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# Climate Justice from the Point of View of Game Theory

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At the turn of the millennium, the first “climate justice summit” took place in the Netherlands, in Den Haag, organized by CorpWatch in parallel of the United Nations Framework Convention on Climate Change Conference of Parties (6<sup>th</sup>) negotiation<sup>1</sup>. Since then the concept gained in popularity.

The idea behind climate justice is relatively simple: global warming is not a purely bio-physical issue or merely an environmental issue, it also raises political, social and ethical issues<sup>2</sup>. Indeed, not only will global warming have asymmetrical consequences (depending on geography, demography, and level of development) but policies considered for addressing climate change will also have redistributional consequences which cannot be disregarded. If a carbon tax is implemented in Europe and affects only European firms, the relative competitiveness of these firms will logically deteriorate, at least in the short run – the impacts in the long run are harder to predict. If the use of energy is made more expensive, richer households and poorer households will not be affected in the same way; tropical countries, polar countries and temperate countries will also be impacted differently. If a technology is banned (producing energy with coal), countries using that technology might have to invest in new technologies dominated by countries which are not relying on this technology (countries using nuclear power for example). This list of asymmetrical consequences is, of course, far from being exhaustive (suffice it to mention the influence of these policies on geopolitics).

One of the purposes of climate justice could then be to identify a “just” way to address these asymmetrical consequences. From a theoretical point of view,

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<sup>1</sup> See for example: J. KARLINER, “Climate Justice Summit Provides Alternative Vision”, *corpwatch*, 2020 <https://corpwatch.org/article/climate-justice-summit-provides-alternative-vision> (page consultée le 28 avril 2021).

<sup>2</sup> Ethical issues associated with climate change have extensively been explored. For example, J. GARVEY, *The Ethics of Climate change: Right and Wrong in a Warming World*, New York: Continuum Books, 2008; S. VANDERHEIDEN, *Atmospheric justice*, New York: Oxford University press, 2008; E. POSNER, D. WEISBACH, *Climate Change Justice*, Princeton: Princeton University Press, 2010.

considering different definitions of climate justice is certainly fascinating and could indeed highlight many relevant dimensions to address the issue of climate change in all its complexity. For example, should climate justice be considered primarily with an eye on the past or with an eye on the future? Should it be considered as a substantial concept (a concept defined by its content) or merely as a procedural one (the content would then be less relevant than the procedure to identify that content)?<sup>3</sup>

Nevertheless, when implementation and actual policies are considered, climate justice was and still is of little or no guidance. For example, some might argue that the developed world should pay more since they largely contributed to global warming due to their level of pollution during the industrial revolution. The developing world only follows the development footsteps of rich countries and it would be “unfair” to increase their development costs. Others could then reply that, it is certain that rich countries polluted a lot in the past, but they also developed new and cleaner technologies. The developing world could then follow a cleaner development path by adopting these new technologies. Still others, arguing on different lines, might stress that the developed world has a duty to do more since it is already developed, or that the developing world should do more since the increase in global emission is largely due to its development and that, anyways, its population will suffer way more due to global warming.

Focusing on what ought to be (at a substantial or at a procedural level), the concept tends to lose sight on what can be achieved<sup>4</sup>. Even worse, the use of the concept could reveal itself to be an obstacle to the emergence of a global solution (assuming that this global solution will be identified, monitored and implemented, at least in part, through international law). This somewhat counterintuitive result could be made clear using basic game theory<sup>5</sup>. I will first show that the question of climate justice emerged because the game that nations play is not a coordination game but a cooperation game. I will then show that the concept will largely be irrelevant in solving such a game and that it might even have a somewhat negative influence for achieving cooperation.

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<sup>3</sup> On these questions, many interesting points are made in E. POSNER and D. WEISBACH, *Climate Change Justice*, *op. cit.*, note 2.

<sup>4</sup> This would also distinguish between a pragmatic approach and an idealistic approach to real-world problems.

<sup>5</sup> Game theory is now largely used to address international law. See for example, E. POSNER and A. SYKES, *Economic Foundations of International Law*, Cambridge (MA): Harvard University Press, 2013; A. GUZMAN, *How International Law Works: A Rational Choice Theory*, New York: Oxford University Press, 2010. These approaches extensively rely on economic analysis of law. One of the first papers to address the relevance of this approach for international law is certainly J. DUNOFF, J. TRACHTMAN, “Economic Analysis of International Law”, *Yale Journal of International law*, vol 24, pp 1-59. This communication will largely use the methodology presented in these works.

In this paper, I will assume that states are self-interested. Such an assumption may be crude but it will help to highlight some core issues when policies designed to mitigate climate change are considered. Of course, if states are not self-interested (which might be difficult to prove) it is likely that solving international issues would be easier.

## I. Climate justice and coordination games

A coordination game is a type of game in which many pure strategy Nash equilibria exists. These equilibria occur, in general, when the parties to the game choose the same strategy (or at least corresponding strategies). For example, driving on the right side or on the left side of the road is often considered as a pure coordination game: parties do not care as much as what is chosen than the fact that they choose the same strategy<sup>6</sup>. In a pure coordination game, it is also assumed that the payoffs are the same for both parties whatever the equilibrium on which they coordinate. Note that in such a case, the fact that one could prefer to drive on the right side of the road and the other on the left side of the road (a game called a “battle of sexes”<sup>7</sup>) does not change much as long as their payoffs are higher if they chose the same strategy (but this could have an incidence on the stability of the equilibrium). If, one Nash equilibrium leads to higher payoffs than

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<sup>6</sup> This game could be represented in this way:

		Right	Left
		Right	0, 0
Left	1, 1	0, 0	
	1, 1		

<sup>7</sup> This game is generally represented in this way:

		WOMAN	
		Boxing	Shopping
MAN	Boxing	2, 1	<u>0, 0</u>
	Shopping	<u>0, 0</u>	1, 2

other Nash equilibria (a game called an “assurance game”), this equilibrium will be the one selected by both parties since it leads to higher payoffs<sup>8</sup>.

If global warming was a pure coordination game, because, for example, only two different (but not compatible) paths were possible, problems would be easy to solve. The only problem would be to choose a path and if either path leads to equivalent payoffs, the problem could even be solved by flipping a coin. If one path leads to clearly higher payoffs for all parties, then this path will be chosen almost automatically. In this type of configuration, parties have symmetrical interest and there is no incentive to deviate from the equilibrium as long as the other party does not deviate. In other words, there is no incentive to “cheat”. In such a game, obviously the concept of climate justice would be irrelevant (largely because parties’ interests are symmetrical) both for the design of a policy or for the implementation of that policy (and logically compliance should be automatic without any monitoring mechanism). Indeed, the concept is only relevant if parties do not have symmetrical interest in the path to solve global warming (they would then try to “justify” their own preferred path using “justice” arguments) or to interpret and sanction cheating (since cheating is irrelevant in a coordination game).

If global warming could be structured as a battle of sexes, things would be slightly different since there would indeed be some asymmetric preferences. Climate justice could then be used as a rhetorical tool to justify the preferred path of one party at the design stage of an international agreement. However, in such a situation, cheating would still not lead to higher payoffs (since choosing a non-corresponding strategy would only lower the payoffs for both parties) and deviating from a chosen equilibrium (assuming one was chosen) would not be in the interest of one party except if that party believes that the other will also change its strategy or if the game is a sequential game in which each party can observe what the first mover did. If the game is not sequential, it could also be proven that even if a mixed strategy equilibrium exists, it will be inefficient (it will lead to lower payoffs than any other pure strategy equilibrium). Climate justice could also be used at the design stage to argue for some “compensation” mechanisms since

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<sup>8</sup> The game would then have this configuration:

		Player 2	
		Cooperate	Defect
Player 1	Cooperate	(11, 11)	(-1, 10)
	Defect	(10, -1)	(0, 0)

by choosing one path over another, a party does systematically better than the other. The idea would then be to solve a battle of sexes by transforming it into a pure coordination game. However, it is unclear up to what point such a transformation would be feasible: it requires, a minima, to be able to identify who are the winners and who are the losers and to have an idea of the magnitude of the gains and losses which, in most real life situation, is far from being transparent. Monitoring mechanism should also be present to ensure that the compensation is indeed paid since there could be some incentives to cheat (if the preferred path of country A is chosen and country A does not pay country B, country B still have an incentive to stay on the path preferred by country A; retaliation mechanism could only occur regarding other areas in which country A and B are cooperating). And, of course, such a situation does not take into account the incidence of different bargaining powers by parties to a convention on the path finally chosen (but, for our purpose, the path is less relevant than the fact that a path is chosen).

Note that if there were an almost unanimous agreement – at the level of countries or at the level of citizens – about what climate justice is (at a substantial level), then the battle of sexes would be transformed into a pure coordination game. The mere fact that the concept is still debated means that transforming the climate change game into a pure coordination game is far from being a reality.

The major problem with coordination game is that incentives to cheat are non-existent which is unrealistic. Considering these incentives is thus changing the game from a coordination game into a cooperation game.

## II. Climate justice and cooperation games

A cooperation game is a game in which it is in the interest of the parties to cooperate (in that they will earn higher payoffs if they both choose the “cooperation” strategy than if they both choose “non-cooperation”) but in which there is also an incentive to cheat (the strategy in which both parties choose to cooperate is “unstable” since one party could earn a higher pay off by choosing a non-cooperation over cooperation). The most famous game of this kind is certainly the prisoner’s dilemma<sup>9</sup> (in which the dominant strategy is to cheat) and

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<sup>9</sup> This game is represented in this way:

		Player 2	
		confess	don't confess
Player 1	confess	(-6, -6)	(0, -10)
	don't confess	(-10, 0)	(-1, -1)

the emergence of cooperation in such a game as generated a vast literature<sup>10</sup>. Prisoner's dilemma is not the only cooperation game, the chicken game<sup>11</sup> could also be relevant to illustrate the difficulty of cooperation when global change is considered. Since cooperation might lead to higher payoffs for both parties, a cooperation game is not a zero-sum game<sup>12</sup>.

If international agreements regarding climate change are conceptualized as cooperation games, then it is possible to inquire into the function of climate justice at both the design stage and the implementation stage of an international agreement. I will show that regarding the former, climate justice is likely to lead to fuzzy multilateral agreements which normativity is at best dubious. Regarding the latter, climate justice will have an incidence on both the interpretation of deviation, the justification of deviation and potential sanctions.

### A. Climate justice and the design of international agreements

If there were an almost unanimous agreement about what climate justice is (beforehand or after some debates), designing a multilateral agreement would be relatively easy. Its purpose would merely be to implement this idea of climate justice. In such a case, it would even be relatively easy to design a “binding” agreement (assuming that the parties to an agreement want to implement climate justice at the design stage) and to introduce mechanisms for monitoring or solving dispute. It would also be possible to introduce compensation schemes if they are part of what climate justice requires. This could explain why regional agreements (assuming a relative homogeneity of interests within a certain region) often (but not always) appear as more precise and binding than multilateral agreements.

If the content of climate justice remains debated (and it is), and this will logically be the case as the number of parties increases, the content of the international agreement is expected to exhibit certain features. In order to

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<sup>10</sup> Most notably AXELROD R., *The Evolution of Cooperation*, New York: Basic Books, 1984.

<sup>11</sup> This game is slightly different from the prisoner's dilemma but also illustrates the difficulty of cooperation in the short run. The game is of this form:

		II	
		C	D
I	C	3, 3	2, 4
	D	4, 2	1, 1

<sup>12</sup> Most games children play are zero-sum game: there is a winner and there is a loser, what one gets is what the other loses. This type of game is of course not the best to understand what is happening when international cooperation is considered.

accommodate the different concepts of climate justice (and the idea of sovereignty), it is likely to adopt relatively unclear dispositions (it will be easier to agree on them if they leave space for interpretation), to allow for reservation (if some dispositions are considered as incompatible with a country's idea of climate justice), to refuse dispute solving mechanisms (since they have an influence on the definition of climate justice), and sanction mechanisms (for the same reason). The agreement might thus often appear as purely "expressive", as a way to recognize the need for cooperation without being able to fully implement such a cooperation.

The design stage will not only be influenced by conceptions of climate justice, the relative (geo)political power of the parties should also be considered. A regional power might, for example, use its power to "incentivize" some countries to accept a certain conception of climate justice or might influence the number of reservation that certain countries might want to add through the proxies of commercial agreements, foreign aids, military protection or political support in other matters. Some countries might also consider that adopting a regional power's conception of climate justice might facilitate commercial deals with this regional power by showing their "will" to cooperate with them even if this conception of climate justice is not fully matching their interests (regarding climate change). They might also believe that their behavior regarding a specific agreement will also influence their ability to obtain some foreign aid, political support or military protection. Climate justice is certainly not the only parameter that will drive the design of an international agreement and considering the short terms benefits of trade agreements compared to the distant benefits associated with a climate agreement which follows a certain conception of climate justice, it is likely that the second will play a minor role in the design of the international agreement.

Institutional rules governing the negotiation like voting procedures should also be considered. An agreement which requires unanimity (which is the default rule of international agreements) will not be negotiated and framed in the same way as an agreement requiring qualified majority (which could be the case for some regional agreement) or simple majority (purely theoretical at an international level). Agreements for which veto power are allocated to certain countries will not be negotiated in the same way as agreements in which such a power does not exist. And, of course, the rhetorical strength of "climate justice" will vary a lot depending on these institutional arrangements.

Regarding the design of agreements when cooperation is required, climate justice seems to only play a minor – and essentially rhetorical (and instrumental) – role. It could also be considered as playing a negative function regarding the "normativity" of the agreement reached, especially if "climate justice" is believed to be the driving principle of a negotiation.

## **B. Climate justice and the implementation of international agreements**

Adopting an international agreement is not sufficient to ensure cooperation. First, and as we have seen earlier, the terms of the cooperation might be too fuzzy to fully allow for appreciating if a certain behavior is cooperative or non-cooperative. Second, and related, incentives to cheat remains in a cooperation game and climate justice might increase the problem of detection and the relevance of “sanctioning” deviation from a cooperative situation that an international agreement tries to establish.

To ensure cooperation in a cooperation game, mechanisms should exist to identify non-cooperative behavior and sanction them (directly or indirectly, legally or through other mechanisms). Either the fear of a sanction or the belief that the fear of a sanction will lead other parties to not deviate from a cooperative strategy will allow for a sustained cooperation between countries. Ideally, thus, agreements trying to solve a cooperation game should be sufficiently clear in what is and what is not a non-cooperative behavior, should facilitate the identification of non-cooperative behavior through monitoring mechanisms and should also design sanction(s) which are of a sufficient magnitude (considering the limits imposed by sovereignty) to incentivize countries not to cheat and induce a sufficient level of cooperation. Of course, these legal sanction(s) could be supplemented by “social” sanction(s) ranging from reputational harm to some form of economic or political retaliation (in the case of environmental agreement, reciprocity is probably not the best mechanism to ensure cooperation).

If what is a cooperative behavior is structured around a diversity of understanding of climate justice, such that what is a cooperative or a non-cooperative behavior might vary among the parties in a multilateral agreement, the problem of detecting “opportunist” behavior and cooperative behavior (even under the understanding of that term by the party which seems to adopt a non-cooperative strategy) is difficult to solve, even in a world in which efficient mechanisms regarding reporting exist. Indeed, in such a situation each state will have to appreciate whether or not a certain behavior is cooperative or non-cooperative which will have an incidence on the relevance of legal sanctions. In such a situation, it seems that relying on “social” sanctions (understood as non “legal” sanctions) is probably more relevant even if it will disproportionately lead to promote the “climate justice” understanding of powerful nations. In this context, “climate justice” could be an argument to justify a perceived deviation or to “push” certain countries to do more considering, for example, the (positive) evolution of the economic environment.

The act of sanctioning will also have an influence on the reputation of the punisher. Punishing could be considered as “unfair” in certain situations by some, it could also be perceived as too “harsh” considering the deviation or the history

of “deviations”; these elements will have an incidence on the “reputation” of the punisher. The punisher is also be at risk of being “punished” in return; especially if its response is judged as disproportionate. In such situation, “climate justice” will also be a rhetorical tool and will not facilitate coordination between the parties to an international agreement. Of course, if the punisher is sufficiently strong, then it might impose its own conception of climate justice but, in that case, it will be difficult to consider that parties coordinate around an understanding of climate justice, they are merely forced to behave in a way “wanted” by the punisher and such an equilibrium (if it occurs) will be dependent on the relative “power” of parties and coalition of parties.

Regarding implementation, climate justice is probably not a driving principle. It makes, on the contrary, cooperation more difficult since it is too vague to allow for a sufficiently clear distinction between cooperative and non-cooperative behavior.

### **III. Climate justice and the question of trust**

In order to solve a cooperation problem, the major issue is to create trust (not only at the implementation stage, but also during negotiation). If parties to an agreement believe that other parties will not choose a non-cooperative strategy whenever such a choice might seem to pay in the short run, cooperation might be sustainable in the long run since it is also leading to the higher payoffs. This explains why cooperation problems are mostly solved when the number of parties is sufficiently low and when these parties have a long cooperation history; it could also explain the evolution of the content of agreement when an issue is addressed over long period of time (like environmental agreements), the possibility to make reservation(s) or the “soft law” nature of international agreements. It should be added that if a non-cooperative strategy does not offer too important payoffs compared to cooperative strategy, cooperation will be logically facilitated.

On this issue, it is not certain that addressing climate justice will facilitate trust. Indeed, if different parties are not ready to discuss their understanding of climate justice, climate justice might have the consequence of closing debates (since there is nothing to debate) and thus cannot facilitate the emergence of trust. Moreover, trying to solve a problem of cooperation through the use of normative notions might not be very pragmatic since it will not manifest the “will” to negotiate a win-win agreement. It would certainly be better not to refer to such a notion but to concentrate on designing an agreement which will try to be as beneficial as possible, directly or indirectly, to all parties to a convention.

If creating trust is indeed the major issue, it is not certain that addressing the problem of climate change at the global level or through an idea of climate justice is the best solution; it would certainly be better to start with local agreements involving a small number of parties (and since, at a local level, it is likely that preferences are more homogeneous than at a global level, trust should be easier to develop).

## Conclusion

If international agreements are addressed through the lens of game theory, it is unclear how “climate justice” could contribute or even facilitate cooperation or coordination between countries at a global level since, due to its multidimensionality, it is unlikely that a common understanding of “climate justice” would emerge. And indeed, it is very difficult to identify a real-world situation in which the concept of climate justice actually played a decisive or even productive function in designing or implementing an agreement.

If climate change is to be addressed pragmatically, it is probably better to reduce the ambitions of climate change agreements: they might certainly have an expressive function, but they are almost bound to not achieve much. It would certainly be better to concentrate on local and regional levels so that, at these levels, countries might develop trust in each other’s. I am convinced that it is only through local agreements that climate change could efficiently be addressed.