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Fairness in Economics: An Overview and a Special Application to Water Systems

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Abstract

This paper provides an overview of the evolving role of fairness in economic thought and discusses how it is related to contemporary policy design. We first discuss the conceptual foundations of fairness in economics by discussing the notions of equity, justice, and efficiency and highlighting they're between differences. Acknowledging the tradeoff between fairness and allocative efficiency we discuss how the economics discipline has addressed this challenge and has provided tools that facilitate prioritizing and decision making. We then study how we can measure and capture fairness in a way that will allow us to quantify the concept and include it in our theoretical and empirical models as well as in experimental settings. Third, we highlight the policy implications associated with fairness literature. Last, the paper applies these theoretical insights to the governance of water resources—a sector where distributional conflicts, environmental constraints, and institutional complexity intersect. Relying on

interdisciplinary research and policy examples, we uncover how fairness principles can shape water allocation, access, and pricing. The paper overall argues that accounting for fairness more explicitly into economic analysis can enrich both normative and practical policy frameworks, especially in resource-scarce contexts.

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Introduction

The field of economics has systematically discussed and prioritized aspects of efficiency, growth, and utility maximization. This has quite often come at the expense of fairness and justice which has raised vivid theoretical and political discussions. Nevertheless, looking back to history, questions of fairness were prevalent in the history of economic thought. Several classical economists such as Adam Smith and John Stuart Mill placed considerable emphasis on moral philosophy and distributive justice. However, these considerations had not systematically found their formal way to policy making and formal economic theory despite their importance.

Nowadays, in the face of several challenges such as persistent inequalities, ecological collapse, and the rise of global dissatisfaction in relation to governance, the need to re-integrate fairness into economic analysis has re-emerged. The climate emergency, in particular, further highlights the distributional consequences of economic decisions, both in space, time and across economic units, as those who contribute least to environmental degradation often suffer its gravest effects.

The aim of this paper is to provide an overview of the fairness literature and to discuss how this applies in the context of climate policy, resource distribution, and global cooperation. In doing so, we will first discuss the broader theoretical concepts of fairness and elaborate on the differences between the terms, equity, justice, and efficiency.

Then we elaborate on the tradeoff between fairness and allocative efficiency, and we discuss how economics have addressed this challenge and have provided tools that facilitate prioritizing and decision making. We then study

how we can measure and capture fairness in a way that will allow us to quantify the concept and include it in our theoretical and empirical models as well as in experimental settings.

Third, we highlight the policy implications associated with the fairness literature. Last, the paper applies these theoretical insights to the governance of water resources—a sector where distributional conflicts, environmental constraints, and institutional complexity intersect. Relying on interdisciplinary research and policy examples, we uncover how fairness principles can shape water allocation, access, and pricing.

Fairness in resource distribution can play a crucial role in preserving social stability and encouraging sustainable water resource management. Life, agriculture, industry, and ecosystem maintenance all depend on water as a basic resource. To guarantee that all parties involved—farmers, businesses, and communities—have fair access to water, water resources must be distributed fairly.

Implementing water rights and allocation systems is one real-world example of how to allocate water resources fairly. These systems are designed to ensure that water is distributed equitably among various users and to balance conflicting demands for water. Frameworks for water rights frequently take into account past water use, environmental factors, and the needs of vulnerable or marginalized communities. Societies can reduce disputes over water use and advance sustainable development by taking equity in water distribution into account. Similarly, other natural resources like land, minerals, and forests can also be allocated fairly.

1. Theoretical Framework

1.1 Fairness in Economics

Within economics, the concept of fairness holds is one of the most hotly debated topic as it allows us to understanding how to allocate and distribute resources (Alesina & Angeletos, 2005). Having as a starting point the scarcity of resources-a corner stone for the development of economic theory-societies needed to develop ways to ethically consider how resources, opportunities, and outcomes should or could be distributed among individuals, groups, sectors, countries, or regions.

Equity, Equality and Need

Our discussion will imitate from the various dimensions of fairness that can be considered, i.e., *equity, equality, and need.*

The concept of *equity* refers to adjusting the distribution of resources, opportunities, and treatment with the aim of ensuring fair outcomes for each individual, while at the same time acknowledging that different people have different circumstances and needs. When equity is considered, the central idea is to achieve parity in outcomes. Consequently, this might result in disparate treatment in order to address or compensate for these disparities (Sandel, 2009).

The second concept associated with fairness is that of *equality*. In contrast to equity, equality is about providing the same level of opportunity and resources to all units of the economy considered, regardless of their differences in starting points or conditions. As a result, the implementation of this principle does not account for the disparities among individuals or groups; it treats everyone the same and relies on the underlying assumption that this will lead to fair

outcomes. A hypothetical example of equality in action could refer to a healthcare system that provides the same level of care to all patients, without taking into account their socioeconomic status or background (Rawls, 1971).

The last concept to consider is that of *need*. This acknowledges that fairness may require providing resources or support to those units that are the most disadvantaged compared to the rest. Considering real world situations, the concept of *need* is integral to discussions on equity and justice, especially when considering how resources are allocated with the aim of ensuring fair outcomes. Addressing needs within an equitable framework might actually imply providing specific resources to individuals or groups in order to enable them to achieve full societal participation.

Fields in Economics that Embed Fairness

The field of economics has developed several ways and frameworks to embed those concepts and to understand and model fairness. Perhaps the most profound field is that of *welfare economics* which primarily aims to study the ways that maximize overall social welfare. The reason for this approach is policy-based as quite often policies are designed with the aim of enhancing the well-being of a society's members. In this field, the concept of fairness is perceived in terms of equalizing opportunities or reducing income inequality. Actual policies can include various measures such as redistributive taxation, social insurance, and public goods provision. It further addresses the challenges imposed by considerations of efficiency and equity, analyzing how alternative allocations of resources can have an impact both on economic prosperity and fairness across different segments of society (see e.g., Sen, 1999; Atkinson, 2015). The fairness-efficiency trade-off is one of the most classical, hotly debated both theoretically and practically in implemented policies, in the field of economics.

A second field that provides tools to discuss the aspects of fairness within the context of economics is that of behavioral economics. It examines the various ways in which individual preferences, biases, and cognitive limitations can guide

and shape perceptions of fairness and ultimately decision-making. By incorporating psychological insights into economic models, this field departs from traditional economic theory and demonstrates how people frequently make decisions that are not in line with rational utility maximization. Examples include factors related to both individual biases—such as loss aversion, framing effects, and the endowment effect—and social preference traits such as reciprocity, altruism, guilt, or sensitivity to intentions. All of these can influence how fairness is actually perceived and eventually acted upon. Behavioral economists study these phenomena to understand how real-world decision-making can lead to outcomes that may seem irrational, using the classical economic theory standards, but are actually consistent when we embed into the analysis potential psychological motivations. This approach is very helpful in designing better policies and interventions since it can account for actual human behavior rather than idealized rational actions (Kahneman et. al, 1986; Thaler, 2015)

A third approach is that of *distributive justice theory*. It revolves around the ethical principles that govern the *fair* allocation of resources within society. Questions that can be addressed are who should receive what portion of resources, based on criteria such as *need, equity*, and *merit*. Various models of distributive justice are discussed by philosophers and theorists in this field (see e.g., Rawls, 1971; Nozick, 1974) such as *libertarianism* (emphasizes individual rights and entitlements), *utilitarianism*, (which aims to maximize overall welfare), and *egalitarianism* (which promotes the equitable distribution of resources). These conversations aid in the development of laws and procedures intended to divide the advantages and disadvantages of society in a way that is fair according to various criteria. Understanding how societies can manage resources in a way that strikes a balance between efficiency and fairness—thereby addressing a variety of social and economic inequalities—requires an understanding of distributive justice.

The development of all these approaches highlights the importance of striving for fairness in economic decision-making. Despite the fact that fairness does not always yield the most efficient outcomes, nevertheless it is important for the field to highlight the significance of fair outcomes. The reason for doing this is to shed light on the fact that fairness promotes social cohesion, trust, and cooperation. The role of these elements for the smooth functioning of a society is vital as argued in Crisp, 2003. Moreover, the fact that resources are allocated in a way that reflects societal values and norms, can enhance allocative efficiency, an aspect of fairness discussed in the follow-up sub-section.

1.2 Allocative Efficiency and Fairness

The emerging tradeoffs are a central concept in economic theory. Consistent with this logic, withing the fairness literature, the concept of allocative efficiency possesses a central role. It entails the balancing of the optimal distribution of resources, on the one hand, and the maximization of societal welfare on the other hand (Thomson, 2018). The underlying idea is that when resources are allocated across alternative uses, they should maximize the total net benefits received by society. If allocative efficiency is hypothetically achieved, any reallocation of resources would in principle reduce the net benefit to society. This could therefore lead to a state where no one can be made better off without making someone else worse off. This principle is widely known as Pareto efficiency.

Achieving efficiency is reassuring that there is no waste of resources, a rather beneficial way for achieving collective welfare. Policies ranging from healthcare and education to environmental regulation and tax, build on this condition when public and private sector decision-making is considered. Methods and criteria such the cost-benefit analysis are often used by economist to evaluate whether an allocation is efficient. The underlying idea of these

methodologies is to assess different allocation scenarios and their impact on overall welfare.

However, in order to ensure an equitable distribution of resources, the pursuit of allocative efficiency must be balanced with fairness considerations (Goel et al., 2008).

What are the mechanisms at play that can resolve the puzzle of achieving allocating efficiency not at the expense of fairness? One approach is via the use of market mechanisms. Widely known mechanisms are price signals and property rights. When the forces of supply and demand allow prices to adjust, markets can efficiently allocate resources to their most valued uses. However, we still need to consider the implications for fairness, given the fact that market mechanisms are not unlikely to result in unequal outcomes and further exacerbate income inequalities.

Government intervention is another approach to balancing allocative efficiency and fairness (Acemoglu et al., 2008). Government has several instruments to mitigate the rise of inequalities (or even reduce them). These include policies such as progressive taxation, social welfare programs, and regulatory measures. This can in turn ensure that the benefits of allocative efficiency are equitably distributed across actors. Progressive taxation is a prominent example as a means of redistribution of income and wealth, while at the same time social welfare programs provide support to those in need.

Another challenge to allocative efficiency and fairness is present in the case of public goods and externalities (Kaplow, 2020). Public goods are considered to be non-excludable and non-rivalrous. Typical examples include national defense and clean air. As a result, market failures in their provision may arise. Additionally, pollution and congestion that are considered to be negative externalities can result in inefficient resource allocation and unjust outcomes. All these challenges require a combination of government intervention, collective

action, and innovative policy solutions that can incorporate allocative efficiency and fairness.

Despite being a demanding task, achieving fairness is a necessary step for inclusive and even effective policy implementation. Integrating principles of fairness into economic decision-making, allows societies allocate resources in a way that advances overall welfare and equity. This effort is crucial for creating a more just and sustainable economic system that can ultimately benefit all members of society.

2. How we Measure Fairness: Empirical, Experimental and Behavioral Approaches

The aim of this section is to review the literature and especially the various methodological approaches that economics use to measure and to proxy for fairness. Widely used methods include survey data, experimental and behavioral approaches as well as machine learning.

2.1 Individual Attitudes Towards Fairness

During the last decades there has been a rise into research related to people's attitudes towards fairness, both in economics and social sciences. The study of how individuals perceive fairness and more importantly how this can be embedded into policies relies heavily on survey data. The reason is that these surveys can help researchers and policy makers quantify their perceptions over the topic or reflect over their experiences. Importantly, they can be asked various hypothetical scenarios and contexts, which make interpretation more feasible and handy for policy making.

As with the use of survey data, economic experiments are on the rise as well. The idea behind these experiments is to offer a rather controlled environment, within which researchers can observe participants' behavior in games. This further facilitates decision-making tasks designed to simulate real-world situations. All in all, via experiments, researchers can “create” a wide range of data and use them to determine how fairness considerations can affect economic choices and social interactions.

Survey data

Perhaps the most known type of survey data is the World Values Survey (WVS). The World Values Survey is a research project that relies on individual questionnaires, takes place every 5-7 years, and explores people's values and beliefs. The topics covered are rather rich and diverse. They include information as demographics and extend to topics such as democracy, gender equality, religiosity, and social capital. They further provide valuable insights into factors that shape individuals' perceptions of fairness. Importantly, as they provide different hypothetical scenarios, they allow us to evaluate fairness in different contexts.

The WVS is cross-national and longitudinal in nature. This allows researchers to compare attitudes towards fairness across different countries and over time. The time variation gives the option to evaluate the evolution of culture over time as well and make intertemporal comparisons.

These surveys also make clear that attitudes towards fairness vary across countries and regions. This has triggered the curiosity of researchers over the globe in studying the cultural, historical, and institutional factors that shaped people's beliefs about what is fair and just. It has also allowed them to study factors such as income inequality, social mobility, and trust in institutions as potential drivers of fairness attitudes.

One of the earliest and most prominent studies on fairness are those of Alesina and Angeletos (2005, 2011) who have made significant contributions to

the study of fairness and its implications in economics. Their work has theoretically examined the interplay between allocative efficiency and fairness and has proposed ways and rationale as to how to combine both.

In order to study the relationship between fairness and redistribution they set up a framework of linear taxation. Relying on this they discuss how linear tax systems can be designed in such a way as to achieve both allocative efficiency and fairness. Their study sheds light on one of the most pronounced trade-offs in the literature, i.e., designing tax policies that promote equity without sacrificing economic efficiency. They then extend this analysis to include the study of social norms and cultural factors. They argue that the latter can influence individuals' attitudes towards fairness and distributive justice and should thus be embedded into the analysis. Policy wise, this provided important implications for policy design that aligns with societal values and beliefs. As discussed above, both papers rely on the World Values Survey to capture the norms about fairness and redistribution.

Figures 1 and 2 are plotted maps that are derived from the World Values Survey. For illustration purposes we illustrate the latest wave, i.e., 2017-2022. We use two questions that are traditionally used in this literature as a proxy for fairness. Individuals declare the extent to which they agree with the following two questions:

1. Democracy: Governments tax the rich and subsidize the poor. Answers range from 1-10, with 1 denoting “Not an essential characteristic of democracy” and 10 “An essential characteristic of democracy”.

2. Success: hard work vs luck. Answers range from 1-10, with 1 denoting “In the long run, hard work usually brings a better life” and 10 “Hard work doesn’t generally bring success-it’s more a matter of luck and connections”.

Both figures hint to the fact that was already mentioned in the beginning of this section. The world holds rather diverse perceptions around fairness. Once we acknowledge this, we can and should embed it into our policy making. Culture is now acknowledged to play an integral role in policy making rendering policies tailor made and thus more effective.

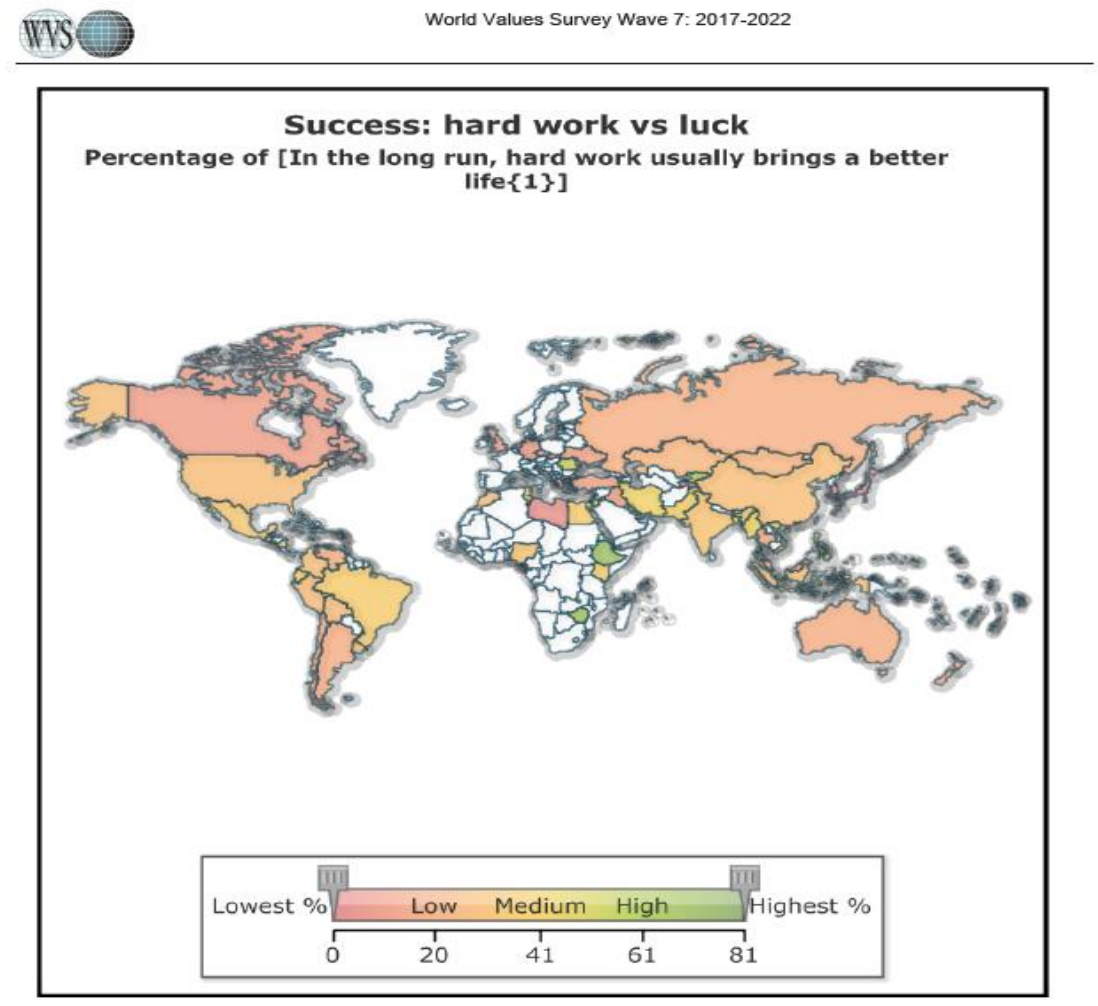

Figure 1: Luck vs Hard Work Attitudes. Source: World Values Survey

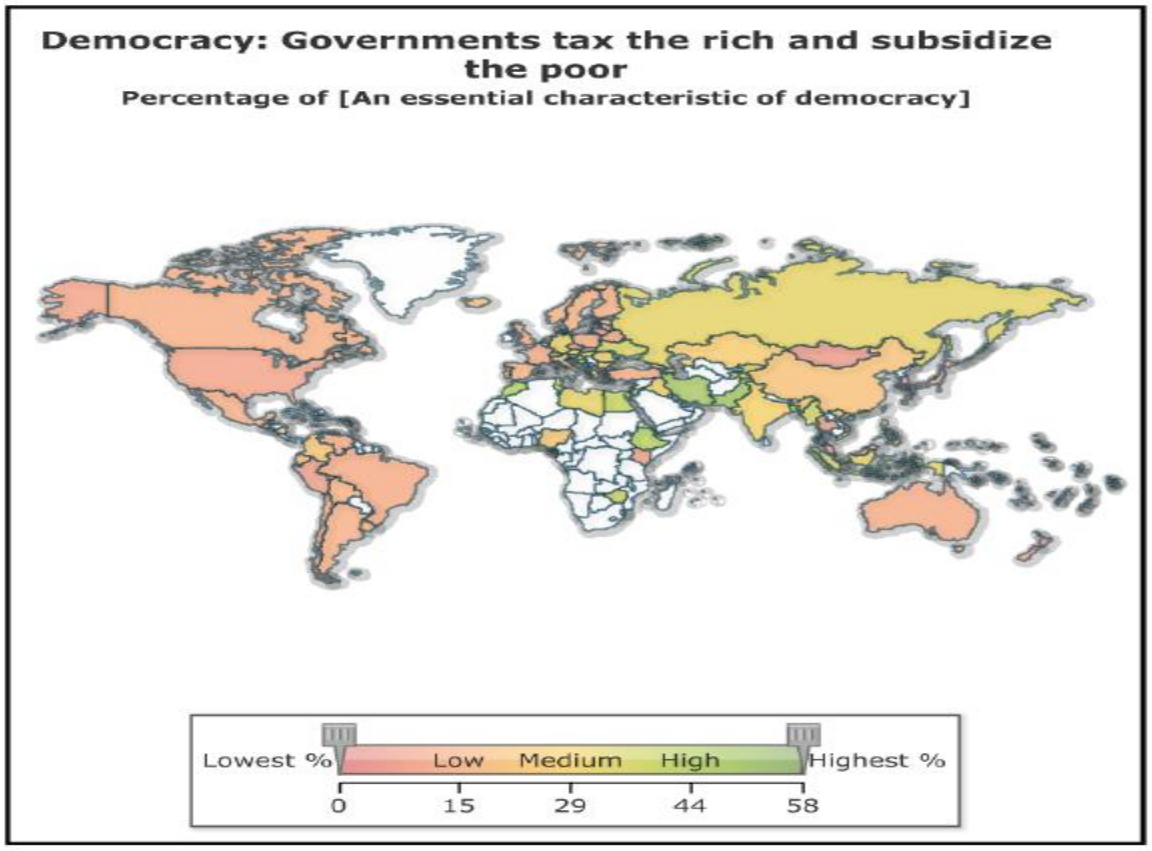

Figure 2: Attitudes towards Redistribution. Source: World Values Survey

Experiments

An alternative approach is that of economic experiments. Their main value added is that they allow for the use of controlled environments, which facilitate the identification of causal relationships and enable the study of fairness in diverse and replicable settings. For instance, Fehr & Gächter, 2000; Henrich et al., 2005; Kahneman et al., 1986 has argued that people often exhibit a preference for fair outcomes, and in order to achieve them they are willing to sacrifice personal gain to achieve greater equity. Such findings are essential to

our understanding of the psychological and behavioral factors that determine fairness. These approaches also shed light on the mechanics of fairness in economic decision-making.

Daniel Kahneman (Kahneman et al., 1986) has seminal work on these topics. One key finding from his work, is that people are willing to sacrifice personal gain in order to achieve greater equity. This actually indicates a strong preference for fair outcomes. And importantly, this preference for fairness is not limited to monetary rewards. It can also be extended to non-monetary incentives, such as classroom points or extra credit (Fehr & Gächter, 2000).

Other prominent examples of experimental games that can study fairness and social preferences include the Dictator Game, the Ultimatum Game, the Gift-exchange Game, the Trust Game and the Public Goods Game, among others.. Such games have been used to study fairness and cooperation even among different populations, ranging from standard student population subjects, professionals and even among traditional hunter-gatherer societies in such contexts (Henrich et al., 2005).

In general, experimental studies have been extensively used to investigate the role of merit, luck, and concerns for equality of opportunity on fairness. Some characteristic examples include Almas, Cappelen, and Tungodden (2020) who studied the relevance of the distinction between luck and merit, Mikula and Uray (1973) who investigated the equity fairness Vs equality principle debate, Cappelen (2007) introduced the idea of pluralistic fairness ideals, Almas et al. (2024) extended this idea and confirmed the vast differences in fairness ideals in a multi-country study, while Brands and Charness (2003) and Charness and Rabin (2007) focused on the role of intentions.

Other more revolutionary approaches explore the hypothesis that social preferences can be explained as a result of gene-culture coevolution (Bowles & Gintis, 2011). This perspective sheds light on the interplay between genetic and

cultural factors and has argued that fairness evolved as part of this evolutionary process (Bowles & Gintis, 2011).

A relevant paper is Johansson-Stenman and Konow (2010) who discuss the relevance of fairness concerns particular in the field of environmental economics. People's fairness views are based on both general rules and the context, where context refers to the set of variables and persons employed to interpret and apply the principles. They argue that fairness views are based on the general rules of accountability, efficiency, need and equity and they conclude that stakeholders suffer from fairness bias, that is they tend, consciously or unconsciously, to interpret fairness principles in a self-serving manner. They split the fairness bias in two: i) Self-centered: using arguments of fairness to protect interests; and, ii) Self-serving: distort own beliefs on what is fair towards direction of interests (see also cognitive dissonance theory in Festinger 1957).

1.2 v

Besides the cultural, economic and institutional factors that may shape fairness, we need to further take into account, psychological factors that influence fairness perceptions and ultimately decisions. To this end the development of fields such as behavioral economics and social psychology were instrumental. Their main value added is that they offer valuable insights into the cognitive biases and heuristics that shape individuals' fairness preferences.

Behavioral economics explores how individuals' cognitive biases and emotional responses influence their perceptions of fairness. There are several types of cognitive biases, e.g., the anchoring effect, confirmation bias, and the endowment effect. All the above result can confer an effect on individuals and make them to systematically deviate from rational and fair decision-making (Fehr and Shcmidt, 1999; Kahneman et al, 1986; Tversky and Kahneman, 1974). Emotions are also relevant in this context. Emotions such as empathy and

reciprocity can actually shape people's fairness perceptions and altruistic behavior.

Social psychology is another field that contributes to the understanding of fairness. In doing so it highlights the impact of social norms, culture, and group identity on people's attitudes towards fairness. Cultural differences in fairness perceptions and reactions to unfairness have been extensively studied, shedding light on the role of societal values and norms in shaping individual preferences for fairness (Ensminger & Henrich, 2017).

Last, another concept that is worth mentioning is that of procedural fairness. This is proposed by social psychologists John Thibaut and Laurens Walker (1975), and emphasizes the importance of fair procedures in shaping people's perceptions of outcomes. It actually suggests that the fairness of decision-making processes, reflected in aspects such as transparency, participation, and consistency, can significantly influence individuals' acceptance of economic outcomes, even if they are not entirely equitable.

1.3 Machine Learning and Fairness

Currently, an increasing number of decisions are being controlled by artificial intelligence and machine learning algorithms, with increased implementation of automated decision-making systems. Some examples include healthcare (Rajcomar et al. 2018), finance and credit scoring (Hurley and Adebayo, 2016), employment and hiring (Raghavan et al. 2020), education (Holstein, et al. 2019), housing (Wachter 2019) or governance (Young et al. 2019), to name but a few.

Given the extensive spectrum of applications of machine learning algorithms in every aspect of daily life, ensuring algorithmic fairness is of paramount importance. As algorithms tend to be trained on historical data that suffer from bias risk perpetuating historical injustices, reinforcing social inequalities, and

undermining public trust in automated systems (Barocas, Hardt, & Narayanan, 2019; Binns, 2020). To mitigate these concerns, a number of fairness metrics has been proposed in the literature. For instance, group fairness approaches include measures like *demographic parity* (ensuring equal acceptance rates across groups), *equal opportunity* (equal true positive rates), and *equalized odds* (equal true and false positive rates across groups) (Hardt et al., 2016). On the other hand, Individual fairness focuses on treating similar individuals similarly, based on a defined similarity metric (Dwork et al., 2012). As a consequence, various tools have been developed to mitigate bias which can be implemented at different stages of the training process of the models including pre-processing adjustment of training data, in-procession strategies to introduce fairness constraints, and post-processing methods, where a model abides to fairness post-training.

Recently, tools from the machine learning literature have been extensively used in various fields of environmental governance (see for example Vinuesa et al. 2020). Recent studies have explored the integration of machine learning into water governance, with a focus on predictive modelling, optimisation, and monitoring (Sit & Demir, 2019; Abdelaziz et al., 2020). However, fairness concerns—such as equitable access to water infrastructure and prioritization under scarcity—remain underexplored in algorithmic terms and therefore, insights from fairness in environmental economics can guide the development of ML systems that not only optimize performance but also promote fairness. These frameworks are particularly relevant in contexts like, the Limassol Water Futures Lab, where as discussed below, decisions must balance social, ecological, and institutional constraints.

3. Fairness Across Different Scales

3.1 Fairness Over Time

The concept of time introduces the dimension of intergenerational equity when it comes to policy making. The work of Elinor Ostrom, the Nobel laureate in economics, is pioneering in that respect. Ostrom has significantly contributed to the understanding of intergenerational equity via her focus on two aspects: i) her work on sustainable resource management, and ii) the governance of common pool resources. She highlights the importance of balancing the needs of present and future generations when considering the allocation and management of resources.

Intergenerational equity pivots on the idea of ensuring that current resource allocation and usage do not compromise the ability of future generations to meet their needs. By acknowledging the finite nature of resources and the potential long-term impacts of current utilization, Ostrom's work underscores the necessity of sustainable resource allocation to uphold fairness across generations (Ostrom, 1990).

Sustainability and long-term resource allocation present a critical juncture in the discourse on fairness. The dynamic allocation of resources, guided by principles of sustainability, raises essential questions about fairness and for whom such allocation is equitable. The intricate balance between the current and future utilization of resources lies at the heart of this debate. On the one hand, sustainable allocation safeguards the interests of future generations. On the other hand, the question of fairness in the present arises. Who should bear the costs of sustainable resource allocation? How should the benefits be distributed among different societal groups?

This complexity uncovers the tension between short-term gains and long-term fairness when we consider resource allocation. As with almost every discourse in the context of economic theory, a tradeoff arises when addressing the fairness conundrum in sustainable resource allocation. Specifically, the trade-off between short-term imperatives and long-term equity. Despite the fact that immediate resource utilization may yield tangible benefits for certain groups, we cannot ignore the sustainability of such practices. Neither can we ignore their impact on future generations.

To sum up, when considering fairness in sustainable resource allocation we need to adopt a balanced approach. On the one hand to acknowledge short-term priorities while on the other hand to uphold the equitable distribution of both present and future benefits. The result of these considerations might entail the creation of mechanisms that can compensate individuals or communities for short-term sacrifices in support of long-term sustainability goals, it can also ensure that that no segment of society disproportionately bears the burdens associated with sustainable resource management.

3.2 Fairness Across Space and Entities

This subsection explores the importance of equitable resource distribution across regional, sectoral, and individual-collective dimensions. In doing so we aim to identify the challenges and policy interventions that are needed to foster a fairer distribution of resources and opportunities.

3.2.1 Regional and Global Disparities: Fairness Between Countries and Regions

Regional and global disparities refer to differences in development and well-being between regions. The sources of such disparities can be found in unequal economic resources, historical conditions, and environmental challenges. The main idea of the fairness literature is to address such inequalities through targeted policies. Key measures include development aid, fair trade rules, and environmental justice. These efforts support sustainable development goals and can help ensure that geography does not determine life chances (Stiglitz, J. E., 2002).

3.2.2 Sectoral Fairness: Equitable Distribution Across Economic Sectors

When we refer to the concept of sectoral fairness, we actually consider the distribution of resources and opportunities across various economic sectors. Such sectors include agriculture, manufacturing, and services and the underlying idea is to prevent imbalances that could destabilize the economy. An equitable approach ensures that the is no particular burden place on a particular sector. To achieve this, balanced fiscal policies, targeted subsidies, and sector-specific development programs can come at play. This approach creates both a resilient economic structure and also supports long-term sustainability by diversifying national economic bases (Porter, M. E., 1990).

3.2.3 Individual and Collective Fairness: Balancing Individual Needs with Societal Welfare

A fundamental ethical dilemma in policy-making is posed by the balance between individual needs and societal welfare represents. This dimension of fairness requires to strike a balance to the challenging task of respecting individual rights while promoting the collective good. Public health policies are a prominent example, since individual compliance contributes to community

health benefits. As a results both ethical frameworks and legislative measures need to carefully weigh individual freedoms against the benefits of collective outcomes (consider e.g., the cases of vaccination programs and public safety regulations (Rawls, J., 1971)).

3.2.4. Fairness across different levels of social vulnerability

Another dimension of fairness is social vulnerability to climate change, a multidisciplinary concept, resulting in various terminologies and definitions. The IPCC's understanding of vulnerability has evolved over time, initially focusing on hazards to human well-being and then incorporating natural systems. The Fifth Assessment Report expanded the definition to include sensitivity, susceptibility, and adaptive capacity (Otto et al., 2017). The concept of social vulnerability was introduced to differentiate between biophysical and human dimensions within this broader context. It is determined by factors such as the population's capacity to respond, recuperate, and adapt to hazards and its susceptibility to them Fussel, 2012; Cutter and Finch, 2008; Schellnhuber et al., 2016). Social vulnerability is shaped by both internal and external elements such as age, race, and health and is dynamic, adapting to evolving environmental and societal situations. Comprehending socio-ecological feedback is essential, as key thresholds may lead to substantial disturbances. Migration and relocation are progressively acknowledged as risks associated with climate change.

Social vulnerability indices (SVIs) are frequently employed to identify and quantify social vulnerability. Mah et al. (2023) sought to map the literature on social vulnerability indices and found that among the most common domains used to measure social vulnerability were at risk population (older adults, children, dependents, etc.), education, household composition, employment and housing. However, certain factors are not readily quantified, like emotional issues or abuse (Shah et al., 2015). These are frequently obscured or intentionally hidden, rendering them challenging to quantify, despite their significance (Arora et al., 2015). This necessitates the development of scales or calibration methods for these variables.

The impact of social vulnerability factors significantly differs among crisis phases and country contexts, underscoring the necessity of context in comprehending the precursors, processes, and consequences of social

vulnerability (Rufat et al., 2015). Evaluating social vulnerability on a larger scale is impeded by alterations in the social environment and insufficient comprehensive data (Mavhura & Manyangadze, 2021). Social vulnerability is a fluid metric that fluctuates over time and across different contexts, evolving at a faster rate than physical vulnerability (Girasole & Cannatella, 2017). An equitable approach to address social vulnerability would be prioritizing high-vulnerability areas for water resilience investments or designing socially inclusive adaptation programs (e.g., targeted subsidies or free water access programs).

4. Fairness in Policy Making

Understanding the various factors that shape fairness perceptions is of the utmost importance for economic decision-making. Policymakers and economists can take advantage of this knowledge in order to design interventions and policies that align with people's fairness preferences. This is essential for promoting not only greater societal acceptance but also adherence.

The design of taxation systems is a rather relevant context. Insights from behavioral economics can inform the framing and communication of tax policies in a way that enhances their perceived fairness (Keen and Slemrod, 2017; Alm and Sheffrin, 2016). The utilization of progressive taxation systems is one prominent example. The scope of this system is to redistribute income and wealth via imposing higher tax rates on higher-income individuals. Naturally the tradeoff between efficiency and fairness arises. As it is a quite debated topic it has attracted lots of attention in research. The effectiveness of progressive taxation in reducing income inequality-and importantly-while minimizing its impact on economic efficiency has been extensively discussed in empirical research. It is thus important to be able to account for individuals' cognitive biases and emotional responses. As such policymakers can reflect how tax reforms are presented so that perceived unfairness is mitigated greater public support is achieved.

Social welfare programmes are a relevant context where the concept of fairness is central. Typical examples include unemployment benefits, healthcare subsidies, and conditional cash transfers. These policies, that are nowadays widely use across countries are designed to provide a social safety net and to decent standards of living for societal members. At the same time, they are argued to potentially operate again economic incentives, thus attracting heated discussions.

Policy makers have several tools in their hands to comprehend and address these issues. Examples include e.g. the "ultimatum game" experiments or psychological mechanisms (Falk and Fischbacher, 2006). In the *ultimatum* game, two individuals must agree on how to split a sum of money. The experiment has consistently shown that people are willing to reject offers that they perceive as unfair, even at a cost to themselves.

As to the psychological mechanisms, these entail understanding cognitive biases and emotional responses. Policymakers can design nudges and cues that appeal to individuals' inherent sense of fairness. Support for nudges is closely linked to the perceived fairness of these interventions rather than just their efficacy (Thaler & Sunstein, 2008; Hagman et al., 2015). Nudges are more a discrete intervention. They aim to change behavior without coercion and as such they have been a subject of debate due to concerns about autonomy and effectiveness (Sunstein, 2014). The interesting element about nudges is that they can be autonomy-preserving and effective. At the same time there are mixed findings on their impact on autonomy and public acceptance (Grüne-Yanoff, 2012). When nudges are considered, a crucial element that determines policy acceptance or not is the framing of information (Tversky & Kahneman, 1981).

All these tools and approaches make policy implementation richer and more tailor made. They also shed light on individual preference on fairness aspects being a fundamental consideration. In this era, the fairness literature suggests that fairness should be an integral part of policy considerations.

5. Applications to Water Management Systems

In this section we focus more explicitly on the application of fairness principles in water management systems. In such a vital resource it is essential to ensure equitable access and sustainable use. Water management is further complicated as it is inherently intertwined with ethical considerations. Therefore, it requires a comprehensive approach that harmonizes regional, sectoral, and individual interests with collective societal goals taking into account social vulnerability parameters. Thus, the aim of this section explores is to practically integrate concepts of fairness into water management strategies that are just and efficient.

The aspects of regional and global disparities that were already discussed in a broader framework, are even more relevant challenges of water management. The reason is the vast variations in natural water availability. Economic and historical inequalities exacerbate the difficulties associated with water management, as they require cooperation across national borders. International treaties on transboundary water resources have a dual purpose. To secure mutual benefits while safeguarding the rights of all parties involved. In regions where water scarcity risks trigger or aggravate conflict these agreements are vital.

The sectoral aspect is also present in water management challenges. Given the scarcity of water, the distribution of water across agricultural, industrial, and residential users should also apply to an equitable allocation. This is a prerequisite for sustainability, economic stability and growth. To this end, tools from the field of economics, such as differentiated water pricing and usage quotas, can be use in this framework. Their aim is to guide the allocation of water based on sector-specific needs and impacts.

A third aspect is the balance between individual rights to water and the collective needs of communities. Individual access to safe and clean drinking water is a basic human right. At the same time, community and national interests, such as food security and economic development, require managing water resources in a way that supports sustainable agricultural and industrial use. How then do policy makers combine both, in the face of scarcity? An option to address this difficult challenge is to encourage public participation in water management decisions. This tactic can enhance the legitimacy and acceptance of policies, as it aligns individual behaviors with broader environmental and economic objectives. Nudges are an alternative option. They can provide information about water conservation techniques and offer incentives for reduced water usage. As such they can motivate individuals to make choices that align with collective sustainability goals.

In addition, different social groups may be subject to varying degrees of climate change that can lead to reduced freshwater availability or salinisation of groundwater in coastal areas. This is due to the sensitivity to water impacts, as communities or individuals can be affected at various levels; for instance, farmers dependent on rainfall or irrigation are particularly vulnerable to drought, and women and children in certain regions may be disproportionately impacted due to their roles in water collection and utilisation. Ensuring that access to water is fair for everyone requires measures, such as investing in climate-resilient water infrastructure, establishing early warning systems, formulating drought preparedness plans, and engaging women, farmers, and marginalised communities in the decision-making processes for water resource management and climate adaptation.

Below we focus primarily on economic to view some approaches to the topic as discussed in the related literature.

5.1 Institutional Design for Fair Water Governance

The role of institutions has been rather prominent in the field of economics (Acemoglu et al., 2008). In the context we study, water management institutions, are central in shaping how individuals and societies interpret fairness and more importantly how fairness is applied in practice. Ostrom (1990) for instance, has argued that institutions that provide forums for participation (e.g., water user associations or basin-level councils) can enhance legitimacy and support equitable outcomes. These tools can be valuable in many water systems, especially under stress or scarcity. In such contexts, perceptions of fairness significantly influence compliance and cooperation.

Then the question arises, how can we design fair water institutions? This process involves setting rules that capture core fairness principles, i.e., accountability, equity, and need. At the same time, they allow for contextual adaptation. To be more specific, tiered pricing systems or targeted subsidies can address distributional concerns without hampering conservation incentives. Resorting to case studies from community-based irrigation systems we find that when users are involved in rule-making and monitoring, then the use of resources becomes more sustainable and equitable (Meinzen-Dick & Appasamy, 2002). This underlines the fact that when embedding fairness into institutional structures we can improve system performance and raise trust among users.

5.2 Behavioral and Experimental Insights for Water Policy Design

In earlier sections we have already discussed the importance of behavioral and experimental insights (Fehr & Schmidt, 1999; Falk et al., 2005). In water governance, it is particularly important to stress that policies ignoring fairness may fail not because of poor incentives, but due to perceived illegitimacy. As in the broader context, similarly in water management, experimental methods help isolate such effects and test how different framings or rules influence user behavior.

The underlying idea from field experiments in water management hints to the fact that even minor institutional changes can reinforce cooperation as long as they are perceived as fair. Transparency promoting interventions or interventions that promote collective choice can increase compliance with water restrictions and investment in maintenance (Baldwin et al., 2019; Janssen et al., 2012). Behavioral approaches also reveal that fairness biases—such as self-serving interpretations of equity rules—can undermine collaborative solutions (Johansson-Stenman & Konow, 2010). Acknowledging and accounting for these behavioral dynamics can lead to more robust, context-sensitive water policies that achieve the desired outcome, i.e., to align individual behavior with collective goals.

5.3 Economic Mechanisms for Fair Water Allocation

Standard economic theory can contribute to several economic mechanisms that can facilitate fair and efficient water allocation. Examples include pricing strategies, market and user-based allocation, regional based allocation, transboundary water management, applications from behavioral economics and procedural justice and public involvement. Analytically:

i. Pricing Strategies: Several studies emphasize the role of pricing strategies in achieving fairness in water management. Dudu and Chumi (2008) and Portland Press Ltd (2013) highlight market-based instruments and cost recovery approaches as tools to promote economic efficiency and equity. These studies illustrated that designing pricing mechanisms carefully can balance the need for sustainable water use with equitable access.
ii. Market and User-based Allocation: Dinar et al. (1997) examine two types of mechanisms: a) market allocation, and b) user-based allocation mechanisms. They find that these approaches can both reinforce

economic efficiency and address equity concerns. They argue though that local contexts and regulatory frameworks matter for the final outcome.

iii. Regional Allocation Systems: Regional allocation systems are argued to play a central role. Reddy (2004) and Dinar et al. (1997) discuss balancing sectoral distribution mechanisms as well as individual vs. collective rights. What all these studies highlight is the complexity of water allocation across different sectors (e.g., agriculture, industry, domestic use). They also highlight the need for frameworks that can address diverse stakeholder interests.

iv. Transboundary Water Management: Water (and in particular river) sharing at an international level is discussed in Ambec and Ehlers (2007). Their study introduces concepts of core stability and fairness criteria. They suggest that these principles can guide equitable water distribution across national boundaries.

v. Behavioral Economics Applications: Syme and Nancarrow (2008) and Johnson et al. (2007) acknowledge the potential for behavioral economics to inform policy design. These studies focus on two aspects: a) institutional arrangements, and ii) enforcement mechanisms. Their findings suggest what is highlighted in other contexts. Understanding social perceptions of fairness can lead to more effective and accepted water management policies.

- Procedural Justice and Public Involvement: Procedural justice and public involvement in water allocation decisions are discussed in Syme et al. (1999) and Johnson et al. (2007). These studies suggest that inclusive decision-making processes can enhance the legitimacy and acceptance of water management policies.

6. Applying fairness principles in the Limassol Water Futures Living Lab

The ERC Water Futures project seeks to establish a novel theoretical and practical paradigm for the design of intelligent urban drinking water systems that are socially fair, economically efficient, and ecologically resilient. This approach integrates real-time monitoring and control with long-term planning, utilising techniques from water science, systems and control theory, economics, decision science, and machine learning to facilitate decision-making under profound uncertainty. The project case study is situated in Limassol, Cyprus. A living lab has been established to examine the structural demands and issues confronting the newly constituted Limassol District Local Government Organisation. In collaboration with partners from all backgrounds and sectors, it aims to co-design solutions that are both effective and equitable. This participatory approach unites stakeholders from various economic sectors and societal and organisational groups (public authorities, regional and local governments, private enterprises, farmers, NGOs, civil societies, and research institutions) aiming to harmonise their interests towards a shared vision. The participants exhibit varying sensitivities to the water concerns, so enhancing the talks with this element.

7. Concluding Remarks

In this paper, we explore the many facets of fairness and how they have taken root within the field of economics. Given the trade-offs that emerge throughout the decision-making process, identifying ways to strengthen support and compliance with policies has become a central goal.

Nowadays, this effort has matured, and the concept of fairness is firmly established. A variety of methods have been developed to reflect this dimension—methods that allow fairness to be measured, approximated, and tested across different contexts.

Finally, we examine how these ideas apply to water management, a particularly complex area due to its geopolitical sensitivity and ethical

dimensions. Our study presents economic tools that can help promote not only equity but also efficiency in the allocation of water resources.

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References:

1. Abdelaziz, S., Elshafie, A., & Moselhi, O. (2020). Big data analytics and AI for water quality monitoring and management: A review. Environmental Science and Pollution Research, 27, 44733–44749.
2. Acemoglu, D., Golosov, M., & Tsyvinski, A. (2008). Markets versus governments. Journal of Monetary Economics, 55(1), 159–189.
3. Acemoglu, D., Johnson, S., & Robinson, J. A. (2005). *Institutions as a fundamental cause of long-run growth*. In P. Aghion & S. Durlauf (Eds.), *Handbook of Economic Growth* (Vol. 1A, pp. 385–472). Elsevier.
4. Alesina, A., & Angeletos, G. (2005, August 1). Fairness and Redistribution. American Economic Review, 95 (4), 960-980.
5. Alesina, A., & Ferrara, E. L. (2005, June 1). Preferences for redistribution in the land of opportunities. Journal of Public Economics, 89 (5-6), 897-931.
6. Alesina, A., & Giuliano, P. (2011). Preferences for Redistribution. In J. Benhabib, A. Bisin, & M. O. Jackson (Eds.), Handbook of Social Economics (Vol. 1, pp. 93-131). Elsevier B.V.

7. Almås, Ingvild, Alexander W. Cappelen, Erik Ø. Sørensen, and Bertil Tungodden. 2024. “Attitudes to Inequality: Preferences and Beliefs.” Oxford Open Economics 3 (S1): i64–79.
8. Almås, Ingvild, Alexander W. Cappelen, Erik Ø. Sørensen, and Bertil Tungodden. 2025. “Fairness across the World: Preferences and Beliefs.” NHH Norwegian School of Economics Institutt for samfunnsøkonomi Discussion Paper 06/25.
9. Almås, Ingvild, Alexander W. Cappelen, and Bertil Tungodden. 2020. “Cutthroat Capitalism versus Cuddly Socialism: Are Americans More Meritocratic and Efficiency-Seeking than Scandinavians?” Journal of Political Economy 128 (5): 1753–88.
10. Alm, J., & Sheffrin, S. M. (2016, November 24). Using Behavioral Economics in Public Economics.
11. Atkinson, A. B. (2015). Inequality: What Can Be Done? Harvard University Press.
12. Baldwin, E., McCord, P., Dell’Angelo, J., & Evans, T. (2019). Collective action in a polycentric water governance system. *Environmental Policy and Governance, 29*(4), 207–220.
13. Barocas, S., Hardt, M., & Narayanan, A. (2019). Fairness and Machine Learning: Limitations and Opportunities.
14. Binns, R. (2020). On the apparent conflict between individual and group fairness. ACM Conference on Fairness, Accountability, and Transparency (FAccT).
15. Bowles, S., & Gintis, H. (2011). A cooperative species: Human reciprocity and its evolution. Princeton University Press.
16. Brandts, Jordi, and Gary Charness. 2003. “Truth or Consequences: An Experiment.” Management Science 49 (1): 116–30.
17. Cappelen, Alexander W., Astri Drange Hole, Erik Ø. Sørensen, and Bertil Tungodden. 2007. “The Pluralism of Fairness Ideals: An Experimental Approach.” American Economic Review 97 (3): 818–27.

18. Charness, Gary, and David I. Levine. 2007. “Intention and Stochastic Outcomes: An Experimental Study.” Economic Journal 117 (522): 1051–72.
19. Crisp, R. (2003, July 1). Equality, Priority, and Compassion. Ethics, 113 (4), 745-763.
20. Dinar, A., Rosegrant, M. W., & Meinzen-Dick, R. (1997). Water Allocation Mechanisms: Principles and Examples. In Policy Research Working Papers. The World Bank.
21. Dudu, H., & Chumi, S. (2008). Improving Logistics Costs For Transportation And Trade Facilitation. World Bank, Washington, DC.
22. Dwork, C., Hardt, M., Pitassi, T., Reingold, O., & Zemel, R. (2012). Fairness through awareness. ITCS 2012, 214–226.
23. Ensminger, J., & Henrich, J. (2017, August 8). Experimenting with Social Norms: Fairness and Punishment in Cross-Cultural Perspective.
24. Falk, A., & Fischbacher, U. (2006, February 1). A theory of reciprocity.
25. Falk, A., Fehr, E., & Fischbacher, U. (2005). Driving forces behind informal sanctions. *Econometrica, 73*(6), 2017–2030.
26. Fehr, E., & Gächter, S. (2000). Fairness and retaliation: The economics of reciprocity. Journal of Economic Perspectives, 14 (3), 159-181.
27. Fehr, E., & Schmidt, K. M. (1999). A theory of fairness, competition, and cooperation. The Quarterly Journal of Economics, 114 (3), 817-868.
28. Festinger, L. (1957). *A theory of cognitive dissonance*. Stanford University Press
29. Hardt, M., Price, E., & Srebro, N. (2016). Equality of opportunity in supervised learning. NeurIPS, 3315–3323.
30. Holstein, K., Wortman Vaughan, J., Daumé III, H., Dudik, M., & Wallach, H. (2019). Improving fairness in machine learning systems: What do industry practitioners need? CHI 2019.
31. Hurley, M., & Adebayo, J. (2016). Credit scoring in the era of big data. Yale Journal of Law & Technology, 18(1), 148–216.

32. Gifford, R., Kormos, C., & McIntyre, A. (2011). Behavioral dimensions of climate change: Drivers, responses, barriers, and interventions. *Wiley Interdisciplinary Reviews: Climate Change, 2*(6), 801–827.
33. Giraud, G., & Renouard, C. (2011, June 1). Is the Veil of Ignorance Transparent? Association Œconomia, 239-258.

Goel, A., Meyerson, A., & Weber, T. A. (2008, August 27). Fair welfare maximization. Economic Theory, 40 (3), 355-377.
34. Grafton, R. Q., & Wheeler, S. A. (2018). Economics of water recovery in the Murray–Darling Basin, Australia. *Annual Review of Resource Economics, 10*, 487–510.
35. Halpern, B. S., White, C., Lester, S. E., Costello, C., & Gaines, S. D. (2011, May 1). Using portfolio theory to assess tradeoffs between return from natural capital and social equity across space. Biological Conservation, 144 (5), 1499-1507.
36. Henrich, J., Boyd, R., Bowles, S., Camerer, C., Fehr, E., Gintis, H., & McElreath, R. (2005). "Economic man" in cross-cultural perspective: Behavioral experiments in 15 small-scale societies. Behavioral and Brain Sciences, 28 (6), 795-815.
37. Janssen, M. A., Anderies, J. M., & Ostrom, E. (2012). Robustness of social-ecological systems to spatial and temporal variability. *Society & Natural Resources, 25*(1), 19–32.
38. Johnson, C., Penning-Rowsell, E., & Parker, D. (2007). Natural and imposed injustices: The challenges in implementing 'fair' flood risk management policy in England. *The Geographical Journal, 173*(4), 374–390.
39. Johansson-Stenman, O., & Konow, J. (2010). Fair air: Distributive justice and environmental economics. *Environmental and Resource Economics, 46*(2), 147–166. https://doi.org/10.1007/s10640-010-9365-2

40. Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1986). Fairness and the assumptions of economics. *Journal of Business, 59*(4), S285–S300.
41. Kaplow, L. (2020, June 1). A unified perspective on efficiency, redistribution, and public policy. *National Tax Journal, 73*(2), 429–472.
42. Keen, M., & Slemrod, J. (2017, August 1). Optimal tax administration.
43. Meinzen-Dick, Ruth & Appasamy, Paul. (2002). Urbanization and Intersectoral Competition for Water. Finding the Source: The Linkages between Population and Water.
44. Mikula, G., and H. Uray. 1973. "Die Vernachlässigung individueller Leistungen bei der Lohnaufteilung in Sozialsituationen." Zeitschrift Für Sozialpsychologie 4 (2): 136–44.
45. Mollinga, P. P. (1998). On the waterfront : water distribution, technology and agrarian change in a South Indian canal irrigation system [Doctoral dissertation, Wageningen University and Research].
46. Nozick, R. (1974). Anarchy, State, and Utopia. Basic Books.
47. Ostrom, E. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge University Press.
48. Pahl-Wostl, C., Lebel, L., Knieper, C., & Nikitina, E. (2012). From applying panaceas to mastering complexity: Toward adaptive water governance in river basins.
49. Porter, M. E. (1990). The Competitive Advantage of Nations. New York: Free Press.
50. Portland, P. L. (2013). Managing Water for All: An OECD Perspective on Pricing and Financing. Water Intelligence Online, 12.
51. Raghavan, M., Barocas, S., Kleinberg, J., & Levy, K. (2020). Mitigating bias in algorithmic hiring: Evaluating claims and practices. Proceedings of the 2020 Conference on Fairness, Accountability, and Transparency (FAT2020).

52. Rajkomar, A., Hardt, M., Howell, M. D., Corrado, G., & Chin, M. H. (2018). Ensuring fairness in machine learning to advance health equity. Annals of Internal Medicine, 169(12), 866–872.
53. Rawls, J. (1971). A Theory of Justice. Harvard University Press.Reddy, V. R. (2004). Managing water resources in India: A synoptic review. *Water Policy, 6*(6), 553–571.
54. Sandel, M. J. (2009). Justice: What's the Right Thing to Do? Farrar, Straus, and Giroux.
55. Schlosberg, D. (2007). *Defining environmental justice: Theories, movements, and nature*. Oxford University Press.
56. Sen, A. (1999). Development as Freedom. Oxford University Press.
57. Sit, M., & Demir, I. (2019). Flood prediction using machine learning models: Literature review. Water, 11(8), 1536.
58. Smith, Z. A., & Ross, K. L. (2017). Human Rights to Water. In Handbook of Globalization and the Environment (pp. 115–133). Routledge.
59. Syme, G., & Nancarrow, B. (2008). Justice and the allocation of benefits from water. *Social Justice Research, 21*(3), 215–231.
60. Stiglitz, J. E. (2002). Globalization and Its Discontents. New York: W. W. Norton & Company.
61. Syme, G. J., Nancarrow, B. E., & McCreddin, J. A. (1999). Defining the components of fairness in the allocation of water to environmental and human uses. Journal of Environmental Management, 57(1), 51–70.
62. Thaler, R. H. (2015). Misbehaving: The Making of Behavioral Economics. W. W. Norton & Company.
63. Thaler, R. H., & Sunstein, C. R. (2008). *Nudge: Improving decisions about health, wealth, and happiness*. Yale University Press.
64. Thibaut, J., & Walker, L. (1975). Procedural Justice: A Psychological Analysis. Hillsdale, NJ: Lawrence Erlbaum Associates.

65. Thomson, W. (2016). Fair Allocation, in Matthew D. Adler, and Marc Fleurbaey (eds), The Oxford Handbook of Well-Being and Public Policy. Oxford University Press.
66. Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. Science, 185 (4157), 1124-1131.
67. Vinuesa, R., Azizpour, H., Leite, I., et al. (2020). The role of artificial intelligence in achieving the Sustainable Development Goals. Nature Communications, 11, 233.
68. Wachter, S., Mittelstadt, B., & Russell, C. (2021). Why fairness cannot be automated: Bridging the gap between EU non-discrimination law and AI. Computer Law & Security Review, 41.
69. Young, M., Bullock, J. B., & Lecy, J. D. (2019). Artificial discretion as a tool of governance: A framework for understanding the impact of artificial intelligence on public administration. Perspectives on Public Management and Governance, 2(4), 301–313.