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THE GREAT DIVIDER OF THE WORLD. CLIMATE CHANGE: WHAT DOES IT MEAN FOR GLOBAL GOVERNANCE

The article considers socio-economic implications of climate changes and reviews the Global Governance capability to manage their socio-economic implications

Key words: *environment, UNEP, horseman, apocalypse, drought, flooding, mass-migration, adaptation*

Throughout history the environment has dictated the rise and fall of civilizations from the great Indus river valley, the fertile crescent, the Yangtze river and the Nile all encompassed the right ingredients for civilizations to thrive by the abundance of food and water thereby driving stable economies and security. A leap forward in time and the age of enlightenment and the subsequent Industrial revolution seemed to do away with that age-old edict of living in harmony with nature. Rather Man could dictate its own terms and pursuit its own ends and after two centuries of this paradigm it seems that it is about to shatter. Because rather than dictating terms and a profound believe in Mankind's dominion over earth we have been borrowing from her and at first, she gave us early warnings of the seriousness of not paying it forward, now loan-sharks are gathering and soon the breaking of bones will surely commence if the debt cannot be paid. This will take the form of drought, flooding, mass-migration and competition for resources. This article shall examine how this is so and the implications they will have on global governance. First this article shall address what the role is if any of global

governance in climate change so that we may understand the frame work in which the problems arise and where they need to be addressed. Secondly the article shall examine four major categories of climate impact namely; food, water, economics and security. Following the third section shall use the information discussed in order to evaluate and propound on the problems and solutions to global climate governance.

One could call them the four horsemen of the apocalypse food, water, economics and war. It is they who determine what civilization prosper and which find their demise. The only thing that globalization has ensured is that in essence the world has merged into one civilization thus the failure of one state could well have dire consequences for the rest. To talk about the future of politics and how climate will influence it is imperative to know how the climate will look like especially in the mid to latter half of the century. It might seem strange to examine the impact of climate change based on biblical scripture, however it did not stop climate doomsday canon from imagining a world of pain from *the day after tomorrow*¹ to *Madmax*² and *Waterworld*³ more importantly it does not mean that those factors do not play a role in international relations. Under the current efforts according to UNEP the world will progress towards a 3.4 degrees' Celsius scenario rather than the promised or hoped +1.5 as identified by the civil society in Norway.⁴ This scenario is rather optimistic as it included all the policies of all nations being implemented. However, with the current leader of the free world and largest per capita polluter not interested in addressing the issue other states are likely to follow the example.

¹**Emmerich R.** *The Day After Tomorrow* Twentieth Century Fox Film Corporation 2004

²**Miller G.** *Mad Max* Kennedy Miller Productions 1979

³**Reynolds K.** *Waterworld* Universal Pictures 1995

⁴ **NNV et al.** Statement brief to the Norwegian minister of climate and environment on the implication of the EU winter package on Norway written collectively by the Norwegian civil society including Forum, NNV, WWF, Framtid I våre hender. 2017

This is one of a number of potential climate tipping points that could rapidly and dramatically destabilize the Earth's climate system.⁵ In the Russian Far East, melting of permafrost may trigger a positive feedback loop, precipitating the release of large quantities of trapped methane into the atmosphere. Such a methane “burp” would greatly accelerate the global warming process because methane is such a powerful greenhouse gas.⁶ Meaning that +6 degrees by 2100 is well within the realm of possibilities. Looking at what this means for the climate in general this article shall explain and explore the changes and effects the current trajectory has on food, water, and economics to paint a picture of the future and the environment that states will have to operate in.

Already extreme weather events have caused 2.5 million deaths since 1980, the sea level rise threatens many island nations and coastal cities that house 2/3 of the earth's population, furthermore droughts such as those experienced in 2010 can be directly linked to food shortages and price hikes that lead to the Arab spring and ¼ deaths can now be linked to climate.⁷ As Heffron notes climate change is threatening lives destabilizing countries and disrupting economies adversarial states on hope to accomplish.⁸ Furthermore, if we look at how climate change

⁵ **Lenton, T.M. et al.** *Tipping Elements in the Earth's Climate System* Proceedings of the National Academy of Sciences of the United States of America 2008 p.1786–1793

⁶**Marshall M.** *Major methane release is almost inevitable* New Scientist 2013 available from <https://www.newscientist.com/article/dn23205-major-methane-release-is-almost-inevitable/> last accessed 26-04-2017; Vaks A. et al. *Speleothems Reveal 500,000-Year History of Siberian Permafrost* [Vol. 340] *Science* 2013; Stranahan S. *Melting Arctic Ocean Raises Threat of 'Methane Time Bomb'* Yale School of Forestry & Environmental Studies Available from http://e360.yale.edu/features/melting_arctic_ocean_raises_threat_of_methane_time_bomb last accessed 26-04-2017;

⁷UNICEF *Climate Change And Children A Human Security Challenge* UNICEF Innocenti Research Centre 2008 p.11 available from https://www.unicef-irc.org/publications/pdf/climate_change.pdf last accessed 26-04-2017 “Among children under 14, however, the figure rises to 36 per cent” according to **Prüss-Üstün, A. and Corvalán C.**, *Preventing Disease Through Healthy Environments* WHO 2008

⁸**Heffron D.** *What do realists think about climate change?* Centre for Geopolitics & Security in Realism Studies available from http://cgsrs.org/files/files/publications_30.pdf last accessed 24-04-2017

develops and affects these factors of security including food, water, economic and material security. We can not only better comprehend the rational of states but also the parameters. It are these conditions that will determine the outcome on many issues of international relations and as this article will attempt to demonstrate will be dictated by the severity of climate change the more radically it changes and difficulties it produces in terms of state operability the higher the probability for conflict.

To substantiate this argument this article examines the factors contributing to conflict, here it is important to place a caveat namely that distinction should be made between conflict and war as one refers to all forms of violence and while war is an extended aggravated form and inter-state. This distinction is important as conflicts within countries on the surface might not seem relevant to international relations however they can spread like the Arab spring or determine the course of foreign policy of a state such as revolutionary France. Here it is also important to place another disclaimer due to the nature of uncertainty in using future predictions on climate, this paper intention is not so much whether they are realized how they come about or whether it is manmade or not. Rather what is important is the theoretical exercise that would allow the evaluation of the challenges to global governance. As such climate and the science behind it provides a realistic and practical framework to base further discussion on. Though the ultimate conclusion might seem bleak as climate policies have been wholly inadequate and states remain blind to the consequences of their actions, Hope remains as many countries taking enormous strides in the right direction from which much can be learned the question therefore becomes is humanity as a whole prepared to do so?

Food: A army marches on its stomach, migrant follow it.

The role of food in sociopolitical stability has long been studied and understood as one of the factors contributing to stability or instability its role in the French revolution, the Russian revolution and to limited extent to the Arab spring are all examples of how food lead people to disrupt the status quo. It is for this reason that states have long prioritized food production and is one of the last sectors to be globalized and it still has high protectionist tendencies such as the EU's common agricultural policy between member states or western trade policies favoring domestic agricultural produce to developing nations undermining their economic development. With our current understanding, there is a dividing line between those who stand to gain and those who stand to lose by increased temperatures. However, even though the effects will be unequally spread the picture it paints still means that all nations will be affected one way or another and that the relations between stated is poised to change not from a uni-polar world to a multi-polar world but one which looks very different from the anything that resembles the current state of affairs. According to the US EPA the changes will be drastic in the main food sources available, in particular, staple foods such as corn wheat and rice and fishing stocks, this discussion will focus on these further. Allowing the article to comment on what this means for international relations and the implications that has for global governance.

	Crop changes by 2050	Africa	South Asia	US	EU	China	Russia
Grain	wheat	- 17%			+8 to +25%	-18 to -37%	-17%
	maize	- 5%	- 16%	-24 to -38%			

	Sorghum	- 15%	- 11%				
	millet	- 10%					
	rice	No change	No change				
	cassava	inconclusive	inconclusive				
	sugarcane	inconclusive	inconclusive				
	sunflower				-13 to 32%		

There are cautious positive voices who indicate no significant reduction in overall food production, given that the growth rate of technological innovations in the past continue but even so climate change remains a severe threat to maintain the growth necessary to keep up with demand.⁹ There are several studies that come to the same conclusion. The problem could therefore become Malthusian catastrophe where either war or famine causes the reduction of the population to a sustainable level which he suggested in, *An Essay on the Principle of Population as early as 1798*.¹⁰ The following data suggests that this could indeed be the case where food insecurity already exists.

In their study, Knox et al. posited that “*Climate change is a serious threat to crop productivity*” especially where insecurity already exists. They, on the basis of distilled Meta data came to the following conclusion on the impact of climate

⁹David B et al. “The Influence of Climate Change on Global Crop Productivity” [vol. 160 no. 4] *American Society of Plant Biologists* 2012 p.1686-1697 available from <http://dx.doi.org/10.1104/pp.112.208298> accessed 28-03-2017

¹⁰Desrochers, P. and Hoffbauer, C. "The Post War Intellectual Roots of the Population Bomb" [vol. 1 No. 3] *The Electronic Journal of Sustainable Development*. 2012

change on the yield of 8 major crops Africa and Asia.¹¹ Europe and by extension Russia have higher yield in the north and lower yield in southern parts as well as a migration of crop growth towards northern territories.¹² This is why it is difficult to express this in percentages. However, determining crop yields remains very complex and difficult but generally speaking, the A1F1 scenario (fuel intensive) will have the greatest negative impacts and decreases in both region and global levels in yields especially by the 2080's in the other A story lines of the IPCC yields between developed and less developed countries is largest.

While in B1 and B2 scenarios the differences are likely to be less significant with B2 scenario having the most favorable outcome, not surprisingly this corresponds with a ceiling temperature increase of +2.¹³ Having analyzed these scenarios and crop yields Parry et al conclude that with the observed climate data and crop model simulations the world is most likely to be able to feed itself for the most part. It is only possible they note by increases in the developed nations compensating for these declines in other places. This would require improving productivity intensity. Otherwise the trend would lead to further regional variance of crop production over time, with substantial price hikes and risk of hunger as a result in poorer regions and populations particularly under A-type scenarios.¹⁴ Though most of the food currently comes from land based sources sea based food production also plays an important role in feeding the world's population.

¹¹**Knox, J. et al.** *Climate change impacts on crop productivity in Africa and South Asia* IOP publishing Ltd 2012 OECD Climate Change, Water and Agriculture: Towards Resilient Systems IWA Publishing 2014

¹² See for further explanation **Müller, C. et al.** CLIMATE CHANGE IMPACTS ON AGRICULTURAL YIELDS Background note to the World Development Report 2010 Potsdam Institute for Climate Impact Research (PIK)

¹³ **Parry, M.L et al.** *Effects of climate change on global food production under SRES emissions and socio-economic scenarios* Glob Environ Change 2004 p. 53–67

¹⁴**Parry, M.L et al.** 2004 for further explanation see IPCC website; or IS-ENES for simplified explanation available from https://climate4impact.eu/impactportal/help/faq.jsp?q=scenarios_different last accessed 28-04-2017

The food production available from the ocean however, is perhaps in greatest peril providing food for more than 3 billion people that furthermore depend on it for their livelihoods.¹⁵ However, on average fish stocks have halved already since 1970¹⁶ and many species being threatened with extinction.¹⁷ That would be a serious challenge especially as according to the UNFAO in 2013 “fish accounted for about 17% (up to 25% in some regions) of the global population's intake of animal protein.” People in coastal areas especially in developing countries are reliant on fish as a staple food.¹⁸ More worryingly over 25 per cent of all marine species live in coral reefs, yet they cover an area about half the size of France¹⁹ and these reefs are in alarming decline due to acidification which is caused by the uptake of CO₂ in water. Creating a double threat to fish stocks namely over fishing and acidification. Furthermore, the IPCC in its report points towards many terrestrial, freshwater, and marine species having shifted their geographic ranges, seasonal activities, migration patterns, abundances, and species interactions in response to ongoing climate change adding to further stresses on temperate and tropical climates in the global south.²⁰

¹⁵**United Nations Food and Agriculture Organization (UNFAO)** *The State of World Fisheries and Aquaculture report (SOFLA) 2016* available from <http://www.fao.org/3/a-i5555e.pdf> last accessed 26-04-2017

¹⁶**WWF** *a living blue planet report: species habitats and human well-being 2015* available from http://assets.wwf.org.uk/downloads/living_blue_planet_report_2015.pdf last accessed 03-04-2017

¹⁷**Vince G.** “How the world's ocean could be running out of fish” BBC 2012 News available from <http://www.bbc.com/future/story/20120920-are-we-running-out-of-fish> last accessed 26-04-2017

¹⁸ UNFAO 2016

¹⁹ WWF 2015

²⁰ **Easterling, W.E. et al.** “Food, fibre and forest products. Climate Change 2007: Impacts, Adaptation and Vulnerability” Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 273-313 Available from <http://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-chapter5.pdf> last accessed 26-04-2017

So however climate change has not directly been connected to extinction of species.²¹ However the current rate of extinction of a hundred times higher than natural is occurring simultaneously leading to far higher probabilities of critical ecological cycle failures such as Bee's, and plankton who both are vital in the food chain to keep the cycle going leading some to say that the sixth mass extinction event is already beginning.²² To compensate for the loss of biodiversity and food production the answer has been further specialization (division of labor) creating ever bigger monoculture farms in need of increasing industrial fertilization and pesticides. Smart farming e.i. a technological approach has had some significant success in increasing crop yields however permaculture advocates at the same time report these same successes relying sole on ecological principles. The real difference here being the one being able to be employed only by wealthy states the other by all.²³

The Differences in vulnerability and exposure arise not only by climatic factors but more specifically in the multidimensional inequalities related to socio-economic sphere. As the IPCC report concludes “*People who are socially, economically, culturally, politically, institutionally, or otherwise marginalized are especially vulnerable to climate change and also to some adaptation and mitigation responses.*”²⁴ In turn this will reinforce the impacts on the human security of vulnerable citizen's countries that are net importers. “Leading to social

²¹Allen M.R. et al. IPCC Fifth Assessment Synthesis Report p.14 Available from <http://templatelab.com/Climate-Change-Synthesis-Report/> last accessed 26-04-2017

²²Barnosky A. D. et al. *Has the Earth's sixth mass extinction already arrived?* [Vol 471 issue 7336] Nature p. 1–57 2011

²³ See the works by Lui, J.D. such as the documentary films “Green Wall of China” and “Green Gold”

²⁴IPCC Summary for policymakers In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects* Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.). Cambridge University Press 2014 p. 1-32.

unrest and possibly malnutrition in extreme cases”²⁵In effect countries like China could export their social and political issues such as water and food insecurity to other nations even more susceptible to difficulties. Likewise limiting what export from Russia and Argentina in order to suppress domestic prices might indicate that the international political competition for food has already commenced²⁶ the Arab spring being one of those more visible results. With a growing hunger, more people will be forcibly displaced thus causing migrants to move to more suitable places such as Europe and North America suggested by Myers for example, who also identified the serious threats to national and global security because of migration.²⁷ Irrespective of the crops there is the added problem of watering them providing a natural progression for discussing this issue in the next section and see the effects it would have on international governance.²⁸

Water: source of life and death.

The issue of water in relation to climate change has three different categories: rising sea level, fresh water resources, and precipitation or drought here we would discuss the first two as the last has already indirectly been discussed in the previous section. To discuss water in this way is to some a for drawn conclusion and many have debated the issue and found that as a cause for war water is not the cause though it has played an important role in the strategy in war however, as pointed out before what many climate issues certainly do contribute to is threat multiplication. More over with a growing population and dwindling fresh water supplies water will be increasingly scares and commoditized this has caused

²⁵ Stern 2006, p. 72

²⁶ Brown, O. et al. “Climate change as the new security threat: Implications for Africa” [vol. 83 issue 6] in: *International Affairs* 2007 p.1141-1154

²⁷ Myers 2003

²⁸ Cochrane, K.; De Young, C.; Soto, D.; Bahri, T. (eds.) “Climate change implications for fisheries and aquaculture: overview of current scientific knowledge” in: *FAO Fisheries and Aquaculture Technical Paper No. 530* 2009. 212p.

some authors to indicate water as the next source for war replacing oil. By assessing the world water supplies and the related conflicts we can extrapolate few cornerstones of what will drive international relations in the century ahead.

For Coast and Low-lying Areas the IPCC has conservatively predicted global sea level to rise by approximately half a meter over the coming century.²⁹ Though some findings indicate more than a meter but uncertainty remains as calculated and factoring in geographic temperature tectonic movement all contribute.³⁰ With rise in sea level many island nations would be threatened for example the Maldives with a one-meter rise in sea level the country would completely disappear.³¹ Some Island nations have already made arrangements for transporting the government and their population to other countries.³² To this end Australia and New Zealand would become focal points for many of these nations. More over with this rise of water it would mean that many coastal cities would face the threat of submersion or increased vulnerability to storms that incidentally due to the increased mass and warmth are predicted to be more severe. These effects, together with acidification of the oceans will cause losses of mangrove forests; an added danger of the loss of these mangroves is that the island they used to surround will become even more vulnerable to storms. Coastlines will almost certainly suffer from accelerated coastal erosion as well as inundation of settlements and arable land with associated social and economic consequences. In the same

²⁹From the time of reliable data collection sea level has risen more than 8 inches Past and projected to rise by range of sea level rise of 1 to 4 feet by 2100; the wider range (0.66 feet to 6.6 feet) reflects uncertainty about how glaciers and ice sheets will react to climate change. Source: National Climate Assessment, 2014 Available from <http://nca2014.globalchange.gov/report/our-changing-climate/sea-level-rise> last accessed 19-04-2017

³⁰Rahmstorf S. "A new view on sea level rise" in: *Nature Reports Climate Change* 2010 available from <http://www.nature.com/climate/2010/1004/full/climate.2010.29.html> last accessed 19-04-2017

³¹ IPCC 2007

³²Astaiza, R. *Sea Level Rise Will Make Several Islands Uninhabitable Within A Decade* Business Insider available from <http://www.businessinsider.com/sea-level-rise-cause-island-evacuation-2012-10?r=US&IR=T&IR=T> last accessed 19-04-2017

scenario, the expected cost to Jamaica USD 462 million, 19 per cent of its GDP.³³ As low-elevation areas are home to 634 million people or about 10% of world population³⁴ lives in coastal areas susceptible to storms it would require serious national efforts to adapt to the new normal. For some countries, this is particularly problematic as they have large population centers in these low-lying areas such as in south East Asia the US and the Caribbean.³⁵

Many ports would have to be upgraded and thus would require to large investments. For those states that are unable to do so would require development aid from funds such as the green climate fund and the IMF or their financial institutions. Though the rise of sea level will be largely a matter of national discussion an interesting point of inquiry is how states would act faced with threat of their survival and whether this could be grounds enough to use force legitimately in order to secure land and the continued existence of their state. Admittedly most states under such threat have no to limited military capacity but as a matter of law and of international politics it is something that requires further investigation. However, something that is far more pervasive and affecting more states and potential for security dilemma is the issue of fresh water, its pathways and access to it which will be discussed below.

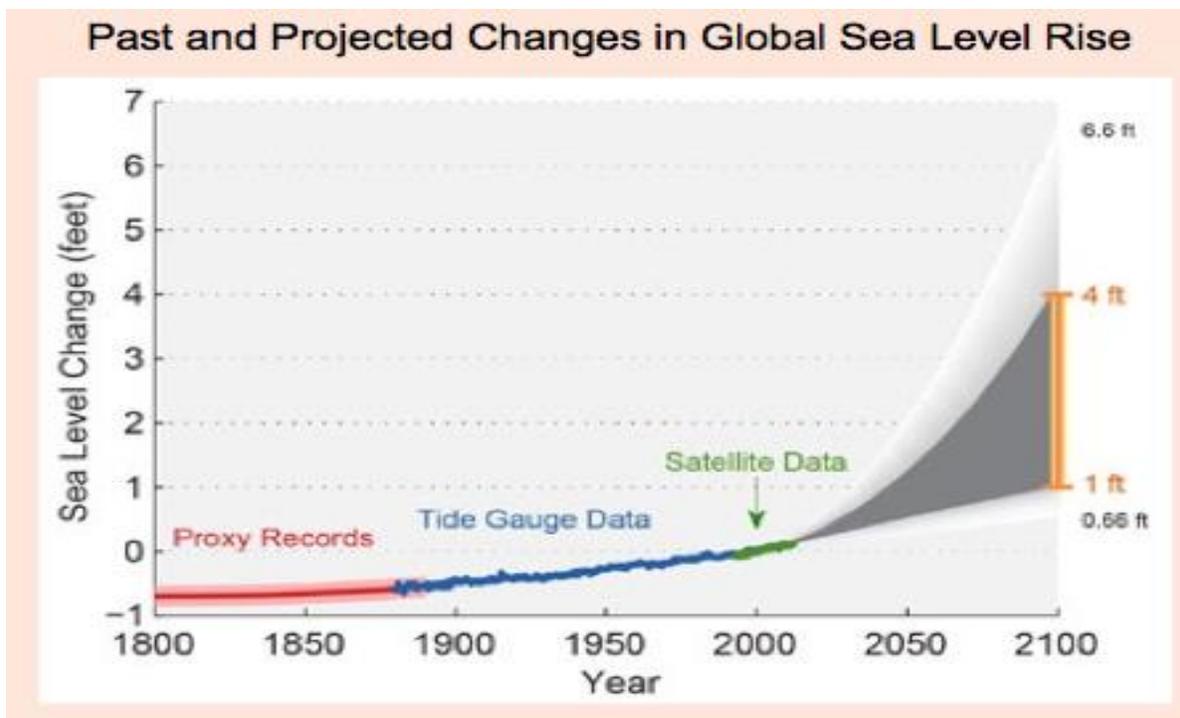
There are 261 international rivers, covering almost one half of the total land surface of the globe, and untold numbers of shared aquifers. To put it into numbers If 71% of the earth's surface is covered by water freshwater however only accounts for a meager 2.5%, and more than two thirds of it is trapped in glaciers that thus leaves human population a third of 2.5% of the total freshwater supply.

³³ IPCC 2007

³⁴ Greenfieldboyce, N. *Study: 634 Million People at Risk from Rising Seas* NPR 2007 available from <http://www.npr.org/templates/story/story.php?storyId=9162438>

³⁵ ibid

Population increases, along with the accompanying rise in agricultural production necessary to support the world's 7 billion-plus peoples, have placed an enormous strain on the world's limited resources. Around 70% of global freshwater consumption, and up to 90% in the developing world, is expended on agriculture, while a sizable portion of the remaining water is used to support industrial activity and energy production. In many places, water consumption has begun to exceed local water recharge. The World Bank estimates that 2.8 billion people, mostly in the developing world, live in areas afflicted by high water stress, where the



demand for water surpasses the supply. This figure will continue to rise as the world's population balloons to 9 billion by 2050.³⁶

³⁶**KurossE.** Water Scarcity Risks Being a Source of Conflict Fair observer 2015 available from http://www.faiobserver.com/region/middle_east_north_africa/water-scarcity-risks-being-a-source-of-conflict-28740/ last accessed 04-04-2017

Water has always been a valuable resource and has always played an important role in the consideration of military strategy. However, Water it seems is but one factor in the overall sources of conflict.³⁷ It is often factored in the problem due to its economic importance³⁸ notably its necessity for agricultural purposes dating back to antiquity.³⁹ In other words it is more of secondary nature that exacerbates already bad relations not the primary cause of conflict. However, it is a cause of serious disputes. In addition, with climate change and industrialization (pollution) making water more scarce, over 50 countries on five continents might soon be caught up in water disputes.⁴⁰ So in terms of future conflicts fresh water might indeed be a source of conflict especially in those areas where water basins are about to run dry, or water shortages can be attributed to dams etc. in other countries or in the case where powerful countries are experiencing drought and need to get it from somewhere else.

Unsurprisingly water has been a cause of political tensions between Arabs and Israelis; Indians and Bangladeshis; Americans and Mexicans; and all ten riparian states of the Nile River. Water is the only scarce resource for which there is no substitute, over which there is poorly-developed international law, and the need for which is overwhelming, constant, and immediate. Consequently, "water" and "war" are two topics being assessed together with increasing frequency.⁴¹

³⁷ But it does sometimes cause some commotion within a state.

³⁸ **Grossman Z** "Water wars and international conflict" results produced as part of a research projects at centre for International Environmental Problems & Policy at the University of Wisconsin-Eau Claire, 2004 available from <http://academic.evergreen.edu/g/grossmaz/oforiaa/> last accessed 26-04-2017

³⁹ **Pacific Institute** "Water Conflict Chronology List" available from <http://www2.worldwater.org/conflict/list/> last accessed 26-04-2017

⁴⁰ according to Global Policy forum further information available from <https://www.globalpolicy.org/the-dark-side-of-natural-resources-st/water-in-conflict.html> last accessed 26-04-2017

⁴¹ **Wolf, A. T.** "Conflict and cooperation along international waterways" Elsevier Science Ltd 1998 p.251-265 Presented at the ADC New Millennium Meeting on International Water Management in the 21st Century, Valencia, 18±20 December, 1997

Growing population and industrial demands have tripled water withdrawals around the world over the last 50 years according to UN figures. As the world's per capita water supply is expected to drop by one third in the next 20 years, the worst strain will be in Africa and the Middle East⁴² thus, making the competition for water fiercer and more likely. There is strong evidence to suggest a tendency for regionalization and localization of water conflicts.

This is probably due to the fact that water is often a localized resource. In any case, looking at the disputes that have caused some close calls in the past up to the present day there are a few areas in the world that might face conflict over water and in most of them if not all the problem of water is one of many and therefore it will be more difficult to identify the cause of the conflict. However, in those cases it is very likely that water will be used as a *causus belli*, a justification for the conflict, or an item that intensifies the dispute. *Between Egypt and Ethiopia the situation is particularly inflammable because the Egyptian, the Sudanese and the Ethiopians are playing a political game.*⁴³ Yet the Declaration of Principles signed by Egypt, Sudan and Ethiopia in March 2015. The declaration included agreements on annual operation of the dam and the mechanisms for the first filling. According to Yass, the declaration calls for Ethiopia to refrain from storing water behind the dam before the studies are completed.⁴⁴ This has subdued fears so far but not extinguished them indefinitely. Especially since Ethiopia plans to become a power exporter more dams will follow and so will potential disputes.

⁴²**RT news** *Waters wars: How aquatic scarcity sparks conflicts between states* Russia Today 2014 available from <https://www.rt.com/news/water-shortage-conflict-africa-280/> last accessed 19-04-2017

⁴³**Hussein H.** *Egypt and Ethiopia spar over the Nile* Aljazeera news 2014 available from <http://america.aljazeera.com/opinions/2014/2/egypt-disputes-ethiopiarenaissancedam.html> last accessed 19-04-2017

⁴⁴**Hussein W.** *Water wars intensify between Egypt, Ethiopia* Almonitor 2016 <http://www.al-monitor.com/pulse/originals/2016/03/egypt-ethiopia-renaissance-dam-water-storage-nile-dispute.html#ixzz4AltYC3FI> last accessed 19-04-2017

The current dispute finds its roots in 1978 that regards the long-standing tensions over the Nile, especially the Blue Nile, originating in Ethiopia. Ethiopia's proposed construction of dams on the headwaters of the Blue Nile leads Egypt to repeatedly declare the vital importance of water. As Egypt's second president Anwar Sadat stated, "The only matter that could take Egypt to war again is water"⁴⁵ something that is reaffirmed in 1988 by Egypt's foreign minister Boutros stating "The next war in our region will be over the waters of the Nile, not politics."⁴⁶ However the Nile basin is not the only hotbed.

The Indian subcontinent relies heavily on monsoon rains that bring water from the Indian Ocean but this also means that drought is cyclical despite heavy rainfall in short periods. From the split the Indus river was treated on (1960)⁴⁷ and divided between India and Pakistan however the source of the river lies in disputed Kashmir. The problem lies in perceived threats even though the treaty has been able to be a force for cooperation. Contrastingly between Bangladesh and India water is also a source for concern but on a lesser scale largely due to the better relations of those countries. "Water shortages present the greatest future threat to the viability of Pakistan as a state and society," as explained by Lieven.⁴⁸ By 2030, Pakistan is expected to face a further downgrade in categorization from "water stressed" to "water scarce" by the United Nations. Similarly, India also suffers from severe water problems. According to the National Geophysical Research Institute (NGRI), groundwater in Delhi, the world's second most populous city, may run dry in three to five years. NGRI hydro geologists blame not only

⁴⁵Statement by Anwar Sadat in 1979

⁴⁶**Boutros Boutros-Ghali 1988** see **Fort, T. L.** and Schipani Cindy A. *The Ecological Challenges of War*<http://alsb.roundtablelive.org/Resources/Documents/NP%202003%20Fort-Schipani.pdf>
⁴⁷**World bank** <http://siteresources.worldbank.org/INTSOUTHASIA/Resources/223497-1105737253588/IndusWatersTreaty1960.pdf>

⁴⁸**Ashraf S.** "Pakistan's water shortage drips towards disaster" the National 2013 available from <http://www.thenational.ae/thenationalconversation/comment/pakistans-water-shortage-drips-towards-disaster> last accessed 19-04-2017

agriculture infrastructure, but also urban planning. Cities are turning into “concrete jungles,” resulting in very little rainfall getting infiltrated into the earth for conversion into groundwater. Ideally, 16 percent of total rainfall must seep into the earth to be recharged as groundwater.⁴⁹

Another source of contention is the Jordan Basin shared by many already having strained relations particularly between Israel and Palestinians because of unequal water rights. Here water again is secondary to the dispute and somewhat crystallizes the issues for example as the Palestinian access to water supplies are walled off. Compared to Israeli settlers Palestinians are charged three times the cost for water that comes from under the West Bank.⁵⁰

In the future climate change, industrialization and mismanagement will mean that fresh water is becoming scarcer, already a billion people or one in seven people on the planet, lack access to safe drinking water. Although Countries at higher northern latitudes and in the tropics, are getting wetter most countries bordering the equatorial zones are running increasingly low on water⁵¹ consistent with the story of food. This also means that water will be more valuable and might become targeted by terrorism. As something that The US security establishment is already warning about stating that potential conflicts as well as terrorist attacks involving water are likely and warned that overuse of water in countries such as India could even be a US national security problem.⁵² Alternatively water might fall prey to corporate interests. However so far water itself has been more a force

⁴⁹**Livanos, N.** *Grab for Water Could Spark Conflict in Pakistan and India*, 19Pub. Interest L. Rptr.24 2013 Available at: <http://lawecommons.luc.edu/pilr/vol19/iss15>

⁵⁰Grossman, Z 2004

⁵¹**Goldenberg S.** Why global water shortages pose threat of terror and war: From California to the Middle East, huge areas of the world are drying up and a billion people have no access to safe drinking water. US intelligence is warning of the dangers of shrinking resources and experts say the world is 'standing on a precipice' The Guardian 2014 available from <http://www.theguardian.com/environment/2014/feb/09/global-water-shortages-threat-terror-war>

last accessed 26-04-2017

⁵² ibid

for cooperation than conflict so it remains to be seen whether it can be considered a source for conflict whether that is at present or in the future.

In contrast, 145 water-related treaties were signed in the same period. These treaties, collected and catalogued in a computerized database along with relevant notes from negotiators, are assessed for patterns of conflict resolution. War over water seems neither strategically rational nor even economically viable. Shared interests along a waterway seem to consistently outweigh water's conflict-inducing characteristics. Furthermore, once cooperative water regimes are established through treaty, they turn out to be impressively resilient over time, even between otherwise hostile riparian's, and even as conflict is waged over other issues. These patterns suggest that the more valuable lesson of international water is as resources whose characteristics tend to induce cooperation, and incite violence only in the exception.⁵³ The next section however will look at the combined effects of climate change in the food and water sectors as well as other factors to examine and analyze the economic effects and its implications for international relations.

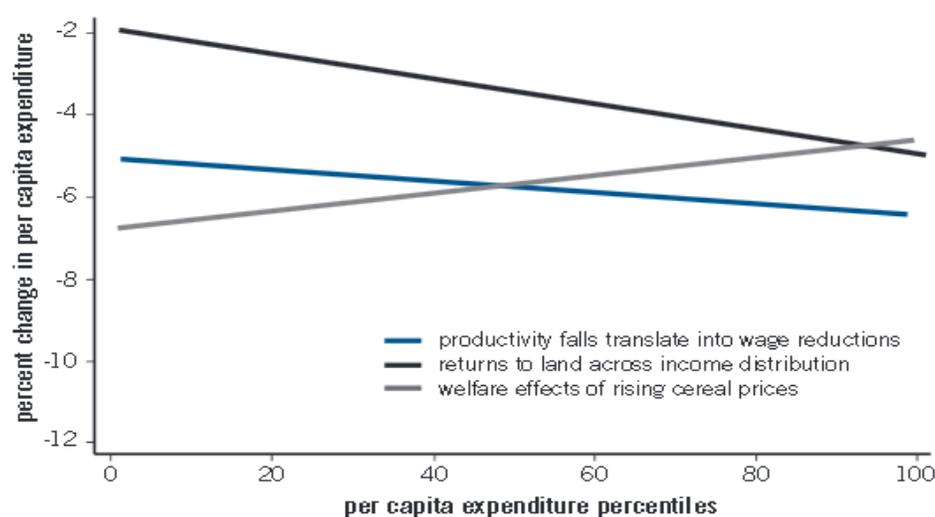
Economics: Costs and benefits, who loses and who gains?

One of the great mysteries of climate action is the contradiction between what science informs policy makers are the possibilities, costs and benefits of climate action, this section therefore will discuss what these are and how they are influenced by the climate to come. According to common analysis such as from Nordhaus Climate change reduces the prospects for global poverty reduction. Expected poverty impact will be relatively modest but far from reversing the major decline in poverty that is expected to occur over the next 40 years as a result of

⁵³Wolf A. T. "Conflict and cooperation along international waterways" [Vol. 1 issue 2] *Water Policy* 1998 P. 251-26 available from http://www.transboundarywaters.orst.edu/publications/conflict_coop/ last accessed 26-04-2017

continued economic growth.⁵⁴ However, a couple of qualifications are in order: first, much of the poverty impact is expected to be concentrated in Africa and South Asia, both of which would see more substantial increases in poverty relative to a baseline without climate change. Second, the occurrence of less probable but more extreme climate damage scenarios would naturally result in larger poverty increases. Third, aggregate projected damages are relatively low over the time horizon analyzed in this note (mid-century). As climate change continues to unfold during this and the next century, aggregate damages could be substantial and have a larger effect on poverty.

Figure 1. Climate Change Incidence Curve



Recent empirical studies confirm that changes in climatic means and variability can have substantial impacts on agricultural output, household welfare and poverty, but that there is considerable variation in outcomes based on geographical location, the assets and income earning potential of the household,

⁵⁴ Skoufias, E. ed. *The Poverty and Welfare Impacts of Climate Change: Quantifying the Effects, Identifying the Adaptation Strategies* World Bank 2012 P. 35-38 available from <https://ru.scribd.com/document/110315545/The-Poverty-and-Welfare-Impacts-of-Climate-Change-Quantifying-the-Effects-Identifying-the-Adaptation-Strategies> last accessed 26-04-2017

whether the household is a net agricultural producer or consumer, and on the opportunities for adaptation and risk management available to the household (see diagram above).

Adaptation to climate change can reduce poverty impacts substantially. If productivity falls it would translate into wage reductions and created another negative feedback cycle as rising cereal prices.⁵⁵ Adverse climate impacts will compromise the ability of the region's populous states to produce sufficient food for their large, growing populations and encourage greater reliance on imports. Given that decreased food production is forecast for food bowl regions across the world, the increasing reliance of regional states on food imports may in turn drive up the cost of food, pricing the vulnerable poor out of the market⁵⁶ This is a recipe for malnutrition and social unrest in countries where adaptive capacity is low.⁵⁷ Also, by increasing food imports at a time of tightening global supply constraints. Well to do states would be exporting the social and political problems of water scarcity and Food insecurity to other more vulnerable nations.⁵⁸ In addition, the high cost of damage to coastal infrastructure associated with industry and commerce, along with possible relocation of such facilities, are likely to make imported products more expensive.

⁵⁵**Skoufias E. et al** The Poverty Impacts of Climate Change in: *Poverty Reduction And Economic Management (PREM) Network* [No.51] World Bank 2011 available from www.worldbank.org/economicpremise last accessed

⁵⁶ **Cruz R .V. et al.** "Climate Change 2007: Impacts, Adaptation and Vulnerability" in: *Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* Parry M L, et al. (eds) Cambridge University Press. Cambridge 2007 p. 469 – 506.

⁵⁷**Tol R. et al.** "Distributional aspects of climate change impacts" [vol. 14 issue 3] *Global Environmental Change* 2004. p. 259-272 available from <http://www.sciencedirect.com/science/article/pii/S0959378004000421> last accessed 26-04-2017

⁵⁸ **Habib, B.** *Climate Change and International Relations Theory: Northeast Asia as a Case Study* Paper presented at the World International Studies Committee Third Global International Studies Conference 2011 available from https://drbenjaminhabib.files.wordpress.com/2011/09/habib-b_wisc2011_climate-change-ir-theory-northeast-asia-case-study.pdf last accessed 04-04-2017

The evidence further suggests there is much that policy makers can do to help the poor better adapt and cope with climate change for example with extreme weather events without reducing human capital. In their report Skoufias et al suggest that Adaptive policies such as creating well-targeted safety nets; improving capital access to the poor; increasing possibilities of upward mobility and further investing in water management in order to circumvent losses during extreme weather patterns and lost but not least ensuring stable food price these policies would kill two birds with one stone as they would both contribute to climate mitigation and adaptation goals as well as reducing the overall poverty rate and improve economic prospect of the economy.⁵⁹

In fact, under the winter package prepared by the European Commission as a 1000 page legislative proposal has laid out in its research report that the differences can be very significant and that green growth is a definite possibility attributing 4 million new jobs in energy efficiency alone when it would set the goal at 40% reduction compared to only 40 thousand extra jobs for the proposed legislation.⁶⁰ The commission is not the only one to draw the conclusion that the possibilities of climate action offer for the economy, several studies amongst others those of the Rocky Mountain Institute, and New Climate Economy continuously show promising economic growth when considering the greening of the economy.⁶¹ On the other hand there are still 6-13 times more subsidies going to fossil industries

⁵⁹Skoufias E. et al. 2011

⁶⁰ The winter package is compendium of laws consisting of energy efficiency, renewables and governance and is still in the negotiating process until 2018. The European Parliament has suggested a 40% efficiency rate however some member states such as Poland and Italy are fiercely against greening the economy and reflect the commission's compromise in the law proposals. For more information see the commissions DG for energy website at <http://ec.europa.eu/energy/en/news/commission-proposes-new-rules-consumer-centred-clean-energy-transition>

⁶¹See for further information <http://RMI.org>; <http://newclimateeconomy.net/>

than to renewable⁶² and it is this conundrum that could question the rationality of states.

Being as it may, what is clear is that climate change offers opportunities and challenges that ultimately will determine who the winners and losers will be. What is more surprising is that developing countries despite their apparent lack of infrastructure are leap frogging past developed nations rapidly. China for example is said to replace its coal dependency by gas and invests heavily in alternative energy sources. In many African and Latin American nations, this same trend is observable, Ethiopia has declared its intention to become an energy exporter on the basis of green energy and Costa Rica is already fully self-sufficient. This will lead these countries to energy independence and will force the devaluation of oil even further than the current levels. Moreover, there are developed nations like Sweden and Germany along many other European countries that intent to be low carbon economies by 2050. From this perspective, we can speculate that energy related disputes such as those in Iraq will diminish as many of the green energy solutions are localized and decentralized meaning that though it can be exported it would mean that the range is limited to the energy dissipation rate over the distance in terms of cost efficiency. Furthermore, the readily available energy would carry little marginal costs which would therefore result in lower prices which could dampen some of the other costs related to increased food prices. Yet the question remains will it be enough to stop conflict from occurring this will be examined in the following section.

⁶²The guardian Fossil fuel subsidies are 10 times those of renewables, figures show Green business network of the Guardian 2010 <https://www.theguardian.com/environment/2010/aug/03/fossil-fuel-subsidies-renewables>

War: The one thing nobody wants but everyone gets.

The question on the mind of many is whether the culmination of the previous horsemen could lead to potential conflict. Not only in the sphere of international relations but in peace studies and development institutes alike. This section will examine how, why and the likelihood of conflict arising and the precondition that may precede it.

War is the ultimate decision maker when diplomacy fails leading to the conclusion that “war is never unintended or accidental, what is often unintended is the length and the bloodiness of the war.”⁶³ Looking back at the issues of food water and economics what can we say about wars in the 21st century, well perhaps unsurprisingly given the previous mentioned facts but what we do know is that the probability of conflict in areas already prone to violence or general instability are far more likely to experience climate change induced conflict than areas of relative safety. However, it seems that what is often forgotten is to ask the question the other way around and would like to posit some food for thought, whether the sole existence of those factors would have led to conflict in the absence of environmental degradation.

In their research, Burke et al. claim to have the “first comprehensive” examination of linking climate change to conflict with notable focus on sub-Saharan Africa. On the basis of regression data analysis, the authors found that there is a causal link between temperature rises, albeit not precipitation, and increased conflict resulting in, “increased conflict during warmer periods.”⁶⁴ Putting this in numbers their study found that a 1% temperature increase lead to a 4.5% increase in civil war in that year and an 0.9% the year following. Hence looking forward in time on the basis of averaged data of 18 different models by

⁶³ Blainey, G. *The causes of war* Penguin Publishing 1973

⁶⁴Notaras, M. *Does Climate Change Cause Conflict?* United Nations University_2009 available from <https://ourworld.unu.edu/en/does-climate-change-cause-conflict> last accessed 20-03-2017

2030 about a 54% increase is expected in armed conflict incidents.⁶⁵ However, the researchers suggested that the violence is mostly the result of economic uncertainties especially economies reliant on agriculture. Critics of this study are abundant, Popovski for example points out that it might have an indirect affect as impoverishment and human security may be imperiled due to climate change but there remains missing evidence for a direct causal relation. Further citing that for the same token countries might even cooperate like in the Nile basin or Lake Chad citing a study by PRIO as further evidence.⁶⁶ Thereby forgetting to mention that war nearly broke out in the region as a result of water rights disputes and the same institute researching more than in one project the connection concluding in at least of them that “both short unusually dry intervals and long, unusually wet intervals increase the likelihood of a communal conflict event.”⁶⁷ Focusing on the additional factors Schwartz and Randall concluded that when scarcity pressures arise stronger competitive tendencies may arise between stakeholders with violence as a result especially in the case where there is a failure of cooperation between state organs and conflict resolution mechanisms.⁶⁸ Thus indicating that institutional weak states or developing states would see disproportionally more violence than stronger states. These incidents would create a negative feedback loop causing further resource consumption to fund their side while forcing any to migrate and thus create further resource pressures in other areas.⁶⁹ Then we can also explain how even developed states can be affected negatively by spillover effects further

⁶⁵ *ibid*

⁶⁶ *ibid*

⁶⁷ Nordkvelle, J. et al. *Identifying the effect of climate variability on communal conflict through randomization* [2017] PRIO available from <https://www.prio.org/utility/DownloadFile.ashx?id=315&type=publicationfile> last accessed 25-03-2017

⁶⁸ Schwartz, P. and Randall, D. *An Abrupt Climate Change Scenario and Its Implications for United States National Security* Pentagon report 2003 p. 1-22.

⁶⁹ Brown et al 2007 p 1148

reinforcing the fact of the interconnectedness of the climate dilemma.⁷⁰ Indeed as illustrated by this short discussion, it is not clear what climate is and how it influences the probability of conflict. That is why some refute such line of augmentation, as mentioned above, by positing that studies premised on the assumption human societies' response to scarcity necessarily lead to violence is false as the historical record support a connection between environment and scarcity-based conflict.⁷¹

In the literature, it is always possible to find a study that confirms the argument anyone likes to make. Shelby has points out in his study of quantitative studies looking at the environment as a source for conflict that the only conclusion drawn from this is that there is no direct causality between the two.⁷²

Atkins attributes this inconsistency to the lack of attention to the socio-economic factors. Furthermore, as he points out there is strong evidence to correlate oil and other precious resources including metal and stones with conflict. This means that resources for economic gain rather than the environmental necessity is more indicative in conflict prediction.⁷³

Later studies have moved beyond the linear Relationships to suggest climate change is expected to become a stress multiplier for all countries, with heightened risk of civil conflict in those states already at risk from internal instability and

⁷⁰**Economy, E.** "The Great Leap Backward: The Costs of China's Environmental Crisis" [Vol. 86 No. 5] *Foreign Affairs* 2007 p. 38-59

⁷¹**Michel, D.** "A River Runs Through It: Climate Change, Security Challenges, and Shared Water Resources" In: D. Michel and A. Pandya *Troubled Waters: Climate Change, Hydro politics, and Transboundary Resources* Henry L. Stimson Center 2009 p. 73-103

⁷²**Selby, J.** "Positivist Climate Conflict Research: A Critique" [Vol. 19 No. 4] *Geopolitics* 2014 p. 829-856.

⁷³**Atkins, E.** "Environmental Conflict: A Misnomer?" In: Sosa-Nunez, G. and Atkins, E. (eds.) *Environment, Climate Change and International Relations* E-International Relations 2016

economic weakness.⁷⁴ Conflict is more likely where physical safety and secure access to food, water, housing, employment and health care are not available.⁷⁵ The provision of these goods is usually the jurisdiction of civilian institutions, the weakness, failure of absence of which can determine the probability of violence.

Yet, as we have seen above not only sub-Saharan Africa the many food-baskets in the northern hemisphere are also affected such as the US mid-west and south-west, the Russian Volga basin and the Mediterranean, though these can be offset somewhat by the increased arability of yet further regions to the north without adequate preparation and policies food and water will increasingly become scarce leading to economic constraints and thus create hard security issues. Not only that but the discussion of water further showed that with the changes in the hydrographic cycle further constraints on states especially in the heartland and other areas relying on glacial water such as Bolivia, Venezuela, china and India to some extent. The scarcity or supply of water might make it a commoditized resource and could replace oil as a source of conflict thus making water rich areas a target for exploitation and or invasion.

If affairs are poorly managed, the entropy of the security dilemma may render conflict scenarios more likely. As surmised by Homer-Dixon who characterized five social effects that can significantly increase the likelihood of violence in the world. These effects are ones that are more complex than can be controlled by security -forces. The first one being constrained agricultural production, something that we see in marginalized eco-systems; Secondly slow economic growth, that affects people mostly depend heavily on their environment for income; Thirdly migration of these affected people in new areas looking for

⁷⁴Dupont, A. "The Strategic Implications of Climate Change" [vol. 50 no. 3] *Survival* 2008 p. 29–54 available from <http://www.iiss.org/en/publications/survival/sections/2008-4e2e/survival-global-politics-and-strategy-june-july-2008-acbb/50-3-06-dupont-2840> last accessed 03-05-2017

⁷⁵Matthew R. et al. *Global environmental change and Human Security* MIT press 2009, 377-8

improved conditions; fourth greater polarization of society, which occur mostly along already existing fault lines like ethnicity; and fifth the failure of institutions, particularly the state.⁷⁶It is therefore possible to deduce that enough of these factors are contributing to the governance problem of climate change and that it will definitely challenge policy makers in the future even more so than it does now. However how do IR theories relate to this problem and what sort of behavior changes if any are posited by these theories. The next section will cover these issues.

Conclusion

This article discussed how the impact climate change on food production both on land and from the ocean by surmising that despite technological developments those that are already on or the poverty line will be severely affected as agriculture becomes more technologically determined. Furthermore the issue of water security for which up to 80% is used in agriculture whilst its sources found in ground water are rapidly retreating countries that depend on glacial and ice melt for their water are especially vulnerable and in places where tensions are already running high this could lead to not only domestic conflicts but a return of inter-state conflict as well. Not to mention the implication of sea level rise and the mass migration this will lead to. Nonetheless, despite economic prediction look somewhat promising overall. However these prediction are based on the premise of growth of GDP which by an increasing amount of scholars a poor indication of economic development, especially when we regard the situation in lesser developed nations. Climate change offers the right incentives to make the appropriate adjustments to the current economic model but not even the most progressive such as the EU seem willing to commit fully despite the large potential to generate win-win

⁷⁶ Homer-Dixon T. *Environment, Scarcity, And Violence* Princeton University Press 1999 p.80

situation and higher economic growth. The lack of such commitment coupled with the environmental degradation of earth could set in motion trends in the ecological sphere that go beyond repaired making apocalyptic movies not just fiction but a vision of what is to come. The actions taken by states so far therefore have not only proven that global governance might be more challenged by elite interest rather than state interest let alone the interest of humanity. The only remedy that should be implemented is one of democratization of the economy taking one step back in order to take three forward. Because making local community produce their own food as many did until 1970 makes these more resilient to food price fluctuations as well as job stability this would apply both to developed and developing nations. It is these sort of initiatives that give hope and are the last piece of the global governance story and that is to think global but act local.

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