

Article

Towards a Moral Compass to Guide Sustainability Transformations in a High-End Climate Change World

Marco Grasso ^{1,*}  and J. David Tàbara ² 

¹ Department of Sociology and Social Research, University of Milan-Bicocca, Via Bicocca degli Arcimboldi, 8, 20126 Milan, Italy

² Universitat Autònoma de Barcelona, Cerdanyola del Vallès, 08290 Barcelona, Spain; jdt@sustainability.eu

* Correspondence: marco.grasso@unimib.it

Received: 19 April 2019; Accepted: 21 May 2019; Published: 24 May 2019



Abstract: High-end climate change (HECC) raises unprecedented challenges for the transformation of society's governance arrangements. In such potentially dangerous situation, these challenges have profound moral—rather than only scientific, technical, or managerial—implications. Unfortunately, despite the growing recognition of the necessity for morally-grounded, urgent social-ecological reconfigurations in order to sustainably navigate the uncertain landscape derived from HECC, explicit moral guidance to support the transformation of governance arrangements is still lacking. This work, through the metaphor of a moral compass, proposes a normative tool to support an integrated assessment processes in order to confront the moral challenges and dilemmas in governance and thus favour sustainable transformations under conditions of HECC.

Keywords: High-end climate change; governance arrangements; moral compass; morality; sustainability science; integrated assessment processes

1. Introduction

There is mounting evidence about the increasing likelihood that the planet will move well beyond the safety level of climate change for humanity by the end of this century [1]. This situation is likely to lead humanity into an unpredictable high-end climate change (HECC) world. The definition of HECC is not univocal: this article uses that of the EU project IMPRESSIONS (www.impressions-project.eu), which by and large provides the theoretical and empirical background against which the current work was developed. This project considers “high-end” as those scenarios leading to a 2 °C increase above preindustrial levels [2]. For instance, using a selection of shared socio-economic pathways (SSP) and representative concentration pathways (RCP) combinations, Harrison et al. [3] evaluated climate impacts in several sectors (agriculture, forestry, biodiversity, water, coasts, and urban) in a subset of such HECC scenarios focusing on those where global average temperatures could be greater than 4 °C in the RCP 8.5 scenario, the worst-case scenario characterized by increasing emissions over time leading to high concentration levels (>4 °C; RCP8.5).

Although nationally determined contributions (NDCs), part of the 2015 Paris Agreement, testify to an unprecedented global scale of climate initiatives, they do not set sufficient emissions cuts to achieve the goal of safely limiting climate change [4,5]. At the same time, evidence suggests that political, economic, and social inertia will very likely prevent emissions being reduced fast enough to avoid further dangerous climate impacts [6,7]. This would require almost unfeasible decarbonisation actions [8], while existing governance arrangements seem unable or unwilling to engage in the necessary deep societal transformations. For instance, the World Meteorological Organization (WMO) in a statement on the state of the global climate [9], openly claimed that humanity is already moving into truly uncharted territory; by the same token, recent authoritative reports [10,11] reiterate that there

is a limited window of opportunity for avoiding dangerous climate change. In fact, HECC could have exceptionally severe global and intergenerational socio-ecological impacts [12], which conventional thinking and policy-making are poorly equipped to deal with [13].

In light of these considerations this article proposes a “moral compass” aimed at providing integrated assessment processes in order to deal with transformations in governance arrangements with practical moral guidance to help navigate HECC in a way that is aligned with sustainability [14]. At the same time, the proposed tool aims to be trans-contextually applicable in order to enhance moral reflexivity about the creation of a sustainable society and long-term well-being even in the absence of such extreme climate scenarios. Those societies able to openly consider at an early stage and develop a strong moral constitution to address the unexpected implications of HECC are also likely to be able to implement sustainable solutions for anticipating and coping better with other complex decisions in different policy domains. The moral preparedness given by considering the implications of HECC in their governance arrangements may help such societies to develop more robust decisions, capacities, and mechanisms to sustainably navigate different undefined futures in a variety of human action domains, either directly affected by HECC or not.

This article proceeds as follows: it first provides the basic theoretical and moral tenets of the proposed moral compass. Then, it defines its structure and different components in terms of “cardinal directions”, “moral standards”, and “moral principles”. Further, it looks at the calibration and adjustment mechanisms that ought to be implemented in order to ensure that the moral compass is employed in a dynamic, reflective, and social learning mode, so as to effectively support just and sustainable transformations in a HECC world. Subsequently, the article applies this tool to provide a preliminary exploration of different forms of moral guidance for governance arrangements in the HECC scenarios defined by the IMPRESSIONS project through a Participatory Integrated Assessment (PIA). The methodology developed in that project and its application for various regions have been already explained in detail elsewhere [2,15], therefore this article has deliberately omitted its treatment and focused on the analysis of moral aspects not addressed so far in that research. Finally, the article, based on the potential of the moral compass, draws some synthetic considerations on sustainability, stressing that a world entering HECC scenarios will only be sustainable if it is guided by a morally strong open constitution and reflection.

2. Foundations, Purpose, and Scope of the Moral Compass

2.1. The Liberal and Democratic Foundations of the Moral Compass

A major requirement for securing the general uptake of collective action patterns in liberal democratic contexts is the inclusion of moral considerations that reflect people’s values and beliefs. In fact, the more collective action—at any level and in any form—is consistent with the prevailing moral norms, the more collective action is likely in the long term [16]. Morality, however, does not exist in a void, but rather it derives from specific philosophical, as well as historical backgrounds, and cultural and social systems of reference. Therefore, a moral compass intended to guide collective action needs to be developed based on existing moral systems, even if its objective is to favour the achievement of a transformed sustainable society, more likely to withstand and successfully navigate a troubled world characterised by HECC.

As a starting point, a moral tool for achieving sustainability in a just way can be usefully grounded in the Western philosophical tradition. Such a broad strand of theories and principles is not of course monolithic or exclusive [17] and has developed a common basis for raising universal moral claims and arguments [18]. In this philosophical and cultural milieu, a convenient starting point for the construction of the moral compass is the consideration of the liberal account of justice. The reference is to modern liberalism and, by and large, to the body of literature that has flourished since the 1970s and Rawls’s groundbreaking contribution of 1971 entitled “A Theory of Justice” (republished in [19]). Liberal justice is based on equality, freedom, redistribution, inclusion, and care. It gives

equal or impartial consideration to the interests of all, and displays a general concern for the least well-off subjects, who should be given the opportunities, means, and choices to live a dignified life, the improvement of which is the most morally important objective. This conception, according to Dworkin [20], is the nerve of liberalism. Liberal justice can be employed to support the governance of climate change because the elements affected by this socio-ecological phenomenon “fit naturally into the standard liberal accounts of justice such as those of Rawls and Dworkin” [21] (p. 171). In this view, liberal justice can play a major role as a unifying basis to facilitate sustainable collective action with respect to climate change [22]. Hence, as an initial operative assumption, it can be argued that the more governance arrangements are informed by liberal justice, the more sustainable and morally robust feasible solutions for navigating HECC can, in principle, be achieved.

This is indeed true in an ideal world, whereas real world constraints can hinder or even imperil the inclusion of moral considerations in governance arrangements for the transition to sustainability. For instance, with regard to the energy transition, the political economy of climate change suggests that the dynamics of global responses to the climate crisis are influenced and, to a large extent, shaped by entrenched contradictions and tensions between the structure and goals of current socio-economic systems and the demands of decarbonising the global economy [23]. In particular, the transition to a carbon-free, sustainable future confronts a dramatic clash of existential interests. On the one hand, owners of assets that cause climate change—and, critically, those who work for them—face increasing threats of being put out of business or losing their jobs; on the other hand, more vulnerable subjects, such as poor people, residents of small island states and coastal areas, and farmers, risk losing everything as the impacts of climate change strengthen [24]. This conflict seriously threatens to expel morality from the energy transition debate and related governance arrangements. We however argue that the emergence of social and moral norms—i.e., standards of appropriate behavior—that delegitimise carbon intensive and non-sustainable lifestyles and business models can help to overcome the resistance against the just transformations envisaged by the moral compass. Social and moral norms have previously worked very well in delegitimising deeply entrenched and influential socio-economic practices, like slavery or tobacco [25]. It seems, additionally, that the time is ripe for the formation and development of such moral and social norms: a growing number of non-state agents—e.g., charismatic individuals, social movements, economic actors, and subnational political actors—are actively involved in delegitimising carbon-intensive, non-sustainable models and activities [26]. Their various initiatives are expected to form the necessary cultural and moral awareness of the wrongness of such behaviours, with the ultimate objective of favouring just and sustainable transitions in line what the indications provided by the moral compass.

It should be stressed also that the choice of developing the moral compass within the Western moral tradition does not imply its superiority, but it is determined by the fact that the theoretical constructs of this tradition are widely acknowledged around the globe [17] and have largely contributed to the formation of existing, albeit weak, global governance institutions. Western morality may thus prove useful for initially addressing the moral requirements of collective action in HECC, since it would not be disruptive for the dominant values and views of world politics, whose likely resistance against the inclusion of different moral traditions can be weakened only gradually. Moreover, moral traditions are open-ended and non-exhaustive systems, so any difference with other moral traditions can be included within them. A further, more ambitious, moral compass could, and indeed should, include non-Western moral traditions, as well as other more radical moral considerations [27] for contributing to the collective journey to a sustainable future, even under the conditions of HECC.

2.2. *The Purpose of the Moral Compass*

The definition and development of the governance arrangements required for navigating in a just and sustainable way possible HECC futures raise crucial issues. These criticalities are mostly determined by the complexity of impacts and magnified by the uncertainties that surround these unknown and unpredictable futures. HECC not only exposes existing governance arrangements to

their weaknesses and risks, but at the same time also generates an opportunity space for the adoption of a challenge-driven approach for shaping such arrangements in different ways. Despite the growing recognition that urgent social-ecological reconfigurations will need to be deployed for sustainably navigating the uncertainties of HECC, an explicit moral guidance to support the deep and swift transformations to confront the impending future is still lacking. Consequently, the rationale for using the metaphor of a moral compass in the deliberative processes envisaged lies in the fact that it may not currently be possible to know exactly what kinds of societal transformations are needed to confront HECC; nonetheless it may be possible to anticipate, despite a landscape of high uncertainty—or even indeterminacy—the basic moral constitution to address some of the major threats that humanity and nature undergo if the present unsustainable trends continue. As societies move along such HECC trajectories, comprehension of the positive or negative consequences of taking a particular route may also influence present decisions about continuing along it. However, this adaptive attitude can only be possible if some morally agreed upon consensus about the direction to be taken is available, a political position which, inevitably, is morally connoted and of a truly normative nature. The lack of moral guidance can, in fact, favour the paralysis of governance arrangements and worsen moral corruption with respect to engaging sustainably with the effects of climate change [13].

Three specifications are in order. First, governance arrangements are broadly understood here as coordinated patterns of behaviour among multiple agents that reproduce and modify the existing forms of societal organisation and are based on shared beliefs, aspirations, ideologies, and/or political values. These arrangements are organized through formal and informal schemes of procedures, rules, enforcement mechanisms, structures, and instruments, and they are deployed over the long term. Such coordinated patterns of behaviours set the political demarcations in which social practices originate, agents' roles are ascribed, and their interactions take place, usually through institutionalised forms. In this understanding governance arrangements are both the processes and the outcomes of such coordinated patterns of behaviours.

Second, the moral compass cannot—and should not—be exogenously imposed on governance arrangements, which should rather adopt it in an endogenous mode and on a voluntary basis. The rationale for their willingness to use the moral compass might just be a sheer will to survive: if governance arrangements want to keep their social license to operate [28] in a climate endangered world, they must behave and operate consistently in accordance with the mounting pressure for morally-sound and sustainable transformations.

A third issue, not directly addressed in this article but extremely significant, is the potential capacity of the moral compass to encourage virtuous individual behaviours. This is similar, for instance, to what Sandler [29] (pp. 103–122) deems necessary for increasing humanity's capacity for taking care of the environment. In this regard, the normative tool proposed, given its moral cogency, is expected also to nudge [30] individuals towards engaging in sustainable thinking, behaviours and interactions.

2.3. *The Scope and Context of the Metaphor*

In contrast to a traditional compass that sets alternative directions, the proposed metaphor of a moral compass normatively provides a set of four pillars—articulated in cardinal directions, moral standards, and moral principles—that should be pursued at the same time by governance arrangements in order to promote morally-sound solutions aligned with the indications of sustainability in confronting a HECC future:

- **Cardinal directions:** The long-term moral yardsticks that governance arrangements should consider in the first place, and gauge their action against, in order to act consistently with sustainability and avoid falling into unjust and unsustainable trajectories. A cardinal direction is a moral benchmark that allows governance arrangements to act and to reflect upon the implications of their behaviour, learn whether the courses of action taken are sustainable, and orient them for (more) sustainably navigating HECC. Cardinal directions should help to interpret

the moral landscape in which contemporary societies operate without necessarily providing specific indications on where we should or should not go.

- **Moral standards:** A second-order foundational moral reference on whose basis governance arrangements should orient and shape their behaviour, so that they act consistently with the general references of cardinal directions. A moral standard provides a more concrete moral indication for individuating the route for moving sustainably, and in a just manner, according to the moral mapping provided by the cardinal direction.
- **Moral principles:** The moral features, specific requirements, and conditions in different contexts that need to be satisfied in order for governance arrangements to progress along the selected route indicated by moral standards. A moral principle infers possible sustainable alternatives, depending on concrete socio-economic and ecological circumstances, for traveling the route indicated by the moral standard towards the relevant cardinal direction.

A basic implication of this metaphor is that—in contrast to a general implicit assumption in the dominant transitions thinking—there is no single direction that needs to unanimously be followed while considering the needed transformations to deal with HECC. Instead, a more nuanced and morally-grounded approach would first consider all directions [31]; then it would examine the possible implications of alternative routes, before designing them consistently with explicit moral standards and principles; and eventually it would continuously re-check and re-route concrete actions or solutions accordingly. This is why the moral compass also needs to include calibration and adjustment mechanisms—in particular epistemic qualities such as accountability and transparency, as argued below—able to highlight and appraise the degree of consistency of collective action with the compass' pillars. Through these mechanisms governance arrangements are involved in a dynamic process of iterative learning [32] that would rearrange their trajectories towards sustainable solutions for navigating HECC worlds.

Before providing the details of the moral compass, a crucial methodological clarification is necessary, one that largely originates from the near-inexistent factual knowledge about the nature of HECC—so far actually derived exclusively from modelling simulations—as well as from the potentially highly contentious context in which the related governance arrangements are supposed to operate in. Such considerations imply, in fact, that the moral compass should be both adaptable to the extreme plurality of moral values that would characterise unknown HECC worlds and their multiple stakeholders, and cogent—i.e., able to resolve, or at least lessen—the relative normative conflicts among involved agents. The integration of pluralism in the highly complex conditions of HECC is therefore crucial to reconcile potential conflicts derived from various moral standpoints and to promote well-functioning governance arrangements [33] (p. 36). Consequently, on the one hand, pluralism requires that the moral compass be minimal; i.e., it must be based on the most parsimonious set of moral values so that it can be acceptable to the largest number of heterogeneous parties. However, on the other hand, pluralism alone cannot vindicate the adoption of a minimal moral compass without qualification [34,35]. Moral minimalism also requires that the compass is trans-contextually applicable, i.e., normatively cogent in states of affairs and circumstances of justice that are different from those of HECC worlds for which the moral compass is developed [36,37]. To satisfy these two requirements, the moral compass' four cardinal directions are based on a single moral standard and include a related single moral principle. Additionally, the compass' pillars are framed so that they can be cogent also in the absence of HECC, the states of affairs that provide the trans-contextual reference for justifying the moral minimalism of the compass.

3. Structure, Scope and Adjustment Mechanisms

In light of the methodological specifications provided in the section above, this section discusses the structure of the moral compass, as well as the calibration and adjustment mechanisms that ensure its most opportune employment for supporting just transformations in HECC worlds.

3.1. The Structure of the Moral Compass

Figure 1 and Table 1 show the pillars of the moral compass, whose components (cardinal directions, moral standards, and moral principles) are later analysed in detail.

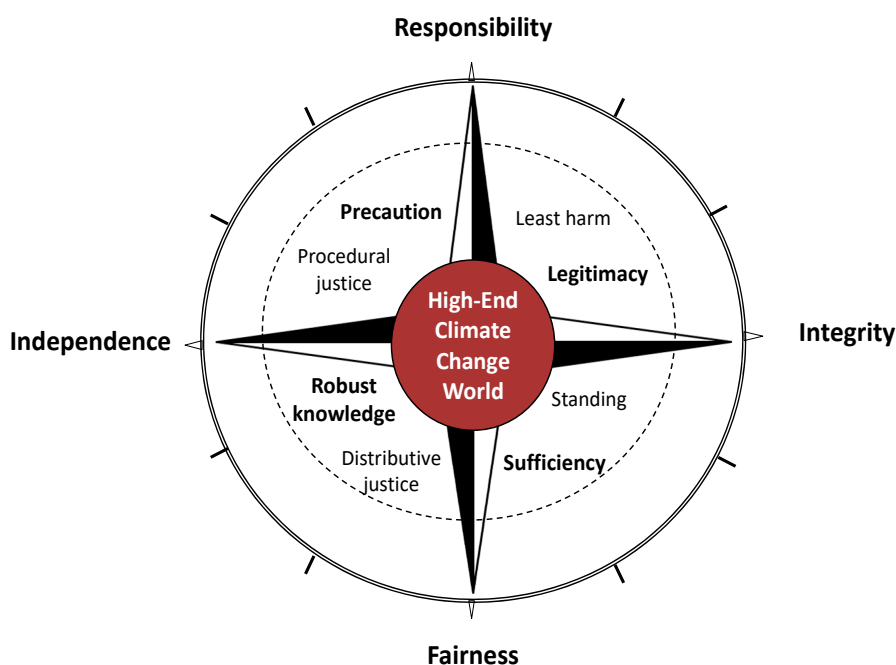


Figure 1. The moral compass.

Table 1. The components of the moral compass.

Pillars	Cardinal Directions	Moral Standards	Moral Principles
Pillar I	Responsibility	Least harm	Precaution
Pillar II	Integrity	Legitimacy	Standing
Pillar III	Fairness	Distributive justice	Sufficiency
Pillar IV	Independence	Procedural justice	Robust knowledge

3.1.1. Pillar I: Responsibility, Least Harm, and Precaution

HECC futures will necessarily entail a redistribution of rights and responsibilities. Responsibility is in turn increasingly challenged by different claims, for instance in relation to the development of a global citizenship that also includes the rights of future generations and of non-human beings. Therefore, responsibility needs to be contextualized in, and shaped according to a HECC future.

A paramount challenge of HECC is the possibility that governance arrangements neglect or underestimate the ultimate objective of concurring to sustainable futures for human and non-human beings. Such arrangements could instead aim at merely self-satisfactory goals as efficiency or efficacy, or even at more abstract goals of institutional solidity [38], rather than serving the common good. This heterogeneity of ends can be provoked by, and would in fact be consistent with, stipulations of institutional autopoietic theories [39], whose envisaged self-referential organizational models able to generate and regenerate themselves are, in fact, likely to be a strong reference for governance arrangements moving in an uncharted terrain like HECC. To obviate this threat, governance arrangements for HECC should include responsibility as a necessary foundation of their meaning and role. Responsibility, the cardinal direction sought after in this pillar, is understood in a classical, almost etymological meaning [40], as the civic virtue [41] of being in charge of, or having a duty towards, someone or something. This notion is consistent with Mill’s classical account of responsibility developed in the nineteenth century in relation to the principles of representative government

(republished in [42] p. 140). It, therefore, strictly resonates with Leopold's land ethic [43] and with the universal outlook put forward by the Earth Charter [44].

To satisfy the cardinal direction of responsibility in HECC, governance arrangements should aim at attaining the moral standard of preventing people and nature from being harmed in the long term [45]. Basically, a least harm moral standard would require that governance arrangements ensure that their actions choose to do the least harm possible and to do harm to the fewest human and non-human beings [46] (pp. 82–119). The least harm moral standard is also a desideratum that can guide normative judgement and action consistent with the political ideal of sustainability by identifying the most appropriate clusters of practices and values [47] (p. 40).

Following these considerations, the most appropriate moral principle for subsuming and systematizing the clusters of practices and values that should guide governance arrangements' action in HECC worlds is precaution [48]. Given the extreme uncertainty that characterizes HECC, precaution should however conform, as for instance suggested by the pragmatic political philosophy of Edmund Burke, to circumstances and the elements that "render every civil and political scheme beneficial or noxious to mankind" [49] (p. 384).

3.1.2. Pillar II: Integrity, Legitimacy, and Standing

A major challenge to governance arrangements with respect to HECC is that they lack the ability to provide the coordination action and the capacities needed to achieve significant benefits or avoid critical burdens at acceptable costs [50] (p. 178). In fact, HECC, besides the expected devastating ecological impacts, especially in terms of persistency of extreme weather patterns [51], involves several thorny issues such as uncertainty, the need to consider the very long term, the possible modification of people's preferences and expectations, and the fact that business-as-usual institutions and enterprises are not well equipped to deal with HECC futures. Moreover, HECC would integrate the above issues in a mutually reinforcing way, so that these challenges would drastically endanger the effectiveness of governance arrangements, as well as undermine their moral solidity [13], and eventually their ability to pursue sustainability.

To obviate or, at least to lessen, these threats governance arrangements aimed at supporting the transformations involved by HECC should be able to achieve the coordination needed to carry out their action in a way that can defensibly be trusted in the long term. In short, governance arrangements must acquire and maintain integrity, the cardinal direction to be considered. Integrity is generally intended here as the capacity to act in accordance with morally justifiable bases [52].

To this end, governance arrangements for HECC need to be grounded in legitimacy. This moral standard should be understood as a normative desideratum that applies to all types of governance arrangements, irrespective of power, authority, and coercion. In fact, the governance arrangements needed for dealing with HECC may not have any power or authority, nor be able to wield coercion, but, for example, their role can be restricted to providing reliable information or involving the relevant agents [48]. Legitimacy is understood in this context as a normative property that favours the convergence of judgements on the necessity to endorse and support the action of governance arrangements in order to deliver sustainable solutions in the face of HECC. Successful convergence of judgements implies that governance arrangements, in relation to the fulfilment of their tasks, be recognized as commanding respect. To this end, governance arrangements should organise their collective behaviours in view of achieving the standing moral principle. The prevalent reason why standing boosts HECC governance arrangements' legitimacy, in order for them to be trusted in the long term, is that this moral principle makes people's compliance with such arrangements more rewarding in terms of social esteem, the primary component of institutional social respect [53] (pp. 274–277). In brief, the standing achieved by governance arrangements through social esteem would increase their legitimacy in terms of endorsement and support of their action, and eventually boost their capacity to be trusted in the long term, i.e., of achieving the needed integrity.

3.1.3. Pillar III: Fairness, Distributive Justice, and Sufficiency

HECC governance arrangements risk determining an unfair distribution of the benefits and burdens of the intended transformations to cope with HECC that could exceedingly penalize more vulnerable subjects [54], as well as future generations [11]. Modifications in governance arrangements for dealing with HECC should therefore take account of, and orient their action according to the requirements of distributive justice, the relevant moral standard for achieving the fairness cardinal direction [55]. Distributive justice envisages a fair allocation of “benefits and burdens in society” [56] (p. 18), these being broadly conceived to also include non-monetary elements. It should be noted that more vulnerable subjects include future generations, since their non-existence precludes them from the possibility of protecting their interests. In other words, the moral standard of distributive justice for HECC governance is at the same time intragenerational and intergenerational, as required by the political ideal of sustainability. It therefore assumes that the future is within the reach of moral analyses too, and that future individuals/peoples/non-humans have the same rights as current ones [57].

The moral principle that would make it possible for governance arrangements to comply with such intra/intergenerational moral standard of distributive justice is sufficiency. Sufficiency holds that every subject must have a sufficient, yet not equal, share of the specific currency of justice: “what is important from the point of view of morality is not that everyone should have the same but that each should have enough” [58] (p. 21). The very point of sufficiency is therefore that all agents should have enough to be above a certain threshold, below which it is impossible to have decent opportunities in life, i.e., to have access to the basic environmental, social, and economic conditions to carry out a decent life. Sufficiency has gained a privileged role in the literature on environmental-related justice [59] by virtue of its strong acknowledgement of, and accordance with, the stipulations of sustainability [60].

Therefore, HECC governance arrangements should abide by a sufficientarian moral principle to be consistent with the moral standard of distributive justice. The configuration of the sufficientarian principle and the resulting distribution of benefits and burdens depend, of course, on the specific element to be distributed.

3.1.4. Pillar IV: Independence, Procedural Justice, and Robust Knowledge

Given their critical role, governance arrangements for sustainably navigating a HECC future risk being appropriated by corporate interests, elites, techno-scientific managers, expert bureaucracies, and profit-seeking investors, as indeed the political economy of climate change and current climate politics evidence already suggest [61]. These composite challenges may encourage forms of non-sustainable governance forged around the potentially predatory will of more powerful groups, largely based on instrumental rationalities and values, as it has been denounced by many different instances [62]. Strictly related to this, a serious danger is that governance arrangements work in an openly quasi-autocratic way [63], excluding other important perspectives from society and stakeholders.

To contrast these detrimental possibilities, governance arrangements for addressing HECC should guarantee independence, since this cardinal direction can actually lessen the threat that their action is carried out according to vested interests, and it can rather magnify their ability to work in the public interest in spite of external interferences [64] (pp. 22–47). The moral standard that can shape and orient governance arrangements towards independence is procedural justice. In relation to governance, this moral standard generally requires that arrangements involve the relevant agents [65] in the design of the proposed social cooperation schemes [66,67] and grant them parity of participation [68].

The moral principle that guarantees that governance arrangements can achieve the necessary procedural justice for being independent relates in different ways to produce accurate and validated (i.e., robust) knowledge, in spite of the only certain trait of HECC, i.e., uncertainty. In fact, dealing with uncertainty requires multiple kinds of knowledge. For governance arrangements, this is particularly relevant in a number of areas. First, they must select and use sources of reliable and robust knowledge that constitute the basis for resolving conflicts and making educated decisions [69]. Consequently,

those agents who are or may be affected by a decision should have an opportunity to contribute, based on their competence and ability, to the various aspects of governance arrangements. For this reason, modifying governance arrangements—particularly decision-making processes and procedures—in anticipation of HECC should be based on learning-by-doing iterative processes able to adapt to ever-changing forms of complexity. Furthermore, governance arrangements should be informed by sound science and multiple source of knowledge and judgement constantly validated over time. They should also have the necessary flexibility to rethink, reframe, and reshape themselves along these lines as new evidence and moral perspectives emerge.

In brief, the effective governance arrangements for HECC worlds should have the capacity of generating, integrating, and providing the timely and fit-for-purpose robust knowledge needed for overcoming problems even in a situation of deep unpredictability in a sustainable and just way.

3.2. Calibration and Adjustment Mechanisms

The effort of governance arrangements to align moral standards and moral principles in view of cardinal directions to pursue sustainable transformations in HECC futures is an extremely complex one. The achievement of the indications of the moral compass will need several iterative attempts to accommodate and fine-tune the entire process to different contexts, policy needs, and constituencies. Therefore, agents and organisations engaged in supervising societal-biophysical interactions may plausibly and sensibly aspire to assess the degree of success of such attempts. They may, for instance, want to understand how a financial instrument for funding HECC-appropriate growth in poorer regions fares in relation to Pillar III—Fairness, Distributive Justice, Sufficiency—of the moral compass, i.e., if such an instrument fairly allocates its resources among beneficiaries according to an adequate sufficientarian principle of distributive justice able to pave the way to sustainability. To facilitate this checking process, whose openness and broadness are guarantees of the absence of self-indulgency and self-referentiality [70], the moral compass should include some overarching and cross-cutting calibration and adjustment mechanisms. Such mechanisms need to involve epistemic qualities able to provide the evidence required for the most complete possible understanding of the consistency of governance arrangements' conduct to the political ideal of sustainability and of the consequent implications for present and future generations and for the planet. The information basis provided by epistemic qualities can make it possible to carry out the most thorough possible critical review of HECC governance arrangements' action [71]. Among epistemic qualities, the most prominent in relation to sustainability in HECC conditions are accountability, i.e., the demand that governance arrangements have a certain conduct and the prospect of judging whether they actually conform to that conduct; and transparency, i.e., the possibility of monitoring the performance of HECC governance arrangements [72]. Such epistemic qualities would make it possible to understand and evaluate the consistency between governance arrangements' action and the indications of the moral compass within a sustainability framework. This iterative, integrated learning approach of adaptive governance can truly magnify governance arrangements' potential of providing sustainable solutions for a HECC world.

Furthermore, it is important to note that understanding sustainability in HECC mainly as a moral challenge—and where action can take multiple directions depending on different futures—does not impede the proposal of a common system of reference to orient governance arrangements. On the contrary, moral discussions aimed at supporting transformations in governance could use this tool to support reflexivity and decision-making within an extended cognitive and moral system of references, where the rights of future generations, global systems, and the well-being of human population as well as the rights of the non-human world and the biophysical conditions that sustain life-support systems are taken into account (see Figure 2).

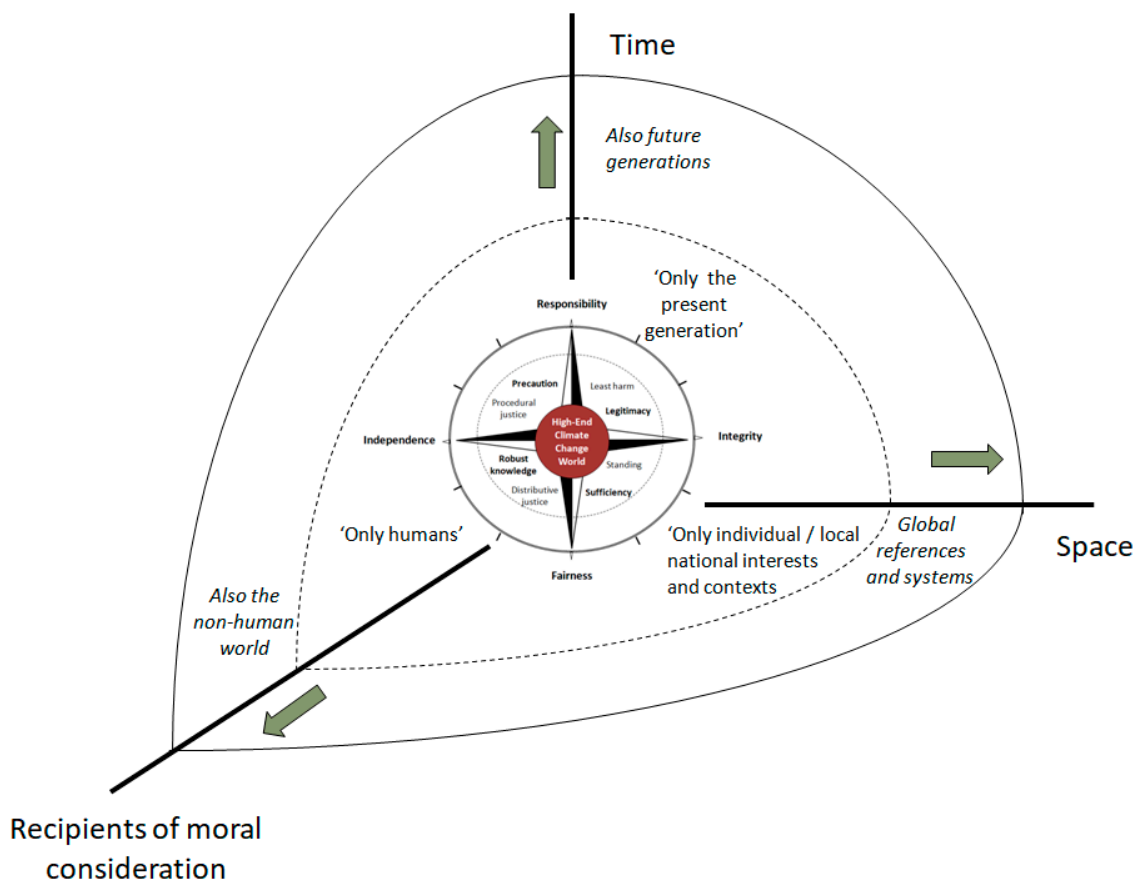


Figure 2. Situating the moral compass in an extended cognitive and normative system of reference to guide the development of transformative solutions and sustainable governance arrangements in HECC worlds (adapted from [73]).

4. The Moral Compass in Various HECC Worlds

This section applies the moral compass to a specific context—the HECC futures developed through PIA by the EU project IMPRESSIONS—in order to discuss the actual practicability and potential of the proposed tool.

There is no single HECC world, but, in fact, many are the HECC worlds. Based on this premise, the EU project IMPRESSIONS was set up with the purpose of co-producing and assessing transformative strategies and pathways in different HECC scenarios. It must be noted that the use of PIA for supporting societal transformations in critical global and intergenerational issues such as climate change is not just a matter of bringing different perspectives into a debate to elucidate individual preferences. The challenge is mostly about engaging stakeholders into a much broader normative and moral reflection which goes beyond the verbalisation of personal, partial, or short-term interests; and of situating such deliberations within a much larger cognitive, moral system of reference as represented in Figure 2. It is from this broader perspective that stakeholders may be given more robust means to think about and to reframe the meaning of the “common good” and to do so in a way which also considers global interlinked problems and solutions, the rights of future generations, as well as the importance of non-human forms of life or the biosphere in general. Making explicit the kinds of moral references (e.g., cardinal directions, standards, principles) may also increase the moral coherence of the various options selected by PIA participants. The main aim of the proposed moral compass is therefore to provide an example of a simple, open, and intelligible normative tool that can be used in such deliberative integrated processes of collective decisions about the future in operational ways – but without falling in misleading reductionisms – to take into account the great moral complexity and

the various options entailed. Our stance is that relevant moral issues ought to be proposed at the very beginning of integrated assessment processes, and in a much more explicit way so as to avoid the usual practice of taking them as given and unmodifiable. Such moral reflection is, in fact, likely to be decisive to shape different courses of collective action and to co-construct different futures. Additionally how morality is collectively understood ought to be acknowledged as the main driving force in the final configuration of various pathways of solutions.

In order to formulate the various HECC scenarios in an integrated way, the IMPRESSIONS project followed an iterative process of downscaling a number of global Shared Socioeconomic Pathways (SSPs) [74] to case studies in different regions—the EU, Iberia, Scotland, Hungary, and Central Asia [15,73,75]. In each case study, four SSPs were created in the form of narratives to set the general socio-economic conditions in which different climatic challenges and the respective societal responses to them *could* unfold (for details on the IMPRESSIONS project's overall approach and its case studies see the project's Information Hub, available at: <http://highendsolutions.eu/>). While SSPs are usually defined in terms of two axes of low/high adaptation and low/high mitigation challenges, IMPRESSIONS characterised the four SSPs in terms of low/high inequality and low/high carbon-intensity worlds, as these variables were considered to better capture the uncertainties regarding the various potential HECC worlds. The rationale is that different intensities in climate impacts (represented and integrated in this project by scenarios RCP4.5 and RC8.5; scenarios and final narratives took slightly different names in different cases, albeit following the same pattern) depending on the different social structures in which agents operate would also yield different effects on demographics, human development, economy and lifestyle, policies and institutions, technology, and environment and natural resources [76]. IMPRESSIONS eventually developed four SSPs: SSP1 (sustainability); SSP3 (regional rivalry); SSP4 (low-carbon inequality); SSP5 (fossil-fuel development). SSP2—the intermediate scenario between the other four SSPs and the most moderate one—was not considered, as it was deemed not to be relevant in the context of HECC. Then, stakeholders were asked to develop a normative vision on where they would like to be by the end of the century. From the interplay between the different socio-economic contexts and stakeholders' visions, alternative *pathways of solutions*—e.g., promoting the broad implementation of renewable and decarbonised energy systems, democratising governance arrangements, or implementing sustainable agro-food systems—had been designed.

This article does not have, of course, the objective to fully apply the moral compass for providing moral guidance to all the pathways obtained in the IMPRESSIONS project's case studies. Rather, the goal is only to introduce the hypothesis that different moral constitutions may in fact drive different socio-economic futures. Therefore the moral guidance provided by the compass may be used to assess which kinds of moral standpoints may need more attention to inform, shape, or redirect governance arrangements according to the dissimilar worlds synthesized by the SSPs.

As Table 2 shows, it is highly plausible that in a HECC world defined by low inequality and low carbon intensity—as in SSP1—governance arrangements are already characterised by high levels of Responsibility, Integrity, Fairness, and Independence, and the calibration and adjustment mechanisms that ensure transparency and accountability are similarly well structured. In this ideal situation, the moral guidance provided by the compass should be limited to fine-tune governance arrangements' actions to the pillars' moral standards and moral principles.

In contrast, in SSP3, the most intractable HECC scenario where high inequality and high-carbon intensity would be the norm, special attention should be given to all the various components of the moral compass for steering and reorienting development towards a more morally consistent and socio-ecologically resilient world, better capable to cope with HECC. Therefore, governance arrangements in a SSP3 HECC world should actively try to orient their conduct along the four cardinal directions suggested by the moral compass. Similarly, the calibration and adjustment mechanisms should be carefully introduced.

In the intermediate scenarios (SSP4 and SSP5) the possible role of the moral compass is instead more nuanced, whereas both scenarios share the necessity that governance arrangements consolidate effective calibration and adjustment mechanisms. SSP4, characterized by high inequality and low carbon intensity, seems less problematic and would likely require that governance arrangements pay particular attention to align their actions with the cardinal direction related to distributive justice issues, i.e., fairness. On the contrary in SSP5—the low inequality, high carbon intensity one, the most problematic of the two intermediate—governance arrangements would possibly need to ensure conduct inspired by the cardinal direction of responsibility in order to lessen/minimize the impact of fossil fuel based development; at the same time, given the very likely powerful carbon lobbies that would characterize a SSP5 HECC world, governance arrangements should aim at acquiring and maintaining the Integrity cardinal direction, as well as autonomy assured by the Independence cardinal direction. However, it is important to underline that the final choices and implications of the application of the moral compass can only emerge from an open and situated deliberation, as those carried out within the IMPRESSIONS project (see also www.highendsolutions.eu) and cannot be anticipated without engaging in such participatory endeavour.

Table 2. SSPs and possible moral guidance provided by the moral compass to governance arrangements.

SSPs	Socio-Climatic Conditions	Moral Guidance
SSP1 Sustainability	Low inequality, low carbon intensity	Fine-tune actions along moral standards and moral principles of the cardinal directions
SSP3 Regional Rivalry	High inequality, high carbon intensity	Orient and shape actions along all cardinal directions
SSP4 Low-carbon inequality	High inequality, low carbon intensity	Orient and shape actions along the Fairness cardinal direction
SSP5 Fossil-fuel development	Low inequality, high carbon intensity	Orient and shape actions along the Responsibility, Integrity, and Independence cardinal directions

5. Conclusions

This article's main objective is to encourage an open discussion about how best to confront the current inadequacy of moral guidance in integrated assessment processes aimed at exploring the transformation of governance arrangements in order to deal sustainably with a HECC future. On the one hand, we have argued that there is not a single conceivable HECC world. On the other hand, and in contrast to some assumptions in transition thinking, we stressed that there is not a univocal pathway to achieve sustainability either. These pathways will ultimately depend on moral choices, whose features need an open discussion accessible to affected stakeholders and large publics. The use of the metaphor of a moral compass is intended to open up such complex discussions in PIA and sustainability science. It is therefore hard to conceive a possible practical application of the moral compass without a well-structured and deliberative process, as both this tool's content and scope may differ in different socio-economic, bio-physical, and political contexts. It is our stance that such moral discussions need to be carried out at the outset of PIA processes, as moral considerations constitute driving forces—and not just static elements—of the various futures to be assessed. The moral compass and its application to think through different and potential futures indicate that humankind is already normatively well-equipped to inform and handle the profound transformations necessary to navigate HECC, as well as, more generally, to specify how a HECC world can be sustainable. The capacity of governance arrangements to implement transformative sustainable solutions for a HECC world is largely dependent on the degree to which the development of such solutions makes explicit and follows normatively sound guidance based on deep cultural transformations and renewals.

Turning the related challenges into beneficial opportunities for societal transformation [76] implies the need to navigate within a robust moral framework of sustainability, which unfortunately at present is still poorly developed or even not acknowledged in many science and decision-making circles. Furthermore, the recourse to moral claims is often only used strategically to justify and ensure the legitimisation of prevalent governance arrangements, which have little to do with sustainability. In other words, moving towards sustainable HECC worlds demands a morally coherent, open, and consistent constitution able to guide transformative action, which, due to the exceptional situation of accelerated global change, can affect traditional conceptions of morality. In the present situation there is, as stressed, a lack of clear moral guidance for the development and application of transformative solutions in many domains of action, from personal, organizational, or systems levels. Such sustainability anomaly—or a lack of norms to confront HECC—creates unprecedented challenges for governance arrangements, which need, therefore, to be better morally equipped in order to chart decisive actions into both biophysical and social territories as yet unexplored [77,78]. To this aim, HECC governance arrangements should shape and orient their actions according to the moral guidance provided by the proposed moral compass, whose purpose is, in fact, to serve as a means for reflection and learning with the objective of framing and steering new social-ecological and governance configurations. The moral compass can thus be used as a heuristic for understanding whether governance arrangements are moving sustainably or not, given that the calculus needed by decision theory may be impracticable or impossible in a HECC world [79]. If governance arrangements were to align their actions consistently with its pillars, they may have a greater chance of sustainably navigating the HECC troubled waters. Overall, we understand that the discussion and use of this heuristic tool could increase the chances to design not only more robust but above all more morally-sound transformative solutions, and in this way reduce the possibilities of producing non-sustainable, unwanted, or morally perverse outcomes. Additionally, the moral compass' calibration and adjustment mechanisms are intended to gauge the degree of moral consistency of governance arrangements' action in different socio-economic and political conditions.

Altogether, the moral compass could provide reliable moral guidance able to operate under different social and ecological futures insofar as it is understood as a starting point for PIA and sustainability science discussions. For this reason, we reiterate that such a tool is not meant to be set in stone or to constitute the conclusive reference for providing moral guidance to HECC worlds. On the contrary, through an iterative process of learning, its practical application and content may be refined and reframed as better sustainable solutions for navigating HECC worlds are being implemented.

Author Contributions: Conceptualization, M.G. and J.D.T.; investigation, M.G. and J.D.T.; writing—original draft preparation, M.G.; writing—review and editing, M.G. and J.D.T.; Figures, J.D.T.

Funding: This research has received funding from the EU Project IMPRESSIONS—Impacts and Risks from High-End Scenarios: Strategies for Innovative Solutions (www.impressions-project.eu; EC FP7/2007-2013 grant no. 603416).

Acknowledgments: We thank Jill Jäger for her suggestions and support.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Proistosescu, C.; Huybers, P.J. Slow climate mode reconciles historical and model-based estimates of climate sensitivity. *Sci. Adv.* **2017**, *3*, e160282. [[CrossRef](#)] [[PubMed](#)]
2. Harrison, P.A.; Jäger, J.; Frantzeskaki, N.; Berry, P. Understanding high-end climate change: From impacts to co-creating integrated and transformative solutions. *Reg. Environ. Chang.* **2019**, *19*, 621–627. [[CrossRef](#)]
3. Harrison, P.A.; Dunford, R.W.; Holman, I.P.; Cojocaru, G.; Madsen, M.S.; Chen, P.Y.; Sandars, D. Differences between low-end and high-end climate change impacts in Europe across multiple sectors. *Reg. Environ. Chang.* **2019**, *19*, 695–709. [[CrossRef](#)]

4. Rogelj, J.; den Elzen, M.; Höhne, M.; Franzen, T.; Fekete, H.; Winkler, H.; Schaeffer, R.; Sha, F.; Riahi, K.; Meinshausen, M. Paris Agreement climate proposals need a boost to keep warming well below 2 °C. *Nature* **2016**, *534*, 631–639. [[CrossRef](#)] [[PubMed](#)]
5. Peters, G.P.; Andrew, R.M.; Canadell, J.G.; Fuss, S.; Jackson, R.B.; Korsbakken, J.I.; Nakicenovic, N. Key indicators to track current progress and future ambition of the Paris Agreement. *Nat. Clim. Chang.* **2017**, *7*, 118–122. [[CrossRef](#)]
6. Athanasiou, T. Paris and after. *Earth Isl. J.* **2015**, *30*. Available online: http://www.earthisland.org/journal/index.php/magazine/entry/paris_and_after/ (accessed on 23 May 2019).
7. Tollefson, J. The 2 °C dream. *Nature* **2015**, *527*, 436–438. [[CrossRef](#)]
8. Rockström, J.; Gaffney, O.; Rogelj, J.; Meinshausen, M.; Nakicenovic, N.; Schellnhuber, H.J. A roadmap for rapid decarbonization. *Science* **2017**, *355*, 1269–1271. [[CrossRef](#)]
9. World Meteorological Organization (WMO). *Statement on the State of the Global Climate in 2016*; World Meteorological Organization: Geneva, Switzerland, 2017.
10. IPCC. *IPCC Special Report on Global Warming of 1.5 °C*; IPCC: Geneva, Switzerland, 2018. Available online: <http://www.ipcc.ch/report/sr15/> (accessed on 23 May 2019).
11. UNEP. *The Emissions Gap Report 2018*; United Nations Environment Programme: Nairobi, Kenya, 2018.
12. Smith, J.B.; Schneider, S.H.; Oppenheimer, M.; Yohe, G.W.; Hare, W.; Mastrandrea, M.D.; Fussel, H.M. Assessing dangerous climate change through an update of the Intergovernmental Panel on Climate Change (IPCC) ‘reasons for concern’. *Proc. Natl. Acad. Sci. USA* **2009**, *106*, 4133–4137. [[CrossRef](#)]
13. Gardiner, S.M. A call for a global constitutional convention focused on future generations. *Ethics Int. Aff.* **2014**, *28*, 299–315. [[CrossRef](#)]
14. Curren, R.; Metzger, E. Preserving opportunity: A précis of Living well now and in the future: Why sustainability matters. *Ethics Policy Environ.* **2017**, *20*, 227–239. [[CrossRef](#)]
15. Tàbara, J.D.; Cots, F.; Pedde, S.; Hölscher, K.; Kok, K.; Capela Lourenço, T.; Frantzeskaki, N.; Etherington, J. Exploring institutional transformations to address High-End Climate Change in Iberia. *Sustainability* **2018**, *10*, 161. [[CrossRef](#)]
16. Dahl, R.A. *On Democracy*; Yale University Press: New Haven, CT, USA, 1998.
17. Jamieson, D. Ethics and intentional climate change. *Clim. Chang.* **1996**, *33*, 323–336. [[CrossRef](#)]
18. Forst, R. Towards A Critical Theory of Transnational Justice. In *Global Justice*; Pogge, T., Ed.; Blackwell Publishers: Oxford, UK, 2001; pp. 169–187.
19. Rawls, J. *A Theory of Justice*, Rev. ed.; Oxford University Press: Oxford, UK, 1999.
20. Dworkin, R. *Liberalism. Public and Private Morality*; Hampshire, S., Ed.; Cambridge University Press: Cambridge, UK, 1978.
21. Miller, D. *Principles of Social Justice*; Harvard University Press: Cambridge, UK, 1999.
22. Grasso, M.; Feola, G. Mediterranean agriculture under climate change: Adaptive capacity, adaptation, and ethics. *Reg. Environ. Chang.* **2012**, *12*, 607–618. [[CrossRef](#)]
23. Paterson, M.; P-Laberge, X. Political economies of climate change. *Wiley Interdiscip. Rev. Clim. Chang.* **2018**, *9*, e506. [[CrossRef](#)]
24. Green, J.; Hale, T.; Colgan, J.D. The Existential Politics of Climate Change. *Global Policy Opinion*. 21 February 2019. Available online: <https://www.globalpolicyjournal.com/blog/21/02/2019/existential-politics-climate-change> (accessed on 23 May 2019).
25. Finnemore, M.; Sikkink, K. International norm dynamics and political change. *Int. Organ.* **1998**, *52*, 887–917. [[CrossRef](#)]
26. Green, F. Anti-fossil fuel norms. *Clim. Chang.* **2018**, *150*, 103–116. [[CrossRef](#)]
27. Brooks, T. How not to save the planet. *Ethics Policy Environ.* **2016**, *19*, 119–135. [[CrossRef](#)]
28. Gunningham, N.; Kagan, R.A.; Thornton, D. Social license and environmental protection: Why businesses go beyond compliance. *Law Soc. Inq.* **2004**, *29*, 307–341. [[CrossRef](#)]
29. Sandler, R.L. *Character and Environment: A Virtue-Oriented Approach to Environmental Ethics*; Columbia University Press: New York, NY, USA, 2007.
30. Thaler, R.H.; Sunstein, C.R. *Nudge: Improving Decisions about Health Wealth and Happiness*; Yale University Press: New Haven, CT, USA; London, UK, 2008.
31. Kortetmäki, T. Reframing climate justice: A three-dimensional view on just climate negotiations. *Ethics Policy Environ.* **2016**, *19*, 320–334. [[CrossRef](#)]

32. Tàbara, J.D. Integrated Climate Governance (ICG) and Sustainable Development. In *European Research on Sustainable Development*; Jaeger, C.C., Schellnhuber, J.H., Brovkin, V., Eds.; Springer: Berlin/Heidelberg, Germany, 2011; pp. 91–109.
33. Nagel, T. *Equality and Plurality*; Oxford University Press: Oxford, UK, 1191.
34. Rawls, J. *Political Liberalism*; Columbia University Press: New York, NY, USA, 1993.
35. Cohen, J. Pluralism and Proceduralism. *Chic. Kent Law Rev.* **1994**, *69*, 589–618.
36. Ceva, E. Plural values and heterogeneous situations: Considerations on the scope for a political theory of justice. *Eur. J. Political Theory* **2007**, *6*, 359–375. [[CrossRef](#)]
37. Ceva, E. Impure procedural justice and the management of conflicts about values. *Pol. J. Philos.* **2008**, *2*, 5–22. [[CrossRef](#)]
38. Rhodes, R.A.W. The new governance: Governing without government. *Political Stud.* **1996**, *44*, 652–667. [[CrossRef](#)]
39. Kickert, W.J. Autopoiesis and the science of (public) administration: Essence, sense and nonsense. *Organ. Stud.* **1993**, *14*, 261–278. [[CrossRef](#)]
40. Jamieson, D. Responsibility and climate change. *Glob. Justice Theory Pract. Rhetor.* **2015**, *8*, 23–42.
41. Tàbara, J.D.; Giner, S. Diversity, civic virtues and ecological austerity. *Int. Rev. Sociol.* **2004**, *14*, 261–285. [[CrossRef](#)]
42. Mill, S.J. *Representative Government*; Original ed. 1861; Batoche Books: Kitchener, ON, Canada, 2001.
43. Leopold, A. *A Sand County Almanac*; Oxford University Press: New York, NY, USA, 1949.
44. Earth Charter Initiative. The Earth Charter. Available online: <http://earthcharter.org/discover/the-earth-charter/.2000> (accessed on 23 May 2019).
45. Godoy, E.S. What's the harm in climate change? *Ethics Policy Environ.* **2017**, *20*, 103–117. [[CrossRef](#)]
46. Regan, T. *A Case for Animal Rights*, Rev. ed.; University of California Press: Berkeley, CA, USA, 2004.
47. Held, V. *The Ethics of Care*; Oxford University Press: New York, NY, USA, 2006.
48. O'Neill, E. The precautionary principle: A preferred approach for the unknown. *Ethics Policy Environ.* **2016**, *19*, 153–156. [[CrossRef](#)]
49. Burke, E. Mr Burke's reflections on the revolution in France. In *The Works of the Right Hon. Edmund Burke*; Rogers, H., Ed.; Samuel Holdsworth: London, UK, 1790; Volume 2, pp. 382–475.
50. Buchanan, A. *The Heart of Human Rights*; Oxford University Press: Oxford, UK, 2013.
51. Mann, M.E.; Rahmstorf, S.; Kornhuber, K.; Steinman, B.A.; Miller, S.K.; Coumou, D. Influence of anthropogenic climate change on planetary wave resonance and extreme weather events. *Nat. Sci. Rep.* **2017**, *7*, 45242. [[CrossRef](#)]
52. Becker, T.E. Integrity in organizations: Beyond honesty and conscientiousness. *Acad. Manag. Rev.* **1998**, *23*, 154–161. [[CrossRef](#)]
53. Brennan, G.; Pettit, P. The Feasibility Issue. In *The Oxford Handbook of Contemporary Philosophy*; Jackson, F., Smith, M., Eds.; Oxford University Press: Oxford, UK, 2007.
54. Green, D. The spatial distribution of extreme climate events, another climate inequity for the world's most vulnerable people. *Environ. Res. Lett.* **2016**, *11*, 091002. [[CrossRef](#)]
55. Sachs, B. The relevance of distributive justice to international climate change policy. *Ethics Policy Environ.* **2014**, *17*, 208–224. [[CrossRef](#)]
56. Miller, D. *Social Justice*; Clarendon Press: Oxford, UK, 1976.
57. Gardiner, S.M. A perfect moral storm: Climate change, intergenerational ethics and the problem of moral corruption. *Environ. Values* **2006**, *15*, 397–413. [[CrossRef](#)]
58. Frankfurt, H. Equality as a moral ideal. *Ethics* **1987**, *98*, 21–43. [[CrossRef](#)]
59. Kanschik, P. Eco-sufficiency and distributive sufficientarianism—Friends or foes? *Environ. Values* **2016**, *25*, 553–571. [[CrossRef](#)]
60. Page, E.A. *Climate Change. Justice and Future Generations*; Edward Elgar: Cheltenham, UK, 2006.
61. Swyngedouw, E. Apocalypse forever? *Theory Cult. Soc.* **2010**, *27*, 213–232. [[CrossRef](#)]
62. *Laudato Si'. Pope Francis' Climate Change Encyclical*; Vatican Press: Rome, Italy, 2015.
63. Sabel, C.F.; Victor, D.G. Governing global problems under uncertainty: Making bottom-up climate policy work. *Clim. Chang.* **2017**, *144*, 15–27. [[CrossRef](#)]
64. Collins, R.; White, N.D. (Eds.) *International Organizations and the Idea of Autonomy: Institutional Independence in the International Legal Order*; Routledge: Abingdon, UK, 2011.

65. Samuelsson, L.; Rist, L. Stakeholder participation as a means to produce morally justified environmental decisions. *Ethics Policy Environ.* **2016**, *19*, 76–90. [[CrossRef](#)]
66. Barry, B. *Political Argument: A Reissue with a New Introduction*; University of California Press: Berkeley, CA, USA, 2002.
67. Grasso, M. Sacchi, S. Impure procedural justice in climate governance systems. *Environ. Values* **2015**, *24*, 777–798. [[CrossRef](#)]
68. Fraser, N. Reframing justice in a globalizing world. *New Left Rev.* **2005**, *36*, 1–19.
69. Thibaut, J.; Walker, L. *Procedural Justice: A Psychological Analysis*; Erlbaum: Hillsdale, NJ, USA, 1975.
70. North, D.C. Institutions. *J. Econ. Perspect.* **1991**, *5*, 97–112. [[CrossRef](#)]
71. Buchanan, A. Keohane, R. The legitimacy of global governance institutions. *Ethics Int. Aff.* **2006**, *20*, 405–437. [[CrossRef](#)]
72. Grant, R.W. Keohane, R.O. Accountability and abuses of power in world politics. *Am. Political Sci. Rev.* **2005**, *99*, 29–43. [[CrossRef](#)]
73. Tàbara, J.D.; Jager, J.; Mangalagiu, D. Grasso, M. Defining transformative climate science to address high-end climate change. Forthcoming. *Reg. Environ. Chang.* **2018**, *19*, 807–818. [[CrossRef](#)]
74. O'Neill, B.C.; Kriegler, E.; Riahi, K.; Ebi, K.; Hallegatte, S.; Carter, T.R.; Mathur, R.; van Vuuren, D.A. New scenario framework for climate change research: The concept of shared socioeconomic pathways. *Clim. Chang.* **2014**, *122*, 387–400. [[CrossRef](#)]
75. Berry, P.M.; Betts, R.A.; Harrison, P.A.; Sanchez-Arcilla, A. (Eds.) *High-End Climate Change in Europe*; Pensoft Publishers: Sofia, Bulgaria, 2017.
76. Tàbara, J.D.; Clair, A.L.S.; Hermansen, E.A. Transforming communication and knowledge production processes to address high-end climate change. *Environ. Sci. Policy* **2017**, *70*, 31–37. [[CrossRef](#)]
77. Ascher, W.L. Scientific information and uncertainty: Challenges for the use of science in policymaking. *Sci. Eng. Ethics* **2004**, *10*, 437–455. [[CrossRef](#)]
78. Tannert, C.; Elvers, H.D.; Jandrig, B. The ethics of uncertainty. *EMBO Rep.* **2007**, *8*, 892–896. [[CrossRef](#)]
79. Lawford-Smith, H. Understanding political feasibility. *J. Political Philos.* **2013**, *21*, 243–259. [[CrossRef](#)]



© 2019 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).