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**COLLECTIVE RESPONSE TO GLOBAL CLIMATE CHANGE: AN
EXAMINATION OF GLOBAL ENVIRONMENT GOVERNANCE
THROUGH THE SHADOW OF THE FUTURE (Part II)**

This article focuses of possibilities of and obstacles to collective action to mitigating threats and risks associated with global climate change

Key words: *game theory, fossil energy, economic behavior, the shadow of the future, environment, climate changes , global governance*

Realism, liberalism, constructivism, marxism or any other theory of international relations are paradigms to make sense of the world and provide a reference framework for future and past occurrences but much like different house rules applied to the same game can give a myriad of different solutions and results depending on who you ask. This article therefore tries to focus on the actual rules of the game. As many theories rely on game theory to prove their point of view, realists for example that defection is the default position and liberals stating that cooperation is most optimum for game players. This does not leave us with a satisfying answer to what climate change will mean for international relations in the near and further future. To answer that question, we will examine game theory and international relations in more detail notably the shadow of the future.

Allowing for a template function that together that together with climate variables determine the utility of policies but also the underlining lack of motivation to make significant changes. In order to support this conclusion this article will cover the influence of game theory on international relations, what the

shadow of the future is and to what extent the role of the domestic and international pressures has on the game.

This article therefore proposes to run the two-level game within the shadow of the future to better reflect the reality of policy making. This will allow us to come to the familiar and unsurprising conclusion that time is of the essence and the utility derived from policies, in the 21st century, are proportionately linked to the climatic change effects on countries. Thereby indicating that the cliché surrounding the discussion of the more time goes by the harder it will be to effectuate positive outcomes holds true.

Game theory and international relations: how does it work?

Founded by Neumann and Morgenstern in their book *the theory of games and Economic behavior*, game theory, is the study of decision makers behavior in a situation of strategic interdependence, which is also known as interactive decision theory.¹ This theory of microeconomics examines the individual strategies in dependence of expectations on the behavior of others, in the IR mainstream. However, Morgenthau, Walt and Wendt relied on the idea of the rationality of states and therefore can be transplanted to suit the needs of their respective interpretation of IR theory.²

Game theory in and of itself is simply the expression of logical reasoning expressed in mathematical language allowing for greater precision in analysis. It is a sub part of rational choice theory which uses the assumption that actors will pursue their goals rationally.³ This lines-up with the assumptions made by IR theories and makes it possible to model the behavior of individual actors on the

¹ Von Neumann, J. and Morgenstern, O. *The Theory of Games and Economic Behavior* Princeton University press 1944

² Guner, S. 2012

³ Kydd, A.H. 2015

basis of their preferences, their aversion to negative consequences and pursuit of rewards.

Now, the study of IR is an analysis of such interplay amongst states. These interactions involve interdependent goal-directed activities which means that the success in reaching the objectives in the agenda of the state not depend upon its own doings but also the actions of others. In the works of Koehane, and Keohane and Hoffmann, the application of the theory has been utilized to great effect and the literature uses various models to explain cooperation or conflict and even the provides an explanation for the situation of non-maximization of net benefits but accepted equilibriums when considering non-rational factors such as idealism, humanitarianism and reciprocity as driving forces of the decisions by agents.⁴

Game theory is especially suited for most international interactions as they come in bilateral or trilateral situations or where the strategies are not overly complex. The reality of the world's intrigues makes it very difficult to completely model real conditions especially with taking matters such as election cycles, economics and other domestic interests.⁵ A compromise between accurate reflection and model testability must be struck.

Before continuing with our discussion it is important to point out that Lake and Powell emphasize that the subject matter of international relations is simply the study of the interactions themselves, rather than of the issues that constitute their substance and their particular form.⁶ Adopting such a point of view means that international relations and game theory are identical therefore, running the risk

⁴Such as with **Keohane, R.O.** 1984, 1989 and **Keohane, R.O. and Hoffmann, S.** *The New European Community: Decision making and Institutional Change* Avalon Publishing 1991

⁵ *ibid*

⁶ **Lake, David H. and Powell, Robert** "International Relations: A Strategic-Choice Approach" in: Lake, David H. and Powell, Robert (eds.) *Strategic Choice and International Relations* Princeton University Press: Princeton 1999 p. 3

of becoming a mere branch of game theory just as microeconomic theory is sometimes referred to applied branch of calculus. To prevent this from occurring the particular social dynamic interactions must be highlighted. Though this could be seen as a problem there are others who argue that game theory has no explanatory value without the interpretation of an IR theory behind it.⁷ Therefore ensuring that IR theory not becomes an applied branch of calculus. Furthermore, it can be suggested that this is near impossible, as the number of factors from top level governance to local initiatives on different fields needed to make an accurate model requires the models to be simplified. It is thus clear that game theory will remain a tool in the IR toolbox and not the principle study as IR will remain necessary to interpret the data. Having covered what game theory is and what it is not, we can now forge ahead and discuss the problem that we are trying to analyze and how this will influence the game theoretic model.

Climate has often been identified as common resource pool problem. In the microeconomics, this problem was described and explained by Hardin as the tragedy of commons.⁸ In the common herding field in community ownership, the rational individual herders' behavior is to add more and more animals onto the field and this way the cattle will overgraze, thus ruining the grass field. This type of "motivation to increase the using without limit in a limited world" is very often the temptation in international resources, like the international biosphere.⁹

Moreover, climate change is also categorized as a wicked problem.¹⁰ The difficulty of wicked problems outlined by Hulme is that unlike 'tame problems'

⁷Correa, H. Game Theory as an Instrument for the Analysis of International Relations University of Kyoto 2001 p.187-208

⁸Hardin, G. "The Tragedy of the Commons" [Vol. 162, Issue 3859] *Science* 1968 p. 1243-1248

⁹ Hardin 1968 p.1244

¹⁰ See Hulme, M. Why we Disagree about Climate Change: Understanding Controversy, Inaction and Opportunity Cambridge University Press; 4th Edition 2009 ch.8

that might be complex require singular or few policy inputs to result in direct changes. Wicked problems on the other hand have interdependencies, synergies, multiple causal factors and require a plethora of policy inputs. As Hulme discusses it cannot be dealt with by looking solely to the market, technology or government to solve individually,¹¹ but requires active coordination from top to bottom from left to right. As such any game modeling would need to account for both domestic and international situation in terms of gain and loss.

Choosing the right game: why the shadow of the future is a right fit?

There are many types of games to choose from¹² and depending on the strategic dilemma to be analyzed these games can be studied to gain an understanding of the optimum and suboptimum outcomes of the interaction between actors or in our case states. Clearly states have interests and preferences which determine the starting point of any interaction between them. In turn, these states will employ different strategies in order to get as close to their position as possible. The outcome of which is often an equilibrium between one and the other, however this requires players to have the possibility of equal gains and losses which simply does not hold true in the climate dilemma as *status quo* powers would lose relative less or even gain power by bigger changes in the environment.

As was previously mentioned, some have already considered the role of game theory in terms of defense and economics as these are the main concerns of states however some such as Correa encouraged others to the further possibilities on terms of environment, human rights an international law.¹³ However as this

¹¹ *ibid*

¹² **Kydd A.H.** international relations theory: A Game theoretic approach Cambridge university press 2015

¹³ **Guner, S.** "A Short Note on the Use of Game Theory in Analyses of International Relations" in: *e-international relations* 2012 available from <http://www.e-ir.info/2012/06/21/a-short-note-on-the-use-of-game-theory-in-analyses-of-international-relations/> last accessed 28-04-2017

paper has attempted to argue is that the two former are inextricably linked to the environmental conditions those states are faced with.

According to de Canio and Fremstad, who provided an exhaustive analysis on game-theoretic treatment of possible characterizations of climate negotiations between two players came to the conclusion that of 144 distinct 2*2 games with strict orderly ranked utilities that there are only 25 with possible relevance for climate problems.¹⁴ They identified that the negotiations can be represented by No-Conflict Game, Prisoner's Dilemma, Coordination Game, Chicken, Type Game, or Cycle, which would depend on the benefits. They further concluded that the actual state of affairs highly depends on the severity of the risks and the perceptions of governments involved in the interaction. As a result of, their study they referred to scientific information and its conclusion on the severity of climate risks negotiations as a Coordination Game¹⁵ or an assurance game¹⁶ rather than a Prisoner's Dilemma. However, though they came to that conclusion there are several others who are more swayed by the prisoner's dilemma,¹⁷ the issue with the coordination game is that it assumes parties to have equal interests and preferred outcomes. It would also leave little room for another important factor that should also be considered regarding climate change, namely the domestic politics.

For example, rising nationalist agitation may influence the public thereby making cooperation harder, this as Putnam explains is due to the two-level game of

¹⁴DeCanio, S. J. and Fremstad, A. *Game theory and climate diplomacy* [Vol. 85] *Ecological Economics* 2013, P. 177–187

¹⁵ibid

¹⁶ Cole, D. "the problem of shared irresponsibility in international climate law" in: Nolkaemper A et. al. (eds.) *Distribution of Responsibilities in International Law* Cambridge University Press 2015

¹⁷ Wood, P.J. "Climate change and game theory" in: Costanza, R. et al (Eds.) *Ecological Economics Reviews Ann. N.Y. Acad. Sci.* 1219: 153–170; Irwin, T. Implications for Climate-Change Policy of Research on Cooperation in Social Dilemmas in: *Policy Research Working Paper 5006 Background Paper to the 2010 World Development Report* World Bank 2010

multilateral negotiations governments in reaching agreements can only concede as much as the domestic audience will allow them to. As Putnam puts it “*Domestic politics and international relations are often inextricably entangled, but existing theories (particularly “state-centric” theories) do not adequately account for these linkages.*”¹⁸ It is therefore important to take this into account when using a game theoretic model.

There is another issue in game theory that like IR theory that needs to be addressed and that it is based on rational decision making. From the observation made by various research institutes as well as governmental bodies and the EU commission there is a clear rational argument to be made that adaptation and mitigation measures are beneficial in terms of economics, security and socio-politically, Yet so far only piecemeal efforts have been made. What seems to be the case is that states are not rational actors *per sé* but actors rationalizing their behavior rather than acting on rational premises, which is a significant epistemological difference.

This could explain why models on the basis of rational actors are poor reflections of reality. This is true for economic models the same as for international relations theories. It is therefore warranted to discuss some of the discussion on behavioral psychology though in international relations is on the fringe there are those that would argue that as states institutions are social constructs made out of humans it only stands to reason that they too would follow such behavioral patterns.¹⁹ In social experiments for example it has been shown that people are far

¹⁸**Putnam R. D.** “Diplomacy and domestic politics: the logic of two-level games” [Vol. 42, No. 3] *International Organization* 1988 p. 427-460.

¹⁹**Miller R. M.** Time to Make Psychology a Part of International Relations in: *The National interest: foreign policy round table* 2014 available from <http://nationalinterest.org/feature/time-make-psychology-part-international-relations-11872> last accessed 02-05-2017

more inclined to clean up if they see other people having done the same, likewise where the street is well kept there is a decrease in bike theft.²⁰ The international version of this is of course that in international customary law such behavior is also observed where states despite having interest's contrary to the set norm will follow it. Factoring this in would give a further strengthening of the positive and negative externalities of the game theory as individual good acts could lead to proportionately higher positive externalities and vice versa.

Another set of external factors also need to be incorporated into the function as these will play an even more important role in determining the outcome of negotiations because these create the pre-conditional basis on which states will interact with another.²¹

The three main issues that are identified here are also the main issues that are necessary for the analysis of the climate dilemma. Given the criteria, those being a unknown period of time, diverging interests and a common resource pool, the problem that this thesis is trying to analyze fits into the construct of the shadow of the future which closely to represents the conditions nations face in international relations.

Furthermore the three problems associated with the shadow of the future further reinforces this argument, if we consider the elements identified by Carlsnaes et al.²² Firstly due to the repeated interaction there will be added insides to strike a better deal thus driving negotiators towards a stale-mate making

²⁰

²¹ **Bennett, P. G.** *Modelling Decisions in International Relations: Game Theory and Beyond* Mershon [vol.39 issue 11 Int Stud Rev 1995 p.19-52 available from https://academic.oup.com/isr/article-abstract/39/Supplement_1/19/1800866/Modelling-Decisions-in-International-Relations accessed 07-04-2017

²² **Carlsnaes, W. et al** *Handbook of international relations* Sage Publishing 1990

cooperation less likely or profitable.²³ Secondly because survival is at stake the future would be heavily discounted, diminishing the cooperation pay-offs²⁴ and thirdly that the uncertainty of rounds played will, given high stakes, make interlocutors choose defection when asymmetrical gains loom.²⁵ Other than one-off games, the shadow of the future runs for an unknown amount of time. As with a normal prisoner's dilemma states can either defect or cooperate the element of the shadow of the future simply ensures that the eventual defection can be deferred into infinity that would otherwise be highly incentivizes on the other hand it also provides that if states defect there is a possibility to cooperate after the fact as both would still gain more by doing so. Given these problems they accurately reflect what has often been referred to as the slow pace of climate action using it as a model therefore would be more fitting than a coordination game. So, what is the shadow of the future and how does it work? As Axelrod stated the shadow of the future is in principle a cooperation theory "based upon [...] individuals who pursue their own self-interest without the aid of a central authority to force them to cooperate with each other."²⁶ In addition the long term perspective increases the incentives for cooperation the longer the time period the higher the incentive.²⁷ The next section will examine and explore how such a game will look like and how it would be played out to determine the effects it would have on world relations.

How is the game is played out?

²³ **Fearon, J.** "Bargaining, Enforcement, and International Cooperation" [Vol. 52 No. 2] *International Organization* 1998 p. 269–306

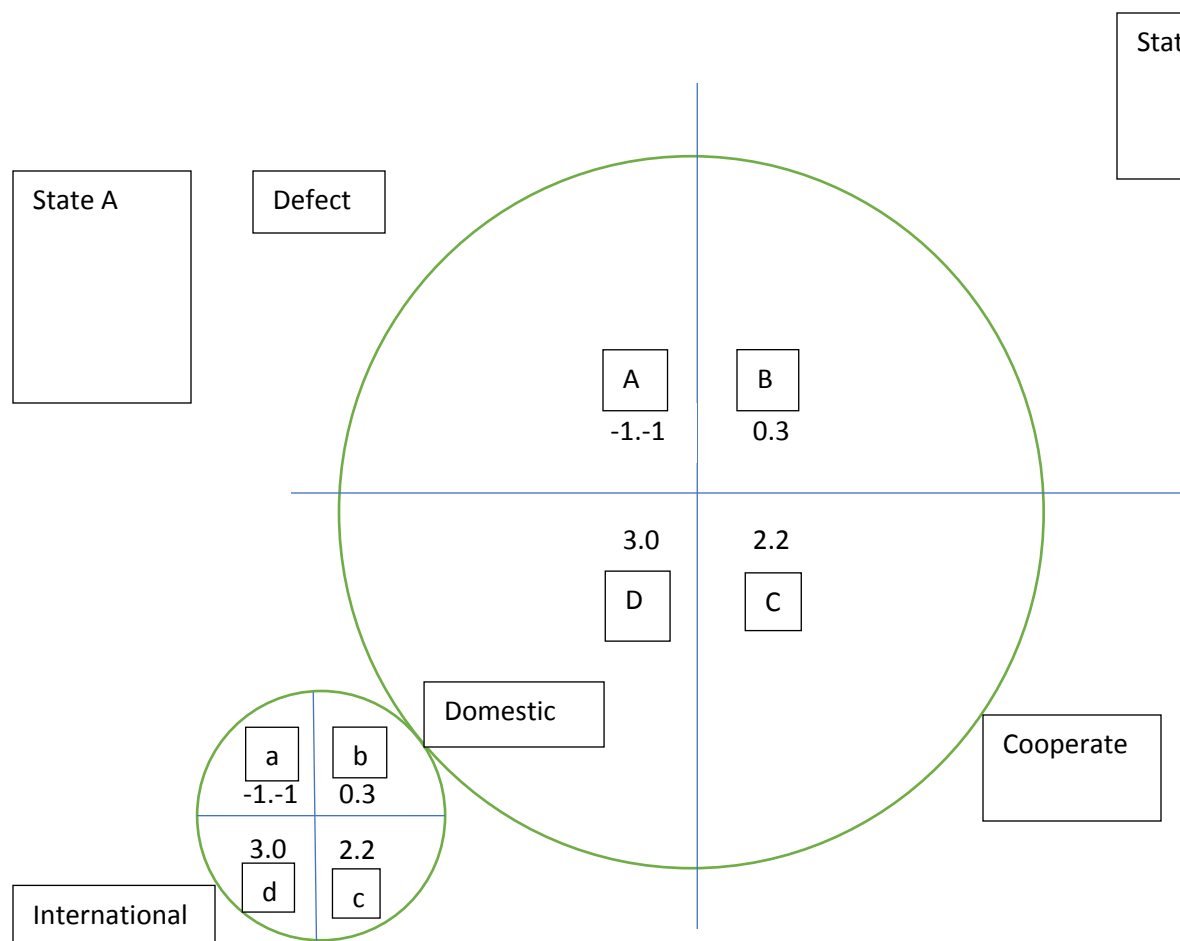
²⁴ **Stein, A.** *Why Nations Cooperate. Circumstance and Choice in International Relations* Cornell University Press 1990 p.87-112

²⁵ **Lipson, C.** "International Cooperation in Economic and Security Affairs" [vol. 37 issue 1] *World Politics* 1984 p.1-23

²⁶ Axelrod, R. *The Evolution of Cooperation* Basic Books 1984 p. 6.

²⁷ **Dal, P.** "Cooperation under the Shadow of the Future: Experimental Evidence from Infinitely Repeated Games" [VOL. 95 NO. 5] *The American Economic Review* 2005 p. 1591-1604

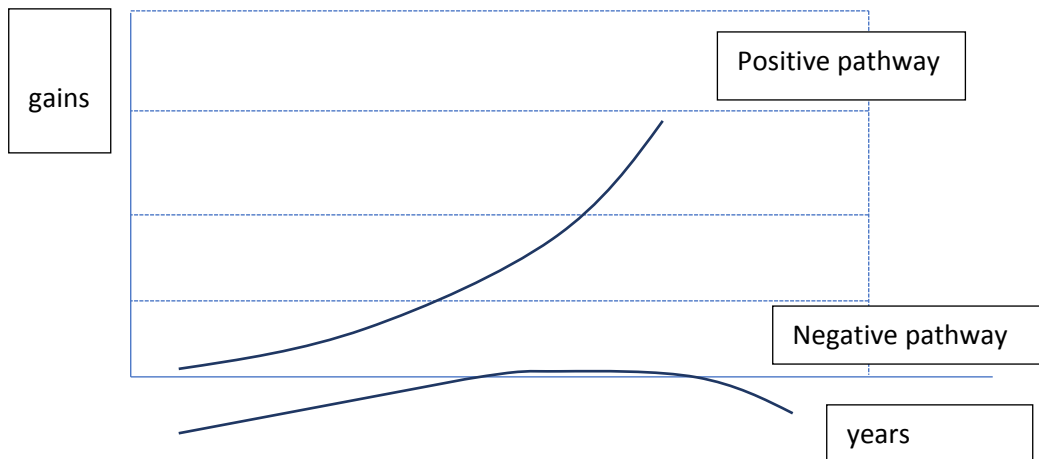
To illustrate this by an example one could imagine that the stop of coal use by china would result in a net gain internationally but would domestically mean more power outages; whereas increased green energies would result in both domestic and international gains. It also allows for the possibility for states to act unilaterally defecting on a world stage while nonetheless benefitting the international community at the cost of domestic gains, this would of course be a sub optimum point but is still a real possibility. These policy implications run in the background of the greater game between states where relative gains matter more. By running two games simultaneously it becomes more reflective of reality as both democracies and autocracies need to keep in mind the domestic game whilst also the international one. Albeit for different reasons but the model is accommodating enough to reflect these differences. Under the motto, the road to hell is paved with good intentions it was necessary to account for the scenario where though both parties were better off the externalities would lead to an overall negative outcome and vice versa, this was necessary to better reflect the conditions set by the climate dilemma being a wicked problem. Below is how it the game looks like graphically.



Deducing from the graph it is therefore possible to have 16 possibilities at any given interaction ranging from -1 to 3, where -1 indicates a loss for all parties including domestically and internationally and 8 being the optimum point as a result of adding the outer cog with the inner cog gives the following function $f(T) = n(a + b) + n\left(\frac{t}{P \cdot pE} - \frac{P \cdot nE}{t}\right)$. Where n is the number of interactions, T the period of time elapsed and a the inner cog and b the outer cog. Unfortunately, due to the wickedness of the problem one also needs to consider the probability (P) of positive and negative externalities occurring, which are represented as pE and nE . Without knowing these values, they only have representative status and would warrant further investigation that goes beyond the scope of this article but by the way the function is set up the less time there is the

more negative externalities would occur, e.g. by way of rash decision making sluggish feedback systems or irreversible climatic catastrophe.

We should also recall that the factors that the climate has on the position and maximization of utility by the state. Hence, we extrapolate from this that U_t as a function of $f(T) = n(a + b + c) + n\left(\frac{T}{P * pE} - \frac{P * nE}{T}\right)$ where C is the condition of the state before the interaction occurs as $C = \left(\frac{F+W+E}{3}\right) - V$. Where F is the condition of food, W for water E economics and V for violence or political cohesion. Plotting this graphically would therefore result in a time line with measurable gains over time by the area under the graph. For simplicity let's say that there is one interaction per year namely COP. These outcomes represent the average of each individual interaction. $Utility \int_x^0 f(x) = n(a + b + c) + n\left(\frac{T}{P * pE} - \frac{P * nE}{T}\right)$



As can be observed from the graph there would still be utility by allowing for a negative pathway this indicates that that despite an overall minimal utility

some countries might still benefit however the marginal returns would continuously decrease, while the opposite would be true for a positive pathway. The greatest determined therefore is time as it rapidly decreases it would mean more drastic policies are required to mitigate and adapt to climate conditions creating more negative externalities. On the other hand, the positive pathway would allow for more time to be generated before catastrophic events hence negatives can be negated. With this in mind we can start discussing how this would work in the real world with the

scenario	category/state	US	Russia	China	EU	G77
B1 $\leq 2^{\circ}\text{C}$	Food	1.4	1.4	1.1	1.6	1.1
	Water	1.0	1.3	1.0	1.1	0.9
	Economics	1.2	1.2	1.6	1.2	1.2
	War/violence	1.1	1.0	1.0	1.1	1.2
B2 2-3$^{\circ}\text{C}$	food	0.9	0.9	0.8	0.9	0.8
	water	1.0	0.9	0.7	0.8	0.7
	economics	1.2	1.2	1.4	1.2	1.2
	War/violence	0.3	0.2	0.2	0.2	0.9
A1/2 $\geq 3^{\circ}\text{C}$	food	0.9	0.9	0.8	0.9	0.5
	water	0.5	0.6	0.4	0.7	0.4
	economics	0.7	0.6	0.7	0.7	0.5
	War/violence	1.1	1.1	1.1	1.1	1.4
A1F1 +4$^{\circ}\text{C}$	food	0.8	0.9	0.8	0.9	0.4
	water	0.4	0.5	0.2	0.6	0.5
	economics	0.6	0.8	0.7	0.7	0.5
	War/violence	1.5	1.2	1.2	1.3	1.6

help of structured analysis on the basis of the IPCC climate models.

When the climate data are scaled from 0 to 2 where 1 is the benchmark for today. The points are awarded on the basis of severity depending on state or region we can by way of structural analysis come to the following table.²⁸

These numbers are presented this way on the assumptions of inter connectedness, climate in those regions, and the consequential effects on economics and violence or even war. The G77 countries are put together because on average they are faced by the same problems in terms of socio-economic structures as well as climate effects being that they are situated in an under the equator. This analysis leaves out small island nations on the basis that they have too little political clout and are likely to be assimilated into the problems of other states such as Australia for the Asia Pacific and the US for the Caribbean region. In short, the higher the cost of inaction the more problems will pervade into the political agenda. In any case referring to the utility function we can observe that C would be significantly different and therefore could adversely or positively affect the situation of the state and its ability to enjoy the benefits of interaction.

What we can deduct from the game model and the structured analysis that action is better than inaction even if this would go against short term interests in terms of overall accrued utility. This was also the conclusion by Zhu-Gang and Cai Wen-Jia in their game theoretical analysis on the key actors in climate negotiations and concluded that in order to secure stability and a win-win scenario for global cooperation it would make sense for the US to assist and compensate technology

²⁸ Please find detailed explanation of the scenario's on the IPCC's website at https://www.ipcc.ch/publications_and_data/ar4/wg1/en/spmsspmpm-projections-of.html last accessed 28-04-2017

transfer to china.²⁹ Though that might have been the simulated outcome the reality of political constraints make this an unlikely event. More convincingly is that argument that china will be able to meet its green energy goals before the US. This is however also a good starting point from which it is possible to discuss state behavior and the role of IR theory in explaining it. This section will continue by discussing the possibilities on a global scale, examining the balance of power in relation to climate and between great powers (US, China, Russia, EU) and their relations to minor states (G77) through the lenses of IR theory and the country's position with the help of the shadow of the future.

The United States as a hegemonic power is the keystone on which climate policy pivots, this was true for the Montreal treaty to combat CFC gases and the relative successes of the COP negotiations have largely been influenced by the willingness of the US to play ball. However, the fact remains that the domestic politics are constraining foreign policy though,³⁰ In terms of climate policy it is more difficult to distinguish international and domestic interests as objectively speaking what at least from a realist perspective its reluctance to binding agreements or goals is not surprising as its survival as hegemon is in greater or lesser extent tied to the petro-dollar. More over the neo-liberalist policies that have been in place has meant that government action has been delegated to market forces that have delivered so well that the targets set have largely been met.³¹ Though NGO's would like to emphasize the point that might only indicates that the targets are not set high enough.³² Constructivist would argue that as long as the

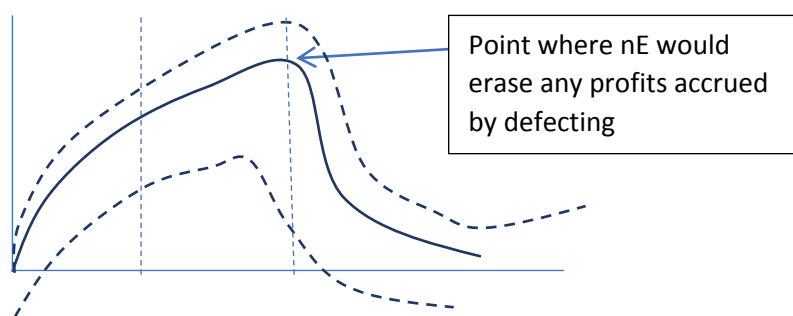
²⁹Zhu-Gang, Jin and Cai Wen-Jia, Wang Can *Simulation of Climate Negotiation Strategies between China and the U.S. Based on Game Theory* [Vol. 5, Issue II Advances in Climate Change Research 2014, P. 34-40 available from <http://www.sciencedirect.com/science/article/pii/S1674927814500056> last accessed 28-03-2017

³⁰ Klein, N. 2013

³¹Kollmus A. 2017

³² Such as CAN; Friends on the earth; WWF; the green cross and Oxfam.

domestic opinion would not change neither would its foreign policy and furthermore the business interests have so interwoven with the political elite that such change in policy would be very difficult to imagine.³³ From these separate liens of argumentation it can only follow that the US would follow the Conference of Parties in a way that would result in a win for domestic interests, assuming that the interlocutors would want to progress with the climate mitigation and adaptation this would usually result in defection or in more moderate terms in the breakdown of negotiations therefore resulting on average on a D2 outcome. Putting this in graphical terms it would mean a rapid acquisition of utility points but due to climate impact, the lack of trust of partners thereby blunting the utility gains and would lead eventually to a Aa, or Ab scenario whereby rapid decreases in utility will be observed. This story would not only apply to the United States but also other economies heavily reliant on fossil industries, such as Canada,³⁴ Norway,³⁵ Saudi Arabia and Dubai if they choose to pursue similar policy positions.



³³ See **Klein, N** 2013

³⁴ **Berke J.** 'No country would find 173 billion barrels of oil in the ground and just leave them': Justin Trudeau gets a standing ovation at an energy conference in Texas Business Insider 10-03-2017 available from <http://www.businessinsider.com/trudeau-gets-a-standing-ovation-at-energy-industry-conference-oil-gas-2017-3> last accessed 02-05-2017

³⁵ Despite its electricity production being 100% renewable the government of Norway has been adamant in maintaining its oil oriented economy rather than diversification through green technologies

Russia is another interesting case as it, like the United States is heavily depended on high oil prices and especially demands for it. Though like the United States the risks and rewards are not always visible in the short run. Safonov and Safonova investigated the crop yields in Russia and found that the potential future losses from a decline in crop yield are considerable on the basis of available data. They estimated that by 2020, losses from a decline in climate-related crop yield will amount to RUB 108bn while by 2050 losses will amount to RUB 120bn in 2012 prices.³⁶ In other words despite some increase in arability of the Russian northwest and northern territories it would not be enough to compensate the losses in other areas. This should put Russia in the same boat as the previous group.

However unlike the US or Canada has a neighbor who is heavily invested in seeing Russia create a green energy producing sector as an alternative to Mediterranean and desert solar power.³⁷ Not only would this allow Russia to supplement any losses from decrease in demand but as some have pointed out it from an EU perspective has a softening effect on Russia's foreign policy creating more win-win situations³⁸ or as liberalism would point out there would be further integration by the creation of a new energy market based on abundance rather than scarcity. It is not like green energy is new to Russia as it has been the first to employ wind turbines for energy production and a major pioneer of hydro technology.³⁹ The energy production potential it possesses is unrivaled and since it

³⁶Safonov, G. and Safonova, Y. Economic Analysis of the Impact Of Climate Change on Agriculture in Russia National and Regional Aspects in: *Oxfam research reports* 2013

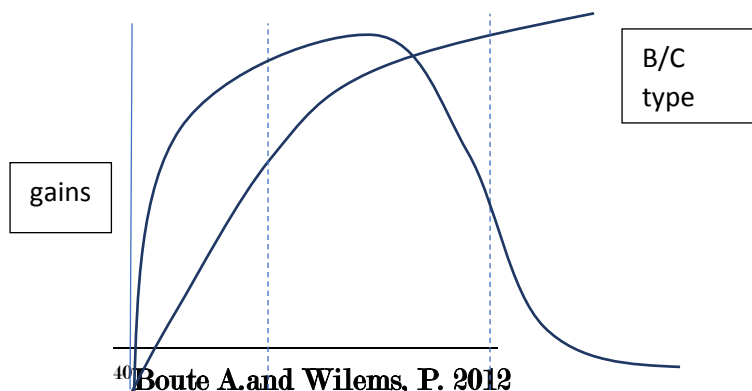
³⁷Boute, A. and Wilems, P. "RUSTEC: Greening Europe's Energy Supply by Developing Russia's Renewable Energy Potential" (No. 51) *Energy Policy* 2012 p.618–629

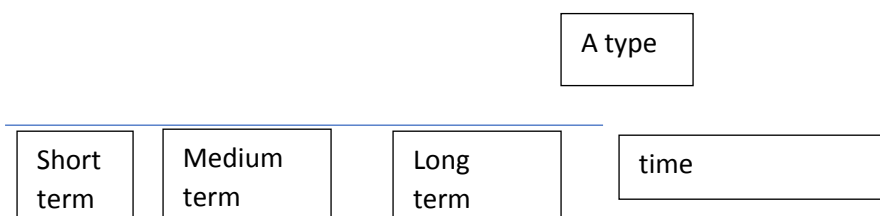
³⁸Kraemer, S. "NATO Renewable Energy To Penetrate Into Russian Petro-State" *Clean technical* available from <https://cleantechnica.com/2017/02/23/nato-renewable-energy-penetrate-russian-petro-state/> last accessed 02-05-2017

³⁹Lee, A. "Country Profile: Russia A thaw in official attitudes could rouse renewable energy's "sleeping giant." 2011 Renewable energy world available from <http://www.renewableenergyworld.com/articles/print/volume-14/issue-2/energy-efficiency/country-profile-russia.html> last accessed 02-05-2017

has the space it would be a complement to the needs of the EU for which the DesertTech is not debatable as long as conflicts roam the southern Mediterranean.⁴⁰ This would put Russia back in political circles while reversing the effects of inter-sectorial brain drain caused by the fossil fuel industry. Despite the Announcement of Rosatom to invest in wind energy and the government's attempt to implement alternative energy sources as part of the energy mix the signals put out by the Kremlin heavily influenced by established vested interest like in other states Russia has opted to focus on Nuclear technology as a viable alternative that would be closed cycle by 2050 and fusion before the end of the century.

In any case through this century Russia will play an important role in both energy and food production for which it does not have to employ grand strategies or walk on a political tight rope. This means that depending on other security dilemma such as terrorism and migration its utility curve would rise fast and slow down by the next equilibrium where climate negatives would outweigh positives *Sateris Paribus*. In turn this means that Russia is also able to cooperate or defect depending on the its needs while at the same time being able to rely on high governmental power and low civil societal influence thus putting it on Bb,c or Cb,c pathways, though Aa and Ab type behavior is also possible and as a result would result in a second possible less beneficial pathway.





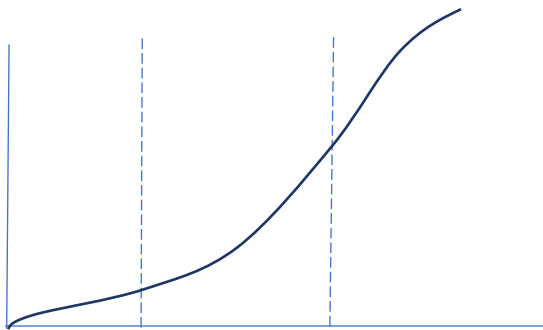
On the other hand, countries that are net importers of fossil energy would have a vested interest in pursuing green energies notably China and EU but also countries that are otherwise negatively impacted by expected climate changes. In other research authors have found that there is a clear first-mover disadvantage in the game whilst the scale of investment required of each country's climate change commitment in a non-cooperative scenario would yield to little result to ensure meeting the below 2°C target.⁴¹ This would mean that the countries that are committed to gaining energy independence would have to invest heavily in renewables while at the same time straining relations with their energy suppliers up to the point of critical mass of energetic dependency when they are no longer in demand for fossil energy.

From a realist point of view this would be very disturbing to the balance of power especially since the status quo is largely determined by the resources that drive economies this could create the potential situation that energy suppliers would undercut their price in order to halt alternative energy technologies. Countries like Germany have heavily invested in technologies and as a result others have need able to benefit from the research and have been able to leap frog in technology such as china.⁴² Heaving faced difficulty in the short to medium term it should stand to reason that such countries would be better positioned to bargain

⁴¹Zhu-Gang, J. and Cai Wen-Jia, W.C. 2014

⁴² Backlight "The breakthrough in Renewables" VPRO productions 2015

from an independent strongpoint. Though due to the nature of manufacturing technology it can only be expected to increase the cooperation between such states and this would allow them to reap the benefits of previous investments therefore a would anticipate a Cc or Cb pathway. This would lead to higher returns as time goes on. However, it is still expected that the overall constraints of climate change will impact the utility gains in the longer run and would thus blunt overall gains. The following utility curve is presented for china and other countries heavily investing in economic restructuring.



Because many of the changes in the economy are indirect there will be a lag in terms of feedback received and moreover many of the benefits associated with renewable energies are difficult to measure in GDP such as closer social cohesion and the locality of profitability this shift from centrality to locality would be observed as a lack of economic growth at first but in the long run would cause for greater economic stability due to the redistributive effects of local energy production and as a consequence would create a greater need for stronger local forms of democracy or cooperatives further strengthening the economic resilience and social cohesion of neighborhoods, cities and regions.

For those countries that are largely depended on great powers or do not have significant political or material capacity there is little choice than to depend on coordination in order to form a strong enough block to influence policy. The BRICS for example is one of those instances where new world policy is developed for that purpose. On the other hand, small island nations together with many of the G77 countries will face near or actual threats to their survival not due to an invading neighbor but due to sea level rise or complete breakdown of societal fabric as food production and or prices cause disintegration of civil society. Unless strong assistance is given that will be their fate. The choice therefore that the players of the international game need to make is whether it would be less costly to invest early on or receive hordes of climate induced refugees that would bring many of their problems across borders something that Myers has discussed at length and already in 1993, stating that as many as a 150 million might seek refuge in Europe.⁴³When we reference back to IR theory it is difficult to posit any helpful policies or enough to make any prognoses on how states ought to operate. Realists would indeed see that the fall off small states would be insignificant and like climate change would attract little attention unless where such countries are bordering them like the Small Eurasian area where Russia has a large influence but also provides security.⁴⁴Liberalist provide a better theoretical framework on the provided that is based on either institutional or ideational liberalism, following such teachings would in principle mean that such help from wealthy to developing

⁴³ **Myers, N.** Environmental refugees in a globally warmed world [Vol.43 No.11] *Bioscience* 1993a 752-761; **Myers, N.** "How many migrants for Europe?" Vol. 2 No. 31 *People and the Planet* 1993b ; **Myers, N.** *Ultimate Security: the Environmental Basis of Political Stability* W.V. Norton 1993c; **Myers, N.** "Environmentally-induced displacements: the state of the art". In: *Environmentally-Induced Population Displacements and Environmental Impacts Resulting from Mass Migration*, International Symposium, 21-24 April 1996, Geneva: International Organisation for Migration with United Nations High Commissioner for Refugees and Refugee Policy Group 1996 p.72-73.

⁴⁴**Shakleina, T.A.** *Russia And The United States In Contemporary International Relations: Selected Papers* MGIMO university 2013

countries could take place under the auspices of mutual absolute gains as it would be beneficial for recipient in terms of development and survival whilst on the other hand unmanageable refugee crises can be averted.

To put this into the shadow of the future perspective there are some significant differences between global south and north not just in terms of power. As these countries would have a shorter time frame as effects are already observable but would also have earlier feedback mechanisms, simultaneously their stakes would be higher than that of those in the northern hemisphere and every interaction would be important to gain utility hence according to the criteria it should indicate that there would be less cooperation or it ought to be more difficult. Perhaps therefore another caveat should be added to the shadow of the future where the losing parties would cooperate/coordinate more amongst each other, the more the winning party gains as observable in COP meetings where discussions increasingly involve climate justice as a unifying element between states in the southern hemisphere. Because of the dependence of external inputs, it would be difficult to plot it graphically and thus the outcome of the utility gained by G77 states would depend on the decisions of other states. Having discussed the different positions of various stakeholders one can only help but wonder what does that mean for international politics overall?

The world's first conflicts of men have been fought over land, for its agriculture as the basis of wealth a tradition that lasted until far in to the industrial revolution. This is hardly new information, however it is something that is worth further contemplation. As can be deduced from the data where we would have an A-type scenario the world situation would deteriorate visibly. On that note, it would also indicate that under whatever IR lenses one looks realist, liberalist,

constructivist or Marxist climate change would have significant consequences for how countries would relate to one another.

Though by different reasons for example from a realist stance the power dynamic would shift even more towards higher latitude countries with the potential for higher friction between those powers. Here it is possible to draw upon the rising interest in the arctic for a parallel comparison. As has been observed there is an ongoing increase in military and scientific expeditions. Though the real benefits are, as of yet, not clear the perceived benefits of controlling the arctic and resources including fossil energy and its waterways are high on the agendas of the arctic countries. However, there might be a third reason that is of yet not been recognize as a legitimate reason to invest in the arctic regions and that is as agricultural lands with a predicted +6 average increase by 2100 it should be possible to at least start agricultural production in summer as winter would still have a lack of sunlight. Thus, meaning that as Habib identified in his article the same is true for the arctic as the resources shrink to a smaller area this could invite tensions to develop further in the future.

From a more positive note following liberalist the resource scarcity could be a catalyst for cooperation especially since more institutions would be demanded to distribute them fairly and where this does not happen to a more or lesser degree both constructivists and Marxists would be happy to explain that the lack of such redistribution would lead to a change in perspective or a need to upset the current economic model both of which would target northern countries creating further security dilemma.

Hence as time progresses there seem to be to diverging pathways leading to different results one based on fossil fuel the other on green technologies. Where the former would mean high intensity adaptation to climate consequences, the

latter to high intensity mitigation leading to high investment costs and creeping spill-over effects where investments will be made in foreign countries. The dichotomy between the old and new philosophies would ultimately conclude in the dismissal of one. In the meantime, those that rely on the old dogma would accrue high benefits in the short to medium term while those adhering to the new dogma would face more challenges in the beginning especially for those hold outs depending on the status quo for their influence and power. Hence without coordination there would be more defection leading to further decrease in absolute gains whilst the asymmetrical or relative gains would further entrench camps into those who have's and the have not's. Creating possible resentment or unstable power dynamics. In either case through which scenario or perspective one looks throughout this century at least climate change would play a very significant role that pervades from environmental into economics cascading further into security and serious political dilemmas at some point in time in the shadow of the future.

To overcome these issues long term thinking will need to be part of short term planning this is not easy but in local societies with decentralized powers take better care of their immediate environment to achieve that stage however national policies need to allow for such trends to develop because “societies grow great when old men plant trees they know whose shade they will never sit in.”⁴⁵ This highlights the contrast between states with short and long term vision but also an even more important aspect that goes to the very core of international relations as the main theories presuppose states to be rational but when it comes to climatic changes and their political implications this article observes that at best: states rationalize their behavior which is quite different from being rational. Because if states are rational they would have executed more comprehensive climate

⁴⁵ Greek proverb

strategies. The failure to do so would mean a propagation of yet further resource conflicts. At first at local levels as are already present, which something that alternative energy sources combined with eco-systemic agricultural practices would dissipate as resources would be ample, local and decentralized. Leading to de-escalation of social tensions, a relieve of environmental pressures and the implications for the economic system would change to such an extent that war as a means to gain power becomes less profitable. It is for these reasons that if the aim of international community is to maintain and build sustainable peace, more ought to be done in the area of development, in green technologies and the proliferation thereof through low cost investment schemes, technology transfers and fair market practices. This would not only ensure that the temperature would not rise above the 2°C helping the environment and equally important help many, perhaps not out of poverty⁴⁶ but, provide them with the means to live worthy lives.

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⁴⁶ Poverty as measured in GDP requires growth and is more often than not a distorted picture of reality because GDP in itself has become a poor reflection of economic health. But in green economic principles the point is not necessarily to increase wage per capita but rather provide the prerequisites to live with dignity as many go hungry the first priority should be to provide them with the means to produce enough for themselves rather than provide a wage that exposes the poor to exploitation and economic enslavement.

Despite its electricity production being 100% renewable the government of Norway has been adamant in maintaining its oil oriented economy rather than diversification through green technologies

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