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‘Climate Change and Political Letdown: Understanding Environmental Degradation through the Prisoner’s Dilemma.’¹

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ABSTRACT

This paper attempts to analyze the political uncertainty surrounding environmental degradation by means of utilizing the game theoretical model. It challenges the popular opinion that views the political exchanges over climate change as a super game where players will eventually learn to cooperate through repeated interactions. Instead the paper argues that the climate change problem is essentially a case of ‘one-shot prisoner’s dilemma’ irrespective of the number of times the players interact with one another. To demonstrate the one-shot prisoner’s dilemma at play, it employs the comparative method to explain the climate politics between the major polluters of the world (US, China, Brazil and India). The debate is analyzed at two distinct levels: Intergenerational and Intra-generational level. Lastly, the paper notes the significance of ‘the immediate threat factor’, which it argues poses a fundamental challenge to the political resolution of the climate change problem.

Keywords: *Climate Change, Super Game, One-Shot prisoner’s dilemma, Intergenerational, Intra-generational, Immediate threat factor.*

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Introduction

‘The minimum that is scientifically necessary (to combat global warming) far exceeds the maximum that is politically feasible’ (McKibben, 2001, p. 38). Climate change and the challenge posed thereof, is one of the most important discourses of the modern times. Its importance and severity increases phenomenally as time progresses. Despite the gravity of the issue and sustained warnings by scientists, the problem of climate change and global warming continues to remain politically irresolvable. The raging ‘climate battles’ not only highlights the political divide

¹ This article has been adopted from a research paper that was written when I was doing my Masters in Politics at the University of Warwick. It has, however, not been published before.

among states, but also explicitly demonstrates the weakness of international institutions.

Over the last two decades, countries around the globe have tried to negotiate an effective climate deal but so far all such efforts have failed to achieve anything meaningful and substantial. A fair amount of literature has since been written to identify and point out the reasons for this persistent political failure. Arguably the most standout reason among them concerns our existing cost-benefit preferences.

Climate change problem demands that we reevaluate most of our longstanding cost-effective practices. Most of us fail to realize that the conventional parameters typically used to gauge progress, prosperity and development simply cannot be applied to a problem as colossal as global warming. As Broome (1992) points out:

cost-benefit analysis, when faced with uncertainties as big as these, would simply be self-deception. And in any case, it could not be a successful exercise, because the issue is too poorly understood, and too little accommodated in the current economic theory (p. 19).

It is because of these reasons that ‘game theory’, a branch of applied mathematics (Davis, 1997), has been used by various political and social analysts to explain the inexplicable, namely the climate change problem. In the game theoretical model, the global warming political dilemma is essentially viewed as a game with different players (states) interacting with one another. The payoffs of different states are seen as their respective individualistic interests. Climate change is a global phenomenon that requires all states to address it collectively. However, since the payoffs of countries are determined in an individualist sense, therefore acting collectively may require a decrease or an undesired change of payoffs, hence making cooperation unlikely. Game theory tends to analyze this complex collective action problem.

This paper will primarily rely on ‘Prisoner’s Dilemma’ (a strand of game theory) to analyze the climate change problem. It mainly argues that the current climate crisis is primarily a ‘one-shot prisoners dilemma’.

The paper seeks to investigate the climate change debate at two distinct levels, namely the ‘Intergeneration and Intra-generational levels’ (Gardiner, 2001). It utilizes the comparative model to analyze the prisoner’s dilemma between the three key polluters or players (USA, China, Brazil and India) in the global climate change crisis. In doing so, it will rely on the realist school of thought to dissect the problem. The paper also proposes (what I call) ‘the immediate threat factor’ which will be shown as an important factor responsible for global climate change policy failure.

It must however be pointed out at the outset that this paper is not intended to provide solutions for political disagreements over environmental degradation. It primarily seeks to understand the political intricacies of the climate change problem by using the game theoretical model.

Global Warming- From a Scientific Fact to a Social Reality

“The technical practices of science have constructed the problem of global warming for us in materially and politically significant ways” (Demeritt, 2001, p. 310).

First and foremost a scientific fact, the phenomenon of global warming and climate change is increasingly becoming a social and political reality. It is, therefore,

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imperative to briefly trace its epistemological and ontological roots before formally starting off with its game theoretical dissection. ‘In little more than a decade, global warming has been transformed from an obscure technical concern into a subject of widespread public anxiety and international regulatory interest’ (Ibid, p. 307).

Scientists are usually charged with observing a natural phenomenon objectively and then after empirically testing it, are responsible for explaining its social and cultural implications. This trend primarily owes to our trust in the validity and reliability of the scientific methods. This ‘Under-Labourer Conception’ (Benton & Craib, 2001) has been the dominant approach since the last two centuries. Climate change, essentially a natural occurrence, was observed in the similar traditional scientific context. Bert Bolin (1994) highlights the role of the Climate Scientists,

Their role is to present available knowledge objectively to policy makers, who are in turn responsible for making political decisions based on a combination of factual scientific information as provided by the IPCC and (their own) value judgments (p. 27).

The phenomenon of climate change and global warming formally came to limelight in the last quarter of the 20th century after strong, credible and irrefutable empirical evidence. The scientists have since insisted on its gravity and severity. Ironically, it is the single major finding of natural scientists (of global implications), which has failed to receive any significant attention in over three decades. This is in strong contrast to the prevailing practices and norms, which define and shape our modern society. These facts not only highlight the failure of acceptance and recognition of scientific evidence, but also draw attention to underpinning epistemological challenges.

Thus, the failure of the political elites and social circles to fully acknowledge the scientific findings of climate change not only raises serious questions over our epistemological preferences but also undermines the very fabric of the modern society (as will become evident over the course of this article). The paper will now analyze and understand this peculiar anomaly by focusing primarily on the ‘Prisoner’s Dilemma’. However first, it is important to revisit Hardin’s groundbreaking and timeless *Tragedy of the Commons*.

From Hardin’s Tragedy to Gardiner’s Real Tragedy

Garrett Hardin’s *Tragedy of the Commons* is possibly one of the most remarkable and thought provoking scholarly work over the human impact on environment. Although the celebrated article was written well before the world was even aware of the dangers of global warming, it has immense relevance for the current crisis of environmental degradation. While Hardin is primarily concerned with population explosion and over utilization of Earth’s resources, his tragedy and the dilemma it poses can, however, be extended to the ongoing environmental degradation. I will begin by analyzing one of Hardin’s central arguments: ‘Each Man is locked in a system that compels him to increase his herd without limit- in a world that is limited’ (1968, p. 1244).

Six key words (Each Man, System, Compels, Increase, Herd, Limited World) have been underlined in the aforementioned statement. Each man implies to all individuals and everyone that is responsible for environmental degradation. The

system implies to the modern way of life every one of us has adopted which compels and encourages us to act in a certain way. The herd may imply to the economic benefits we indefatigably pursue and the increase of herd can be associated with maximizing pay-offs. The limited world implies to the finite world we live in along with its finite resources. Thus in other words, this intricate system of 'pay-offs' and the desire of everyone to maximize them in a world of finite resources, lays the foundation for a game theoretical analysis. Hardin focused primarily on individuals, the logic however, can easily be extended to states.

Stephen Gardiner's critique of Hardin's work in *The Real Tragedy of the Commons* is highly relevant to the analysis and central assertion of this paper. Gardiner views Hardin's commons as a 'multi-person prisoner's dilemma' (2001, p. 390). In Hardin's Commons, the two dilemmas that arise are; a) It is collectively rational to cooperate, since everyone prefers the outcome produced by everyone cooperating to no one cooperating. b) At the same time, it is individually rational to not cooperate because when each individual has the choice to decide whether or not he/she will cooperate; each person (rationally) prefers not to cooperate, irrespective of what others do (Gardiner, 2001). However, further adding on to this argument, each individual prefers to not cooperate because there is no guarantee that the other player will cooperate.

Thus in order to avoid the worst pay-offs, everyone at the individual level (assuming all individuals are rational), decides not to cooperate. This indeed is a classic case of prisoner's dilemma where prisoners wanting less jail time would ideally prefer to collectively cooperate; however their desire for less jail time also makes it individually logical for them to not cooperate (Gardiner, 2001).

For Gardiner, the main issue at hand is not the tragedy of commons as presented by Hardin, but the intergenerational dilemma, which is at the root of current climate change crisis. According to him, 'The problem of global climate change has an intergenerational aspect that makes it significantly worse than Hardin's commons, and for this reason (as opposed to Hardin's) extreme responses may be needed to avert environmental catastrophe' (Gardiner, 2001, p. 388).

The intergenerational problem applies to 'future generations'. Future generations are often described as 'those future people whom those presently alive will not live to meet' (De-Shalit, 1995, p. 138). Gardiner considers the future generations as the real victims in the dangerous game of climate politics. Most of the present generations will not be around to witness the real horrors of climate change and environmental degradation, as global warming (from a generational standpoint) is somewhat of a slow process. As Gardiner (2001) vividly points out:

The lifetime of carbon dioxide in the upper atmosphere is over 100 years, so the full (cumulative) effects of current emissions will not be felt until the beginning of the twenty-second century. By contrast, the benefit of burning fossil fuels, the energy thereby produced, is consumed by the present generation (pp. 402-403).

Since no one living right now will possibly be able to experience the true effects of climate change, we all share a strong individualistic interest of ignoring it, whereas the future generation, which is not around to represent itself, will have to face consequences of our actions. As Gardiner (2001) pithily sums up, 'Hence, whereas

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the present generation both causes the environmental damage and reaps the rewards, most of the costs fall on future generations’ (p. 403).

Gardiner’s second case involves the ‘Intra-generational problem’ that implies to the current generational disagreement over addressing the problem of climate change. He points out that even if somehow the intergenerational problem can be resolved there is still the problem of collective action at the intra-generational level. The intra-generational problem is the root of the climate change crisis and a solution to this problem could hold the key to solving the prevailing dilemma. I will now use the ‘prisoner’s dilemma’ to elaborate and develop an understanding of both Inter and Intra-generational problems.

Intergenerational Prisoner’s Dilemma

Though I have briefly touched on this dilemma in the preceding discussion, I will try to elaborate it a little further to support and build my argument later. To accomplish this, I have devised a ‘pay-off matrix’ to analyze Gardiner’s ‘intergenerational problem’ in a purely prisoner’s dilemma sense.

		Future Generation	
		Cooperate	Defect
Present Generation	Cooperate	Lose- Win Much (2,5)	Lose Much- Win (0,4)
	Defect	Win Much- Lose Much (4,0)	Win Much- Lose Much (5,0)

* 5 Being the Highest payoff

The intergenerational prisoner’s dilemma is somewhat tricky because one of the players (future generation) does not exist. Nonetheless, the Pay-off’s in the Matrix primarily imply economic and material benefits, with a slight undertone of moral contentment. ‘Defect’ of FG (future generation) in the pay-off matrix indicates their reluctance to pursue effective climate change policies in their own time. The maximum pay-off for PG (present generation) is (5,0), where both the players defect. So if PG knows that FG is going to defect, then they can reap the advantages by damaging the environment knowing that their future generations will follow suit. On the other hand, the maximum pay off for FG is (2,5), where both players cooperate. As the matrix indicates, there is no ‘equilibrium position’ as both players can change their strategies unilaterally (Davis, 1997), though it may be argued that FG will not change its strategy for two main reasons; Firstly, it will be facing the real threat of climate change in its own time. And secondly, it will morally owe it to the sacrifices of PG (provided PG cooperates).

Thus, the most desired outcome of this dilemma would be (2,5), where both the present and future generations cooperate. This will naturally come at a cost to the present generation, as it will have to drastically cut down on its Green House Gas (GHG) emissions. In the matrix above, it can only be brought about by an appeal to the conscious of present generation along with the guarantee that the future generations will cooperate and honor their sacrifices. Unfortunately, however, we are currently in (4,0) where the present generation is not cooperating while being fully aware of the dangers climate change poses for the future generations and the fact that the future is very much counting on the present generation. Hence, the only

way to achieve a desired outcome out of the intergenerational dilemma would be to appeal to the moral obligation of the present generation (however, all such efforts so far have proven to be futile).

The Intra-generational Prisoner's Dilemma

I will now turn my attention to the 'intra-generational dilemma'. Gardiner's analysis of the intra-generational problem is insufficient and therefore I will subsequently rely on Hugh Ward's work, who has made an extensive analysis of climate change by using different game theoretical models.

I earlier identified lack of 'collective action' as the main impediment to solving the climate change crisis. This verity forms the basis of the intra-generational problem. A basic assumption that can be drawn in this context is that states are unitary actors that make choices between different alternatives so as to maximize their respective payoffs (Ward, 1996).

The prisoner's dilemma preferences for the existing states regarding environmental degradation could be presented as such; '1st preference: I pollute, you don't. 2nd preference: No one pollutes. 3rd preference: Everyone pollutes. 4th preference: You pollute, I don't' (Gardiner, 2001, p. 406). Collectively it is best for all countries to choose the 2nd preference, i.e. no one pollutes, however, on Individual level (since there is no guarantee that the other players will choose the 2nd option), it is best to not cooperate. So even though we can collectively have our 2nd proffered option, everyone ends up choosing the 3rd option since the final decision is made on the individual level. Hence, presenting a classic case of prisoner's dilemma.

The Real World Intra-generational Game

The 1979 World Climate Conference was the first major international event that laid the foundation for the Intergovernmental Panel on Climate Change (IPCC) in 1988. The convention was signed by 153 Countries and came into effect in 1994. The primary aim of IPCC was to stabilize the greenhouse gas concentrations in the atmosphere. Under the IPCC, majority of the countries agreed and signed the Kyoto Protocol in 1997, which came into force in February 2005 after Russia ratified it (Harris, 2010).

Ever since the Kyoto Protocol came into force, it has been criticized and scrutinized by various academic circles. The various reasons for the failure of the protocol can be understood by using the game theoretical model. The major problem with Kyoto Protocol is the absence of the biggest emitter of greenhouse gases namely, USA.

The United States, which accounts for almost 23% of the total world emissions (Gardiner, 2004), has so far been reluctant to participate in Kyoto Protocol. And while it is a signatory to the 2016 Paris Climate Agreement, it intends to withdraw from it in the coming years (as expressed by President Donald Trump who considers climate change as a hoax) (McKee, Greer & Stuckler, 2017). It is often argued by leading climate change experts around the globe that the biggest obstacle in the way of sound global environment policies is the persistent defiance of United States. It is for this reason that I find it imperative to discuss the case of United States separately. The non-cooperation of United States can be understood through a 'comparative analysis model' and by applying the game theory and more precisely, the prisoner's dilemma.

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United States Vs CBI (China, Brazil and India)

I’ll tell you one thing I’m not going to do is, I’m not going to let the United States carry the burden for cleaning up the world’s air, like the Kyoto Treaty would have done. China and India were exempted from that treaty. I think we need to be more even-handed (Bush in Singer, 2002, p. 30).

This statement tragically goes on to show United States’ stance towards global environmental treaties, notably the Kyoto protocol. The Kyoto protocol indeed does adopt a lenient approach towards the developing countries. However, there is deep reasoning behind it. The developing countries are not in the real sense responsible for the current environmental crisis; the blame for this goes primarily to the developed world.

After the dissolution of Soviet Union, United States had emerged as the sole super power. It has maintained this uni-polar status for almost three decades now. With the rise of some developing countries, notably China, Brazil and India (CBI), there is a threat to United States’ hegemonic position in global politics. The United States, under such circumstances, will never accept an environmental agreement that will limit its emissions (and taps its economic growth) but will give a free hand to the developing countries, that it sees as future competitors. In order to analyze this argument from the game theoretical stand point, I have devised a payoff matrix shown below.

		China, Brazil and India (CBI)	
		Cooperate	Defect
United States	Cooperate	(2,2)	(0,3)
	Defect	(3,0)	(1,1)

* 3 being the highest payoff

As the payoff matrix indicates, the best possible (collective) outcome of the dilemma is (2,2) where both the players cooperate and get better payoffs. Unfortunately, however, since both the players are free to make their own decisions individually, they choose to go with (1,1) which is not desired by both. United States is not certain whether CBI will cooperate and assuming that it will defect which might result in the worst outcome (0,3), it too decides to defect. The CBI on the other hand also fear the worst and decide to defect, hence the prisoner’s dilemma. This dilemma in fact is the most crucial of all intra-generational dilemmas and a solution to this may hold the key to a future resolution of the environmental problem.

One Shot Game Vs Super Game

Countries are usually pictured as playing super-games rather than one-shot games. As Ward suggests,

nations should be pictured as having repeated opportunities to make decisions about whether or not to cooperate. They play super-games in which they repeatedly play a one-shot game, the number of rounds being infinite or uncertain (Ward, 1996, p. 852).

Now, it is argued that prisoner’s dilemma in a super-game, are usually resolvable. Firstly, because everyone eventually realizes (through repeated one-shot games) that

individual choices will leave them worse off than they would be otherwise (Gardiner, 2004). Secondly, as Hollis and Smith point out,

‘In a super game players may act differently from how they would act in a one-shot game. If today’s free riders [a country that gets all the benefits of a cooler climate without any effort] are going to be judged in tomorrow’s game, they may decide not to free ride today’ (Hollis & Smith, 1990, p. 22).

If we now assume that climate change dilemma is essentially a super-game, then that would also entail that it can be resolved. It is because of this very point that Gardiner (2004) discounts not just the prisoner’s dilemma, but also the entire game theory as somewhat inadequate to address the climate change problem. Ward (1996), on the other hand, assumes the position that ‘Play is still in the pre-game phase in which some nations are attempting to make commitments in order, finally, to get a favorable equilibrium’ (p. 854). I will disagree with both these positions on two accounts.

Firstly, I believe that climate change should be considered as a one shot prisoner’s dilemma, irrespective of how many times it is played. The reason for this is twofold; firstly, each time the players meet (lets say to negotiate climate change challenges), their respective pay-offs remain the same, this is ensured and facilitated by the ‘Nation State System’. Under the current Westphalian System, all countries are sovereign entities serving primarily their own self-interest. Under the state system, countries are not easily allowed to intervene in each other’s affairs, least of all due to environmental reasons. So irrespective of how many times the countries meet, their pay-offs remain the same as before (I am taking a realist position and assuming that all states are locked in struggle for survival and maximizing their power through the principle of self-help, making cooperation all the more difficult) (Hobbes, 1651).

Secondly, super-game prisoner’s dilemma rests on the notion that ‘if one side ever free rides for a round, the others will punish it by provoking a permanent breakdown of cooperation. When this occurs, play reaches an equilibrium’ (Ward, 1996, p. 855). Additionally, it also requires that the threat of punishment should be credible.

Various different kinds of threats have been suggested by different writers, like trade embargo, sanctions etc. The problem in case of climate change, however, is that there is no possibility of a credible threat. Even if credible threats could be made, they would prove to be ineffective. It is, for example, impossible to threaten United States with trade sanctions. The countries for which such threats could be credible, are mostly poor and underdeveloped countries that are neither truly responsible for the current environment crisis, nor would their GHG emission reduction make any notable difference. Hence, in case of climate change, there is no possibility of a credible threat and because of this each time the players meet, the situation is no different than their last encounter. Thus, it can safely be deduced that climate change is essentially a ‘one-shot prisoners dilemma’, as each time the players meet, their respective pay-offs remain the same (and the situation is no different than their last encounter).

The Curious case of ‘Live and Let Live System’ (Ashworth, 2000)

Since I have chosen ‘Prisoner’s Dilemma’ as my primary mode of game theoretical analysis, I find it imperative to discuss the intriguing case of ‘live and let live system’ observed during the ‘Trench Wars’ in WW1 (an elaboration of this system will also support my main argument). During the trench wars in WW1 (especially during the first two months) the soldiers on the front line, despite orders to the contrary, refrained from shooting the soldiers on the other side, provided the other side observed similar restraint. As Ashworth’s has observed,

Despite the proscriptions of high command, verbally arranged truces were possibly wide spread and probably the most common forms of live and let live during the first few months of trench warfare (Ashworth in Neiberg, 2006, p. 214-215).

This incident indeed presents a fascinating case of Prisoner’s Dilemma. The prisoner’s dilemma preferences regarding the ‘live and let live system’ could follow as such; “1st preference: I kill, you don’t. 2nd preference: No one kills. 3rd preference: Everyone kills. 4th preference: You kill, I don’t. Now the soldiers were expected by their respective high commands to opt for the 3rd preference. A wrong preference could have posed disastrous consequences for both sides, yet they were able to achieve their 2nd preference i.e. cooperation. And surprisingly, this cooperation emerged in the complete absence of friendship and extremely limited communication (Ashworth, 2000).

Axelrod (1984), in ‘*The Evolution of Cooperation*’, explains that cooperation can emerge if ‘individuals have a sufficiently large chance to meet again, so that they have a stake in their future interaction’ (p. 27). The trench soldiers, according to Ashworth, had an obvious stake in their future interaction. One important question that arises here is that if people were able to cooperate in such life threatening circumstances because of future stakes through repeated interactions then why can states not cooperate now to solve the climate change problem, considering they do have repeated interaction (certainly a lot more than the Trench soldiers) and a much greater future at stake (the future of all Humanity)?

The answer takes me to my next argument ‘the immediate threat factor.’ It is true that one of the reasons for successful ‘live and let live system’ was because the soldiers faced each other for long periods (supporting the super-game prisoner’s dilemma model). However, at the same time, they were also faced with the immediate threat of death which made cooperation all the more appealing. One of the tragedies of global warming is that even though it is getting worse with every passing second, we do not feel immediately threatened by it. I believe therefore that the ‘immediate threat factor’ is important in any discussion of climate change. It is an important factor that further explains why countries repeatedly fail to cooperate in their interactions and are continuously caught in the vicious prisoner’s dilemma.

Justice and Fair Play

‘Consequently, because of its causes and its consequences, climate change is an issue that cries out for Justice’ (Harris, 2010, p. 38).

Justice and fair play are very important in any discussion of climate change. Following the course of our discussion, they can be analyzed at two different levels:

Intergenerational Injustice and Intra-generational Injustice. Intergenerational justice is concerned with the injustice being done to the future generations. It is unanimously agreed by the scientific community that the true effects of global warming will be faced by future generations. The sense of justice implies that we have responsibility of passing on a safe planet to our future generations.

The idea that the present generation has a strong obligation to future generation needs yet to be taken to a substantive level. Barry Holden (2002) presents the idea of 'Intergenerational Democracy' in this context. Intergenerational democracy is the idea of representing the future generations- or at least their interests in today's decision-making process (Ibid). The idea appears to be quite attractive but its effective practicality raises serious questions.

The second level, which might hold a key to the first injustice, is the 'Intra-generational Injustice'. Two distinct kinds of intra-generational injustices can be identified. The first is towards the poor and under-developed countries of the world, which are not even responsible for the current environment debacle.

Tragically and unjustly, climate change will cause the most suffering among those least responsible for it. While most of wealthy countries and people will be able to cope with climate change, at least now, millions- and probably billions- of the world's poor will not be so lucky. (Harris, 2010, p. 17)

The second injustice is towards those countries that are trying to negotiate and resolve the climate change problem. The efforts of the countries that have ratified the likes of Kyoto Protocol and Paris Agreement and are working to negotiate a climate deal are seriously being undermined by the 'free-riders'. The United States in particular is leading all the free-riders of the world.

Harris (2010) in *'World Ethics and Climate Change'* defends the 'cosmopolitan approach'. A cosmopolitan approach recognizes the duties and obligations of all individuals regardless of their nationalities. It assumes that people in one state do not matter any more than people in other states. This approach does seem appealing, as climate change can never be addressed without transcending the tightly locked Westphalian frontiers. Nevertheless, the practicality and applicability of such an approach remains highly questionable.

The 'intergenerational democracy' and the 'cosmopolitan approach' intend to address the 'inter and intra-generational' problems respectively. Both the approaches put faith in human conscious, cooperation and institutions that transcend all borders and restrictions. It is perhaps a gesture towards United Nations (or some super-state organization) taking charge and acting unanimously for all humanity rather than individual nations acting selfishly.

One of the fundamental challenges of the ongoing prisoner's dilemma is that it is essentially a 'non-cooperative game' where players are acting own their own personal convictions and there is no neutral party to enforce their agreements. 'The prisoner's dilemma game is bound to end in tears, unless, any contract agreed to is enforced by the sword' (Hollis & Smith, 1990, p. 15).

Hollis and Smith (1990) suggest 'contractarian thinking' and how it may help the smooth functioning of game theory. They draw on Hobbes's theory of social contract and believe that it might hold the key to resolving various Inter-State games.

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“The challenge for international relations is that, without a world government, all agreements should be dangerously fragile and prone to free riding” (Hollis & Smith, 1990, p. 27). Ward (1996) suggests ‘Regimes of Cooperation’, that provide ‘favorable circumstances for the existence of conditionally cooperative equilibria’ (p. 853). For the Regimes may alter the incentives to free-ride by threatening to reduce free-riders’ payoffs.

While all such propositions are well intended and thought provoking, the fact remains that there is currently no international institution powerful enough to implement or enforce them. It can all therefore be rightly termed as wishful thinking as the climate change game continues to stay in a perpetual state of ‘prisoner’s dilemma’.

Conclusion

I have shown that the climate change game, irrespective of how many times it is played, is essentially a ‘one-shot prisoner’s dilemma’. The main reasons for this can be summarized as follow:

- The respective ‘payoffs’ of the players remain the same; irrespective of how many times the game is played.
- It is conveniently facilitated by the Westphalian state system, which gives near to absolute internal independence to all the players in the game.
- With the absence of world government, countries will continue to serve their respective individualistic interests and maintain the state of prisoner’s dilemma.
- Continued mistrust, particularly between United States and the rising powers, promotes non-cooperation each time the game is played.
- Without ‘the immediate threat factor’ countries are as of now, not immediately threatened by climate change, which encourages them to undermine and ignore it.

Based on my analysis, it is somewhat fair to assume that because of the absence of any world government (or any international mechanism to enforce and ensure compliance) and with the absence of ‘the immediate threat factor’, the notorious and undesirable one-shot prisoner’s dilemma will continue to dominate all political negotiations and discourses on climate change.

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