

A NORMATIVE FRAMEWORK OF JUSTICE IN CLIMATE CHANGE

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A normative framework of justice in climate change

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Abstract

The more the various dimensions of climate change are just, the more an international agreement is in principle attainable. That is the reason why justice plays a major role in favouring collective action against global warming.

In this article I spell out the dominant notions of justice and the consequent criteria of equity for the main domains of global warming negotiations, in order to identify a normative ethical framework.

As far as mitigation is concerned, for the definition of a just initial allocation of endowments the reference point should be a per capita distribution corrected by a factor which takes into account all undeserved inequalities, as suggested by Rawls' theory of justice. With regard to the subsequent exchange of endowments, I consider the Pareto principle supplemented by the envy-freeness one as the most viable option.

Turning to adaptation, my point is that the criterion of responsibility based on historical accountability is inevitable. The related underpinning of justice can be found in principle I of Rawls' theory of justice. Finally, for the issues raised by the just allocation of compensations for climate related damages I consider Sen's capability approach the soundest option.

Keywords: adaptation, climate change, equity, justice, international climate agreements, mitigation

JEL: Q54, D63

1. Facing climate change

Climate variations, which are essentially irreversible, are supposed to have a number of impacts on our lives and our ecosystems. For instance: reduced productivity of resources, damage to human-built environments, risk to health and life, damage to 'less managed resources' such as wilderness and biodiversity. The current literature agrees on the conclusion that expected burdens will be heavier for poorer countries¹ (IPCC, 2001b, pp. 6, 8, Grubb, 1995, p. 467), which are more vulnerable because of their greater dependence on agriculture, lack of financial resources, technology and institutional capacity. The poverty-related global warming effects include reduction in crop yields affecting food security, employment, incomes and economic growth, displacement of people from coastal area, exposure to new health risks, increase in the frequency and severity of extreme climatic events. Therefore, such an exceedingly unbalanced distribution of negative impacts is going to widen even more the gap between the North and the South, confirming the view of climate change as essentially a matter of justice.

1.1 Problems

The scientific evidence has demonstrated that the atmosphere cannot continue to absorb greenhouse gas (GHG) emissions at the rate of the latest years. Its indiscriminate use by one party produces an overexploitation that can eventually harm other parties. The atmosphere is in fact a life-supporting common which operates as a collector of man-made emissions. In a social sciences perspective it is a global public good²:

¹ According to Richards (2003, p. 5, note 1): "Between 1990 and 1998, 94% of 568 major natural disasters, and 97% of all disaster-related deaths have taken place in developing countries. Another study has found that 35-40% of the worst catastrophes have been climate change related".

² Specifically, global climate stability is a global public good, and global warming is the corresponding global public "bad".

“In many ways, global warming is the quintessential global pure public good, because each country’s release of GHG augments the world’s atmospheric stock in an additive fashion and each country’s cutback results in a greater cost than benefit for that country unless assurances can be given that a sufficient number of action will act” (Sandler, 1998, p. 225).

The two main characteristics of public goods are: non-excludability (i.e. it is impossible to prevent everyone from enjoying the benefits deriving from the consumption of the good) and non-rivalry (i.e. the consumption of the good from one person does not undermine another’s consumption). Global public goods have also a third dimension: they provide globally available benefits unconstrained by national boundaries. These elements may eventually provoke a policy failure, inducing some countries not to participate (or to participate in a limited way) in the provision of goods themselves. This failure is ascribable to a series of problems in public behaviour, such as the prisoner’s dilemma and free riding. According to the former, the provision of a global public good, though in everyone’s interest, remains unsatisfactory because it is unclear both how the associated collective actions should take place, and who should coordinate them. And without shared information and cooperation, is very unlikely to reach an efficient and fair allocation of the services delivered by the public good. The latter problem of free-riding occurs when some parties benefit from the public good (because of its non-excludability) without participating in its provision. Hence there is a strong incentive for everyone to escape facing its cost, waiting for others to take initiative.

1.2 Strategies

The voluntary based consent implied by the Westphalian principle, stating that obligations may be imposed on a sovereign state only with its consent, suggests that no supranational institution can, unilaterally and legitimately, adopt any climate treaty and bind states to comply with it: such a treaty can depend only on voluntary agreements³. Furthermore, appeals to global economic efficiency alone are not sufficient to rally countries together, given the wide disparities in their well-being implied by mitigation policies, different vulnerability levels, and diversified costs of adaptation to climate change impacts. At the same time, there is widespread consensus on the fact that greater cooperation is likely if the climate agreement is perceived to be fair both in its process and in its outcomes⁴ (Shue, 1992). Inevitably, then, justice plays a major role as a unifying principle to facilitate collective actions against global warming: the more climate negotiations are informed by justice, the more the participants and the more a global manageable solution can in principle be achieved.

There are basically two main strategies to deal with climate change: mitigation and adaptation. Mitigation is defined as “an anthropogenic intervention to reduce the sources of greenhouse gases or enhance their sinks” (IPCC, 2001c, p. 3), in order to reduce their concentration in the atmosphere. Adaptation relies on the development of adaptive capacities for vulnerable natural and human systems, in order to resist physical effects due to climate variability. These two routes obviously reinforce one another: “Adaptation is a necessary strategy at all scales to complement climate change mitigation efforts” (IPCC, 2001a, p. 23).

The chances that the adverse effects of global warming will take place are rather poorly understood and the ensuing socio-economic outcomes are even less foreseeable. GHG have a long persistence in the atmosphere, climate variability has global impacts potentially harmful and unpredictable, and the distributions of costs and benefits are not completely known. Therefore, each country has different interests and objectives, and different perspectives on policy options. At

³ This point is partly questioned by the Stockholm Declaration on the Human Environment (1972), which at principle 21 reads: “States have the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other states”.

⁴ Carraro and Bruchner (2002, p. 10) conclude, on the contrary, that cost-effectiveness is more useful than fairness in inducing more countries to enter an international climate coalition. However this conclusion holds only with regard to the outcomes of the mitigation process for the three chosen equity criteria (equal average abatement costs, equal per capita abatement costs, equal abatement costs per unit of GDP), and within the limits defined by the RICE model of simulation.

the same time the UN Framework Convention on Climate Change (UNFCCC), which requires that all countries enter the international policy arena (“meaningful participation”) with a role proportionate to the respective responsibilities (“common but differentiated responsibilities”), implies that all these different claims do not hinder collective actions against global warming. However, since no global institution enforcing an international climate agreement does exist, the deal should be self-enforcing. In turn a self-enforcing commitment is in general more likely when the risk is clear and present, when the stakes are relatively small and when the incentives for free-riding are negligible. This is not, regrettably, the case of global climate change. Consequently any such agreement should be widely shared, a condition which is certainly favoured when the agreement itself is informed by principles of justice and shaped by criteria of equity. In fact, justice and equity imply greater legitimacy and can persuade parties with conflicting interests to better cooperate in collective actions. Hence sticking to principles of justice and criteria of equity is the straightest, if not the only, way to effectively address the “common but differentiated responsibilities” demanded by the UNFCCC.

2 Sharing climate burden: elements of a just puzzle

Justice concerns are rooted in a fundamental difference in the balance of power and in the perception of climate change among developed and developing countries. Power, as a result of natural and historical processes, is unevenly distributed in favour of rich countries, which can in principle use their superior influence in framing convenient international treaties. Furthermore, in the industrialized North⁵ there is an ecological view of the effects of rising temperatures, and hence climate change is seen basically as a problem of threatening the environment. Accordingly, environmental effectiveness is a key criterion in the assessment of measures against global warming. In the South, on the contrary, climate change is primarily perceived as an issue mostly affecting human well-being: the harm is against humans, who have to suffer the physical impacts generated primarily by others, namely the industrialized North. Therefore, the usual North’s conception of justice as the sharing of mitigation costs in the name of a general principle of responsibility is at least incomplete. It must be supplemented by the South’s one, which is essentially focused on the disproportion between the responsibility for and the efforts of adaptation to burdens imposed by global warming impacts.

2.1 What is to be distributed?

In the climate debate the term justice is often used interchangeably with equity and fairness⁶. However, even though these notions are undisputedly interconnected and complementary, principles of justice, alone or articulated in composite theories of justice, exist independently before any process of judgement. Equity refers to normative criteria for orienting the implementation of principle(s)/theory(s) of justice, whereas fairness relies on the individual’s perception emerging after a process of judgement.

Therefore, what is to be distributed, or more specifically which is *lato sensu* the burden to be shared? In general, environmental justice is a social concept focusing on the distribution of environmental benefits, risks and harms among human beings⁷. Coming to climate change, the sharable burden consists of costs (and benefits) both of mitigation efforts for reducing global emissions, and of adaptation attempts for preventing harmful effects of global warming. Regrettably, in spite of the evident complementarity of these two domains of justice, ascribable to the complementarity of mitigation and adaptation strategies for coping with climate change (IPCC,

⁵ Not of course geographically intended, rather in terms of wealth and economic development.

⁶ See, for instance, Muller (2001, p. 273), Ashton and Wang (2003, p. 1, note 1). This perspective can ultimately be ascribed to Adam Smith’s impartial spectator with impartial judgment.

⁷ I halt at the level of human beings and of intra-human relationships, accepting the unavoidable charges of anthropocentrism and of cultural ‘west-centrism’, in the hope of making the problem more tractable. I nonetheless acknowledge the risk of human supremacism, which considers nature just a resource to use indiscriminately and that, treating non-human as inferior and replaceable, is intrinsically unjust and potentially destructive.

2001a, p. 23), burden sharing has been intended mainly, if not solely, as a problem of mitigation. Mitigation is however one side of the justice issue. Adaptation and the consequent compensations form the other. Furthermore, it is important to point out that the global public good nature of climate stability originates a sort of spatial and temporal asymmetry between actions and their external effects (Schukla, 1999, p. 145). Indeed, most of anthropogenic GHG emissions took place in the past decades in developed countries, whereas the largest amount of impacts is going to be suffered by poorer countries. In other words, the distribution of impacts essentially does not depend on the specific profile of each country's emissions. This circumstance, in my opinion, links indissolubly the two dimensions of justice: the sharing of GHG abatement costs and the distribution of costs of impacts and of adaptation. The first issue aims at a just minimization of global mitigation costs by equalizing the marginal cost of abatement, on the basis of an equitable allocation of initial endowments, the rights to use (i.e. to release GHG into) a common resource like the atmosphere. The second seeks a perceptible fair distribution of the dimensions of adaptation processes, both in terms of financing of prevention activities and of compensation of damages.

2.2 Notions and domains of justice

When dealing with global warming, it is necessary to consider both distributive and procedural notions of justice⁸. At the same time, justice has both spatial (within and between countries, the latter declination being our focus) and temporal (between present and future generations) notions. The temporal notion - which is out of the reach of this article - rests on the fact that while actions against global warming and resulting costs are shouldered by the present generation, likely benefits of avoided losses will affect both present and future generations.

I concentrate on distributive international justice between nation states. This does not imply that the question of justice can be defined forgetting individuals or local communities, that directly face diverse climate impacts and have diverse levels of vulnerability, and that therefore are the ultimate subjects of any climate policy. I admit that the process of anthropomorphising nations is, to stay with Sen (in Eyckmans and Schokkaert, 2003, p. 14), a "fantasie" leading to a distortion of sub-national and inter-individual issues. Having acknowledged that, I however assume that justice operates mainly at the state level. Matter-of-factly, in climate-related justice disputes nation states are expected to mediate between supranational interests (e.g. emission abatements, adaptation patterns) and the ones of individuals and communities, essentially related to the mere distribution of costs and benefits deriving from the pursuing of those general interests. Actually, nation states can effectively deal with global scale problems on behalf of their citizens, and in this sense justice, although referring to individuals and communities, can be synthesized, regulated and eventually analysed at the national level⁹.

International climate justice can be framed in the following domains:

- just initial allocation of endowments,
- just exchange of endowments,
- just allocation of costs for preventing and managing the impacts of global warming,
- distribution of wealth and power allowing a just international negotiating process.

The first two points deal with the mitigation of GHG emissions and implicate a sharp and well-delineated question of distributive justice: it is a matter of proportionality according to morally relevant quantifiable attributes. To put it with Aristotle "what is just is what is proportional, and what is unjust is what violates the proportion" (in Muller, 2001b, p. 273).

Alas, no agreed solutions exist. Some privilege an initial allocation of emissions rights according to past or other, say perspective, levels of emissions. Some, according to a libertarian perspective, claim instead rights to the atmosphere as the reference. In this latter perspective a just distribution of endowments depends on the entitlement to use the atmosphere by virtue of being the first one

⁸ Distributive justice concerns the distribution of positive and negative impacts of global warming. Procedural justice relates to the level of participation and recognition of all the actors involved in the decisional processes.

⁹ Nonetheless, taking into account sub national circumstances remains a crucial issue in a further step of climate change studies.

to do so. Therefore the *status quo* is the reference for emissions, and developed countries hold the right to emit at current level, independently of any past or present responsibility. Others look for a path encompassing the arbitrary distribution of social, environmental and economic characteristics of involved parties. As far as the just redistribution of endowments is concerned, the market is by and large considered the best solution to achieve efficient outcomes, and justice concerns are usually defended on the basis of welfare economics theorems.

This controversial situation eventually suggests the urgency to find a just solution, grounded on an equitable distribution of initial endowments and in a morally actable principle to distribute some homogeneous divisible quantities. However, as already pointed out, it is necessary to integrate this partial view of justice and widen its range in order to encompass the other domains, namely the distribution of costs (and benefits) of adaptation and of damages due to climate change effects. From an operational point of view this latter domain of justice, still a distributive one, can be split into two more elements: the financing of adaptation activities¹⁰; and the compensation for the damages and economic losses caused by climate change, in turn based on two subsequent moments, financing and allocation.

Table 1 – Strategy and domains of justice in climate change

<i>Strategy</i>	<i>Domains of justice</i>
Mitigation	Initial distribution of endowments Exchange of endowments
Adaptation	Financing of adaptation activities Compensation for damages (financing and allocation)

The first aspect deals with the division among countries of costs of adaptation programs and projects. The second issue copes with the raising and the allocation of resources available for damage compensation. This last point has very scarcely been considered, neither at the theoretical nor at the practical level, but it is very likely going to play a fundamental role in the framing of future climate commitments (Paavola and Adger, 2002; Ringius and Frederiksen, 2002).

Finally, while the first three domains are focused on the distributional notion of justice, the fourth one deals with the procedural one, that is on the equity and fairness of the process by which a possible agreement is attainable. A viable climate treaty should grant all the parties equal access, and ensure that issues posed by subjects who believe to have interests at stake be fairly dealt with. Another, more problematic, aspect of procedural justice involves the effective capacity of parties to participate in the negotiation processes. Actually, climate negotiations are extremely complex, and therefore only richer countries can usually afford platoons of skilled negotiators, while poor parties send to the battlefield few if not only one negotiator. Matter-of-factly most of the climate change debate is carried out among institutions, scholars and activists from the richest industrialized countries (and from oil countries, in the latest year), whereas procedural justice would require assuring equal opportunities to all involved parties to protect their own interests.

In what follows I focus on the distributive aspects of justice, because the aim of this article is that of setting a normative framework for justice and equity issues in mitigation and adaptation domains. Therefore procedural justice is out of the picture. Nonetheless I acknowledge the all important role that it is going to play in future climate change negotiations.

3. In need of a comprehensive normative framework of justice

Political philosophy devotes many efforts to the exploration of issues of justice. Specifically, it has delivered a number of theories of justice, intended as a set of principles for guiding public judgement in addressing and organizing the various aspects of justice¹¹.

¹⁰ There are not allocative issues here, since adaptation activities are usually financed on a project basis. The selection of projects would imply allocative questions, but this point would lead the analysis too far.

¹¹ In these theories equality and liberty are often the most important issues dealt with. Non-surprisingly, the main difference among them is to be seen in the way in which they articulate and balance equality and liberty.

The main philosophical approaches that lay behind the debate on justice can be generally framed in four theoretical families. The first one is focused on the observation of consequences and end states and can be paradigmatically represented by utilitarianism and welfare economics. The second category is based on individual responsibility and proportionality: Nozick's entitlement theory is the epitome of this libertarian perspective. The third one is centred on equality, needs, opportunities and freedom and reveals a general concern for the least well-of members of society. Rawls' social contract theory and Sen's capability approach¹² are probably the most significant examples of liberal theories of justice. Finally, there is a group of theories stressing the importance of considering the notion of justice as context related¹³, which I do not consider appropriate when dealing with global public goods and supranational issues¹⁴.

The point of this paper is neither to analyse the various families and theories of justice, nor to formulate an exhaustive theory of justice. Rather, I intend to spell out the dominant dimensions of justice and equity with respect to the specificity of global warming, in order to identify a comprehensive normative framework for climate-related justice.

The domains of justice of table 1, in my opinion, can be framed according to the theories of justice and consequents conceptions of equity put forward in table 2.

Table 2 – Strategies, domains, theories of justice (TJ) and criteria of equity in climate change

Strategy	Domains of justice	Theory of justice	Criteria of Equity	
Mitigation	Initial distribution of endowments	Rawls' TJ I & II principles	Differentiated equality (on the basis of unjustified inequalities)	
	Exchange of endowments	Utilitarian TJ Welfare economics	Pareto optimality supported by Envy-freeness	
	Financing of adaptation activities	Rawls' TJ I principle	Responsibility (based on historical accountability)	
Adaptation	Compensations for damages	Financing	Rawls' TJ I principle	Responsibility (based on historical accountability)
		Allocation	Sen's TJ Capability approach	Capability lack (in the space of functionings)

Global problems need global solutions. Global climate solutions in turn have to gain the consensus of the largest number of sovereign parties, which are more prone to enter an international agreement when it is perceived as fair. Hence the more the various dimensions of climate change (the domains of tables 1 and 2) are just, equitable and perceived as fair, the more a climate agreement is attainable, even if the grounds for consensus diverge among actors. It is in fact the existence of a comprehensive ethical framework that can make a climate agreement acceptable in spite of the great variability of climatic outcomes. That is the reason why justice plays a major role as a unifying principle to facilitate collective actions against global warming.

3.2 Justice in mitigation

The issue of justice in mitigation can be seen as a problem of defining a just initial allocation of endowments and equitable consequent exchange patterns. The first point has generated a notable debate and a vast literature, which I am not going to review. The second one has been so far underestimated, attributing to the market the role of ensuring efficient transactions of emissions

¹² Even if, according to Sen (1999), the capability approach simply specifies an evaluative space and therefore it cannot be considered a complete theory of justice. Rather, it is an important constituent for a new general theory of justice, and this is the reason why I consider it important in the climate debate on justice.

¹³ Some authors attack from particular perspectives, such as the feminist or the communitarian ones, the abstractness - Rawls himself describes his theory of justice with an oxymoron as "realistically utopian" - of general theories of justice, proposing alternative, more concrete and contextualized approaches. On this ground these critics are increasingly questioning the universalism of liberal theories of justice.

¹⁴ At least at this general level. Indeed, when entering into the details of an operational framework of justice, they can prove very useful to deal with particularisms.

rights, in the name of the second theorem of applied welfare economics which intends markets as means to reach any desired distribution of resources potentially purported by initial allocations. I intend, conversely, to highlight separately the notions of justice and the consequent criteria of equity that can provide a common and ethically justifiable ground for GHG control processes.

3.2.1 Distribution of initial endowments

As far as the distribution of initial endowments is concerned, in the climate change theoretical literature an equal *per capita* distribution of entitlements is generally considered the most just, equitable and fair alternative (IPCC, 1996, p. 106). Unfortunately, it is by no means the most viable, being rather quite unfeasible. Actually, it would result in the largest ever wealth transfer from developed to developing countries¹⁵ (Panayotou et al., 2002, p. 440), and therefore it would be harshly opposed by rich and influential countries. Realistically, an agreement incorporating such a criterion has no chance to succeed.

I alternatively propose an ethical framework based on Rawls' theory of justice (RTJ). RTJ intends justice as fairness, and is based on two principles of justice which guide equal, free, mutually disinterested, rational individuals in their judgments about their social contract and their economic and social arrangements. The first - the egalitarian principle - states that every individual has the same right to the most extensive system of equal basic personal and political liberties, rights and duties, compatible with a similar system for all. The second - the difference principle - holds that inequalities are tolerable only if they satisfy two conditions. First, legitimate inequalities can characterize only situations open to all, under conditions of fair equality of opportunity. Second, inequalities must be to the greatest benefit for the least advantaged members of society¹⁶. In brief, "An injustice is tolerable only when it is necessary to avoid an even greater injustice" (Rawls, 1971, p. 4).

These principles form the basic structure of societies, insofar they:

"are to regulate all further agreements; they specify the kinds of social cooperation that can be entered into and the forms of government that can be established. This way of regarding the principles of justice I shall call justice as fairness." (Rawls, 1971, p. 11).

In particular, the difference principle requires a socio-economic system that lessens illegitimated and undeserved inequalities. Put slightly differently, it holds that inequalities owing to differences in contingencies of social and natural fortune be minimized. Eventually, the two principles say that (principle I) in order to assure to any individual a real equality of opportunity, (principle II) society must pay more attention to those whose life is more affected by "arbitrariness of natural contingency and social fortune" (Rawls, 1971, p. 96), i.e. to people with fewer assets and born in disadvantageous positions. Rawls seems hence to refer explicitly to "the old and relatively uncontroversial Aristotelian notion of treating equals equally, in strict accordance with the rules, to ground a theory of justice which allows considerable discrepancies in equality." (Cullen, 1992, p. 19).

Furthermore, Rawls points out that each and every individual "possesses an inviolability founded on justice that even the welfare of society as a whole cannot override" (Rawls: 1971, p. 3). Therefore a central point of the difference principle is the definition of the notion of this inviolability in terms of advantages. Being advantaged is basically determined by the availability of primary goods and services. Each individual is in fact entitled to a certain minimum level of basic goods and services such as food, clothing, shelter, social services, health, education, income. In my opinion, in current societies emerges vigorously another fundamental basic need: energy requirement, that is the availability of energy services.

¹⁵ According to Aldy et al. (2001) this criterion would also generate other problems. The emission limit would not be binding for developing countries for a long time; the allocation scheme could foster population growth; it would give a large share of the permits to a very limited number of countries (38% to China and India); finally, it would not consider the circumstances of different countries.

¹⁶ These principles are integrated by rules of priority, both between the principles themselves (the priority of liberty) and within the second one (the priority of justice over efficiency and welfare).

My essential idea is that each individual entails at least a certain level of energy services, which are influenced by 'undeserved inequalities' such as different climatic conditions. At the same time, not all energy services produce GHG emissions: not the ones met by renewables, for instance. Furthermore, some countries might have higher capacity of absorbing GHG emissions, because they have vast forested areas. The uneven distribution of these characteristics eventually jeopardizes the way people can reach a genuine equality of opportunity, at least as far as the access to these energy services is concerned, as prospected by principle I of RTJ.

Hence, to ground the initial distribution of endowments in (principles I and II of) RTJ it is necessary to develop an equity criterion encompassing all the elements determining the fruition of the flow of energy services, with respect to the consequent GHG emissions. I name it the criterion of 'differentiated equality'. It suggests that, according to the egalitarian principle, the reference point must be an equal *per capita* distribution of endowments. On the basis of the difference principle, and of the "arbitrariness of natural contingency and social fortune" it encapsulates, undeserved inequalities, such as the ones in energy needs due to weather conditions, availability of renewables and of sinks, should be reduced. Ultimately, the equal *per capita* distribution of endowments put forward by principle I must be corrected by a factor which takes into account all these different elements influencing the demand for GHG emitting energy services, as required by principle II.

3.2.2 Exchange of endowments

There is widespread evidence that the negotiation of carbon endowments among countries would benefit all participating countries and would make possible more stringent emissions cutbacks in the future (Bohm, 2000). This is due to the fact that marginal costs of emissions abatement differ greatly among countries. Therefore the search for efficiency calls for a redistribution of emission rights equalizing different marginal costs. In economic terms the outcomes of such an efficient redistribution are considered to be Pareto-optimal social states, in the sense that there are not other social states that can make someone better off without making at the same time someone else worse off.

Pareto optimality is the core of new welfare economics, which in turn upholds that choices, according to act utilitarianism, are evaluated only in terms of their consequences on social welfare, which hence depends solely on individual utility¹⁷. Utilitarianism, in the wake of Jeremy Bentham and John Stuart Mill, David Hume and Adam Smith, considers as the sole axiom for morality the principle of utility, or the 'greatest happiness principle', stating that societies must pursue the greatest happiness for the greatest number. Utilitarianism is a consequentialist doctrine, insofar the rightness of conduct depends solely on the goodness of outcomes. The Pareto principle overtakes the strong cardinality and comparability assumptions of utilitarianism, endorsing the much weaker value judgment mentioned above. Unfortunately Pareto-optimality ignores justice issues. In fact different states can be Pareto-optimal and still highly unjust: "If preventing the burning of Rome have made emperor Nero feel worse off, then letting him burn Rome would have been Pareto-optimal. In short a society or an economy can be Pareto-optimal and still be perfectly disgusting" (Sen, 1970, p. 22). Hence the Pareto principle by itself will necessary lead to the defence of the *status quo*. Nor even the Kaldor-Hicks compensation principle is sufficient to make it include justice issues.

Therefore the Pareto principle, though necessary for maximizing the wealth to be eventually (justly) redistributed, must be supported by some criterion of distributive justice. I state this in spite of the fact that I consider an initial allocation of endowments based on Rawls' TJ and on the differentiated equality criterion just. And consequently, according to the second theorem of applied welfare economics, I acknowledge that a number of potentially just final Pareto-efficient redistributions of emission rights could be achieved through market mechanism. This nonetheless holds only in a first-best world, with lump sum redistribution. Alas, climate change negotiations do not take place

¹⁷ Amartya Sen defines this approach welfarism.

on perfectly competitive markets, nor does exist any international body disposing of lump sum redistributive instruments.

Abandoning the theoretical first world heaven, I consider the envy-freeness criterion as a way to choose between different Pareto-optima, thereby identifying allocations that are at the same time efficient and equitable: "To a significant extent, envy-freeness has become the first and foremost 'distributive companion' of the aggregative requirements of Pareto efficiency in the literature of normative economics" (Arnsperger, 1994, p. 155). The absence of envy criterion is the foundation of the quintessential economic TJ, known as the theory of fairness (or of equity). In its simplest form an allocation is envy-free if no agent prefers the bundle of commodities of another. Here individuals envy other's consumption bundle, and not other's utility, therefore this criterion does not involve interpersonal comparison of utility and does not provide a complete ordering of social states, avoiding the Arrow impossibility theorem without an enlargement of the informational basis. As far as GHG emission rights are concerned, Pareto-efficiency and envy-freeness require the possibility of compensation payments to favour the division of a global public good such as (the right to discharge into) the atmosphere. Specifically, the Pareto principle suggests that subsequent redistributions allocate emissions rights where the marginal cost of abatement is lower (generally in countries of the South), till the equalization of marginal abatement costs across emitters. Simultaneously, envy freeness states that Southern countries be compensated¹⁸ by countries with lower initial cutbacks (typically from the North, where marginal abatement cost is higher) for their proportionally larger share of emission cutbacks, in order to prevent any party preferring resulting allocations of endowments and compensation payments of the others, provided that the new efficient allocations can give every party at least the utility implied by the just original one, and no more utility than the one achievable if there were only one party¹⁹.

3.3 Justice in adaptation

The higher vulnerability of the South and the much larger share of past and current GHG emissions of the North make the financing of adaptation activities and the compensation for climate damages major elements of disagreement between developed and developing countries. These topics should therefore be resolved and put at the centre of the stage in order to favour fair and effective climate negotiations.

3.3.1 Financing of adaptation activities

Who should pay for activities put forward in order to avoid the negative impacts of global warming? The polluter-pays-principle says that the ones who have caused the problem are to be held responsible. Accordingly, I assume that as far as financing of adaptation activities is concerned, responsibility based on historical accountability is inevitable. Since climate systems are far too complex to clearly figure out harmed and benefited parties, not to say the dimensions of harms and benefits, it seems to me that the most equitable criterion to make polluters pay is to render their contributions to adaptation activities proportional to their responsibility resulting from historical accountability as measured by past emissions, which are fairly measurable figures.

My point is that in this way it is possible to directly link past emissions of polluters and their contribution to GHG concentration in the atmosphere to specific actions expressing the willingness to support development efforts of most threatened and 'no guilty' countries.

The justice principle backing responsibility based on historical accountability is, again, principle I of RTJ, the egalitarian one, whose ultimate goal is to assure to any individual a real equality of opportunity. Actually, the atmosphere, its absorptive capacity of man-made emissions, is a global public good and the rights to it belong to all actual and potential human beings around the world.

¹⁸ Compensation is intended as the use of a private resource like money for making compensatory payments, in order to attain a just division of a common property resource like the atmosphere.

¹⁹ These are sometimes known as separated criteria, respectively the criterion of individual rationality, and the stand-alone one. I prefer to acknowledge them as precautionary bounds, respectively the lowest and the highest, for the distributions envisaged by Pareto-efficiency and envy-freeness.

All individuals should therefore be assured a certain just amount of endowments. For this amount of endowments to be just to any individual, it is necessary to account for past emissions in order to offer equality of opportunity to everybody, irrespectively from where and when she happens, happened or will happen to live. Otherwise, ignoring historical accountability would imply favouring people who lived in the past in heavy emitters rich countries, and to discriminate against the ones who live now in low emitters developing countries, and, furthermore, against future generations. A normative criterion such as the responsibility based on historical accountability is more likely to be accepted by the reluctant North, the major responsible for actual GHG concentration, when rooted in a sound philosophical framework as the one offered by RTJ.

3.3.2 Compensation for damages

The compensation for damages can be usefully split into two connected but subsequent issues. The first deals with the sharing of the shouldering of costs of climate change impacts. The second copes with the allocation of the resources raised among harmed countries.

As far as the first point is concerned, I consider principle I of RTJ and the criterion of responsibility based on historical accountability as the justice and equity references. The problem is in fact by and large very likely to be the one faced in financing adaptation activities.

Rather the challenges posed by the allocation of compensation payments are more subtle. Intuitively, the most appealing benchmark for grounding the allocation of compensations for damages seems to refer to the notion of vulnerability as spelled by the Intergovernmental Panel on Climate Change (IPCC). According to the IPCC, vulnerability “is the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change” (IPCC 2001b, p. 6). Unfortunately the measure of vulnerability of specific countries, or even regions, is subject to substantial uncertainties due to many factors that are difficult to incorporate adequately into the analyses. Therefore any resulting rankings based on vulnerability cannot be an uncontroversial reference for the allocation of compensations for damages. Once more, justice principles and equity criteria can represent the basis for setting a more agreed allocation of compensations.

From a theoretical point of view the most agreed notion of justice in the (limited) debate about damages compensation seems to be the egalitarian one, grounded in the recognition of the sovereignty of all nations. This approach would provide an egalitarian solution through the allocation of an equal amount of *per capita* resources to all eligible harmed countries. In my opinion the egalitarian principle patently violates principle II of RTJ, and therefore I do not consider it justifiable according to an ethical perspective. Rather, I deem more promising Amartya Sen’s capability approach.

Table 3 - Principles of justice and implications in the allocation of damage compensation

<i>Principle of justice</i>	<i>Implications</i>
Equality	Equal amount <i>per capita</i> to be distributed to all harmed countries
Sen TJ - Capability approach	The more a country/region lacks some achieved functionings, the more damage compensation it receives

I refer to the capability approach primarily as a method for making comparisons of well-being²⁰, that prove ethically sound enough to ground the allocation of damage compensations. In brief, this approach requires “a broader informational base, focusing particularly on people’s capability to choose the life they have reason to value” (Sen,1999, p. 63), to highlight the social and economic factors which give people the opportunity to do and to be what they consider valuable. Thus the capability approach concentrates directly on the substantive freedoms of individuals involved. In this sense, Sen suggests that well-being be considered in terms of functionings and capabilities.

²⁰Indeed, in Sen’s intention it has a far wider significance: it is first of all a framework of thought, which aims to highlight the drawbacks of other approaches in identifying and defining well-being and human development. Since Sen’s interest seems to be mainly concerned with this foundational level, he has never provided a formula or path to carry out welfare and development measurements and comparisons

Functionings relate to what a person may value doing or being: they are the living conditions achieved by an individual and represent a set of interrelated activities and states ('doings' and 'beings') that form her life. Capabilities concern the ability of an individual to achieve different combinations of functionings, and define the freedom to choose the life that she prefers. These two categories are complementary but however distinct:

"A functioning is an achievement, whereas a capability is the ability to achieve. Functionings are, in a sense, more directly related to living conditions, since they are different aspects of living conditions. Capabilities, in contrast, are notions of freedom, in the positive sense: what real opportunities you have regarding the life you may lead" (Sen, 1987, p. 36).

Thus well-being in this perspective deals with the enlargement of individuals' substantive freedoms: capabilities. Nonetheless in order to use the capability approach as a justice reference in the climate debate I introduce a major simplification. I in fact refer to the chosen vector of functionings as the proper normative criterion for ranking harmed countries²¹. Ultimately my conclusion is that the allocation of damage compensations be done with regard to the level of some properly selected achieved functionings: the less the overall level of these achieved functionings, the more, proportionally, damage compensations are due.

At a first glance this perspective seems very similar to the one prospected by RTJ, especially to the focus on the least well off put forward by principle II. In the end both in fact suggest to pay more attention to the most disadvantaged parties. Actually there is a sharp distinction between these two notions of justice. It lies in the different informational base they rely on, the "focal personal features" (Sen, 1990, p. 112). The ones of the Senian TJ are substantive freedoms, while the ones of RTJ are primary goods. According to Sen the ability of converting these primary goods into freedoms varies for individual, social, institutional reasons, and thus equality of primary goods can produce harsh inequalities in the level of enjoyed freedoms. In other words primary goods are only means to achieve freedoms, which are the real ends of development.

The beneficiaries of damage compensations are mostly developing countries, by and large characterized by lower levels of social and institutional capacity of turning resources like primary goods into freedoms, i.e. into valuable beings and doings. This is the reason why I prefer to root the allocation of damage compensations in a ranking based on functionings (ends), rather than in one referred to the simple basis of goods and services (means).

4. So what?

To conclude, what does the normative framework put forward suggest?

When looking for a just initial distribution of endowments the criterion of differentiated equality demands a rule that can take into account the 'net' actual consumptions of GHG emitting energy services. In other words, this rule should be neutral respect of the most striking undeserved inequalities, such as energy needs caused by weather conditions, use of renewables and availability of sinks. This perspective envisions an initial distribution of pollution rights relying on some form of 'cardinalization' of a Borda ranking of countries, where the Borda ordering elements other than population can be *per capita* (i.e. weighted by population): heating needs, cooling needs, carbon intensity of energy use, forested area (all data easily available). A problem remains in the 'cardinalization' of the Borda ranking. A *prima facie* solution, not scientifically significant but with all the strength of objectivity, may be to make the initial distribution of endowments proportional to the Borda sum which determines the relevant Borda ranking.

In the international climate policy arena the Pareto-optimality criterion implies, as far as subsequent exchanges of endowments are concerned, that swaps of emissions rights take place till the reach of a global allocation where costs for the last avoided unit of GHG, i.e. marginal abatement costs, are equal in all countries. This in turn entails that there should be quite a

²¹ Sen himself suggests that at a practical level the most appropriate focus of attention should not always lie in the measure of capabilities: "Some capabilities are harder to measure than others and attempts to putting them on a 'metric' may sometimes hide more than they reveal" (Sen, 1999: 81).

substantial trade of rights from industrialized countries with higher marginal abatement costs, to developing countries with lower marginal abatement costs. In fact, in the North the marginal return of controlling GHG cutbacks has dramatically decreased, while its costs have substantially increased. Developed countries are now working on the steepest segment of the curve of GHG abatement marginal costs. Hence, giving to the South a greater share of emissions' rights, is by any means efficient, since developing countries are still on a low and not very steep segment of the curve. But this state, if justified by Pareto-efficiency, requires monetary compensation making no party prefer the emissions' right and compensation payments of the others, in order to be envy-free. Furthermore, this desired Pareto-efficient, envy-free distribution should maintain every parties' utility between the original level of the just initial state (lowest bound) and the lone-party-gains all one (highest bound). In order to achieve such a just final allocation, in the practical terms of international climate policy, it is necessary that parties that should undertake the majority of GHG cutbacks for efficiency reasons (developing countries) be fully compensated by parties where marginal abatement cost are inefficiently high (developed countries). This solution is the only one that can in principle be both Pareto-efficient and envy-free. At the same time it can assure that neither parties (the South and the North) would be worse off than in the just original situation, nor better off than in the hypothetical stand-alone situation.

The financing of adaptation and damage compensation activities is straightforward. The criterion of responsibility based on historical accountability, purported by Rawls' egalitarian principle, claims evidently for a burden sharing pattern proportional to cumulative emissions or to current concentrations²².

Damage compensation is an issue by and large neglected in actual climate change negotiations, but it is going to play a major role in future agreements, being this topic a priority in developing countries' agenda. My point is that justice and equity concerns raised by the allocation of compensations for climate related damages be rooted in Sen's capability approach. Specifically, they should be carried out proportionally to the level of some properly selected achieved functionings: the less the overall level of these achieved functionings, the more damage compensations are due. Actually, the beneficiaries of damage compensations are mostly developing countries, with lower levels of social and institutional capacities of turning resources into freedoms. Hence it seems preferable to ground the consequent compensations in a ranking based on functionings which encompass also the ability of converting resources into valuable doings and beings, rather than in one that refers only to the basis of goods and services.

In practical terms it is possible to refer to the UNDP Human Development Index (HDI). The HDI is a summary measure of human development, obtained averaging the indices of three basic functionings. They are: 'being able to live a long and healthy life', as measured by life expectancy at birth, 'being able to have an adequate level of knowledge', as measured by adult literacy rate and gross enrolment ratio, and 'being able to have a decent standard of living', as measured by *per capita* GDP in PPP US\$. Though its apparent simplicity and its somehow crude use of the notion of functionings, the HDI has had a notable impact on policy-making and it is still the most known operationalization of the capability approach. With normalization of the indices of functionings, the HDI value ranges from 0 to 1, being 1 the maximum possible value. The difference between the value achieved by a country and 1 measures its lack of capabilities. Therefore the wider this difference, the lower the ability to deal with climate-related damages and the greater should proportionally be the share of damage compensation.

²² According to the Climate Analysis Indicators Tool (CAIT) version 1.5. (Washington, DC: World Resources Institute, 2003, available at: <http://cait.wri.org>.) the two distributions have the highest possible level of correlation (1.00). Actually among the ten highest ranking countries in cumulative emissions, only two, Germany and France, show a slight difference (- 1) in current concentrations ranking.

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