience as an effective and desirable social response of systems to stresses or shocks (although competing definitions vary in exactly what they deem desirable). Resilience building is also partly aligned with procedural justice, since many resilience determinants (cf. Table 2) are goals relative to enhancing the political conditions of agency (e.g. *inclusion*, *participation*, maybe also *decentralization* or *polycentric governance*) or the epistemic conditions of agency in resilience building (e.g. *promote learning*, *foster complex adaptive systems thinking*). In addition, building resilience is more or less closely linked to intergenerational justice: many transformative views include sustainability or long-term persistence as dividends of resilience (Table 1- def. 9), and determinants like *flexibility* stress the need to avoid irreversible decisions and outcomes.

These alignments are significant because building resilience requires seeing to it that the above mentioned demands are met. To put it in other words: resilience practitioners will generally try to accomplish these demands, even if they do not recognize them as demands of justice. While this cannot be a full guarantee that the demands will be fulfilled,[19] therefore, it is at least a partial one. Indeed, one could argue that these alignments between justice and resilience approaches are opportunities for advancing justice through adaptation.

In contrast, other demands recognized in our model are either ignored by, or difficult to include in, resilience practice. We consider three problems as especially critical: distributive justice, responsibility arrangements and correcting past injustices.

For instance, many critiques discussed in section 2 relate to distributive injustices in resilience building. While some of them can be interpreted as implementation deficits (e.g. the inequities in selection mechanisms for resilience programs, cf. section 2.3), the place of distributive justice in resilience is generally awkward. For example, given that concepts of system resilience ignore individual outcomes, they clearly disregard

distributive justice. In turn, notions of individual or community resilience are not without problems. Consider Norris et al. (2008) influential account, which identifies community resilience with a high prevalence of well-being in communities after disaster. While this criterion of resilience has distributive significance,[20] note that it is compatible with a high degree of suffering among vulnerable community members, and moreover, that it tolerates massive losses of well-being in disasters, as long as enough people remain well-off. This conclusion is highly problematic, considering that many climate disasters will hit the most vulnerable first and that any loss of their well-being could be dramatic. To some extent, transformative views of community resilience can accommodate this objection, because they consider disasters as opportunities for improving – and so, for example, as opportunities for communities to become more distributively just. Yet, even these approaches lack tools for specifying what vulnerability or well-being are, or which distributive rule should be preferred. Such tools rather come from vulnerability studies, justice theory, etc. and their operationalization in resilience practice is still in its infancy (Doorn, 2017; cf. section 4.1).

There is also much need for debate on responsibility arrangements, both in relation to whom should take which roles in resilience efforts (procedural justice), and to the liabilities that apply to unjust or maladaptive decisions (retributive justice). In the absence of regulations or of much theoretical work on the topic (Doorn & Copeland, forthcoming; Doorn et al., 2021), two responsibility regimes have emerged as dominant: the technocratic, which views resilience as an apolitical issue or a matter for resilience engineers (Bahadur & Tanner, 2014), and another based on improvisation and bottom-up action (Joseph, 2013). Both types of regime build on features of resilience theory[21] and our model shows why each is problematic: while technocracy hinders participation, bottom-up regimes efface questions of political and legal liability. Moreover, bottom-up regimes may facilitate responsibilizing citizens for their maladaptation or lack of resilience, and thus hinder the adoption of measures seeking to improve their situation. Thus, a mechanism of injustice is at work here, whereby procedural and retributive injustices are likely to result in distributive ones.

Resilience approaches also disregard past harms and injustices (restorative and retributive justice). In part, this is due to their outcome-oriented character: resilience focuses on how to respond to risks, not on avoiding risks or on addressing the differential vulnerability of populations to them – yet, it is these problems which are often inseparable from past injustices.[22] Another reason may be that system perspectives ignore individual harms and wrongdoing, not just because they focus on system outcomes, but also because, within a system perspective, undesirable outcomes are more likely to be interpreted as consequences of system dynamics. The neglect of these issues is especially worrying because justice frameworks in the adaptation domain also step over them, typically on the grounds that they are politically controversial and that including them in international climate negotiations can render negotiations ineffective (Jagers & Duus-Otterström, 2008; Paavola & Adger, 2002). While these arguments may be valid for the international arena, recall that many resilience projects are local or regional efforts embedded in transnational networks (cf. section 2.4). Thus, we suggest that restorative and retributive demands could be valuable at least for informing urban planning, resilience frameworks and other areas of resilience practice.

Here we have showed that our model can help with identifying which assumptions in resilience practice are justice-sensitive (in a positive or negative sense) and, in relation to this, which justice issues are more challenging in resilience building. Now we turn to considering how these lessons can inform future work on justice in this domain.

7. Constructing Climate Resilience and Justice

Designing justice frameworks for climate resilience involves answering two questions. One is: what theories and principles are most suitable for this domain? Another is: what kinds of justice concerns and demands matter in this domain, and why? While the second question is more fundamental, we found that the common response to it, namely the tripartite model of justice, is flawed for various reasons. Thus, we proposed and justified an alternative model, featuring six forms of justice that represent distinct concerns, temporal orientations and societal levels of consideration. Any model of this sort is probably debatable. Yet, we believe that ours improves on its alternatives because it both broadens and clarifies the landscape of normative reasons that matter and should be weighed in resilience building. This feature helped us to show, for instance, that some goals of resilience and justice are aligned, thus challenging the popular but mistaken idea that resilience approaches are either unjust (Pelling, 2010) or unrelated to justice (Derissen et al., 2011), and highlighting opportunities for collaboration between resilience practice, policy-making and justice theory, especially around procedural and intergenerational justice. Our model also does a better job than the tripartite model at identifying and linking demands that resilience practitioners are ill-equipped to handle.

Now turning to the first question, which is one we have largely set aside in this paper. Our model does not tell us which theories and principles of justice we should prefer. Indeed, it is deliberately underspecified to recognize the fact that there are many possible theories and that the model does not prejudge among them.[23] Yet, the model is at least a partial guide for making this choice. In particular, considering the four demands identified as critical in climate resilience (distributive, procedural, restorative and retributive), it seems that we should choose justice theories that are capable of addressing those demands.

While we are not aware of any theory that covers all these four forms of justice, a recent proposal coming from Táíwò (2022) comes close.[24] Táíwò thinks that reparations for colonialism and slavery should respond to the challenges faced now by the descendants of those who suffered those injustices, including the challenges that relate to climate vulnerability. The peculiarity of his constructive view on reparations therefore is that it focuses on reparations but also attends to retributive and distributive demands. In particular, Táíwò proposes the following division of labor between historical and distributive considerations. Historical considerations (about slavery and colonialism) would determine who receives reparations, namely the descendants of the oppressed (restorative justice), and who bears their burden, namely the descendants of offendants (retributive justice). In turn, distributive justice would determine the content of reparations, according to the challenges faced by the targets of reparations. Given that some of these challenges are climate-related,[25] Táíwò's theory advances a strong case for binding reparations to questions of adaptation finance and targeting. More specifically, it suggests that high (GHG) emitters should finance the adaptation actions of low-emitters, both because the former had greater responsibility in human-induced climate change, and

thus in the reduced climate resilience of the latter (Füssel, 2010); and because colonization and slavery were, in many ways, what generally made this double inequality possible (Táíwò, 2022). We agree very much with this perspective: responsibilities for mitigation are often assigned on a retributive basis (Dooley et al., 2021) and we see no reason why such concerns should not inform adaptation as well.

Yet, even if Táíwò's approach were to be followed, justice frameworks operating in this domain still face a double challenge, because Táíwò leaves open the question of which distributive theory is preferable, and he more or less puts procedural justice aside. Elsewhere (Cañizares et al., forthcoming) we partly address this impending challenge by critically assessing the capability approach and concluding that some applications of it indeed offer promise. Nonetheless, as we have argued here, it is probably impossible to find a theory that covers all demands of justice, and we need to ensure that our justice approaches at least consider those that are more important in a given context. Our model is a step toward identifying which aspects of justice matter most in the climate resilience domain, why, and what kinds of justice theories might offer suitable responses to them. We therefore hope that this model and the insights developed throughout the paper will inform further debates in this domain and beyond.

Notes

1. In what follows, we use the label *climate resilience* to refer to the application of resilience to climate change adaptation.
2. This point may not fully reflect Holling's own views. Holling (1996) criticized 'recovery' resilience because it committed ecological resource managers to stability, predictability and a drive toward maximizing yields. He also said that, despite its usual short-term success, this approach makes ecosystems and organizations vulnerable in the long run. Thus, resilience sensu Holling might be said to include long-term persistence, especially when one considers definitions such as (def. 8) (see also Cañizares et al., 2021).
3. This analysis of resilience illustrates the interpretive flexibility of this term with respect to which outcomes are considered resilient (i.e. recovery, persistence and adaptation, persistence plus adaptation plus some extra dividend, etc.). It also highlights a possible point of confusion. The term *adaptation* used in this analysis comes from ecological work on resilience and it represents adaptation as a naturalistic property; that is, it refers to the changes that allow systems to withstand disturbance and to resume normal functioning after disturbance. This view of adaptation should not be confused with the common interpretation of this term in the context of climate change, for example by the IPCC, as 'the process [whereby humans adjust] to actual or expected climate and its effects [, seeking] to moderate or avoid harm or. exploit beneficial opportunities' (IPCC, 2014). In the remainder of the article, when we mention or use *adaptation*, we will be referring to this social adaptation to climate change. We also want to observe that, for reasons of time and space, we will not problematize the notion of climate adaptation or scrutinize the wealth of views on it – for some useful distinctions here, see Norris et al. (2008).
4. The language used by Simonsen et al. (2015) is very clear on this point. The idea that we should *maintain* diversity entails that diversity is good or desirable, for example. For other qualities, they use verbs with similar connotations (e.g. *encourage*, *broaden*, *promote*). Rockefeller Foundation, and Arup (2016) and Norris et al. (2008) do not use these verbs, but nonetheless they also portray those qualities as positive.
5. The SES account concurs with Rockefeller Foundation, and Arup (2016) in appraising *integration* positively insofar as it means something like 'tight information feedbacks' in organizations (Walker & Salt, 2006; Simonsen et al., 2015). Yet, for Arup, *integration* also refers to the

integrated functioning of infrastructure and other systems, at city level and across scales (Table 2; Rockefeller Foundation, & Arup, 2016). This is roughly what SES approaches mean by *connectivity*, which they view as ambivalent since, in highly connected systems, risks propagate more quickly and can cause cascade disasters. Other reference texts on resilience agree with this diagnosis (OECD, 2003).

6. In the development arena, the key actor is the World Bank with its Climate Resilient Development program (CSR) (Brown, 2012, 2015; World Bank, 2008; World Bank et al., 2008).
7. The Foundation pioneered the application of resilience ideas to urban governance in the aftermath of Katrina, and then launched the *Asian Climate Change Cities Resilience Network* (ACCCRN) in 10 Asian cities (Tyler & Moench, 2012). This vision was then upscaled into the (now defunct) *100 Resilient Cities* program (Spaans & Waterhout, 2017), possibly the most ambitious of its kind.
8. Adaptation involves different actors than mitigation (e.g. non-state actors such as communities and public-private coalitions) and a more uncertain and complex geography of risks, vulnerability and responsibility (Bulkeley et al., 2014, p. 2; Jagers & Duus-Otterström, 2008). Paavola and Adger (2002) discuss other asymmetries.
9. Paavola and Adger's definition (Paavola & Adger, 2002; cf. above) implicitly refers to these two decisions ('*beneficial and adverse effects*' is the evaluative basis; '*how* [these effects are] *distributed across groups of people*' concerns the distributive rule). The authors also make the pertinent remark that there are many justice theories and many principles or rules. Yet, strikingly, the subsequent discussion is about the differences between 'consequentialist rules' and 'deontological rules'. This terminology is misguiding, since it suggests that the two aspects of distributive justice are in fact one.
10. Climate mitigation justice features more detailed proposals, however (Klinsky & Dowlatabadi, 2009; Okereke (2010).
11. Procedural justice is often (and correctly) associated with democratic processes, and thought to be absent in discriminatory, market or elite-driven forms of planning and governance. Civil rights such as the rights to consent and dissent, the right to elect representatives or to participate in democratic processes, etc. figure in most accounts of fairness and procedural justice, and can be viewed as principles that enable political agency.
12. This is a generalized version of Rawls (1993) famous idea that a society cannot be fair (or procedurally just) if its principles of justice are not knowable for everyone.
13. Elsewhere we explore some opportunities and obstacles in relation to this problem (Cañizares et al., forthcoming).
14. For Rawls (1999), the social bases of self-respect are one of the primary goods that all members of a society should be entitled to. The potential of the capability approach in accounting for socio-cultural diversity is also well-known (Nussbaum, 2000; Nussbaum & Sen, 2010; Robeyns, 2017; Sen et al., 2003).
15. For example, the Brundtland definition speaks about not 'compromising the ability of future generations to meet their own needs' (WCED, 1987). Also, debates on discounting, the substitutability of goods, etc. are, in theory, about persons (i.e. personal preferences) (Klinsky & Dowlatabadi, 2009), but, in effect, about general economic trends. Similarly, in adaptation and resilience research, intergenerational concerns often refer to the long-term impacts of climate change (and adaptation to it) on cultures or ways of life (Byskov et al., 2021).
16. Restorative justice overlaps with *transitional justice*, a term used in the context of wars, civil strife, genocide and human rights abuses (Doak & O'Mahony, 2012). Here we assume that the latter notion is encompassed by the former.
17. Paavola and Adger (2002; cf. above) consider rights perspectives as examples of deontology. In our view, despite their many similarities, none of these perspectives are species of the other. Deontology asks what actions constitute duties for someone; rights perspectives are concerned with what is owed to someone. That is, deontology is concerned with agents and rights perspectives with patients, so to speak. These

perspectives are, thus, complementary when an action has identifiable agents and patients, which may not always be the case: for example, some professional codes prescribe behavior in deontological terms but on the grounds of e.g. national security, rather than e.g. consumer rights.

18. Nonetheless, caution is advised with this terminology, since consequentialist theories may be partly based on rights and duties (Pettit, 1988) and the converse also holds (Scanlon, 1977): for example, Rawls' theory combines all these perspectives. Thus, we prefer to view these concepts as ideal types of normative thinking rather than as kinds of theories, as Paavola and Adger (2002) suggest. This is another reason why Paavola and Adger's (2002) terminology is inadequate, in our view (cf. note 9).
19. We saw, for instance, that some orientations in urban resilience conflict with sustainability and that participation is limited in resilience projects (cf. sections 2.2 and 2.3). Also, in our model, the vagueness of resilience concepts can be interpreted as conducive to epistemic injustice (cf. section 4.2). Nonetheless, one could argue that some of these problems are not exclusive of resilience approaches (e.g. deficits in participation are common in planning and related areas) and that others can be addressed within resilience practice (e.g. definitions of specific resilience will be less vague than definitions of general resilience, for example; and sustainability can be prioritized by adopting long-term and ecologically-sensitive views of resilience in relation to infrastructure).
20. The authors do not discuss distributive justice explicitly, but well-being indeed is a plausible evaluative basis of distributive justice.
21. The technocratic tendency seems unavoidable because resilience practice mobilizes a heavy scientific basis from complex systems thinking for informing technically complex decisions. The bottom-up regime finds a rationale on determinants like *decentralization*, which justifies state retrenchment, self-governance, etc. (Walker & Cooper, 2011).
22. As Füssel (2010) argues, the geography of climate vulnerability reflects a 'double inequity': while the non-beneficiaries of GHG emissions (low-emitters) are also most vulnerable to climate impacts, the beneficiaries (high-emitters) are generally less vulnerable.
23. This underspecified character of the model is visible its justice criteria (Table 3). To be able to inform assessments or policy, these criteria should be more precise: choosing concrete theories of justice would in fact involve specifying the key terms in these criteria (in bold). For example: different theories of distributive justice would choose different distributive rules, or have a different view on what counts as positive or negative impacts.
24. It is common to find theories that cover various aspects of justice at once. For example, Rawls' theory (Rawls, 1999) attends to distributive and procedural considerations, but also includes intergenerational demands; Nozick's theory of entitlements ignores distributive issues to emphasize procedural and restorative ones (Nozick, 1973); and so on. To some extent, this feature of theories is to be expected because the six forms of justice are related in various ways, as we showed: in practice, it is difficult to address reparations but not retributions, and if we care about distributive injustice, we also have reasons to care about procedural injustice as one of its common causes.
25. Táíwò documents the high correlation between colonized countries and mortality due to pollution and climate vulnerability, respectively (Táíwò, 2022, p. 164 and p. 171).

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