

Working paper

AJUST Applied Justice Taxonomy and Assessment Framework: A descriptive guideline for science and policy

Formerly IIASA/EQU Justice Framework: A descriptive guideline for science and policy

Susanne Hanger-Kopp
Zehma Herring
Jarmo Kikstra
Kian Mintz-Woo
Karl Scheifinger
Thomas Schinko
Ivo Wallimann-Helmer
Christopher Wong
Elliott Woodhouse
Caroline Zimm

WP-24-012

Approved by:

Name: Anne Goujon

Program: Population and Just Societies

Date: [31 May 2024]

Table of contents

Abstract	3
About the authors	4
Acknowledgments	5
 Introduction	 6
Objective	6
Background	6
State of the art	7
Terminology	8
Justice	8
Fairness	8
Equity	8
Equality	9
 Why use the framework?	 9
Who could and how to use the framework	10
 The framework	 11
Context	11
Scope	12
Space	12
Time	12
Entities	12
Forms	12
Recognitional justice	13
Procedural justice	14
Distributive justice	16
Corrective justice	19
Transitional justice	20
 Applications	 22
Designing just biodiversity scenarios	22
Identifying research avenues for mitigation scenarios	23
Developing guidance materials for scenario development	24
A tool for co-designing fair mitigation scenarios	25
 Discussion and Outlook	 26
References	28

Abstract

Justice considerations have become a critical concern for researchers due to an increasing awareness that perceived injustices are a main barrier to effectively tackling the grand and interconnected global challenges posed by climate change. Insufficient attention to the varied perceptions of justice, particularly within scientific and policy-oriented literature, has slowed progress on major climate policy interventions. Justice, as a concept, is difficult to grasp given its multi-dimensional and culturally diverse usage. In the global field of socio-environmentalism, the term has yet to be formally and uniformly institutionalized.

This working paper introduces the Applied Justice Taxonomy and Assessment Framework (AJUST), formerly the IIASA/EQU Justice Framework: A descriptive guideline for science and policy. AJUST is a comprehensive justice outline aimed at facilitating justice assessments across a diverse array of research and policy contexts. AJUST is a descriptive framework with no normative objectives. Grounded in philosophy and tested through a variety of applications, this framework is useful for research and decision making. It is accessible across disciplines, powerful in its capacity to express justice concerns, and modular so that researchers can select and deploy the aspects that are most appropriate or useful.

Version control:

This iteration of the framework introduces a definitive title, has been language edited, and adds a note on an alternative use of transitional justice, Zehma Herring significantly contributed to these changes and has thus been added as a co-author (November 2025).

ZVR 524808900

Disclaimer:

The authors gratefully acknowledge funding from IIASA and the National Member Organizations that support the institute (The Austrian Academy of Sciences; The Brazilian Federal Agency for Support and Evaluation of Graduate Education (CAPES); The National Natural Science Foundation of China (NSFC); The Academy of Scientific Research and Technology (ASRT), Egypt; The Finnish Committee for IIASA; The Association for the Advancement of IIASA, Germany; The Technology Information, Forecasting and Assessment Council (TIFAC), India; The Indonesian National Committee for IIASA; The Iran National Science Foundation (INSF); The Israel Committee for IIASA; The Japan Committee for IIASA; The National Research Foundation of Korea (NRF); The Mexican National Committee for IIASA; The Research Council of Norway (RCN); The Russian Academy of Sciences (RAS); Ministry of Education, Science, Research and Sport, Slovakia; The National Research Foundation (NRF), South Africa; The Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (FORMAS); The Ukrainian Academy of Sciences; The Research Councils of the UK; The National Academy of Sciences (NAS), USA; The Vietnam Academy of Science and Technology (VAST).



This work is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/).
For any commercial use please contact permissions@iiasa.ac.at

About the authors

Susanne Hanger-Kopp coordinated this working paper, as well as its conceptual development. She drafted and edited the document. Susanne is a Research Scholar at the Equity and Justice (EQU) Research Group, in the Population and Just Societies Program at IIASA. She leads the Strategic Initiative *Co-production and agent-based modelling at the water-food-biodiversity nexus* (fairSTREAM). Susanne is also a senior scientist at the Climate Policy Lab at ETH Zurich (hanger@iiasa.ac.at).

Zehma Herring contributed to the editing of this paper and to writing on the multi-faceted concept of transitional justice. She is a student at Princeton University's School of Public and International Affairs and a visiting researcher in the Equity and Justice (EQU) Research Group at IIASA (zh4263@princeton.edu).

Jarmo Kikstra contributed the example application about guidance materials for scenario development. He is a Researcher at the Integrated Assessment and Climate Change, Sustainable Service Systems and Transformative Institutional and Social Solutions Research Group at IIASA (kikstra@iiasa.ac.at).

Kian Mintz-Woo contributed to the conceptual development of the framework and manuscript writing. He is a Senior Lecturer in Philosophy and co-affiliated with the Environmental Research Institute, both at University College Cork; he is also a Guest Research Scholar at the Equity and Justice (EQU) Research Group at IIASA (kian.mintz-woo@ucc.ie).

Karl Scheifinger contributed the example application about a tool for co-designing fair mitigation scenarios by operationalizing patterns of distributional justice. He is a Researcher at the Integrated Assessment and Climate Change Research Group at IIASA (scheifinger@iiasa.ac.at).

Thomas Schinko contributed to the conceptual development of the framework and writing of the manuscript. He is the Research Group Leader and a Senior Research Scholar at the Equity and Justice (EQU) Research Group at IIASA (schinko@iiasa.ac.at).

Ivo Wallimann-Helmer contributed to the conceptual development of the framework and writing of the paper. Ivo is Professor in Environmental Humanities and Director of the UniFR_ESH institute at the University of Fribourg and a Guest Research Scholar at the Equity and Justice (EQU) Research Group at IIASA (ivo.wallimann-helmer@unifr.ch).

Christopher Wong contributed to the conceptual development of the framework and writing of the manuscript. He provided the application of the framework to biodiversity transformation pathways and designed the framework graphic. He is a Researcher at the Equity and Justice (EQU) Research Group at IIASA (wong@iiasa.ac.at).

Elliott Woodhouse contributed to the conceptual development of the framework and writing and editing the manuscript. He is a Research Scholar at the Equity and Justice (EQU) Research Group at IIASA (woodhouse@iiasa.ac.at).

Caroline Zimm contributed to the conceptual development of this paper and associated research and writing and editing of the manuscript. She is a Research Scholar at the Transformative Institutional and Social Solutions (TISS) and Equity and Justice (EQU) Research Groups and leads the Strategic Initiative *Just Transitions to Net-zero Carbon Emissions for All* (JustTrans4All) at IIASA (zimmc@iiasa.ac.at).

Acknowledgments

The framework presented here has benefited from a lengthy process of research, engagement, review, and evaluation, and we are grateful to all peers, policy makers, and practitioners who at any point have been involved in this process.

[On positionality]

The authors of this working paper all operate within a Western tradition of research and philosophy. Our perception and treatment of justice is strongly influenced by our socialization and experience within Western institutions – both formal and informal. We are aware that this is a particular perspective on justice. We are open to discussing and reflecting on this framework, to adapt, refine, or rethink it upon constructive feedback. Our ambition is to enrich the framework through directly involving non-Western traditions of research and philosophy in future development steps.

Introduction

Objective

In this working paper, we present the Applied Justice Taxonomy and Assessment Framework (AJUST). The objective of this framework is to deconstruct the multi-layered concept of justice for the purpose of systematically addressing each relevant aspect of justice within policy-oriented research on the socio-ecological transitions brought on by the global challenge of climate change.

Justice is a malleable term, heavily context dependent and sensitive to different worldviews and socio-cultural backgrounds. This framework provides a consistent way of using justice terminology in the context of research and policymaking. AJUST has a broad and flexible potential for application, and it can be tailored to fit a variety of spatial and temporal scales. It is also modular, with individual components that can be applied, as appropriate, to specific research or policy contexts.

Justice is relevant, but often only implied, in most applied research and policy-making contexts pertaining to socio-ecological transitions and sustainable development. Neglecting to explicitly address justice issues is a significant barrier to the implementation of just policies in this realm. AJUST thus provides a comprehensive foundation for the transparent identification and description of justice issues to enable explicit justice assessments in the design of more successful climate-induced transition policies.

Ultimately, justice is normative, and conflicting perceptions of what is considered morally right are what we need to understand for more effective policy making. **AJUST is not normative in the sense of defining a specific view of what is just. Rather, it allows researchers and policy makers to reveal often-implicit aspects of justice and communicate them using consistent terminology.**

Background

The concept of the Just Transition garnered attention in academic discourse in the early 2000s, bringing justice to the forefront of international policy and research agendas concerning major global challenges (Morena et al. 2020). While the Just Transition movement is rooted in the U.S. labor movement sparked in the 1970s in response to job losses from environmental regulations, the concept has since expanded to encompass the need for fair and inclusive transitions to a net-zero economy—emphasizing green jobs, worker protections, and community support (Mikaelsson and Lager, 2024). A renewed interest in this movement emerged with growing environmental justice concerns and climate justice debates in the 1990s. Early climate justice debates focused on differentiated responsibilities for reducing greenhouse gas (GHG) emissions. Over time, attention shifted toward the unequal distribution of climate impacts and vulnerabilities. In the context of net-zero emissions targets, these concerns have evolved into broader debates around “just transitions” (e.g., Carley and Konisky, 2020; McCauley and Heffron, 2018; Healy and Barry, 2017).

At the forefront of research on global challenges, IIASA has put justice at the heart of its research strategy. The IIASA Equity and Justice (EQU) Research Group was established in 2021 with the explicit task of creating a justice framework at IIASA. This working paper is the second iteration of the initial framework, which rests on a three year process involving a variety of interdisciplinary workshops, projects, and publications. Researchers from IIASA's Strategic Initiative on Just Transitions to Net-zero Carbon Emissions for All (JustTrans4All) laid the groundwork for this working paper in numerous ways: empirically (tracing multidimensional human well-being in low-income countries), in modelling (advancing awareness and reflections on justice in mitigation scenario research) and conceptually (clarifying language). Moreover, the Strategic Initiative fairSTREAM focused particularly on the relationship between transdisciplinary research and procedural justice, and thus contributed to elaborating the procedural justice section.

Justice has long been a key research topic at IIASA and has yielded several notable contributions: developing thinking on equity in economics (Peyton Young 1994); in the context of Cultural Theory (Linnerooth-Bayer et al. 2006, Linnerooth-Bayer and Vári 2006); in the work on energy access (e.g. Pachauri 2014, Cameron et al. 2016, Rao and Pachauri 2017); in research on wellbeing (e.g. Rao and Minh 2018); as well as with respect to Loss and Damage from Climate Change (Mechler et al., 2019; Wallimann-Helmer et al., 2019; Schinko et al., 2019).

State of the art

In the field of environmental science and socio-ecological transitions, justice frameworks are not a novel concept. With the momentum of the environmental justice movement in the early 1980s came literature addressing the disproportionate burdens of environmental hazards on marginalized communities in the United States (Attapattu et al. 2021, Shrader-Frechette 2002, Bullard 2000 and 2019, Lazarus 1993). The first frameworks on climate justice were developed on the basis of this literature (e.g., Ikeme 2003, Gardiner et al. 2011, Schlosberg 2004). More recently, similar frameworks have emerged in related and increasingly specified contexts such as energy justice (e.g., Gross et al. 2007, McCauley et al. 2013, Sovacool et al. 2017), just transitions (Evans and Phelan 2016) disaster risk justice (Lukasiewicz and Baldwin 2020, de Goër de Herve, 2022), and earth system justice (Gupta et al 2023). While some conceptual frameworks have clearly normative implications, such as many developed for environmental justice, others describe categories and patterns of distribution to analyze actual circumstances of communities, states, and individuals, e.g., in the context of disaster risk. Justice frameworks of international organizations, however, are frequently normative by defining specific patterns as just (e.g., OECD 2021).

Our justice framework goes beyond existing work in two main ways: breadth and depth. Its breadth stems from the fact that it is not limited to distributional, procedural, and recognitional justice, but also encompasses corrective and transitional justice. The framework also shows depth by separating justice considerations into more components than many other frameworks, first, by pointing out that forms of justice are subject to context and scope assumptions, and second, by breaking down forms of justice into relevant metrics and indicators. By expanding upon the five forms of justice presented and illuminating their depth on a fundamental level, this state-of-the-art framework allows for more precision in discussions of justice and in pinpointing sources of disagreement.

Terminology

The term “justice” has been used in a broad range of disciplines from philosophy to legislative and judicial systems. In the public sphere, “justice” is also used as part of day-to-day language in many cultures. For these reasons, justice-related terminology is inconsistently used and can be difficult to define. Some of the most prominent terms that are often used synonymously with “justice” are “fairness”, “equity”, and “equality”. We briefly discuss each term and explain how we use them. Although their usage is mostly grounded in philosophical theory, there are some departures from philosophical usage, which we explicitly note and explain in our respective justifications.

Justice

The definition of “justice” that we use in this framework, as proposed by Miller (2021), is “the constant and perpetual will to render to each [their] due.” This definition, which draws on ancient philosophy (Institutions of Justinian), highlights that justice refers to the treatment of individuals. Categories of people can also be treated as individuals who can advance claims. Moreover, this definition implies that justice is due to somebody, vis-à-vis a person or institution that dispenses said justice. Justice differs from other kinds of ethical virtues, e.g., charity, or mercy, in that it is about obligations – it is the minimum that is morally owed. Justice is demanded by its claimants and can be enforced. The next important implication is that justice needs to be dispensed impartially and consistently. Finally, this definition highlights that there needs to be an agent who brings about just and unjust states of affairs.

Fairness

In informal or non-specific academic contexts, fairness is sometimes used synonymously with justice. In these contexts, fairness often relies on formal or procedural conditions. However, justice often carries a stronger connotation of upholding rights, following established laws, and correcting wrongs. Fairness emphasizes impartiality, even-handedness, and a level playing field. This is the case in Rawls’ “Justice as Fairness” (Rawls 1958, 1971), where the original position promotes fairness by ensuring principles of justice are chosen under impartial conditions and do not benefit any specific group (veil of ignorance). Justice, as the fair distribution of benefits and burdens, is achieved through principles chosen from this fair (original) position (Wenar 2021). Fairness is also a key concept for policy analysis, as it has been shown in many environmental policy contexts (see Krütli et al. 2015, Bergquist et al., 2022; Martin et al., 2020; Thaller et al., 2023) to be intricately linked with policy acceptability in the wider public. Fairness can be understood in this context as subjective preferences towards justice.

Equity

“Equity” is a term that has not been extensively analyzed in philosophical debates of justice. In more applied contexts, however, the term is used frequently, albeit inconsistently. Equity has been used synonymously with justice, for example by McDermott et al. (2013) in an environmental studies context. Equity has also been

used specifically to denote distributional justice: for example, in applied psychology (Adams 1965, Inequity in social exchange), or in economics (Young 1995, Equity: In Theory and Practice).

In other instances, equity has been treated as a specific pattern of distributional justice: in contrast with equality, equity follows a needs-based distribution pattern (e.g., Menendian 2023). Equity also has a long-standing meaning in legal contexts, where it is a branch of law that is about achieving a just result beyond the strict application of legal rules. Courts might use equitable remedies to address these situations (e.g., Subrin 1987, Hudson 2021, Humphreys 2023).

We use the term “equity” as a synonym for distributional justice, which is an increasingly common use in the context of sustainability science (e.g., Ikeme 2003).

Equality

“‘Equality’ (or ‘equal’) signifies correspondence between groups of different objects, persons, processes, or circumstances that have the same qualities in at least one respect, but not all respects, i.e., regarding one specific feature, with differences in other features.” (Gosepath 2021). This implies at least two different meanings of the term. Both are prominent in various debates and are often confused. Equal treatment vs. treatment as equals. As in this framework, equality appears most prominently as a distributional egalitarian pattern (equal treatment). According to these theories, if there are no relevant reasons justifying unequal distribution, treating two individuals equally means providing them with the same amount of a relevant metric. Equality may also hold the idea of treatment as equals. Although this second understanding of equality may often imply equal distributions, in many contexts treating individuals as equals means justified unequal distribution according to patterns of justice like merit, needs, or sufficiency (Miller 2003, Olsaretti 2009). This latter understanding of equality is close to what is often called recognitional justice (see below) and what some philosophers discuss under the header of “social equality” (e.g., Fourie et al. 2014).

As there is potentially a lot of controversy around this term, we refer interested readers to the in-depth treatment of the topic in the Stanford Encyclopedia of Philosophy (Gosepath 2021).

Why use the framework?

The AJUST framework facilitates identifying and addressing the various justice implications of any given policy problem, and especially potential conflicts that may arise due to stakeholders’ diverse perspectives on what makes a process or outcome just, increasing the feasibility of transformational policy options.

This framework is accessible to those who are less familiar with philosophy or justice terminology. A vast range of justice discussions are covered, including “social justice”, which is usually a combination of distributional, procedural, and recognitional justice. The AJUST framework is modular, allowing users to pick and choose, or even add, relevant forms and patterns of justice. Finally, AJUST is well grounded in philosophical literature, as opposed to being an arbitrary set of justice considerations that a select few scholars view as important.

Who could and how to use the framework

The target users of this framework are researchers and policymakers, particularly those with a focus on sustainability and socio-ecological transitions. We aim to facilitate the diagnostic assessment of and reflection on justice across each framework element. With this in mind, individuals are then able to identify and address the extent to which justice is considered throughout the research or decision-making process. The framework may be approached from a variety of entry points depending on the type of research or policy in question (Table 1).

Table 1: Examples of how to use the framework distinguished by target groups.

Application	Target groups	Question that can be answered
Clarifying language	Researchers, policy makers, journalists, etc.	What is coherent language to discuss justice issues in a specific research or policy challenge?
Gap-analysis and transparency	Researchers, policy makers	Which justice considerations have and have not been addressed in existing research and policies?
Tool and analysis design	Researchers, policy makers	Which justice considerations are implied by using a certain methodology, and how could they be made more transparent?
Writing research proposals	Researchers	Which justice considerations are part of the research envisaged and which aspects of justice could be researched explicitly?
Conducting a research project	Researchers	Which justice considerations are explicitly being considered in the research process itself?
Interpreting research results	Researchers, policy makers, journalists	Which justice considerations are relevant for the discussion of research results and how do they play out in the final interpretation?
Communicating research insights	Researchers, policy makers, journalists	Which justice considerations are relevant for the target audience?
Policy design	Policy makers	Which justice considerations are relevant for designing policies, in terms of processes and outcomes?
Policy evaluation	Policy makers, consultants, researchers	How does a policy perform vis a vis alternative justice considerations?

The framework

In this section, we describe the components of the framework. This introduction of necessity remains at a high and abstract level, as specification requires contextual details, which depend on the application at hand (e.g., Voiron & Wallimann-Helmer 2023). Alternative forms of justice may be of varying relevance in given applications; however, in principle, each application can be scrutinized through the lens of each form of justice albeit to a varying degree of usefulness. This means forms are not mutually exclusive. The framework builds on and relates to the climate research-specific framework published by Zimm et al. (2024), but expands it in several places, such as contexts of justice, scope, and level of detail on some forms of justice.

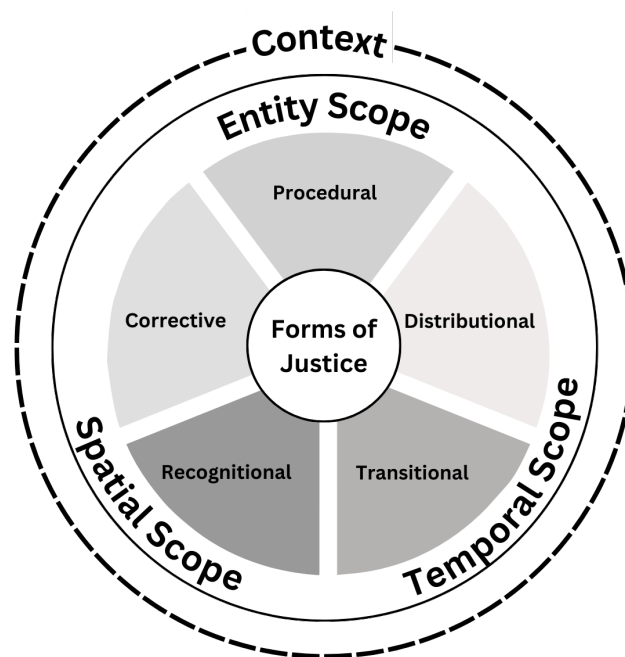


Figure 1: AJUST framework. The context of justice is followed by the scope of justice (space, time, and entity) and the forms of justice. For the analysis of any form of justice, further specification is needed. Based on Zimm, Mintz-Woo et al (2024). Graphic courtesy of Christopher Wong.

Context

Context refers to the area in which justice is being explored. It may be a specific sub-discipline or subject matter, for instance: energy justice, climate justice, migratory justice etc. In this paper, we provide a basic, high-level overview of key aspects of justice, but often these will have to be further specified to meet the context you are working in. For instance, in our high-level overview, we might say that distributive justice is about how scarce resources are shared, but in the context of energy justice, it might be further specified to how limited energy resources are distributed amongst users. We aim for the framework to be sufficiently basic to allow the user to apply it to whichever context they are working in.

Scope

Space

Specifying the spatial resolution at which a process or research is taking place is another important step towards a complete justice assessment. Space refers here both to geographic spaces (horizontal) and to levels of governance (vertical). Justice may be examined at an individual or household level, at a sub-national or national resolution, and at a regional or global scale. Homing in on a spatial scope reveals implications for further assessing various forms of justice (see below).

Time

Temporal scope refers to the period of time around which justice is being assessed. This scope may be backwards and/or forwards-facing (perhaps in annual, decadal, or generational steps), but could also be a snapshot of the present.

Intergenerational justice is a specific form of temporal justice which refers to whether and what we owe to future generations (e.g., Barry 1997). Intergenerational justice is closely linked to the idea of sustainability, most often in terms of sustainable resource use. Economists have suggested (social) discount rates to address intergenerational justice. The more certain outcomes appear in the future, the less weight they have for the currently living (Mintz-Woo, 2021 is a philosophy-based introduction).

Entities

Justice is a social construct and is often viewed through an anthropocentric lens. However, most environmental ethicists favor the concept of interspecies justice, expanding the scope of justice considerations to include non-human entities (Weinheus 2020). The scope could then include all beings capable of suffering (sentientism) (Singer 1975/2009, Nussbaum 2024) or all living beings (biocentrism) (Taylor 1986). Holistic accounts claim that moral duties are owed to collective entities rather than individual non-human entities, for instance: species, ecosystems, bioregions, or “the land” (Callicott 1989, Naess 1973).

Societal discourses determine which entities can be selected, which is still one step removed from the question of which entities will be selected both? Are questions of recognitional justice or is the latter already procedural.

Forms

Forms (sometimes called “dimensions” or “pillars”) of justice, are the main level of categorization of justice. There has been no definitive set of forms established. Distributional and procedural justice have been two dominant forms in policy discussions, with a trend to focus particularly on distributional justice in the climate discourse (e.g., Zimm et al. 2024). However, this unidimensional focus overemphasizes the benefits and burdens to be shared, and neglects considerations of how societies and cultures are structured (Preston and Carr 2019). When evaluating climate policies, it is more informative to consider multiple forms of justice (Wallimann-Helmer 2019a; Mintz-Woo 2024; Schinko et al., 2023; de Goer de Herve et al., 2023).

Philosophy offers a more differentiated view of justice (e.g., Miller 2021). We have tried to be conscious of philosophical precedent in considering forms of justice for explicitly applied frameworks. Therefore, these forms are not exhaustive.

Forms of justice are not mutually exclusive but provide entry points or lenses from which to explore justice and may sometimes intersect (e.g., procedural and recognitional justice are closely aligned (Wallimann-Helmer 2019b), or corrective justice can be considered within distributional justice).

Recognitional justice

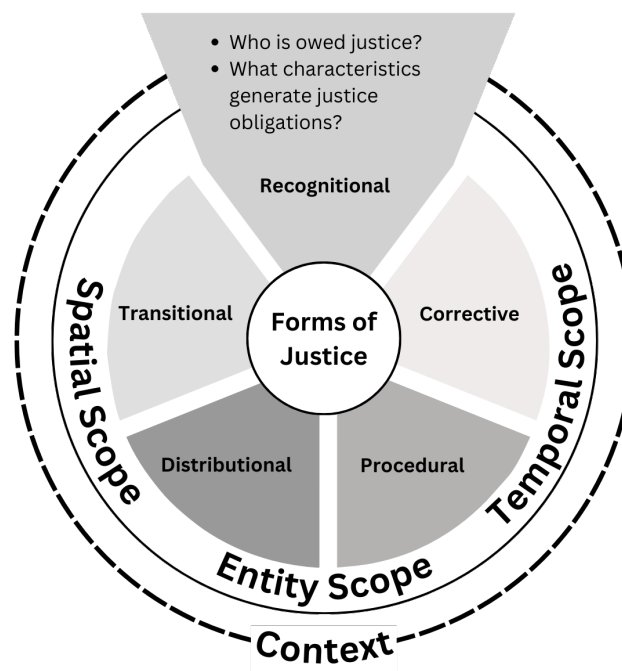


Figure 2 - Recognitional Justice

Recognitional justice has been used diversely across academic literature. Van Uffelen (2022) highlights that this diversity may obscure what recognitional justice actually measures. Most fundamentally, recognitional justice is about identifying who the legitimate claimants of justice are. The most egregious forms of recognitional injustice are cases in which certain individuals or groups are wrongfully not recognized as legitimate claimants of justice. This occurs when people of a racial group are denied access to a state's legal system or given a second-class form of citizenship. We first consider to whom justice is owed, and who may demand it, in the Scope section of this paper (c.f. entity). In this understanding, recognitional justice underlies/precedes all further forms of justice).

Practically, recognitional justice also means duly "representing and considering the cultures, values, and situations of all affected parties" (Whyte, 2011, p. 200). Recognitional justice then is concerned with the proper apportionment of dignity and respect (Honneth 2004) amongst members of a society. According to this meaning, recognitional justice asks us to consider how the history of injustice present in the world has left some groups of people lacking in the dignity and respect they are due. Recognitional justice can therefore

require us to recognize the heterogeneity of stakeholders, or to consider how we model populations. Models constructed around a homogeneous depiction of a population might fail a recognitional justice test, by failing to consider how historical and ongoing injustices shape the desires/position/dignity afforded to distributional patterns of groups within the population. Recognitional justice will require consideration of these specificities in the design and implementation of policies.

As with each of these forms, it is important that recognitional justice is not taken as sufficient without consideration of other forms of justice. Nancy Fraser has made important criticisms of the comparative refocusing on recognitional justice in comparison to distributional justice and has argued that equal recognitional dignity can only be achieved with a redistribution of material goods, too (Fraser 1997).

Procedural justice

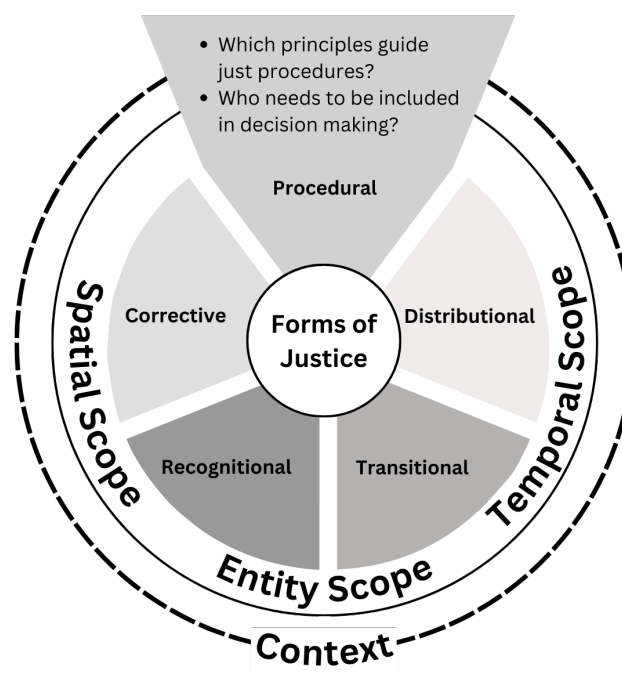


Figure 3 - Procedural Justice

Procedural justice relates to questions about the fairness of processes. There are ongoing debates about the precise relationship between procedural and distributional justice. For many philosophers, procedural justice is a factor of the likelihood that just distributions are achieved (Rawls 1995 p.170, Beitz 1989, Cohen 1994), but other theorists have claimed that the value of a just procedure is independent of the procedure's outcome (Nozick 1974, Habermas 1995). Central to this dispute is the Rawlsian distinction between "perfect", "imperfect" and "pure" procedural justice. Perfect procedural justice maintains just procedures that guarantee just outcomes, treating the procedure and outcome as independent factors. Imperfect procedural justice is strictly concerned with maintaining just procedures. Finally, pure procedural justice assumes just outcomes are an inherent result of just procedures.

Within any procedure, including in policy and research, there is also a distinction between justice in distributional processes and decision-making processes. A distributional process is the system that leads to metrics being distributed in a particular way – e.g., a race for distributing medals, or a job market for distributing jobs. Justice for distributional processes is the extent to which they lead to just distributional patterns. If the just pattern is equality, but the processes fail to distribute metrics equally, then the process is unjust. Decision-making processes are the setups, both formal and informal, which govern how societies or organizations make decisions – parliaments, board meetings, courts, executive officers, planning committees etc. Here, procedural justice refers to the extent that these processes conform to certain principles of proper conduct. Ensuring that proper conduct is adhered to is essential for the legitimacy of the distributional outcomes, while the precise distributional pattern remains less relevant. Reference literature on democratic decision making!

Interactional and epistemic justice are sometimes subsumed under procedural justice. We propose to include these two as sub-forms in our framework as they broadly fit the idea of process design, both highlighting aspects of information provision. Interactional justice refers to the standards of treatment that those subject to the decision-making process receive, and the extent that the reasoning behind the procedures they are subject to is adequately explained to them (Greenberg 1993). Epistemic justice ensures that certain kinds of knowledge are not prioritized over equally credible ones. A lack of epistemic justice occurs when a person or group's testimonial credibility is depressed in value (testimonial injustice), or when a person or group is unfairly excluded from the process of concept formation and thus rendered unintelligible to those in power (hermeneutical injustice) (Fricker 2007). Epistemic humility means recognizing how subject knowledge is socially conditioned and fragile and requires us to act (both personally and institutionally) with openness to other views and perspectives (Kidd 2016).

A non-exhaustive list of common principles for procedural justice is outlined below. These principles are primarily drawn from social and applied psychology but have also been the subject of philosophical analysis. The philosophical literature has examined the kinds of procedures that enable individuals to willingly cede decision-making authority to legitimate institutional authorities. Together, these principles contribute to a robust body of evidence as to why individuals and groups care deeply about the perceived fairness of decision-making processes, even when outcomes are not always personally favorable (Cohen-Charash and Spector 2001; Krütli et al. 2015). Perceptions of procedural fairness are thus recognized as a driving factor in organizations and institutions achieving legitimacy and effectiveness.

Principles for procedural justice for decision making processes/legitimate outcomes

The following principles include formal criteria for designing or evaluating the justice of procedures as well as the pre-conditions that make such procedures possible.

Equal representation: Mechanisms are in place to ensure individuals involved in a decision-making process receive equal treatment, both formally and informally (Habermas 1995; Leventhal 1980). This principle highlights the relevance of non-discriminatory treatment as a factor shaping procedural fairness perceptions.

All-affected: In contexts where decisions have moral or practical implications for multiple stakeholders, this principle refers to the inclusion of all those affected in the decision-making process (Goodin 2007). In

representative institutions, this means reflecting the concerns, values, and perspectives of all constituent subgroups through accessible procedural mechanisms.

Suppression of bias: The impartiality of decision-makers is a well-established dimension of perceived procedural fairness. Bias suppression prevents allocative decision-makers and distributing agencies from acting on self-interest, blind allegiance, or doctrinaire devotion (Leventhal 1980 p.26).

Accuracy: When a sincere effort is made to base decisions on pertinent, reliable, and well-sourced information, the resulting accuracy builds legitimacy and credibility in decision-making processes (Leventhal 1980).

Transparency: Transparency allows for affected individuals to access and understand the rationale and methods behind procedures, contributing to perceptions of fairness by facilitating greater accountability (Thompson 1999; Waldron 2016).

Equal voice: Perceptions of procedural fairness are strengthened when all participants are able to express their views without being undermined by unequal power dynamics. This presupposes both the provision of adequate resources to articulate one's position and the social recognition of participants as credible contributors (Fricker 2007).

Ability to shape decisions: This principle is often discussed under the term "consideration" (Smith and Donough 2001). Beyond merely having the ability to express preferences or beliefs, participants tend to perceive procedures as fairer when there is a reasonable expectation that their input will influence the outcome, or in other words, that their input will be placed under consideration by decision makers.

Ability to correct errors: The presence of institutional pathways to revisit and revise decisions, e.g., through an appeals process, provides an important safeguard in reinforcing perceptions of procedural fairness (Leventhal 1980).

Distributional justice

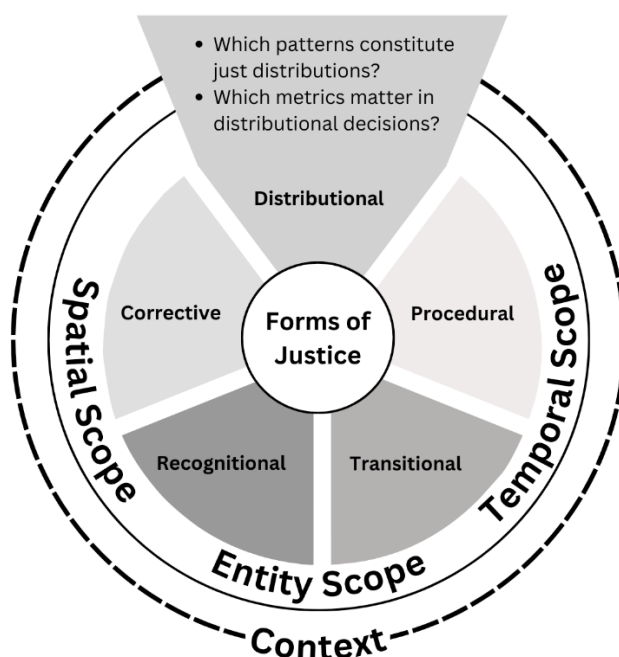


Figure 4 - Distributional Justice

Distributional justice is the form of justice concerned with, as the name suggests, the distribution of benefits and burdens amongst the members of a group in which justice is being analyzed. Whether the scope extends nationally or globally, in the present or across generations, there will usually be some implicit or explicit (set of) forms which determine how those benefits and burdens, in terms of a given metric, are to be distributed amongst the membership (Page 1999). The result is a distribution, which may be more-or-less just depending on how closely the result matches some ideal pattern of distribution.

There is no consensus amongst philosophers about what distributional pattern is ideal – some key positions are described below. Debates between the positions often revolve around the importance that should be attributed to equality and deservingness. Broadly speaking, egalitarian perspectives argue that more equal distributions of the chosen metric are more just – and egalitarians are often willing to sacrifice the total amount of goods to be distributed to achieve this.

Metrics of distributional justice

In considering distributional justice, one must first know something about what is being distributed. Depending on the context, this might be jobs, incomes, opportunities, natural resources, emissions rights, health, etc. Distributional justice is also concerned with distributing burdens: taxes, obligations, responsibilities, pollution, refugees, new construction, or resource extraction, etc. These examples are typically referred to as the metrics or currency of justice. However, some metrics may not be directly observable, so researchers may make conclusions about the metric distribution by considering more empirical, but approximate, indicators. For instance, with a metric like health, which is difficult to directly observe, a suitable indicator might be longevity.

Not everything which can be distributed is the concern of justice – certain metrics are much more important to people than others (Dworkin, 1981), and some things are completely morally trivial. Another issue to consider is commensurability – how much of benefit x is worth the same as benefit y? Not everyone places the same value on each benefit - Person a might value access to an art gallery highly, while Person b may be indifferent. At the philosophical level, this is often resolved by considering the key metric to be something like personal wellbeing, flourishing, capabilities, or utility. What matters is not the distribution of any single metric or resource, but how the overall distribution of things that matter contributes to the overall achievement of this key metric for everyone.

Patterns of distributional justice

Once we have settled on what it is to be distributed, the pattern of justice refers to our preferred principle for organizing how the distribution of these metrics occurs. There is no settled agreement amongst philosophers on which pattern is preferable – and each pattern makes assumptions and tradeoffs about the relative moral importance of equality, liberty, deservingness, needs and more. These patterns are not necessarily mutually exclusive – it is common, for instance, for sufficientarians to advocate a priority principle for those under the requisite minimum threshold, but still think egalitarian principles ought to govern interactions amongst those above the threshold. We can refer to these as hybrid views. Other views may be genuinely incompatible, for instance: utilitarianism might be incompatible with egalitarian views if maximizing total welfare is best achieved with an unequal distribution of benefits and burdens.

Some prominent patterns of distributional justice are listed below:

Utilitarian patterns maximize total welfare, for example, by preferring the most cost-efficient options. Utilitarianism, following the tradition of neoclassical economics, is often the unquestioned default in policymaking and research.

Egalitarian patterns minimize differences among entities by making sure that everyone receives the same quantity if there are no reasons justifying unequal distribution. E.g., luck egalitarians¹ (Arneson 2007) classically advocate responsibility and preferences as the only justifications for unequal distribution of opportunities or access to advantage.

Prioritarian patterns prioritize those who are worst off (Rawls difference principle) or at least those worse off than others (Parfit 1991). Hence, priority can be absolute or comparative.

Sufficientarian patterns demand providing some threshold of goods or services to meet some minimum, basic, or decent level of human needs (e.g., decent living standards) (Huseby 2009). In principle, they do not allow for any deviation from this minimum to be justifiable.

Limitarian patterns restrict a metric below an upper limit (for example, of consumption, wealth) (Spengler 2016, Robeyns 2019).

In addition to the scarcity of the metric to be distributed relative to the size of the group it is being distributed to, most patterns of distributional justice also consider merit. This means that a certain value is placed on recognized skill, talent, contribution, effort, or other kinds of acts which make some claimants more deserving of goods than others (Milne 1986). We see this in job interviews, Nobel prizes, grant funding awards, and as a justification for wage differences.

Patterns of distributional justice can also be expressed in principles of justice that are not as general and encompassing as the ones mentioned thus far. Prominent in the climate ethics context are principles like the polluter-pays, beneficiary-pays and the ability-to-pay principles to distribute the burdens of mitigating climate impacts (Gardiner et al. 2010, Hayward 2012). The polluter-pays principle aims at internalizing negative externalities to the environment. The beneficiary-pays principle does something similar with an eye on benefits that have (unjustifiably) been gained through negative impacts. Ability-to-pay defines capacities of agents as relevant to assign burdens of mitigation. In the climate justice context, these patterns also relate to questions of corrective justice, as past emissions by Global North countries may be considered historic wrongs, as resulting climate change impacts affect Global South countries disproportionately. Accordingly, the grandfathering principle has frequently been invoked by Global North countries. This pattern refers to an exemption (permanent or temporary) that allows entities or groups to continue activities that were permissible before new rules were put in place.

¹ The widely-held view that justice only requires misfortunes caused by chance (rather than choice/talent) need to be equalized. Anderson (1999) is a prominent critic.

Corrective justice

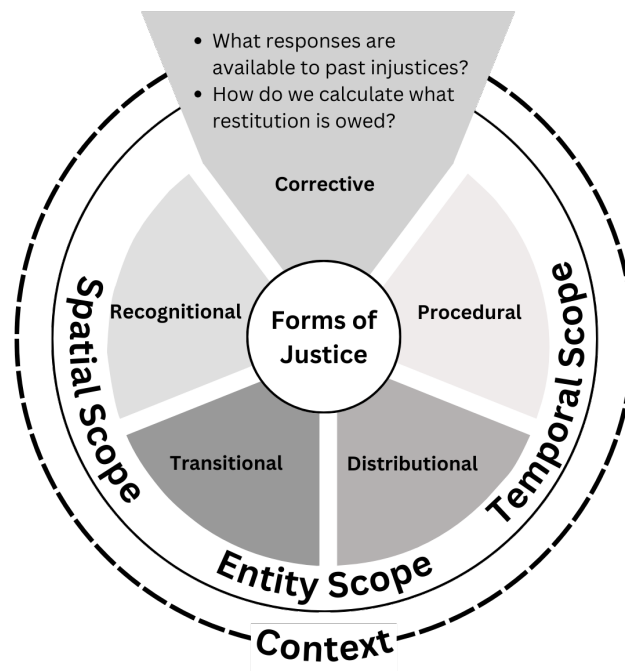


Figure 5 - Corrective Justice

Corrective justice is about what is owed to those who have previously been wronged, and about the processes of reaching a state where those wrongs have been accounted for and corrected. Corrective justice can incorporate distributive elements. The apt corrective measure to make up for ill-gotten gains or amend damages caused to another might be a redistribution of those gains and burdens. Methods for achieving this can be compensation or reparations, or the provision of alternative means for the wronged group to achieve their ends (Goodin 1989, Huggel et al. 2016).

Corrective justice is not limited to the redistribution of goods, and it often involves recognitional and procedural justice elements:

Retributive justice – the branch of justice concerned with punishments – is occasionally held to have a recognitional element to it, rather than simply acting as a means to dissuade others from acting in a like manner. Proportional punishment can be understood as a form of public apology that recognizes the responsibility borne by the wrongdoer for harm caused. (Bennett 2008, Duff 2013).

Restorative Justice is often positioned as an alternative to punitive reactions to crime or injustice. Restorative justice instead focusses on attending to the needs of the victim rather than sanctions due to the perpetrator – although they are not necessarily mutually exclusive (Braithwaite 1989). Corrective procedural amendments might be owed to those who have previously been wrongfully excluded from decision-making authority. For instance, affirmative action hiring policies are a method for correcting previous procedural injustices.

Transitional justice

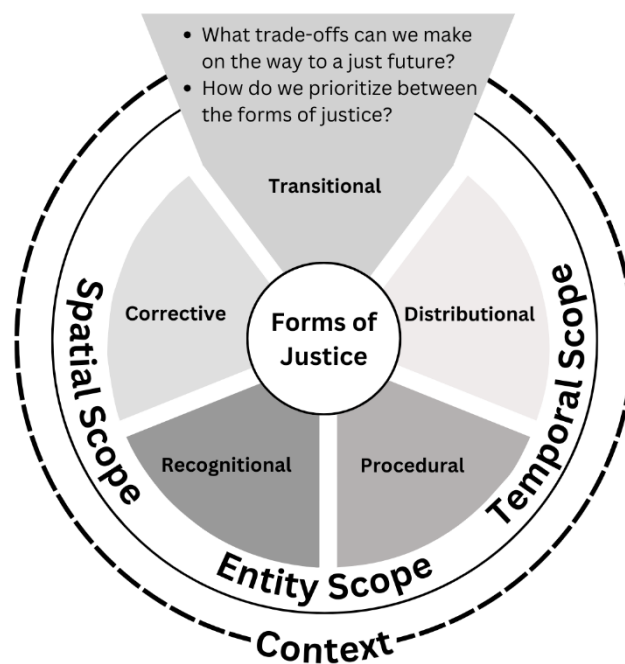


Figure 6 - Transitional Justice

The term *transitional justice* has a well-established and prominent usage in the context of post-conflict societies and human rights, where it refers to how societies respond to legacies of large-scale human rights violations. This includes processes such as restitution, reparations, institutional reform, and criminal accountability (e.g. UN Security Council 2004, van Noorloos 2021, Jefferey 2024). In this paper, however, we employ *transitional justice* in a distinct and novel sense. While we acknowledge the original meaning and its importance in post-conflict reconstruction, our use of the term refers more broadly to considerations of justice *during* transitions from less just to more just states of affairs, particularly in the context of policy and institutional change.

In this alternative usage, *transitional justice* is the form of justice used to manage moral and practical trade-offs along the path to a more just world. It emphasizes the importance of evaluating not only the justice of outcomes, but also the dynamics that lead to those outcomes. This reconceptualization of transitional justice reveals a less examined ethical terrain: how to navigate moral and practical tensions between ideal justice goals and feasible progress.

There are two central reasons why this notion of transitional justice warrants attention. First, it acknowledges the importance of interim dynamics: not just whether we ultimately reach a just outcome and utilize just procedures, but whether the sequence of steps along the way is itself acceptable. For example, we may question whether justice demands continual improvement (e.g., a steady increase in distributive fairness), or whether temporary regressions might, in the long run, accelerate progress toward a more just end state.

Secondly, this concept brings into view the complex trade-offs that may occur between different forms of justice. There may be scenarios in which realizing a distributively just outcome requires deprioritizing or

modifying other forms of justice—such as procedurally just norms associated with property rights. For instance, we often see this logic invoked in cases of compulsory purchase, where a state may override standard procedural protections or market norms in order to advance a broader public good, such as infrastructure or climate resilience. Likewise, when faced with morally urgent harms (e.g., extreme poverty or the loss of entire island nations due to climate change), the moral weight of these injustices may justify exceptional measures that depart from existing justice requirements and call for a reconfiguration of priorities and goals.

Social Justice

Social Justice is a term that is frequently used which does not naturally fit into the Five Forms of Justice outlined in the framework. Within liberal democracies, social justice usually refers to calls for justice between distinguishable subgroups of citizens, and demands for social justice are often expressed through social movements, for example: minority ethnic, LGBTQIA+, disability rights etc. Social justice reflects a belief in the inadequacy of traditionally liberal conceptions of equality – as formal equality in the eyes of institutional power – which is thought to obscure the practical inequality of circumstances, which difference in cultural, cognitive, and physical factors precipitates. Social justice straddles several forms of justice included in the framework. When expressed as a kind of justice which occurs between groups with different social identities, it can be a kind of recognitional justice – a call to have one’s identity recognised, specific needs acknowledged, and treated with the dignity demanded as a being with equal moral status to all others (Honneth 1995). Achieving social justice may also include a redistribution of resources to allow the entire material basis to participate on an equal footing. These redistributive efforts may be a form of corrective social justice, possibly as reparations for historic unjust treatment of particular social groups.

Applications

The framework can be applied in a variety of ways. Initially, we developed it as a tool for climate research (Zimm et al. 2024) to determine the extent to which justice is considered in this field of research. The AJUST framework can also be applied outside of academic research, to evaluate policy documents or policy processes, for example. We expect and encourage users to explore innovative uses of the framework, especially as we continue to expand and refine it. In this section, we provide four examples of ongoing applications of the AJUST framework.

Designing just biodiversity scenarios

Objective: The Rainforest project seeks to develop and evaluate viable transformative change pathways for food and biomass value chains to meet biodiversity, climate and socio-economic targets laid out in the Sustainable Development Goals (SDGs) 1-3 and 12-15. To develop these pathways, the focus was on creating value-explicit scenarios, which were transparent about the justice and ethical assumptions embedded in them.

Description: The Rainforest pathways were created using three frameworks; the Sustainable Development Pathways (SDP) framework, the Natures Futures Framework (NFF) and the EQU/IIASA Justice Framework (IJF), which was the previous iteration of the AJUST framework. The SDPs were created to explore alternative value-explicit pathways to reach a specific target space based on the SDGs. They were combined with the NFF illustrative narratives, which focus on relationships to nature based on three axes; autonomy of nature, instrumental values, and cultural values, to give a base set of three pathways. The IJF was then used to explore relevant justice aspects to bring transparency to key areas such as preferences over procedural justice, distributional justice and recognitional justice that are integral to the narratives.



Figure 7: Rainforest pathway narratives. Just and value-explicit transformational pathways. Source: Rainforest project.

Next steps: The pathways and associated justice principles are now being used to downscale EU (European Union) and CBD targets for biodiversity to show how the distribution of burden differs significantly depending on the justice principles used.

Reference: The full pathway narratives and method for their design can be found here, <https://rainforest-horizon.eu/deliverables/D1.1.pdf>.

Identifying research avenues for mitigation scenarios

Objective: Identify suggestions for improvements in terms of justice considerations for mitigation scenarios from literature or available expertise in the author team, and organize these by form of justice and relevant sub-component.

Description: The result was an overview of research avenues corresponding to forms of justice (see Table 3).

Table 2: Avenues for future research in mitigation scenarios. Source: Zimm et al. (2024).

Form of justice		Options for expansion	Examples of implementation approaches
Distributinal	Utilitarian		Expand utility/welfare to include different aspects of human well-being (for example, the application of specific social welfare functions in ref. ¹⁰⁷)
	Prioritarian	• Expand domain coverage	Different groups being served beyond efficiency considerations
	Egalitarian	• Investigate different patterns and combinations of patterns	Per capita and Gini coefficient (reductions in Gini) of different indicators (beyond gross domestic product and greenhouse gases)
	Sufficientarian	• For different metrics and indicators at more granular scopes and with different regional configurations	Minimum levels of different indicators
	Limitarian	• Include in narratives	Caps/upper limits of different indicators
Procedural	Model design	• Transparency about objectives and underlying assumptions	Share underlying assumptions and their potentially different impacts with regard to justice questions
	Scenario development	• More and broader stakeholder involvement	Discuss regional/national choice and preference for metrics and patterns with stakeholders
	Scenario selection	• Greater diversity in research teams	Share of population living in democratic regimes
Corrective	Restorative	• Include in individual scenario application narrative	Combined with distributinal justice (modify patterns considering historical contributions or inclusion of compensatory payments ¹⁰¹)
	Compensatory	• Inclusion of compensatory payments	Adjust patterns and metrics reflecting historical responsibility
Recognitional		• Acknowledgement of issues	Using trusted locals to communicate climate policy or suggest contextually sensitive ways to implement policy or design scenarios ²⁰
Transitional		• Different policy sequencing options for different metrics and patterns	Introducing initial rebate cheques before fully implementing carbon pricing ¹⁰⁸

Learnings and limitations: We identified exemplary avenues for further improvement based on available literature and our expertise. This was not based on a structured assessment or full expert elicitation.

Next steps: Currently no next steps are foreseen. Many more suggestions are thinkable, e.g., going into more detail for individual model configurations or types. Also, we only looked at aspects related to forms of justice but did not elaborate on other justice considerations, such as scope on its own.

Reference: Zimm et al. 2004, *JustTrans4All*, *IIASA Strategic Initiative 2021-2024*.

Developing guidance materials for scenario development

Objective: This contribution aims to illustrate one way how justice could be systematically described and discussed in scenario research. Creators of scenarios can find contexts of justice-relevant research that have not been explored before and use them to reconsider scenario designs. Users of scenarios may receive better contextualization of a modelled scenario. Both creators and users can use it to explicate what aspects of justice are covered in an available analysis.

Description: We bridge the gap between a theoretical justice framework and a study-specific application for integrated assessment modelling, for both scenario creators and users. We propose a blueprint for analyzing justice in model-based scenario studies. We use guiding questions (Table 3) that enable the identification of aspects of justice in model-based scenario studies across research steps. We then answered these questions in detail for scenarios of a recent model intercomparison project ENGAGE (results not included here).

Table 3: Set of guiding questions related to each element of this framework to develop a set of specific questions that enable the identification of aspects of justice in model-based scenarios.

Element of Justice Framework	Research question	Research methods	Results
Area of justice	For each element of the justice framework, how is justice are addressed in your research question?	For each element of the justice framework, what components of the used research design and operationalization have justice implications? How are elements of justice represented in the research and what might be associated limitations?	What research results and scenario quantifications are reported, with what detail, and what are the justice implications?
Scope of justice			
Form of justice			
Metric			
Pattern of justice			
Procedural justice	Is the research reflective of, and relevant to, relevant stakeholders?	Does the research incorporate the viewpoints of various stakeholders? Are research and views from vulnerable or marginalized groups considered, and present in the research team itself?	Are the results communicated appropriately to the public as well as policymakers?

Requirements: Detailed scenario and model knowledge, and an understanding of the justice framework.

Learnings and limitations: A useful tool to identify justice aspects needs to be simple and intuitive, enable comparability across applications, while also being sufficiently comprehensive. With this guidance, we hope to show its usefulness for explicating what justice aspects are addressed by the scenarios and the study process itself. We hope that this will enable international scientific assessment bodies to include more robust discussions on what types of justice are addressed in scenario ensembles.

Next steps: We argue that this process should be repeated systematically for a much broader set of scenarios and studies to highlight justice entry-points for specific studies while also enabling a robust, research

community-driven effort to understand justice across scenario ensembles. Comparability across studies still needs to be demonstrated and would benefit from a standardized approach. A future justice model intercomparison project (JustMIP), currently under development, uses a similar approach to the one presented here. Such an exercise not only pinpoints what aspects of justice have been left underexplored but also provides a justice-cognizant scenario evidence base to inform just transition debates around the world.

Reference: JustTrans4All, IIASA Strategic Initiative 2021-2024, Kikstra et al. 2023

A tool for co-designing fair mitigation scenarios

Objective: To enable a debate on distributional justice across scientific and non-scientific communities, by visualizing distributional patterns in scenarios and developing a method to elicit stakeholder preferences.

Description: This research shows that it is possible to visualize justice patterns through stylized sets of trajectories of economic growth, nutrition, housing, and mobility (variables relevant to climate mitigation modelling). In a web-app, users are tasked to select the scenario that they perceive as the fairest and give the reason for their choice (see Figure 4). The web-app translates often intangible debates around justice into concrete scenarios that enable users to reflect upon their preferences and justice understandings.

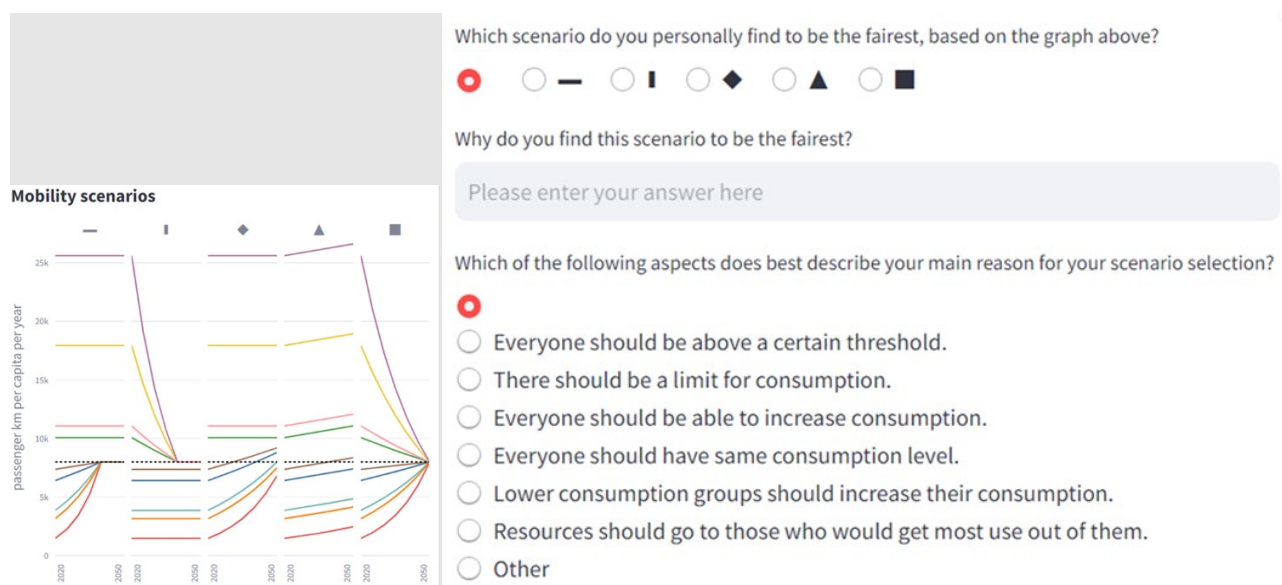


Figure 8: The web-app displays five scenarios, each featuring stylized trajectories that are aligned with one specific justice pattern and asks users to pick the fairest scenario. Colored lines represent different world regions, the dashed line represents a specific threshold. The web-app includes multiple variables and multiple thresholds, the scenarios are presented in random order. The distributional justice patterns are: Horizontal Bar - Sufficientarian; Vertical Bar - Limitarian; Diamond - Prioritarian; Triangle - Utilitarian; Square - Egalitarian. Graphic courtesy of Karl Scheifinger.

Requirements: A workshop that guides through the app takes about 20 minutes.

Learnings and limitations: Our findings indicate diverse fairness perceptions regarding distributions, depending on what is being distributed. Users are driven by diverse motivations, such as ensuring that everyone surpasses a certain threshold when selecting distribution patterns, and that multiple patterns can

speak to the same motivation. These results suggest that there is no universal definition of a fair distribution, highlighting the need for careful stakeholder elicitation on a case-by-case basis.

Next steps: More research is needed to further operationalize distributional justice patterns, especially on setting the thresholds (i.e., limits and floors). The web-app could be deployed to ex-ante inform an outcome-centered modelling by describing a 'fair' scenario space, enriching the scenario space as some trajectory configurations are not captured in current scenarios. The app could also be used outside of workshop settings to collect inputs from many stakeholders through an online consultation.

Reference: JustTrans4All, IIASA Strategic Initiative 2021-2024, (Scheifinger et al. Breaking Barriers with Patterns: New Tools for Integrating Distributional Justice into Global Mitigation Scenarios in preparation).

Discussion and Outlook

This working paper gives a high-level overview of key aspects of justice, enabling researchers and policy makers to illuminate implicit or hidden ethical challenges. The aim is to introduce, explain, and standardize frequently used terms amongst an audience of non-specialists, and additionally to provide a starting point for thinking deeper about justice considerations in research and practice.

We consciously did not provide a clear sequence for using the framework – even though the order in which we presented the various elements (scope, form, sub forms, applications) of the framework may frequently be useful. Having no clear sequence may be confusing for those who have no clear purpose or entry point in mind. However, we believe that depending on the objective, different entry points are warranted, or even only a subset of elements may be of interest. For example, frequently in research on burden sharing, specific patterns of distributional justice are at the heart of a question, and only from there does it make sense to question metrics, scope, and potentially other forms of justice.

This framework does not establish the plausibility of, or advocate for any pattern or principle of justice at the expense of another. It remains agnostic, at a fundamental level, as to what the optimal just distributional pattern is or normative imperatives dictating what just procedures entail. Some patterns of distributional justice are incompatible with one another, and it is up to the reader to decide for themselves which they find plausible, and how they want to include it in their work. This framework is a starting place for further investigation into theories of justice. At a more nuanced level, with the framework's help, users may explore what is implicitly or explicitly assumed to be just in a certain context (e.g., a research paper or a policy document). This also means when aiming to actively consider justice in your work, you will need to find a way to determine what justice practically involves in that context. For instance, whether justice demands equality of outcome across some important distributional metric, or whether justice is satisfied by everyone attaining a sufficient level.

Additionally, we have not looked in any great detail at the *specific* justice considerations which users may practically encounter in practice. This framework alone is unable to tell users, for example, how to reconcile the fair sharing of risks between parties, or what the appropriate corrective response to historical exposure to environmental toxins might be.

At this point, the framework is still biased towards Western Philosophy and Science, so we cannot claim its global usefulness or representation of cultural diversity. We hope to remedy this with future applications and outreach together with colleagues from non-Western philosophy and science traditions.

There are two main interlinked avenues for further research. First, developing and refining the framework itself, and second, applying the framework in a wider variety of contexts: The framework needs refining particularly with respect to the lesser explored forms of justice, such as corrective, recognitional and transitional justice. Thus far, these forms have been less thoroughly explored for criteria, patterns, or principles as compared to distributional and procedural justice. This requires more extensive and ongoing review of the ever-growing literature on the topic, but also thoroughly tracing their evolution. Additional applications might contribute to the refinement, but are also encouraged to gauge the framework's usefulness and limitations. Applications particularly in diverse cultural settings will be necessary to challenge the framework at its roots and create opportunities for its expansion, beyond Western philosophy.

We see the framework as a boundary object to interact with our academic peers, as well as non-academic experts, practitioners, and policy makers. For this purpose, outreach and capacity-building activities will be crucial. Thus far, two justice framework workshops have taken place, and we foresee regular similar engagement for the future, both for the IIASA community specifically, but ultimately also for the larger justice research community. Outreach and capacity building should also target IIASA Member Organizations and Observers. This could happen as part of research visits involving workshops, focus groups, and presentations.

This justice framework is only the second of what we plan to be regular iterations. We intend the process to include diverse potential users for this to become a credible, salient, and legitimate boundary object. We thus expect the framework to continuously improve and to enable transparent and systematic considerations of justice in policy relevant research and practice, but also to foster effective communication across disciplines, decision-making areas, and subject matters.

References

- Adams, J. S. (1965). Inequity In Social Exchange. In L. Berkowitz (Ed.), *Advances in Experimental Social Psychology* (Vol. 2, pp. 267–299). Academic Press. [https://doi.org/10.1016/S0065-2601\(08\)60108-2](https://doi.org/10.1016/S0065-2601(08)60108-2)
- Anderson, E. S. (1999). What Is the Point of Equality? *Ethics*, 109(2), 287–337. <https://doi.org/10.1086/233897>
- Arneson, R. (2009). Luck Egalitarianism Interpreted and Defended. *Philosophical Topics*, 32(1), 1–20. <https://doi.org/10.5840/philtopics2004321/217>
- Atapattu, S. A., Gonzalez, C. G., & Seck, S. L. (Eds.). (2021). *The Cambridge Handbook of Environmental Justice and Sustainable Development*. Cambridge University Press. <https://doi.org/10.1017/9781108555791>
- Barry, B. (1997). Sustainability and Intergenerational Justice. *Theoria: A Journal of Social and Political Theory*, 89, 43–64.
- Beitz, C. (1989). *Political Equality*. Princeton University Press.
- Bennett, C. (2008). *The Apology Ritual*. Cambridge University Press.
- Braithwaite, J. (1989). *Crime, Shame, and Reintegration*. University Press.
- Bullard, R. D. (2019). *Dumping In Dixie: Race, Class, And Environmental Quality, Third Edition* (3rd ed.). Routledge. <https://doi.org/10.4324/9780429495274>
- Bullard, R. D., & Johnson, G. S. (2000). Environmentalism and Public Policy: Environmental Justice: Grassroots Activism and Its Impact on Public Policy Decision Making. *Journal of Social Issues*, 56(3), 555–578. <https://doi.org/10.1111/0022-4537.00184>
- Callicott, J. B. (1989). *In Defense of the Land Ethic: Essays in Environmental Philosophy*. SUNY Press.
- Cameron, C., Pachauri, S., Rao, N. D., McCollum, D., Rogelj, J., & Riahi, K. (2016). Policy trade-offs between climate mitigation and clean cook-stove access in South Asia. *Nature Energy*, 1(1), 1–5. <https://doi.org/10.1038/nenergy.2015.10>
- Carley, S., & Konisky, D. M. (2020). The justice and equity implications of the clean energy transition. *Nature Energy*, 5(8), 569–577. Scopus. <https://doi.org/10.1038/s41560-020-0641-6>
- Cohen, J. (n.d.). Pluralism and Proceduralism. *Chicago-Kent Law Review*, 69(3), 589–618.
- Cohen-Charash, Y., & Spector, P. E. (2001). The role of justice in organizations: A meta-analysis. *ORGANIZATIONAL BEHAVIOR AND HUMAN DECISION PROCESSES*, 86(2), 278–321. <https://doi.org/10.1006/obhd.2001.2958>
- De Goër De Herve, M. (2022). Fair strategies to tackle unfair risks? Justice considerations within flood risk management. *International Journal of Disaster Risk Reduction*, 69, 102745. <https://doi.org/10.1016/j.ijdr.2021.102745>
- De Goër De Herve, M., Schinko, T., & Handmer, J. (2023). Risk justice: Boosting the contribution of risk management to sustainable development. *Risk Analysis*, risa.14157. <https://doi.org/10.1111/risa.14157>
- Duff, A. (2013). Punishment and the Duties of Offenders. *Law and Philosophy*, 32, 109–127. <https://doi.org/10.1007/s10982-012-9150-5>
- Dworkin, R. (1981). What is Equality? Part 1: Equality of Welfare. *Philosophy and Public Affairs*, 10(4), 185–246. <https://doi.org/10.4324/9781315199795-6>
- Evans, G., & Phelan, L. (2016). Transition to a post-carbon society: Linking environmental justice and just transition discourses. *Energy Policy*, 99, 329–339. <https://doi.org/10.1016/j.enpol.2016.05.003>
- Fourie, C., Schuppert, F., & Wallimann-Helmer, I. (Eds.). (2014). *Social Equality: On What It Means to be Equals*. Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780199331109.001.0001>
- Fraser, N. (1997). *Justice Interruptus: Critical Reflections on the Postsocialist condition*. Psychology Press.
- Fricker, M. (2007). *Epistemic Injustice: Power and Ways of Knowing*. Oxford University Press.

- Goodin, R. E. (1989). Theories of Compensation. *Oxford Journal of Legal Studies*, 9(1), 56–75.
<https://doi.org/10.1093/ojls/9.1.56>
- Goodin, R. E. (2007). Enfranchising All Affected Interests, and Its Alternatives. *Philosophy & Public Affairs*, 35(1), 40–68.
- Gosepath, S. (2021). Equality. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy* (Summer 2021). Metaphysics Research Lab, Stanford University.
<https://plato.stanford.edu/archives/sum2021/entries/equality/>
- Greenberg, J. (1993). The social side of fairness: Interpersonal and informational classes of organizational justice. In *Justice in the workplace: Approaching fairness in human resource management* (pp. 79–103). Lawrence Erlbaum Associates, Inc.
- Gross, C. (2007). Community perspectives of wind energy in Australia: The application of a justice and community fairness framework to increase social acceptance. *Energy Policy*, 35(5), 2727–2736. Scopus.
<https://doi.org/10.1016/j.enpol.2006.12.013>
- Gupta, J., Liverman, D., Prodani, K., Aldunce, P., Bai, X., Broadgate, W., Ciobanu, D., Gifford, L., Gordon, C., Hurlbert, M., Inoue, C. Y. A., Jacobson, L., Kanie, N., Lade, S. J., Lenton, T. M., Obura, D., Okereke, C., Otto, I. M., Pereira, L., ... Verburg, P. H. (2023). Earth system justice needed to identify and live within Earth system boundaries. *Nature Sustainability*, 6(6), 630–638. <https://doi.org/10.1038/s41893-023-01064-1>
- Habermas, J. (1995). Reconciliation Through the Public Use of Reason: Remarks on John Rawls' Political Liberalism. *Journal of Philosophy*, 92(3), 109–131. <https://doi.org/10.2307/2940842>
- Hayward, T. (2012). Climate change and ethics. *Nature Climate Change*, 2(12), 843–848.
<https://doi.org/10.1038/nclimate1615>
- Healy, N., & Barry, J. (2017). Politicizing energy justice and energy system transitions: Fossil fuel divestment and a "just transition." *Energy Policy*, 108, 451–459. Scopus. <https://doi.org/10.1016/j.enpol.2017.06.014>
- Honneth, A. (1995). *The Struggle for Recognition: The Moral Grammar of Social Conflicts*. Polity.
- Honneth, A. (2004). Recognition and Justice: Outline of a Plural Theory of Justice. *Acta Sociologica*, 47(4), 351–364. <https://doi.org/10.1177/0001699304048668>
- Hudson, A. (2021). *Principles of Equity and Trusts* (2nd ed.). Routledge.
<https://doi.org/10.4324/9781003123668>
- Huggel, C., Wallimann-Helmer, I., Stone, D., & Cramer, W. (2016). Reconciling justice and attribution research to advance climate policy. *Nature Climate Change*, 6(10), 901–908.
<https://doi.org/10.1038/nclimate3104>
- Humphreys, S. (2023). Equity before "Equity." *MODERN LAW REVIEW*, 86(1), 85–121.
<https://doi.org/10.1111/1468-2230.12750>
- Huseby, R. (2009). Sufficiency: Restated and Defended. *Journal of Political Philosophy*, 18(2), 178–197.
<https://doi.org/10.1111/j.1467-9760.2009.00338.x>
- Ikeme, J. (2003). Equity, environmental justice and sustainability: Incomplete approaches in climate change politics. *Global Environmental Change*, 13(3), 195–206.
- Jeffery, R. (2024). Transitional justice at the National Human Rights Commission of Nepal: Challenging legitimacy, credibility, and effectiveness. *The International Journal of Human Rights*, 28(5), 827–851.
<https://doi.org/10.1080/13642987.2024.2323595>
- Kidd, I. J. (2016). Intellectual Humility, Confidence, and Argumentation. *Topoi*, 35(2), 395–402.
<https://doi.org/10.1007/s11245-015-9324-5>
- Kikstra, J. S., Mintz-Woo, K., Zimm, C., Schinko, T., Pachauri, S., Min, J., Brutschin, E., Hoffmann, R., & Rogelj, J. (2023, November 14). *A Guide for Describing Aspects of Justice in Climate Scenario Research*. 16th IAMC Annual Meeting, Venice, Italy.
- Krütli, P., Törnblom, K., Wallimann-Helmer, I., & Stauffacher, M. (2015). Distributive versus procedural justice in nuclear waste repository siting. In B. Taebe & S. Roeser (Eds.), *The Ethics of Nuclear Energy: Risk,*

- Justice, and Democracy in the post-Fukushima Era* (1st ed.). Cambridge University Press.
<https://doi.org/10.1017/CBO9781107294905>
- Lazarus, R. (1993). Pursuing "Environmental Justice": The Distributional Effects of Environmental Protection. *Georgetown Law Faculty Publications and Other Works*.
<https://scholarship.law.georgetown.edu/facpub/154>
- Leventhal, G. S. (1980). What Should Be Done with Equity Theory? In K. J. Gergen, M. S. Greenberg, & R. H. Willis (Eds.), *Social Exchange: Advances in Theory and Research* (pp. 27–55). Springer US.
https://doi.org/10.1007/978-1-4613-3087-5_2
- Linnerooth-Bayer, J., & Vári, A. (2006). Extreme weather and burden sharing in Hungary. In N. Adger, J. Paavola, S. Huq, & M. J. Mace (Eds.), *Fairness in adaptation to climate change* (pp. 239–259). MIT Press.
- Linnerooth-Bayer, J., Vári, A., & Thompson, M. (2006). Floods and Fairness in Hungary. In M. Verweij & M. Thompson (Eds.), *Clumsy Solutions for a Complex World: Governance, Politics and Plural Perceptions* (pp. 181–203). Palgrave Macmillan UK. https://doi.org/10.1057/9780230624887_8
- Lukasiewicz, A., & Baldwin, C. (Eds.). (2020). *Natural Hazards and Disaster Justice: Challenges for Australia and Its Neighbours*. Springer Singapore. <https://doi.org/10.1007/978-981-15-0466-2>
- McCauley, D., & Heffron, R. (2018). Just transition: Integrating climate, energy and environmental justice. *Energy Policy*, 119, 1–7. Scopus. <https://doi.org/10.1016/j.enpol.2018.04.014>
- McDermott, M., Mahanty, S., & Schreckenber, K. (2013). Examining equity: A multidimensional framework for assessing equity in payments for ecosystem services. *Environmental Science & Policy*, 33, 416–427. <https://doi.org/10.1016/j.envsci.2012.10.006>
- Mechler, R., Bouwer, L. M., Schinko, T., Linnerooth-Bayer, J., & Surminski, S. (Eds.). (2019). *Loss and Damage from Climate Change: Concepts, Methods and Policy Options* (1st ed. 2019). Springer International Publishing : Imprint: Springer. <https://doi.org/10.1007/978-3-319-72026-5>
- Menendian, S. (2023). Equity vs. Equality: What's the Difference? *Opinion, Berkeley Blogs*.
<https://news.berkeley.edu/2023/03/29/equity-vs-equality-whats-the-difference>
- Mikaelsson, M. A., & Lager, F. (2024). Justice and equity in climate change adaptation: Overview of an emerging agenda. Stockholm Environment Institute, (p. 6).
- Miller, D. (2003). *Principles of social justice* (3. print). Harvard Univ. Press.
- Miller, D. (2021). Justice. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy* (Fall 2021). Metaphysics Research Lab, Stanford University.
<https://plato.stanford.edu/archives/fall2021/entries/justice/>
- Milne, H. (1986). Desert, Effort, and Equality. *Journal of Applied Philosophy*, 3, 235–243.
<https://doi.org/10.1111/j.1468-5930.1986.tb00423.x>
- Mintz-Woo, K. (2021). A Philosopher's Guide to Discounting. In M. Budolfson, T. McPherson, & D. Plunkett (Eds.), *Philosophy and Climate Change* (p. 0). Oxford University Press.
<https://doi.org/10.1093/oso/9780198796282.003.0005>
- Mintz-Woo, K. (2024). Carbon Pricing is not Unjust. *Global Challenges*, 8(1), 2300089.
<https://doi.org/10.1002/gch2.202300089>
- Morena, E., Krause, D., & Stevis, D. (Eds.). (2020). *Just Transitions: Social Justice in the Shift Towards a Low-Carbon World*. Pluto Press. <https://doi.org/10.2307/j.ctvs09qrx>
- Naess, A. (1973). The Shallow and the Deep, Long Range Ecology Movement: A Summery. *Inquiry: An Interdisciplinary Journal of Philosophy*, 16(1), 95–100. <https://doi.org/10.1080/00201747308601682>
- Nozick, R. (1974). *Anarchy, State, and Utopia*. Basic Books.
- Nussbaum, M. (2024). *Justice for Animals*. Simon & Schuster.
- OECD. (2021). *OECD Framework and Good Practice Principles for People-Centred Justice*. OECD.
<https://doi.org/10.1787/cdc3bde7-en>
- Olsaretti, S. (2008). Justice, Luck, and Desert. In J. S. Dryzek, B. Honig, & A. Phillips (Eds.), *The Oxford Handbook of Political Theory* (p. 0). Oxford University Press.
<https://doi.org/10.1093/oxfordhb/9780199548439.003.0024>

- Pachauri, S. (2014). Household electricity access a trivial contributor to CO2 emissions growth in India. *Nature Climate Change*, 4(12), 1073–1076. <https://doi.org/10.1038/nclimate2414>
- Page, E. (1999). Intergenerational Justice and Climate Change. *Political Studies*, 47(1), 53–66. <https://doi.org/10.1111/1467-9248.00187>
- Parfit, D. (1991). *Equality or Priority?* University of Kansas Press.
- Parsons, M., Asena, Q., Johnson, D., & Nalau, J. (2024). A bibliometric and topic analysis of climate justice: Mapping trends, voices, and the way forward. *Climate Risk Management*, 44, 100593. <https://doi.org/10.1016/j.crm.2024.100593>
- Preston, C., & Carr, W. (2018). Recognition Justice, Climate Engineering, and the Care Approach. *Ethics, Policy & Environment*, 21(3), 308–323. <https://doi.org/10.1080/21550085.2018.1562527>
- Rao, N. D., & Min, J. (2018). Decent Living Standards: Material Prerequisites for Human Wellbeing. *Social Indicators Research*, 138(1), 225–244. <https://doi.org/10.1007/s11205-017-1650-0>
- Rao, N. D., & Pachauri, S. (2017). Energy access and living standards: Some observations on recent trends. *Environmental Research Letters*, 12(2), 025011. <https://doi.org/10.1088/1748-9326/aa5b0d>
- Rawls, J. (1971). *A theory of justice*. Harvard University Press.
- Rawls, J. (1995). Reply to Habermas. *Journal of Philosophy*, 92(3), 132–180. <https://doi.org/10.4324/9780203723869-8>
- Robeyns, I. (2019). What, if anything, is wrong with extreme wealth? *Journal of Human Development and Capabilities*, 20(3), 251–266. <https://doi.org/10.1080/19452829.2019.1633734>
- Schinko, T., Berchtold, C., Handmer, J., Deubelli-Hwang, T., Preinfalk, E., Linnerooth-Bayer, J., Scolobig, A., Serra, M., & Plana, E. (2023). A framework for considering justice aspects in integrated wildfire risk management. *Nature Climate Change*, 13(8), 788–795. <https://doi.org/10.1038/s41558-023-01726-0>
- Schinko, T., Mechler, R., & Hochrainer-Stigler, S. (2019). The Risk and Policy Space for Loss and Damage: Integrating Notions of Distributive and Compensatory Justice with Comprehensive Climate Risk Management. In R. Mechler, L. M. Bouwer, T. Schinko, S. Surminski, & J. Linnerooth-Bayer (Eds.), *Loss and Damage from Climate Change* (pp. 83–110). Springer International Publishing. https://doi.org/10.1007/978-3-319-72026-5_4
- Schlosberg, D. (2004). Reconceiving Environmental Justice: Global Movements And Political Theories. *Environmental Politics*, 13(3), 517–540. <https://doi.org/10.1080/0964401042000229025>
- Shrader-Frechette, K. (2002). *Environmental Justice: Creating Equality, Reclaiming Democracy*. Oxford University Press. <https://doi.org/10.1093/0195152034.001.0001>
- Singer, P. (2009). *Animal Liberation*. Harper Perrenial.
- Smith, P. D., & McDonough, M. H. (2001). Beyond Public Participation: Fairness in Natural Resource Decision Making. *Society and Natural Resources*, 14(3), 239–249. <https://doi.org/10.1080/08941920120140>
- Spengler, L. (2016). Two types of 'enough': Sufficiency as minimum and maximum. *Environmental Politics*, 25(5), 921–940. <https://doi.org/10.1080/09644016.2016.1164355>
- Subrin, S. N. (1987). How Equity Conquered Common Law: The Federal Rules of Civil Procedure in Historical Perspective. *University of Pennsylvania Law Review*, 135(4), 909–1002. <https://doi.org/10.2307/3312053>
- Taylor, P. (1986). *Respect for Nature: A Theory of Environmental Ethics*. Princeton University Press.
- Thaller, A., Fleiß, E., Brohmer, H., Köstenbaumer, D., Posch, A., & Athenstaedt, U. (2023). When perceived fairness and acceptance go hand in hand—Drivers of regulatory and economic policies for low-carbon mobility. *PLOS Climate*, 2(5), e0000157. <https://doi.org/10.1371/journal.pclm.0000157>
- Thompson, D. (1999). Democratic Secrecy. *Political Science Quarterly*, 114(2), 181–193. <https://doi.org/10.2307/2657736>
- United Nations Security Council. (2004). *The rule of law and transitional justice in conflict and post-conflict societies* [Report of the Secretary-General]. <https://documents.un.org/doc/undoc/gen/n04/395/29/pdf/n0439529.pdf?OpenElement>

- van Noorloos, M. (2021). A Critical Reflection on the Right to the Truth about Gross Human Rights Violations. *Human Rights Law Review*, 21(4), 874–898. <https://doi.org/10.1093/hrlr/ngab018>
- van Uffelen, N. (2022). Revisiting recognition in energy justice. *Energy Research & Social Science*, 92, 102764. <https://doi.org/10.1016/j.erss.2022.102764>
- Voisard, A., & Wallimann-Helmer, I. (2023). Towards a Practical Climate Ethics: Combining Two Approaches to Guide Ethical Decision-Making in Concrete Climate Governance Contexts. *Ethics, Policy & Environment*, 0(0), 1–17. <https://doi.org/10.1080/21550085.2023.2236504>
- Waldron, J. (2016). *Political theory—Essays on institutions*. Harvard University Press.
- Wallimann-Helmer, I. (2019a). Justice in managing global climate change. In *Managing Global Warming* (pp. 751–768). Elsevier. <https://doi.org/10.1016/B978-0-12-814104-5.00026-0>
- Wallimann-Helmer, I. (2019b). The ethics of waste policy. *Routledge Handbooks in Applied Ethics*, 501–512. <https://doi.org/10.5167/uzh-160043>
- Wallimann-Helmer, I., Meyer, L., Mintz-Woo, K., Schinko, T., & Serdeczny, O. (2019). The Ethical Challenges in the Context of Climate Loss and Damage. In R. Mechler, L. M. Bouwer, T. Schinko, S. Surminski, & J. Linnerooth-Bayer (Eds.), *Loss and Damage from Climate Change: Concepts, Methods and Policy Options* (pp. 39–62). Springer International Publishing. https://doi.org/10.1007/978-3-319-72026-5_2
- Wienhues, A. (2020). Disentangling different forms of justice. *Animal Sentience*, 4(27). <https://doi.org/10.51291/2377-7478.1554>
- Wenar, L. (2021). John Rawls. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy* (Summer 2021). Metaphysics Research Lab, Stanford University. <https://plato.stanford.edu/archives/sum2021/entries/rawls/>
- Weinheus, A. (2020) Disentangling different forms of justice. *Animal Sentience*. 27(21), 1-3. <https://doi.org/10.51291/2377-7478.1554>
- Whyte, K. P. (2011). The Recognition Dimensions of Environmental Justice in Indian Country. *Environmental Justice*, 4(4), 199–205. <https://doi.org/10.1089/env.2011.0036>
- Young, H. P. (1995). *Equity: In theory and practice* (1. Princeton paperback printing). Princeton Univ. Press.
- Zimm, C., Mintz-Woo, K., Brutschin, E., Hanger-Kopp, S., Hoffmann, R., Kikstra, J. S., Kuhn, M., Min, J., Muttarak, R., Pachauri, S., Patange, O., Riahi, K., & Schinko, T. (2024). Justice considerations in climate research. *Nature Climate Change*, 1–9. <https://doi.org/10.1038/s41558-023-01869-0>