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# CLIMATE CHANGE AND THREATS TO HUMAN SECURITY

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**Abstract**

Climate change, which has been on the fringe of human concern in the name of development based on fossil fuels and limitless consumption and inordinate life style, has been catapulted to the center stage of security concern being christened as human security. Climate change could exacerbate existing environmental crises such as drought, water scarcity and soil degradation, intensify land-use conflicts and trigger further environmentally-induced migration. Rising global temperatures will jeopardize the bases of many people's livelihoods, especially in the developing regions, increase vulnerability to poverty and social deprivation, and thus put human security at risk. Climate change, particularly in weak and fragile states with poorly performing institutions and systems of government, is also likely to overwhelm local capacities to adapt to changing environmental conditions and will reinforce the trend toward general instability, thus raising the need to put primacy on human security.

## INTRODUCTION

The debate over the direct connection between climate change and security harks back to the day security threats were outsourced to non-military and non-traditional elements. There are sceptics who maintain that climate factors will only marginally influence

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tomorrow's security environment, if at all. They point to significant natural fluctuations in climate patterns and short term cyclical phenomena like El Nino and the recently identified Pacific Decadal Oscillation, the causes of which are not fully understood and deciphered. In their opinion, even if global warming does take place, many of its effects may be localized, benign or favourable. While reductions in rainfall may lead to desertification or water shortages in some regions, others will derive dividends from increased rainfall and higher crop yields. Even where the fabric of the state is torn by environmentally induced conflicts, in all likelihood they will be localized and have negligible effects on existing world order. Sepulchral visions of starving millions from the South on their heels to edge their ways into the North in search of food are far fetched.

On the other hand, mainstream climate scientists and some international security specialists contend that the magnitude of expected climate change will be substantial and certainly beyond the societal and eco-system experience, exposing genuine and multiple risks to global security. The traditional concept of security presupposes that threats arising from outside the state are more dangerous to the state than those that arise within it. Non- military threats within states- such as poverty, social vulnerability, ecological devastations- are generally not perceived as concrete and tangible. Yet one could argue with equal plausibility that the wrong end of a smokestack can be as much of a security threat to humans as the barrel of a gun.

The late 1970s witnessed a spurt of intellectual fermentation resulting in a myriad of calls to redefine security in non- military terms that include rising poverty, rapid population growth, spread of infectious diseases, and environmental degradation. The realist understanding and definition of security was state centric connected with state secrecy, nuclear and military power. The realist framework of national security, as a function of the successful pursuit of interstate power competition through military means, continued right through the Cold War. According to Dalby, "Cold War versions of security have usually been understood in spatial terms as moves of exclusion and protection is a spatial exercise in

distancing and boundary making".[1] This means in geopolitical parlance, the spatial limitation of Soviet political control. During the last half century, security has been primarily a matter of concern for states and their military alliances. The legitimacy of the governments is generally understood in terms of provision of internal security for the inhabitants residing within its territorial jurisdiction. Where stability of the regime has been held synonymous with national security, serious inroads into the realm of human rights and internal repression have been rationalized in the name of national security. Where political instability has been identified as threat, national security is understood as containing and limiting political change and legitimizing the status quo. Intensification of the Cold War climaxed in the proliferation of nuclear weapons and in the Reagan administration's Strategic Defense Initiative and Star wars merely exposed the paradox of security where the enhancement of nuclear power does not mean the enhancement of security to the people. The problems plaguing the entire humanity in terms of grinding poverty, burgeoning population growth, spread of diseases, scarcity of resources and environmental degradation could not be comprehended within the realist framework based on state centric military capability. Thus, the dominant realist paradigm to understand the current realities seems to be inadequate. It has "become an anachronism that has lost much of its explanatory and prescriptive power."[2]

## ENVIRONMENTAL SECURITY: THE FIRST DIMENSION

The state-centric and military perspective of security has lost both practical relevance and intellectual credibility in the context of a number of historic forces and events in the contemporary age. These include the end of cold war, global integration of national economies, erosion of national identifies and cultures, the shift in priority from military rivalry to economic competition, and the diminishing role of state as the dominant actor in international politics. On the other hand, there have emerged diverse new issues-

[1] S.Dalby, "American Security Discourse: The Persistence of Geopolitics," *Political Geography Quarterly*, 9, 1990, pp.171-88.
[2] O.R.Holsti, "International Systems, Systems Change and Foreign Policy," *Diplomatic History*, 15, 1991, p.94.

ranging from poverty to refugees crises, information privacy to cyber- terrorism, environmental problems to natural disasters – which requires non-state and non-military policies and strategies. These newly emerging security concerns have been characterized as non-traditional, and are now considered a major component of what is christened as comprehensive security. Among these emergent problems replacing the threat of East-West ideological divide, military aggression and struggle for global preponderance is the global environmental crisis. It looms large in terms of global warming, sea level rise, acid rain, greenhouse effect, diminishing capacity of the agricultural system, depletion of earth's finite resources, punching holes in the ozone layer, and biodiversity loss. Simply put, the global agenda has expanded since the demise of Cold War, as has the need for urgent attention to these problems for solution. It is thus seen that "welfare not warfare, will shape the rules and global threats like ozone holes and pollution will dictate the agenda."[3] It is within this context that the environmental question has gained worldwide significance as a security issue. In fact, environmental security stands out as perhaps the most widely debated issue, especially due to its all-pervasive nature, cross national scope and inter- generational implications.[4]

While many of the past, present and future causes of conflict and war may seem to have little or no direct connection with the environment or resources, a strong argument can be made for linking certain resources and environmental problems with the prospects for political frictions and tensions, or even war and peace. At the centre of the ongoing debate is the assertion that resource scarcity and certain forms of environmental degradation are important factors contributing to political instability or violent conflict at the local, regional and interstate levels. There is a growing perception that local, regional and global environmental deficiencies or resource

[3] J. Joffe, "Entangled for ever", in C.W. Kegley Jr. and E.R. Wittkoff, eds., *The Future of American Foreign Policy* (N w York: St. Martin's Press, 1992), P.35.
[4] M. Shamsul Haque, "Non-Traditional Security and the Environment in North east Asia", *Work in Progress* Vol.16, No.3, Summer 2002, P.24.

scarcities will increasingly produce conditions that may lead to conflict. [5]

This conceptual shift towards environmental security in the context of the collapse of the Soviet Union and diminution of security threats associated with the Cold War, pitch forked into the mainstream security debates urging the policymakers to cast about for a new security focus. Despite contentious debates within the field of environmental security, a wide variety of recent comments by senior diplomats and policy makers are symptomatic of the recognition that issues related to environmental security have ascended to the highest levels.

In 1987, the General Secretary of the Communist Party of the Soviet Union, Mikhail Gorbachev, stated:

> [The World] is not secure in the direct meaning of the word when currents of poison flow along river channels, when poison rains pour down form the sky, when an atmosphere polluted with industrial and transport waste chokes cities and whole regions, when the development of atomic engineering is justified by unacceptable risks…The relationship between man and the environment has become menacing. Problems of ecological security affect all the rich and the poor. [6]

In November 1989, Prime Minister Margaret Thatcher of the United Kingdom gave a speech to the United Nations General Assembly saying: While the conventional political dangers – the threat of global annihilation, the fact of regional war- appear to be receding, we have all recently become aware of another insidious danger. It is as menacing in its way as these more accustomed perils with which international diplomacy has concerned itself for centuries. It is the prospect of irretrievable damage to the atmosphere, to the oceans, to earth itself.[7]

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[5] Peter H.Gleick, *World's Water: The Biennial Report on Fresh Water Resources* (Washington D.C.: California: Island Press, 1998), pp.105-106.
[6] M.Gorbachev, "Reality and guarantees for a secure world", *Moscow News*, No.39, 1987, p.3287.
[7] Quoted in Peter H.Gleick, *World's Water, op.cit*, p.106.

In April 1997, the United States Secretary of State Ms Albright said:

> Not so long ago, many believed that the pursuit of clean air, clean water, and healthy forests was a worthy goal, but not part of our national security. Today environmental issues are part of the mainstream of American foreign Policy.[8]

It was in this backdrop of future non-military threats that a number of studies and research institutions undertook works to determine if and how environmental factors were related to the intra and inter state conflicts or violence that appeared to be surfacing around the globe.[9] These studies varied in their approach, their terminology, and their specific findings and consistent in their explanations suggested that environmental stress, operating through a set of intervening variables, could contribute to violent conflicts, and thus constituted a threat to national and international security. Furthering this argument that the mounting environmental problems and the associated issues need an attention with which the conventional outlook of national security appears to be incongruent, Jeremy Rifkin points out: "The environmental threats facing the planet are not simply the result of scientific miscalculation. Nor are they merely the consequences of ill-conceived management decisions. Ironically it is the notion of security upon which our entire modern worldview is based that has led us to the verge of ecocide… In less than a century the practice of geopolitics thus pushed the world to the brink of both nuclear Armageddon and environmental catastrophe forcing us to reconsider the basic assumption of security that animates the modern world view". [10]

Similarly, Lodgaard feels that "the concept of environmental security challenges established frames of mind and political

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[8] U.S. Department of State, "Environmental Diplomacy: The Environment and U.S. Foreign Policy", U.S. Department of State, Washington, D.C.: 1997.

[9] Ted Gurr, *Minorities at Risk: A Global View of Ethnopolitical Conflicts* (Washington DC: US Institute of Peace Press, 1993)

[10] J.Rifkin, *Biospheric Politics: A New Consciousness for a New Century* (New York: Crown, 1991), p.2.

conflicts. It conveys a message that environmental problems have a legitimate claim for status as military problems have."[11]

Another proponent of environmental security in the same vein opines:

…national security is not just about fighting forces and weaponry. It relates to watersheds, croplands, forests, genetic resources, climatic and other factors that rarely figure in the minds of military experts and political leaders, but increasingly deserve in their collectivity to rank along side military approaches as crucial to a nation's security.[12]

The growing significance of environmental security is quite evident in major international forums. Some well known examples include the UN Conference on Human Environment (1972), Ottawa Conference on Conservation and Development (1986), United Nations Conference on Environment and Development (1992), World Summit for social Development (1995) and UN symposium on the Global Environment in the 21st Century (1997). These conferences and symposia eventually resulted in various international conventions and protocols for environmental protection or security, such as the Vienna Convection for the protection of the Ozone Layer, the convention on Biological Diversity, the Framework convention on climate change, the convention to combat desertification, and the Kyoto protocol.[13] Harking back to as far as 1987, for example, The World Commission on Environmental Development (Brundtland Report), entitled 'Our common Future", stresses the factor of environmental degradation causing the violent relationship between states:

"Environmental stress is both a cause and effect of political tension and military conflict…nations have fought to assist or resist

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[11] Sverre Lodgaard, "Environmental Conflict Resolution," paper presented at the UNEP meeting on Environmental Conflict Resolution, Nairobi, 30 March 1990, p.18.

[12] Norman Myers, "The Environmental Dimension to Security Issues", *The Environmentalist* Vol.6, Winter 1986, p.251.

[13] See M.Shamsul Haque, "The Fate of Sustainable Development Under the Neoliberal Regimes in Developing Countries", *International Political Science Review* 20/2 (1999), pp.199-222.

control over raw materials, energy supplies, land, river basin, sea passages and other key environmental resources. According to the report, such conflicts are likely to increase as these resources became scarcer and competition for them will increase."[14]

Environmental security as a concept encompassing non-military aspects was officially mentioned for the first time in the International Conference on the Relationship between Disarmament and Development convened by the UN General Assembly in New York from 24 August to 11 September 1987. The final document adopted by consensus states:

> Recently non-military threats to security have moved to the forefront of global concern. Underdevelopment and declining prospects for development as well as mismanagement and waste of resources, constitute challenges to security. The degradation of the environment presents a threat to sustainable development…. Mass poverty, illiteracy, diseases, squalor and malnutrition affecting a large proportion of world's population often become the cause of social strain, tension and strife.[15]

Two distinct features of environmental security are: First, the environmental causes of conflict, i.e. environmental factors behind potentially violent conflicts; Second, the impact of environmental degradation on overall political economy, health and life of the people. If environmental degradation or deficiencies create the conditions that render conflicts, act as multipliers that aggravate core causes of conflict[16] or act as a catalyst factor in creating conflicts,

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[14] World Commission on Environment and development, *Our Common Future* (Brundtland Report (New York / London: Oxford University Press, 1987)) p.290.

[15] Quoted in Dietrich Fisher, *Nonmilitary Aspects of Security: A System's Approach*, United Nations Institute for Disarmament and Research (UNIDIR), (Aldershot: Dartmouth Publishing Company Ltd, 1993), p.10.

[16] Norman Myers, "The Environmental Dimension to Security Issues," *The Environmentalist* Vol.6, Winter 1986, p.253.

then environmental degradation or scarcity of resources becomes a national security issue.[17]

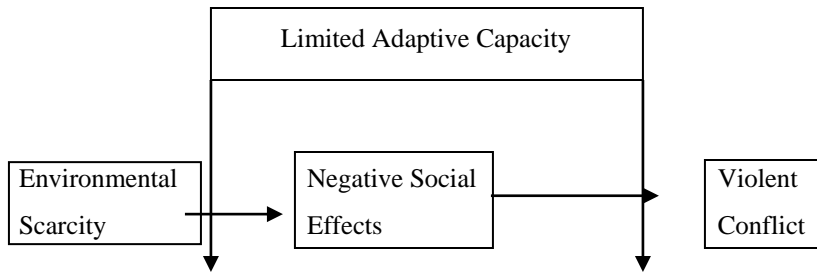## ENVIRONMENTAL CONFLICT: THE SECOND DIMENSION

In spite of these criticisms, the most influential arguments in the field have concluded that environmental stress is linked to conflict indirectly, but significantly. While the precise character of the linkage varies from case to case, it is made possible environmental stress is supposed to overwhelm the adaptive capacity of some societies while simultaneously introducing and reinforcing forms of conflict and instability. While division and debate characterize the field of environmental security, there is a strong degree of theoretical consensus among researchers. The most prominent and dominant thread that runs through the entire environmental security literature is that the environmental stress simultaneously reduces adaptive capacity and engenders conflict.

The dominant paradigm in the environmental security literature harks back to writers like Thomas Malthus, but it has obtained its contemporarily influential formulation in the work of Thomas Homer Dixon and Toronto Group. From a myriad of empirical case studies conducted by them on Haiti, Chiapas, Gaza, Pakistan and Bangladesh – India, they concluded that environmental scarcity of renewable resources viz., water, forest, fisheries and cropland give rise to a number of deleterious social effects including economic decline, social segmentation and human migration – these social effects in interaction with other political, economic and social factors, can generate conflict and instability. Central to their model was the notion of supply of ingenuity gap or a disparity between the solutions required to cope with environmental scarcity and the human, social and institutional capital that could be mustered to provide these solutions. This ingenuity gap essentially undermines human adaptive responses. That means, according to their studies,

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[17] Gareth Porter, "Environmental Security as National Security Issue", *Current History*, May 1995, p.218.

resource scarcity and limited or inadequate adaptive capacity coalesce together to generate violent conflicts in various regions.[18]

## Dominant Paradigm

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            ┌─────────────────────────────────────┐
            │     Limited Adaptive Capacity        │
            │                                      │
  ┌──────────────┐      ┌──────────────┐      ┌──────────────┐
  │ Environmental│─────▶│ Negative Social│────▶│  Violent     │
  │ Scarcity     │      │ Effects        │     │  Conflict    │
  └──────────────┘      └──────────────┘      └──────────────┘
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A theoretical representation is made in this figure[19] to understand the linkage between environmental stress and conflict. On theoretical ground it is criticized that even if resource scarcity plays a causal role in conflict, there are other more convincing explanations for conflict. Further, the prospects for adaptation, cooperation or resolution are not as completely bleak as is often presented. At the very prospects of an unlikely nuclear war, the fear of destructibility by the use of nuclear weapons has not any way diminished the universality of nuclear weapon as a main national security issue. It is that fear of destruction, which may have brought many nuclear powers to negotiating table for cooperation or disarmament. The resultant cooperation should not be cited to underrate the holistic perception of nuclear weapons as being a national security concern.

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[18] Thomas F.Homer Dixon, *Environment, Scarcity, and Violence* (Princeton, New Jersy: Princeton University Press, 1999); Thomas F.Homer Dixon and Jessica Blitt, *Evidences: Links Among Environment, Population, and Security* (New York: Rowman and Littlefield, 1998); Thomas F.Homer Dixon, "Environmental Scarcities and Violent Conflict: Evidence from Cases", *International Security,* Vol.19, 1994, pp.5-40.

[19] Thomas F. Homer Dixon, *Environment, Scarcity, and Violence*, P.7 and Daniel Esty et. al., "The State Failure Task Force Report: Phase II Findings", *Environmental Change and Security Project Report 5*, 1999, p.63; S.C. Lonergan, ed., *Environmental Change, Adaptation and Security,* (Boston: Klewer, 1999); David Dessler, "Review of Environmental Scarcity and Violence", *Environmental Change and Security Project Report 5* (1999),pp.100-101.

Similarly, environmental scarcity of resources with its disastrous social effects may not be everywhere a direct cause of violent conflict, sometimes in combination with other factors, causes conflict. For example, sea level rise a consequence of global warming due to North's mindless pursuit of industrialization based on fossil fuel technology will affect low-lying areas such as Bangladesh below the sea level turning millions of them as refugees fleeing to Indian territories that is likely to exacerbate the already infested ethnic conflict in North-Eastern states. That it would not affect other countries does not in any way diminish the environmental causes of conflict not less than the universality of nuclear weapons as a security concern. The consequences of environmental scarcity of resources on political, economic and social life of a state or states may prompt states or nations to cooperate to avoid the negative effects of war on environment.

So the environmental co-operation syndrome as argued by some should not be overrated to diminish the role of environmental scarcity of resources causing conflict or violence. No nuclear war has ever been fought in this world after America's dropping of hydrogen bombs on Japan's Hiroshima and Nagasaki during the course of Second World War. This would be as preposterous to say that nuclear weapon lack the potential or prospects for conflict as to say that the environmental scarcity of resources lacks the potential for conflict as it has not resulted in conflict in some areas or has resulted in cooperation. Adoption means the involvement of all state apparatus, institutions, scientific community, even the social system and value structure including the affected to take steps that would obviate the negative effects of environmental scarcity. The poor developing countries may not have the economic and scientific wherewithal as argued by Dixon to cope with the situation. Even the developed countries will not find it a smooth sailing while responding to the environmental crisis. For example, in regard to stabilization of $CO_2$ in the atmosphere American steps to renege on its commitment agreed to at Kyoto were a capitulation to the petroleum, coal industrial lobby. What has threatened the world is the Western inordinate life style and pattern of development causing global warming, sea level rise and ozone layer depletion. To ensure environmental security what it requires is to make an overhaul of its pattern of life and development, which is not possible with strong

protestations from high-class people. So Bush, American President caving in to the pressure of the industrial class justified his rejection of Kyoto protocol on the ground that countenancing the Kyoto commitment would hamper its economy and life style of its people.[20] Environmental security means overhauling the entire economic development pattern and existing social values related to liberal capitalism that is not possible without politico-socio-economic disruption. So the potential for conflict lies as much in the environmental scarcity of resources as in the very remedies and adaptive measures – a part of fulfillment of environmental security.

In spite of the criticisms above, the main thrust of the studies showing the linkage between environment and conflict, remains paramount: the environmental scarcity operates through a set of intervening variables, contexts or ideational factors that directly cause conflict, and that environmental social effects and stress, as such outstrips attempts to cope with the crisis.

Another study undertaken by Swiss Peace Institute's Environment and Conflicts Project (ENCOP) was in the direction of what the Toronto group suggests. Gunther Bachler belonging to this group in his study used the term transformation by which he meant "the introduction of a heuristic concept in recording those interactions between the three levels – nature, human beings and the economy in a regional context-which have led to conflicts between human communities and will …increasingly lead to such conflicts."[21]

Degradation is used in this context as an indicator of the degree of environmental transformation. In the words of Kates et al, "the biosphere has accumulated or is on its way to accumulating such a magnitude and variety of changes that it may be said to be

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[20] David L. Levy and Daniel Egan, "Capital Contests: National and Transnational Channels of Corporate Influence on the Climate Change Negotiations", *Politics and Society*, Vol.26, no.3, September 1998, pp.337-361. See also N.Gaan,"Politics of Governance of Global Climate Change: Not on Equity but on North's Interests", *India Quarterly* Vol. LVIII, no.4, October-December 2001,pp.89-112.

[21] Gunther Bachler, Conflict and Cooperation in the Light of Global Human- Ecological Transformation, ENCOP, *Occasional Paper* 9, October 1993,p.5.

transformed."[22] In other words, "transformation conflicts are caused by fundamental anthropogenic changes in the environmental media and by the interactions between the processes of change and their consequences in the eco-regional context."[23]

Another authority Stephan Libiszewski belonging to ENCOP, making a distinction between traditional resource wars and environmental causes of conflict is of the view that an environmental conflict is a conflict caused by the environmental scarcity of a resource that means: caused by a human made disturbance of its normal regeneration rate. Environmental scarcity can result from the overuse of a renewable resource or from the overstrain of the ecosystem's sink capacity, that is pollution. Both can reach the stage of destruction of space of living. Conflicts caused by physical, geopolitical or socio-economic resource scarcity are not environmental conflicts but traditional conflicts of resource distribution.[24]

As found in the Toronto Group's research the ENCOP also walks on the same furrow that scarcity gives rise to conflict. Also it is alleged to be silent about human adaptation to resource scarcity. In these studies, it is mal- development, a condition similar to Homer Dixon's ingenuity gap that undermines human responses and enhances conflicts.[25] Though the ENCOP model is more complex

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[22] Robert W.kates and B.L. Turner II and William Clark, "The Great Transformation", In B.L. Turner II, and William C.Clark, Robert W.Kates, John F.Richards, Jessica T.Matthews, William B.Mayer, eds., *The Earth as Transformed by Human Action: Global and Regional Changes in the Biosphere over the Past 300 years* (Cambridge: Cambridge University Press with Clark University, 1990),p.1.

[23] Gunther Bachler, *Conflict and Cooperation, Ibid.* p.16.

[24] Stephan Libiszewski, What is an Environmental Conflict? ENCOP, *Occasional Paper no*. I, July 1992,p.6.

[25] Richard A. Matthew, Ted Gaulin, and Bryan McDonald, "The Elusive Quest: Linking Environmental Change and Conflict" submitted to Canadian Journal of Political Science, Revised Manuscript submitted; Dec 21, 2001, File Number: 01-12, p.7.

than the Toronto group's general model, but the theoretical argument presented by both is very similar.[26]

In a 1999 NATO pilot study this dominant environmental conflict paradigm was found in the line with the other studies.[27] According to this study, "[it] is not environmental stress in isolation that characterizes the nature of the conflict between groups but other factors".[28] Here too political, economic and social factors intervene between environmental stress and conflict.

The State Failure Task Force (SFTF), another research group marking the same dominant paradigm as with the preceding studies, reiterates the causal weight of environmental stress through intervening variables.[29]. While the researches did find that massive environmental damage in a short time frame could directly cause political collapse, the far more common scenario was that environmental stress operates through the intervening variable of quality of life to generate conflict.

Though highly critical of Toronto group, recent work by Gleditsch and de Soysa appears to have been co-opted by the dominant paradigm. According to their studies, resource scarcity, one component of a multifaceted development problem that they call "poverty" reduces agricultural production that in turn leads to conflict. That is, scarcity leads to a negative social outcome that becomes the proximate cause of conflict.[30] Beyond this however, the Gleditsch and de Soyasa model is similar to the Toronto Group in that there is little room for human adaptation to conditions of scarcity. Indeed, their key independent variable, poverty, is defined by a lack of social and human capital. "Like Homer Dixon's ingenuity gap, Gleditsch and de Soyasa's explanatory variable

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[26] See for details, Nancy Peluso and Michael Watts (ed.,) *Violent Environments* (Ithaca: Cornell University Press, 2001), pp.15-24.

[27] Committee on the challenges of Modern Society, NATO, "Environment and Security in an International Context", *NATO Report 232*, 1999.

[28] *Ibid*, p.22.

[29] Daniel Esty et.al., "The State Failure Task Force Report: Phase II Findings", *Environmental Change and Security Project Report 5*, 1999.

[30] Ted Gaulin, "To Cultivate a New Model: Where do Soyasa and Gleditsch Fall Short", *Environmental Change and Security Project Report 6*, 2000, pp. 104-107.

appears to lock in negative social outcomes, leaving little room for human adaptation."[31]

There is some variation in these models and term presented by these research groups. But in each case the general theory linking resource scarcity and conflict is the same. Homer Dixon focuses on an "ingenuity gap", ENCOP on "mal-development" and Gleditsch and de Soysa on "poverty". Nevertheless, all these phrases describe a similar process- a limited capacity to respond to scarcity.

The model which is critical of all the above models adopted by Richard A Matthew et al finds flaws in current theory in environmental security on two counts. "First, it focuses on too short a time frame. Second, and relatively, it underestimates human adaptive capacity."[32] They were averse to accepting the two extremes, Homer Dixon's lack of adaptive capacity in the poor countries, and Julian Simon and Herman Kahn's faith in the infinite capacity of individuals to adopt. To them, human adaptive capacity lies somewhere between these two extremes. Julian Simon writes, "there is no physical or economic reason why human resourcefulness and enterprise cannot forever continue to respond to impending shortages and existing problems with new expedients that, after an adjustment period, leave us better off than before the problem arose."[33]

Homer Dixon responds to this saying, "while I acknowledge the extraordinary potential of human resourcefulness and enterprise, I nonetheless argue that some societies – especially poor societies – will not be able to supply the unprecedented amounts of ingenuity they will need to solve their emerging scarcity problems."[34] This clearly demonstrates, Homer Dixon never maintains that all societies will not be able to cope with the situation. It is some poor societies because of various factors will be in dearth of required supply of ingenuity to adapt to the situation. This brings Homer Dixon closer

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[31] Richard A. Matthew, et al., "*The Elusive Quest*", op.cit, p.9.

[32] Ibid, p.25.

[33] Julian Simon, *The Ultimate Resources* (Princeton, N.J.: Princeton University Press, 1981), p.345; and Julian Simon, *The Ultimate Resource 2* (Princeton, N.J.: Princeton University Press, 1996)

[34] Thomas F. Homer Dixon, *Environment, Scarcity and Violence,* p.114.

to the position taken by Richard A. Matthew and his associates. If adaptation is a dynamic and continuous process, then there may be adoption failure in some and adoption success in others visited with trauma, travails and hardships. When such individual trauma, travails and ordeals while adapting to the environmental stress becomes a collective or group phenomena in a particular political context or in the face of growing incapability of state, the potential for violent conflict exists. Taking a departure from this, Matthew group holds that from a longer time perspective even if the adaptive failures through feedback will result in adaptive success, thus avoiding the prospects for environmental conflicts. Contrary to what Neo-Malthusians such as Paul Ehrlich, Robert Kaplan, and Thomas Homer Dixon contend, "adaptive mechanisms do not simply stall or become overwhelmed while levels of environmental stress continue to escalate."[35] To quote Richard A Mathew further: "This is not to say that all forms of adaptation are socially desirable. Adaptation can mean people of the developing world going further and further into the hinterland to gather fuel, wood and water; parents sending their children to work in factories because of crop failure; and simple belt-tightening people eating less,"[36] or as happened in Kalahandi district of Orissa(India) people eating the dried up Kernel of ripen mangoes died while adapting to food scarcity, or people in these tribal areas of Orissa are forced to sell their children as bonded labourers as a mark of adaptation to the environmental scarcity of crop land and food. These latter examples are certainly unsettling and portent of potential for violent behaviour in an organized form depending on the nature of political system prevailing.

If, to use the language of Matthew, these starvation, death, or going without food, or half fed situations are the genuine form of adoption, then conflict arising out of these situations created by environmental scarcity in the form of collective or group behaviour or response can be a genuine version of adoption with a view to develop new legitimate and representative political authority and institution and new value structure that would reinvent the political-economic thinking which so far has contributed to environmental scarcity. As Walzer argues, conflict is a normal and important aspect

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[35] Richard A. Matthew, et.al., *The Elusive Quest*, p.21.
[36] *Ibid*, p.16.

of social development.[37] Then the portrayal of environmental crisis as an environmental conflict paradigm from a broader perspective does not lose its significance or acceptability, as a theoretical framework as argued by Richard Matthew and his group. The conclusion that this group arrived at is not to deny the linkage between environmental scarcity and conflict but stresses on "longer term studies "that might provide deeper understanding of the ways in which concerns about environmental stress and degradation are relevant not only to the those concerned with international security, but also those worried about human rights, social justice and sustainable development.[38]

On the one side the economic deprivation, decreased agricultural production, health hazards, poverty, starvation or half fed or even death situation due to pollution and water scarcity- part of the adoptive success as propounded by Matthew – may cause indirect conflict in association with other factors as nuanced by Volker Boge[39] or Homer Dixon[40]. The other side is the situation of direct conflict or violence arising out of the environmental scarcity of resources - a case of adoptive failure. Hence the conflict emanates directly from the overuse and or pollution/destruction of a renewable natural resource. For example, if a downstream riparian threatens to go to war against an upstream riparian, because the latter pollutes river water so gravely that it cannot be used by the inhabitants of the downstream riparian, who are highly dependent on this water, then the environmental character of conflict is evident.[41] An array of evidences can be cited to show such threats of conflict over

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[37] Michael Walzer, *Just and Unjust Wars: A Moral Argument with Historical Illustrations* (New York: Basic Books, 1992); Michael Walzer, *Spheres of Justice: A Defence of Pluralism and Equality* (Oxford: M. Robertson, 1993); Michael Walzer, *Thick and Thin: A Moral Argument at Home and Abroad* (Notre Dame: University of Notre Dami Press, 1994); and Michael Walzer, "*The politics of Rescue", Social Research 62*, 1995,pp.53-67.

[38] Richard A. Matthew, et.al, "*Elusive Quest,* p.24.

[39] Volker Boge, "Proposal for an Analytical framework to grasp environmental conflict", ENCOP, *Occasional Paper no. I,* July 1992, Swiss Peace Foundation. P.5.

[40] Homer Dixon, Environment, Scarcity and Violence, op.cit.

[41] Volker Boge*, op.cit.*

environmental scarcity of water all over the globe.[42] That in some cases it has led to cooperation to avoid war does not divest the environmental conflict of its theoretical appeal. Another example of direct violent conflict over environmental scarcity of resources like fish can be cited. The decline in fish catch due to environmental degradation all over the globe and in South Asian regions in particular could result in a series of violent conflict between Tamil Nadu fishermen of India, and Sri Lanka over fishing in waters of Kachchativu Island ceded by India to Sri Lanka as a gesture of friendship and good will in 1974.[43]

The two aspects of environmental scarcity induced situation in terms of adaptive failure and adaptive success can dovetail together into what is called environmental security in a broader sense. What is called as adaptive success at micro level along with adaptive failure in terms of poverty, food scarcity, health hazards or suffering due to environmental degradation at macro level, for example the impact of global warming due to western pattern of development based on fossil fuel industrialization and inordinate life style, poses challenges to redefine development and the vision of and approaches to life.

## HUMAN SECURITY: THE THIRD DIMENSION

The study on environment and security has evolved over the years: from an early primacy on incorporating environmental and its

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[42] Peter H.Gleick, *World's Water: The Biennial Report on Fresh Water Resources* (Washington D.C.: Covels, California, Island Press, 1998); Haleh Hatami and Peter H.Gleick, "Chronology of Conflict over Water in the Legends, Myths and History of the Ancient Middle East", *Report of the Pacific Institutes of the Studies in Development, Environment, and Security*," Oakland, California, October 1992; Helga Haftendorn, "Water and International Conflict", *Third World Quarterly* vol.21, no.1, 2000, pp.51-68; Marq De Villiers, *Water Wars*, London: Weidenfeld and Nicolson, 1999) ; World in Transition: Ways towards Sustainable Management of Fresh Water Resources, *German Advisory Council on Global Change, Annual Report 1997* (Heidelberg: Springer – Verlag Berlin, 1999)

[43] N Gaan, Environmental Scarcity of Fish and Conflict: The Case of India and Sri Lanka over Kachchativu Waters", *International Studies Notes* Vol-22, No.3, Fall 1997, pp.17-23.

concomitant upshots into the "definition of security" to putting a new premium on how environmental degradation can be a cause or magnifier of violent conflict both intrastate and interstate. An emerging trend within this evolution of non military security threats has been a move toward greater emphasis on the concept of human security. Human security is not in opposition to the earlier trends of redefining security or accounting for the environmental roots of violent conflict. It is an offshoot of these two trends. In a broader sense, human security concerned with security of the people in non-military terms is nothing but an extension of environmental security. The very verbiage used to define the term security in these non traditional and broader senses is today found not dissimilar to that used to understand and define human security.

Those analysts who have focused on explicating the environmental causes of violent conflict have also brought the debate closer to "the concept of human security [ which] offers a third perspective that allows us to move beyond conventional security thinking, appreciates both the local and global dimensions of the many insecurities experienced by real individuals and groups, and identifies useful ways of linking security and development policies."[44]

While the concept of "human security" has earlier roots, its recent prominence emanates from the 1994 Human Development Report (UNDP, 1994). Its importance was further advanced by the report of the Commission on Global Governance (CGG, 1995). Both reports tried to shift the direction of the security discussion by focusing on issues of human life and human dignity rather than on weapons and territory.

Lorraine Elliott points out two dimensions of the human security paradigm: The first is that the concept of "human security" provides an antidote to the more   conventional focus on states, borders and territorial integrity. The answer to the question "security for whom" is not the state but the individual and communities, which suggests

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[44] Geoffrey D. Dabelko, Mark Halle, Steve Lonergan and Richard Matthew, *State of the art review on environment, security and development co-operation.* Prepared for the Working Party on Development, Co-operation and Environment, OECD Development Assistance Committee, Paris. P.48.

that even when a state is secure from external threats or internal instabilities, security for its people is not guaranteed. Protecting individuals and communities from the consequences of environmental decline is therefore a security issue. The second dimension is that human insecurity (which includes equity, gender, human rights, and identity concerns) is a central factor in social tensions and political instabilities and conflicts that can… become a feature of state insecurity…. If peoples and communities are insecure economically, socially, politically, environmentally, state security can be fragile or uncertain. Environmental security becomes a distributive equity problem rather than one simply of market failure, externalities or zero sum calculations about access to resources and environmental services.[45]

The primacy of state security is strongly embedded in the notion of sovereignty. In its historic meaning, sovereignty implied the security of the sovereign, or "the Prince". The emergence of democratic polity and the transfer of power to the "Citizen" question interestingly the very concept of security rooted in the sovereignty. With sovereignty now ensconcing in the citizenry rather than in the Prince, the notion of security must also be broadened to include the security of the people not the apparatus of the prince. Such a conceptual shift in understanding security does not mince in any way the importance of state security, but it does explicate the need to broaden the term. It is no longer sufficient to hold security of state as synonymous with security of people. Security in conventional parlance understood as synonymous with territorial exclusivity or Prince fails to give security to the individuals and communities. The inadequacy of state security and its brittle impregnability are no where felt so grotesquely than in the case of global climate change. Even the most powerful state well equipped with all modern and sophisticated weapons will come to its knees in the face of climate change affecting millions of people in both the developed and developing worlds. Environmental security and human security meet the same confluence where the need for sustainable development,

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[45] Lorraine Elliott, "Regional environmental security: Pursuing a non-traditional approach" In Andrew T.H. Tan and J.D. Kenneth Boutin (Eds), *Non-Traditional security issues in Southeast Asia* (Singapore: Select Publishing, 2001),p.449.

and new environmental ethics emerging to redefine western pattern of development and its inordinate life style, meet together.

**CLIMATE CHANGE AND HUMAN SECURITY**

The question as to how will the changing climate patterns affect inter-state relations, national and international security as well as the well-being and survival of humankind comes to the fore with the findings of scientists about the imminence and impending danger of climate change looming large on the entire humanity. On 6 April, 2007, the Intergovernmental Panel on Climate Change (IPCC) released the second part of its Fourth Assessment Report demonstrating that the poor of this planet are most likely to suffer the worst effects of climate change.  Human security takes on a broader meaning when one considers basic needs for food, water and health – in short, livelihood and a place to live – the issues addressed in the Millennium Development Goals. Poor communities can be especially vulnerable, in particular those concentrated in high-risk areas. They tend to have more limited adaptive capacities, and are more dependent on climate-sensitive resources such as local water and food supplies.[46]

Furthermore, within the larger category of 'the poor' lies the frequently invisible (including within that IPCC summary document) group: women. Worldwide, seventy percent of those living below the poverty line are women[47] for whom climate change represents very specific threats to security. When the impacts of climate change are brought home, then women, in their roles as the primary managers of family, food, water and health, must deal very directly with the impacts.

While natural climate variations have existed for millennia, anthropogenic climate change has gradually emerged since the

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[46] Quotations from the IPCC rely on "Working Group II Contribution to the Intergovernmental Panel on Climate Change, Fourth Assessment Report Climate Change 2007: Climate Change Impacts, Adaptation and Vulnerability, *Summary for Policymakers,* 6 April 2007 http://www.ipcc.ch/SPM6avr07.pdf .

[47] See: Ulrike Röhr (2006) "Gender and Climate Change," *Tiempo* 59 (April): 3-7

http://www.tiempocyberclimate.org/portal/archive/pdf/tiempo59high.pdf .

industrial revolution and especially after World War II. This has also been due to western pattern of development based on the availability of cheap fossil fuels (coal, oil, natural gas) and the dramatic increase in its consumption first in the industrialized countries and now increasingly also in the rapidly growing economies of the BRIC states (Brazil, Russia, India, China), especially of China and India.

## CLIMATE CHANGE, SECURITY AND CONFLICTS

Ben Wisner and others have established the linkages between climate change and conflict having implications on national and international security[48]. On 9 January 2004, David King, the UK Government's chief scientific adviser claimed that climate change is a far greater threat to the world than international terrorism. In February 2004, John Reid MP, then British Secretary of State for Defence and now Home Secretary, argued that climate change may spark conflict between nations. He forecast that violence and political conflict would become more likely in the next 20 to 30 years as climate change turned land into desert, melted ice fields and poisoned water supplies. He listed climate change alongside the major threats in future decades, including terrorism, demographic changes, and global energy demand. "As we look beyond the next decade, we see uncertainty growing; uncertainty about the geopolitical and human consequences of climate change. …Impacts such as flooding, melting permafrost and desertification could lead to loss of agricultural land, poisoning of water supplies and destruction of economic infrastructure. …More than 300 million people in Africa currently lack access to safe water; climate change will worsen this dire situation."[49] John Ashton, the UK Foreign Secretary's Special Representative for Climate Change, said at a

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[48] Ben Wisner and others, "Climate Change and Human Security" Simultaneously   uploaded to Radix - Radical Interpretations of Disaster: http://www.radixonline.org/cchs.html                                      & http://www.radixonline.org/cchs.doc ;
Disaster Diplomacy: http://www.disasterdiplomacy.org; Peace Research and European Security Studies (AFES-PRESS): http://www.afes-press.de/html/topical.html .
[49] Ben Russell and Nigel Morris (2006) "Armed forces are put on standby to tackle threat of wars over water", *Independent*, 28 February http://news.independent.co.uk/environment/article348196.ece .

conference on "Climate Change: The Global Security Impact",  at the Royal United Services Institute on 24 January 2007: "There is every reason to believe that as the 21st century unfolds, the security story will be bound together with climate change."[50] "Climate change is a security issue because if we don't deal with it, people will die and states will fail," Ashton concluded.

Ashton pointed out that defense and security planners must face a paradox when assessing their responses to the problem. Most security threats in today's world are amenable to some extent to a "hard power" or conventional reaction, he said, and demand will rise for such responses to climate change-related security problems. "But there is no hard power solution to climate change - you cannot force your neighbour to change its carbon emissions at the barrel of a gun."[51]

Sir Crispin Tickell, the former UK Permanent Representative to the UN, highlighted the environmental factors behind societal collapse. Professor John Mitchell, the chief scientist at the UK Met Office, forecast that the coming decades will see a 30 per cent increase in severe drought. He added that Africa will experience increased desertification, water stress and disease.[52]

Besides the UK, other nations have begun to assess the security implication of climate change.  In 2002, the German Ministry for the Environment, Nature Conservation and Nuclear Safety published a commissioned report on climate change and conflicts raised the question whether climate change impacts can increase conflict

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[50] Quoted in Ben Vogel (2007)  "Climate change creates security challenge 'more complex than Cold War',"*Janes.com*
http://www.janes.com/security/international_security/news/misc/janes0701 30_1_n.shtml .

[51] Quoted by Chris Littlecott (2007)  "Climate Change: The Global Security Impact"  February http://www.e3g.org/index.php/programmes/climate-articles/climate-    change-the-global-security-impact / .

[52]    Sir Crispin Tickell (2003) "Risks of conflict: Population and Resource Pressure", In: Hans Günter Brauch, P.H Liotta, Antonio Marquina, Rogers, Paul; Selim, Mohammed El-Sayed, eds. *Security and Environment in the Mediterranean. Conceptualising Security and Environmental Conflict*, pp. 13-18. Hexagon Series on Human and Environmental Security and Peace, vol.  Springer: Berlin-Heidelberg.

potentials.[53] n spring 2004 an internal report by Randall and Schwartz for the U.S. Department of Defense on the impact of Abrupt Climate Change on U.S. national security was leaked to the press.[54]

The British initiative during its Security Council Security Council presidency to put climate change on its agenda for 17 April 2007 has been the most recent attempt to "securitize" climate change in the context of geo-politics.[55]

## CLIMATE CHANGE AS A THREAT AND CHALLENGE TO INTERNATIONAL, NATIONAL AND HUMAN SECURITY

Climate change poses many new threats and challenges to national security and international stability as well as to human security at other scales.  The concept of human security was introduced first by UNDP in 1994[56] and then developed further in a report by the Human Security Commission, co-chaired by Sadako Ogata and Amartya Sen, in its report *Human Security Now* (2003).[57]

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[53] See: Hans Günter Brauch (2002) "Climate Change, Environmental Stress and Conflict," In: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, ed. *Climate Change and Conflict*, pp. 9-112. Federal Ministry for the Environment, Nature Conservation and Nuclear Safety: Berlin
http://www.afes-press.de/pdf/Brauch_ClimateChange_BMU.pdf .
[54] Hans Günter Brauch (2004) "Abrupt Climate Change and Conflicts: Security Implications from a European Perspective - Hobbesian vs. Grotian Analyses," Friedrich Ebert Foundation and Carnegie Endowment for International Peace, Washington, DC, 29 March
http://www.afes-press.de/pdf/Brauch_ClimateChange.pdf
[55] See: "Press Conference by Security Council President, 4 April 2007" http://www.un.org/News/briefings/docs//2007/070404_Parry.doc.htm .
[56] UNDP (1994) *Human Development Report: New Dimensions of Human Security.* UNDP: New York.
[57] On the narrow and broad definitions of 'security', see: Hans Günter Brauch: *Environment and Human Security*," InterSecTions, 2/2005 (Bonn: UNU-EHS); at: http://www.ehs.unu.edu/file.php?id=64; and   Hans Günter Brauch: *Threats, Challenges, Vulnerabilites and Risks in Environmental and Human Security*. Source 1/2005 (Bonn: UNU-EHS) http://www.ehs.unu.edu/file.php?id=63   and   Commission   on   Human

The environmental dimension of human security has been addressed by an international team working on Global Environmental Change and Human Security (GECHS) and in several studies by the United Nations University Institute for Environment and Human Security (UNU-EHS).[58]

In February 1999, during its presidency of the United Nations Security Council, Canada, a founding member of the Human Security Network, put human security on the agenda by addressing the impact of armed conflicts on human beings.[59] In March 2005, UN Secretary General Kofi Annan, in his report *In Larger Freedom,*[60] wrote of human security in a broad sense. The issue was placed on the agenda of the UN General Assembly in the fall of 2005.

UNDP will take up the relationship between human development and climate change in its *Human Development Report 2007* (HDR), to be launched in November. Over 17 years, UNDP has incrementally developed a sensitive measure of human development

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Security (2003) *Human Security Now*.  Commission on Human Security: New York

http://www.humansecurity-chs.org/ .

[58] For GECHS see http://www.gechs.org/ ; Janos Bogardi and Hans Guenter Brauch    (2005) "Global Environmental Change: A Challenge for Human Security – Defining and conceptualising the environmental dimension of human security", In: Andreas Rechkemmer, ed. *UNEO – Towards an International* Environment, pp. 85-109.  Nomos: Baden-Baden.  GECHS will also be holding a conference on the mainstreaming of human security, *The International Conference on Human Security in Asia: Theory, Practice and Impacts* will be held in Bangkok, October 4-5 2007 http://www.ids.polsci.chula.ac.th/humansecurity.htm .

[59] Jürgen Dedring (2007) "Human Security and the UN Security Council", In: Hans    Günter Brauch, John Grin, Czeslaw Mesjasz, Pal Dunay, Pal Chadha, Navnita Pal, Béchir Chourou, Ursula Oswald Spring, Ursula, P.H. Liotta,  Patricia  Kameri-Mbote,  eds.  (2007)  *Globalisation  and Environmental Challenges: Reconceptualising Security in the 21$^{st}$ Century.* Chapter 48. Hexagon Series on Human and Environmental Security and Peace, vol. 3.  Springer: Berlin (in press).

[60] Kofi Annan (2005) *In Larger Freedom: Towards Development, Security and  Human  Rights  for  All*.  United  Nations:  New  York http://www.un.org/largerfreedom/ .

(the human development index – HDI). The earlier studies have shown that the HDI correlates well with measures of disaster risk, such as UNDP's disaster risk index (DRI), especially for the less developed countries.[61] Preliminary analysis for this year's HDR suggests that climate change poses major obstacles to progress in meeting MDGs and maintaining progress raising the HDI: "There is a clear and present danger that climate change will roll back human development for a large section of humanity, undermining international cooperation aimed at achieving the Millennium Development Goals (MDGs) in the process."[62]

Concerning the MDGs individually, UNDP states:[63]

…[C] limate change may pose a threat to food security through erratic rainfall patterns and decreasing crop yields, contributing to increased hunger. Furthermore, adverse climate change impacts on natural systems and resources, infrastructure, and labor productivity may lead to reduced economic growth, exacerbating poverty. These effects threaten the achievement of MDG 1. Loss of livelihood assets, displacement and migration may lead to reduced access to education opportunities, thus hampering the realization of MDG 2. Depletion of natural resources and decreasing agricultural productivity may place additional burdens on women's' health and reduce time for decision-making processes and income-generating activities, worsening gender equality and women's' empowerment (MDG 3). Increased incidence of vector-borne diseases, increases in heat-related

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[61] UNDP (2004) *Reducing Disaster Risk: A Challenge for Development*. Geneva: UNDP, Bureau for Crisis Prevention and Recovery http://www.un.org/special-rep/ohrlls/ldc/Global-Reports/UNDP%20Reducing%20Disaster%20Risk.pdf

[62] UNDP (2007) *Human Development Reports* http://hdr.undp.org/ ; see also UNDP, UNEP, World Bank,
 ADB, AfDB, GTZ, DFID, OECD, and EC (2003) *Poverty and Climate Change: Reducing the Vulnerability of the Poor through Adaptation*. World Bank: Washington http://www.undp.org/climatechange/adap01.htm .

[63] UNDP (2007) "Poverty Eradication, MDGs and Climate Change" http://www.undp.org/climatechange/adap01.htm .

mortality, and declining quantity and quality of drinking water
will lead to adverse health effects threatening the achievement
of MDGs 4,5,6 and 7. In general terms, the realization of MDG
7 may be jeopardized through climate change negatively
impacting quality and productivity of natural resources and
ecosystems, possibly irreversibly, threatening environmental
sustainability. Climate change, a global phenomenon, calls for
a collective response in the form of global partnerships (MDG
8 )

## LINKAGES BETWEEN CLIMATE CHANGE AND SECURITY

Some effects of climate change are already evident and will
become very clear in the human and climatic short run (2007-2020).
These will increase and the others will manifest themselves in the
medium term (2021-2050). In the long run (2051-2100), these will
all be active and interacting strongly with other major trends: the end
of the petroleum economy for many producing and consuming
nations, possible financial and economic crisis, a larger population of
humans, and a much more urbanized humanity – far in excess of the
50% now living in small to very large cities. All these processes will
be accompanied by redistribution of population nationally and
internationally.[64] Such redistributions typically have significant
gender dimensions; for example, extreme event impacts can lead to
male out migration in search of work, culminating in an increase in
women-headed households – a group often considered particularly
vulnerable.[65]

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[64] David Simon (2007), "Cities and Global Environmental Change:
Exploring the   Links," *The Geographical Journal* 173, 1 (March): 75-79 &
see chapters 3 & 4 of Sir Nicholas Stern et al. (2007) *Stern Review on the
Economics of Climate Change*. London: UK, Department of the Treasury
http://www.hm-
treasury.gov.uk/independent_reviews/stern_review_economicsclimate_cha
nge/stern_review_report.cfm
[65] Delaney and Shrader (2000) report the percentage of women-headed
households    more than doubled in both Honduras and Nicaragua following
Hurricane Mitch in 1998. See:  Patricia L. Delaney and Elizabeth Shrader

The linkages between climate change and security are complex in many ways. To begin with, climate change involves the interactions of many systems such as the atmosphere, hydrosphere, cryosphere, and biosphere that are immensely complex in their own right. Thus, a recurrent theme in IPCC reports is the significance of thresholds and non-linearities. When human systems are added to the mix, complexity escalates.[66] Livelihood security and other aspects of human security interact with geo-strategic (or "hard") security issues because of the national and regional upheavals that climate stress may put on livelihood systems already vulnerable and incapable of adapting.[67] World wide the rural and urban poor are already under stress, and for some groups such as women headed households in Africa, adaptation to climate-induced stress will be very difficult indeed. As Simon points out, climate change has both intermittent but increasingly frequent, extreme impacts (such as large storms and heat waves) and slow on-set, pervasive, cumulative effects (such as extinction of life forms and sea level rise).[68] Both kinds of effects may have a role in displacing human populations and disrupting their livelihoods. Some major climate changes may actually occur rapidly.

Some efforts by state actors to mitigate and adapt to climate change may also further stress weak and marginal sections of the population such as indigenous groups and ethnic minorities, increasing discontent and alienation. In particular, large scale water management and forestry projects in the past have displaced such

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(2000) "Gender and Post-Disaster Reconstruction: The Case of Hurricane Mitch in Honduras and Nicaragua", LCSPG/LAC Gender Team, *The World Bank, Decision Review Draft,* page 24
http://www.gdnonline.org/resources/reviewdraft.doc .

[66] Millennium Ecosystem Assessment (2006) *Our Human Planet: Summary for Decision Makers*, p. 6, Box 1.2, "Millennium Ecosystem Assessment Conceptual Framework"
http://ma.caudillweb.com//en/Products.Global.Summary.aspx .
[67] On the definition of "vulnerability" at the scale of household livelihoods and its linkage with macro-scale processes, see Ben Wisner, Piers Blaikie, Terry Cannon, and Ian Davis (2004) *At Risk: Natural Hazards, People's Vulnerability and Disaster.* 2nd Edition. Routledge: London.
[68] David Simon (2007) *Ibid.*

groups,[69] and without safeguards are likely to do so as states expand mega-projects as part of their national climate adaptation programs. One example is the new dams being built in Guatemala.  Such intra-state tension and possible conflict over the distribution of winners and losers in climate adaptation may spillover into regional conflicts, on the basis of recent experience in Darfur.  State actor adaptations may also weaken treaties such as regional water basin management and lead eventually to inter-state conflict.  For example, Sudan's decision to build a new dam on the Nile could have that result.

One must also consider that the world around us in 2007 has in it a large number of weak and crisis-prone nation states.[70] It is not likely that such chronic instability will diminish (although details of the pattern may shift geographically) before severe impacts of climate change are felt.  Humanitarian intervention in the crises that are likely will become more difficult and run the danger of exacerbating conflict, especially as civilian humanitarian and military relations become more interwoven.[71]

Figure 1 provides an overview of these complex interactions arranged on a time scale.

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[69] Art Hansen and Anthony Oliver-Smith (1982) *Involuntary Migration and Resettlement: The Problems    and Responses of Dislocated Peoples* Westview Press: Boulder, Co;  World    Commission on Dams (2000) "People and Large Dams: Social Performance," In: *Dams and Development* http://www.dams.org//docs/report/wcdch4.pdf  ;  Chris de Wet, compiler (2002) Improving Outcomes in Development-Induced Displacement and Resettlement
 (DIDR)   Projects.   Oxford   University,   Refugee   Studies   Centre http://www.rsc.ox.ac.uk/PDFs/rrimprovingoutcomes02.pdf ;  W.  Courtland Robinson  (2004)  "Minimizing  Development-Induced  Displacement," Migration *Information Source*
http://www.migrationinformation.org/feature/display.cfm?ID=194 .
[70] See: Crisis States Programme, Development Studies Institute, London School of  Economics:
http://www.crisisstates.com/News/seminars1.htm .
[71]  International  Famine  Program  (2004)  *Ambiguity  and  Change: Humanitarian NGOs    Prepare for the Future*. A report prepared for: World Vision, CARE, Save US, Mercy Corps, Oxfam USA, Oxfam GB & Catholic Relief Services
 http://famine.tufts.edu/pdf/ambiguity_and_change.pdf .

**Figure 1: Matrix of Possible Climate Change/Security Interactions over Time**

| | Direct impact | Indirect Consequences | | | | | Slow-onset |
|---|---|---|---|---|---|---|---|
| | Water | Food | Health | Mega-projects | Disasters | Bio-fuel | Sea level |
| Short term (2007-2020) | Local conflict over water | Failure to meet MDGs | Failure to meet MDGs | Long history of development-induced displacement from 1950s | Nation states begin to lose credibility due to inability to prevent large disasters | Isolated food – fuel competition & price spikes | Small number of displacements |
| Medium term (2021-2050) | Increased local & some international conflict over water | Significant displacement due to famine | Interacts with food production problems | Displacement of rural poor due to CDM & large scale dams & other state based mitigation & adaptation projects | Significant political unrest due to failure of DRR & inadequate recovery in many countries | Food-fuel competition increases & biodiversity erosion | Increasing displacement & national/ international tension |
| Long term (2051-2100) | Major international conflict over water | Major displacement & political upheaval | Major displacement due to epidemics | Major urban upheaval and other political fall out from mega-project displacement | Major upheaval with international implications due to unattended weather catastrophes | Major discontent due to food-fuel competition | Major international tensions due to population displacement |
| | All   of  these processes strongly interact with   each other | | | | | | |

Source: Ben Wisner and others, "Climate Change and Human Security" Simultaneously uploaded to Radix - Radical Interpretations of Disaster: http://www.radixonline.org/cchs.html & http://www.radixonline.org/cchs.doc ; Disaster Diplomacy: http://www.disasterdiplomacy.org; Peace Research and European Security Studies (AFES-PRESS): http://www.afes-press.de/html/topical.html .

## CLIMATE-INDUCED CONFLICT CONSTELLATIONS

WBGU identifies four conflict constellations[72] in which critical developments can be anticipated as a result of climate change and which may occur with similar characteristics in different regions of the world. "Conflict constellations" are defined as typical causal linkages at the interface of environment and society, whose dynamic can lead to social destabilization and, in the end, to violence.

### Conflict Constellation "Climate-induced degradation of freshwater resources"

More one billion (1.1 billion) people are currently without access to safe drinking water. The situation could worsen for hundreds of millions of people as climate change alters the variability of precipitation and the quantity of available water. At the same time, demand for water is increasing due to the world's growing population and its mounting aspirations. This dynamic triggers distributional conflicts and poses major challenges to water management systems in the countries concerned. For example, regions which depend on melt water from mountain glaciers – which are at risk from climate change – will require new water management strategies and infrastructures, as well as political efforts to avert national or even trans-boundary conflicts over the distribution of increasingly scarce water resources. However, the countries which will suffer the greatest water stress are generally those which already lack the political and institutional framework necessary for the adaptation of water and crisis management systems. This could overstretch existing conflict resolution mechanisms, ultimately leading to destabilization and violence.

There is no dearth of evidence in the past to show as a population growth/ demand problem, water scarcity may, indeed, become a source of conflict and instability, but more as a function of

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[72] German Advisory Council on Global Change – WBGU Secretariat Reichpietschufer 60-62, 8. OG D-10785 Berlin.The summary can be downloaded through the Internet from the
website http://www.wbgu.de/wbgu_jg2007_kurz_engl.html.

supply.[73] International regimes such as the Nile Treaty are old, inadequate, and fragile.  Newer, more forward-looking treaty regimes, such as the Nile Basin Initiative, are still in their infancy and subject to similar divisive pressures despite the efforts of multilateral agencies like the World Bank. The other tensions and sources of instability discussed above could also place international water management and sharing agreements under pressure. Management of many of the world's 261 international rivers will face severe tests.[74] Furthermore; many coastal freshwater aquifers will suffer salinization as a result of sea level rise.  In Africa alone: by 2020, between 75 to 250 million people are projected to be exposed to an increase   of water stress due to climate change. If coupled with increased demand, this will adversely affect livelihoods and exacerbate water-related problems.[75]

A team at Keele University and the UK's Centre for Ecology and Hydrology has produced a water poverty index (WPI)[76.]  Using the WPI they found that already in 2005 a large number of countries were suffering moderate, high, or severe stress.  If this is the baseline situation, what will additional stress due to climate change do in many of these places?

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[73] On the neo-Malthusian roots of "environmental conflict" discourse, see Elizabeth   Hartmann (2003) *Strategic Scarcity: The Origins and Impact of Environmental Conflict Ideas*, PhD Thesis, Development Studies, London School of Economics & Betsy Hartmann, "Degradation Narratives: Over-Simplifying the Link Between Population, Poverty and the Environment*," IHDP Update, Newsletter of the International Human Dimensions Program on Global Environmental Change*, No. 4, 2002: 6-8 & Elizabeth Hartmann (1998) "Population, environment and security: a new trinity," *Environment and   Urbanization* 10,2:   113-127   --       summarized   in http://popdev.hampshire.edu/projects/dt/dt27.php .

[74] Twin Basin, "International River Basins of the World"

[75] Quotations from the IPCC rely on "Working Group II Contribution to the Intergovernmental Panel on Climate Change, *Fourth Assessment Report Climate Change 2007: Climate Change Impacts, Adaptation and Vulnerability,* Summary   for   Policymakers,   6   April   2007 http://www.ipcc.ch/SPM6avr07.pdf . P.10.

[76] *Water Poverty Index*
http://www.ceh.ac.uk/sections/ph/WaterPovertyIndex.html

**Conflict Constellation "Climate-induced decline in food production**"

More than 850 million people worldwide are currently undernourished. This situation is likely to worsen in future as a result of climate change, as food insecurity in the lower latitudes, i.e. in many developing countries, will increase with a temperature rise of just 2 °C (relative to the 1990 baseline). With global warming of 2–4 °C, a drop in agricultural productivity is anticipated worldwide. This trend will be substantially reinforced by desertification, soil salinization or water scarcity. In South Asia and North Africa, for example, the areas suitable for agriculture are already largely exploited. This may well trigger regional food crises and further undermine the economic performance of weak and unstable states, thereby encouraging or exacerbating destabilization, the collapse of social systems, and violent conflicts.

Food and livelihood pressure due to climate change will lead to populist and/or military coups in a number of countries. After the roll-out of macro-economic "structural adjustment" programmes in Africa in the 1980s, one witnessed junior officers in a number of militaries seizing power in the name of workers and peasants who suffered (e.g. in Burkina Faso). This will produce continuing instability in Africa, in particular. Between 1980 and 2001 there were 95 attempted coups in Africa -- 33 of them successful. Popular discontent over livelihood security was a contributing cause of many of these.[77] The same pressures as well as the "push" provided by conflict will cause considerable population movements and displacement both within countries and internationally.[78] That, in turn, will increase insecurity – a process that is already occurring. Effects in Africa may include the following:

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[77] See: Patrick J. McGowan (2003) "African Military Coups d'Etat, 1956-2001: Frequency, Trends and Distribution.." *Journal of Modern African Studies*, 41, 3: 339–370; at:
http://journals.cambridge.org/download.php?file=%2FMOA%2FMOA41_03%2
FS0022278X0300435Xa.pdf&code=aad776a39cf997c090aecae20ceafeb1 .
[78] See: Spanish Environment Ministry (2006) *Conference on Desertification and    Migration*. 25-27 October 2005, Almeria, Spain
http://www.sidym2006.org/eng/eng_ponencias_conclusiones.asp .

Agricultural production, including access to food, in many African countries and regions is projected to be severely compromised by climate variability and change. The area suitable for agriculture, the length of growing seasons and the yield potential, particularly along the margins of semi-arid and arid areas, are expected to decrease. This would further adversely affect food security and exacerbate malnutrition in the continent. Local food supplies are projected to be negatively affected by decreasing fisheries resources in large lakes due to rising water temperatures, which may be exacerbated by continued over-fishing.[79]

Women are responsible for around 70 percent of household food production in sub-Saharan Africa, often on the basis of informal resource rights.  Climate-induced changes in crop and livestock production could threaten those rights, as well as affect the gendered division of labor with negative effects on women's and men's incomes, livelihoods and household security.[80]

The climate-food connection will not only affect the poor.  In some industrial and industrializing nations, as climate change creates new patterns of food production -- new exporting and new importing zones – access to supplies and the energy to import them may become strategic concerns and lead to international conflict.

## Conflict Constellation "Climate-induced increase in storm and flood disasters"

Climate change is likely to result in further sea-level rise, more intensive storms and heavy precipitation. This will greatly increase

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[79] Quotations from the IPCC rely on "Working Group II Contribution to the Intergovernmental Panel on Climate Change, *Fourth Assessment Report Climate Change 2007: Climate Change Impacts, Adaptation and Vulnerability,* Summary for Policymakers, 6 April 2007
 http://www.ipcc.ch/SPM6avr07.pdf . P.10.

[80] CIDA (no date) *Gender Equality and Climate Change. Why consider gender      equality when taking action on climate change?*  Canadian International Development Agency
www.acdi-cida.gc.ca/INET/IMAGES.NSF/vLUImages/Climate%20change3/$file/Gender-2.pdf .

the risk of natural disasters occurring in many cities and industrial regions in coastal zones. Those risks will be further amplified by deforestation along the upper reaches of rivers, land subsidence in large urban areas and the ever greater spatial concentration of populations and assets. Storm and flood disasters have already contributed to conflict in the past, especially during phases of domestic political tension, e.g. in Central America, India and China. Conflicts are likely to occur more frequently in future, firstly because regions especially at risk from storm and flood disasters, such as Central America and Southern Africa, generally have weak economic and political capacities, making adaptation and crisis management much more difficult. Secondly, frequent storm and flood disasters along the densely populated east coasts of India and China could cause major damage and trigger and/or intensify migration processes that are difficult to control.

## Conflict Constellation "Environmentally-induced migration"

Experience has shown that migration can greatly increase the likelihood of conflict in transit and target regions. It can be assumed that the number of environmental migrants will substantially rise in future due to the impacts of climate change. In developing countries in particular, the increase in drought, soil degradation and growing water scarcity in combination with high population growth, unstable institutions, poverty or a high level of dependency on agriculture means that there is a particularly significant risk of environmental migration occurring and increasing in scale. Most environmental migration is initially likely to occur within national borders. Trans-boundary environmental migration will mainly take the form of south-south migration, but Europe and North America must also expect substantially increased migratory pressure from regions most at risk from climate change. The question as to which states will have to bear the costs of environmentally-induced migration in future also contains conflict potential.

## Health-Climate-Livelihood-Conflict-Security

Health impacts of climate change including epidemics and insect outbreaks will have a similar effect, also compounding food and livelihood crises.  This is beginning, but it will accelerate in the

medium term.  As we have seen with SARS and avian influenza, disease does not respect national boundaries in a globalized world. Changing climate may bring many epidemiological surprises as vector habitats change, sometimes quite rapidly.

Projected climate change-related exposures are likely to affect the health status of millions of people, particularly those with low adaptive capacity, through:

* increases in malnutrition and consequent disorders, with mplications for child  growth and development;

* increased deaths, disease and injury due to heat waves, floods, storms, fires and    droughts;

* the increased burden of diarrhoeal disease; the increased frequency of cardio-respiratory diseases due to higher concentrations of ground level ozone related to climate change; and, the altered spatial distribution of some infectious disease vectors.

Climate change is expected to have some mixed effects, such as the decrease or increase of the range and transmission potential of malaria in Africa[81].

## Mitigation-Adaptation-Inequity-Conflict-Security

Adger *et al* raise the issue of "fairness" in adaptation to climate change.[82]  Mega-projects conceived by nation states as solutions to climate change such as the planting of large scale forestry under the

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[81] Quotations from the IPCC rely on "Working Group II Contribution to the Intergovernmental Panel on Climate Change, *Fourth Assessment Report Climate Change 2007: Climate Change Impacts, Adaptation and Vulnerability,* Summary for Policymakers, 6 April 2007 http://www.ipcc.ch/SPM6avr07.pdf . P.9.

[82] Neil Adger, Jouni Paavola, Saleemul Huq, M.J. Mace, eds. (2006) *Fairness in Adaptation to Climate Change.* Cambridge, MA: MIT Press; See also: Michael H. Glantz (1990) "On the Interactions between Climate and Society," *Population and Development Review* 16: 179-200 & Michael H Glantz and Dale Jamieson, co-convenors (2001) "Climate Ethics and Equity," *NCAR Working Group Web Page* (October) http://www.ccb.ucar.edu/ethics/ .

Kyoto Protocol's Clean Development Mechanism (CDM) and the building of more large dams and reservoirs, are beginning to displace other numbers of poor and marginal people, having effects on politics and stability similar to those mentioned above while negatively affecting biodiversity. In the medium term such mega-project investments – already a major feature of rapid urban industrialization in China and India, the world's two most populous countries – will grow rapidly as water shortages intensify. Already "an estimated 40–80 million people have been forcibly evicted from their lands to make way for dams."[83]

The social and economic impacts of climate change focused mitigation projects have not yet been fully assessed. Skutsch, for example, highlights the absence of gender impact analysis of CDM projects.[84] The "clean, green" solution of nuclear energy so heavily promoted in the early years of this century and recently adopted as a climate change-fighting strategy by the EU and others has led to a planet-wide race to capture extractive rights and exploit uranium reserves. At this writing, the historically high value of uranium has led to violent conflict in the Congo and the renewed use of forced labor. The profound, degenerative human health consequences of working and living in a toxic and radioactive environment are only recently being understood. Epidemics of cancer and other radiogenic health problems now prevalent in areas that hosted the Cold War nuclear machine are certain to expand.[85] In addition, a new phase in the growth of nuclear power could exacerbate the problem of "leakage" of weapons grade material into the hands of non-state actors.

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[83] International Rivers Network, "*About Rivers and Dams*" http://www.irn.org/basics/ard/ .

[84] Margaret Skutch (2004), *CDM and LULUCF: what's in it for women*? A note   for the Gender and Climate Change Network, Technology and Sustainable Development TDG, University of Twente; at: http://www.gencc.interconnection.org/skutsch2004.pdf.

[85] Johnston, Barbara Rose (2007) Half-lives & Half-truths: *Confronting the Radioactive Legacies of the Cold War.* SAR Press: Santa Fe, NM.

## Food-Fuel Conflict and Human Security

Large-scale investments in bio-fuels in the medium and long term as a substitute for green house gas-producing petro-based energy sources may have the perverse effect of taking considerable land out of food production and diverting food grains, thus raising food prices and eroding biodiversity. The maize (corn) price in Mexico has already increased because of demand for grain by US ethanol plants, and protests have resulted.[86] If this occurs, then food and livelihood pressures will increase and the desperation of many rural and urban people will increase national and regional insecurity. Rapid expansion of sugar production in Brazil and Africa palm in Colombia, as energy feed stocks, have been a major source of displacement of small farmers from their lands. Also, recent research has shown the energy and carbon efficiency of biofuel production to be variable and often lower than with the burning of fossil fuels.[87]

## Disaster-Livelihood-Governance-Conflict-Security

Also in the medium term livelihood security and hence the ability to govern will be undermined by the increasingly frequent occurrence of more and more mega-disasters such as those associated with hurricane Mitch (1998), the Orissa super-cyclone (1999), hurricanes Katrina and Rita, and tropical storm Stan (2005). Even now, the UN reports that over a million people are threatened by erratic weather in five southern African countries.[88] Such catastrophic weather events often produce cascades of secondary physical hazards such as landslides (as Nicaragua during Mitch or in Vargas, Venezuela in 1999) or downstream inundation when dams

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[86] Brittany Sauser (2007) "Ethanol Demand Threatens Food Prices," *Technology Review* (13 February)
 http://www.technologyreview.com/Energy/18173/ .
[87] Jeffrey A McNeely (2006) "Bio-Fuels: Green Energy or Grim Reaper?" *The Green Room*, 2 September
http://news.bbc.co.uk/2/hi/science/nature/5369284.stm .
[88] United Nations Office for the Coordination of Humanitarian Affairs - Integrated    Regional Information Networks (IRIN) (5 April 2007) "Southern Africa: Extreme weather threatens over a million people" http://www.reliefweb.int/rw/RWB.NSF/db900SID/SHES-6ZYQST?OpenDocument .

overflow or dam authorities release large volumes of water to safeguard large dams (as in Mozambique at present and in several recent years). They also trigger changes in social relations, including the exacerbation of unequal gender relations manifested in lack of land and property rights and the rise in sexual and gender based violence towards women and girls.[89] In urban industrial landscapes such as greater New Orleans, Manila, or Osaka, storms and flooding often bring further complications by damage done to factories, storage facilities, and pipelines. The resulting "natural-technological" (natech) hazards are very expensive to clean up and can have long term public health consequences.[90]  Institutional systems for anticipating or even timely recognition of the "surprises" that natech hazards may present in the future are not yet been developed world wide. Where extreme weather events become more intense and/or more frequent, the economic and social costs of those events will increase, and these increases will be substantial in the areas most directly affected. Climate change impacts spread from directly impacted areas and sectors to other areas and sectors through extensive and complex linkages.[91]

Disasters, development, and conflict have been shown to have complex interactions with one another, quite apart from the

[89] Maureen Fordham with Madhavi Malalgoda Ariyabandu, Prema Gopalan and Kristina J Peterson (2006) "Please don't raise gender now – we're in an emergency!" *World Disasters Report 2006*, Chapter 6. International Federation of Red Cross and Red Crescent Societies: Geneva http://www.ifrc.org/publicat/wdr2006/summaries.asp .

[90] A.M. Cruz, L.J. Steinberg, A.L. Vetere-Arellano, J.P. Nordvik, and F. Pisano,  (2004). *State of the Art in  Natech (Natural Hazard Triggering Technological Disasters) in Europe.* DG Joint    Research Centre, European Commission and United Nations International Strategy for Disaster Reduction, Ispra, Italy.

[91] Quotations from the IPCC rely on "Working Group II Contribution to the Intergovernmental Panel on Climate Change, *Fourth Assessment Report Climate Change 2007: Climate Change Impacts, Adaptation and Vulnerability,* Summary for Policymakers, 6 April 2007 http://www.ipcc.ch/SPM6avr07.pdf . P.16.

additional stresses and management challenges likely to accompany increasingly variable weather and more extreme storms.[92]

## Sea Level-Displacement-Security

Finally, sea level rise in the long term and its collateral impacts on river flow and ocean discharge regimes will cause displacement of many millions of people currently living in coastal areas. For the small island nations of the world, especially the many cultural groups living on coral atolls, entire nations face complete submersion. A recent study calculates that around 634 million people are living less than 10m above sea level. The study notes that "of the more than 180 countries with populations in the low-elevation coastal zone, about 70 percent have urban areas of more than five million people that extend into it." The authors then list Tokyo, Japan; New York, U.S.; Mumbai, India; Shanghai, China; Jakarta, Indonesia; and Dhaka, Bangladesh.[93] One could add other cities as well to the list, for example, Cartagena, Colombia; Lima, Peru; Buenos Aires, Argentina; and Recife and Rio de Janeiro, Brazil. African exposure is high.

Nigerian scholars Ibe and Awosika state: "This coastal zone consists of four major basins which are bordered on the ocean side by low-lying coastlines which are sandy and muddy in some cases. General beach elevations range from 2-3 m above sea level."[94] Most

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[92] Ben Wisner (2008) "The Interactions between Conflict and Natural Hazards in an      Unstable, Globalizing World: Swords, Plowshares, Earthquakes, Floods, and Storms," In: Hans Guenter Brauch, et al., eds.*Globalisation and Environmental Challenges: Reconceptualising Security in the 21st Century*, Vol. II, Chapter 15. Springer-Verlag: Berlin (in press); See earlier version *Journal of Natural Disaster Science* (Kyoto, Japan)26,2 (2004): 63-72.
http://www.drs.dpri.kyoto-u.ac.jp/jsnds/download.cgi?jsdn_26_2_3.pdf .
[93] Thomas Wagner, (28 March 2007) "Major Cities Warned against Sea Level     Rise" *Independent     (South     Africa)     On     Line* http://www.iol.co.za/index.php?set_id=1&click_id=31&art_id=nw2007032 8024424684C606123
[94] A.C. Ibe and L.F. Awosika (1991) "Sea level rise impact on African coastal   zones," In: S.H. Ominde and C. Juma, eds., *A change in the weather: African perspectives on climate change*, 105-12. African Centre

of Africa's major cities are coastal, including Dakar, Senegal; Accra, Ghana; Lagos, Nigeria; Luanda, Angola; Cape Town and Durban, South Africa; Maputo, Mozambique; Dar es Salaam, Tanzania; and Mombasa, Kenya; and Mogadishu, Somalia. The cost of dislocation – which will include salinisation of coastal aquifers and other low-lying fresh water resources - and loss of infrastructure will be difficult for poor countries to bear, especially in Africa.[95] The Intergovernmental Panel on Climate Change agrees.[96] Considerable political instability may result. Just considering Africa: Towards the end of the 21st century, projected sea-level rise will affect low-lying coastal areas with large populations. The cost of adaptation could amount to at least 5-10% of GDP. Mangroves and coral reefs are projected to be further degraded, with additional consequences for fisheries and tourism.[97]

Additional negative feedback can be anticipated as degradation of coastal wetland vegetation and coral reefs reduce or remove their protective influence in the face of storms.

## SIX THREATS TO INTERNATIONAL STABILITY AND SECURITY

In the light of current knowledge about the social impacts of climate change, WBGU identifies the following six key threats to international security and stability that will arise if climate change mitigation fails[98]:

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for Technology Studies: Nairobi, Kenya [Reprinted with permission by CIESIN http://www.ciesin.columbia.edu/docs/004-153/004-153.html .

[95] Simon (2007) *Op. Cit.*

[96] IPCC (1997) "African Coastal Zones", in: *IPCC Special Report on The Regional Impacts of Climate Change: An Assessment of Vulnerability* http://www.grida.no/climate/ipcc/regional/030.htm .

[97] Quotations from the IPCC rely on "Working Group II Contribution to the Intergovernmental Panel on Climate Change, *Fourth Assessment Report Climate Change 2007: Climate Change Impacts, Adaptation and Vulnerability,* Summary for Policymakers, 6 April 2007 http://www.ipcc.ch/SPM6avr07.pdf . P.10

[98] German Advisory Council on Global Change - WBGU Secretariat Reichpietschufer 60 - 62, 8. OG D -10785 Berlin. The summary can be downloaded through the Internet from the website http://www.wbgu.de/wbgu_jg2007_kurz_engl.html

## 1.   Possible increase in the number of weak and fragile states as a result of climate change

Weak and fragile states have inadequate capacities to guarantee the core functions of the state, notably the state's monopoly on the use of force, and therefore already pose a major challenge for the international community. So far, however, the international community has failed to summon the political will or provide the necessary financial resources to support the long-term stabilization of these countries. Moreover, the impacts of unabated climate change would hit these countries especially hard, further limiting and eventually over-stretching their problem-solving capacities. Conflict constellations may also be mutually reinforcing, e.g. if they extend beyond the directly affected region through environmental migration and thus destabilize other neighbouring states. This could ultimately lead to the emergence of "failing sub-regions" consisting of several simultaneously overstretched states, creating "black holes" in world politics that are characterized by the collapse of law and public order, i.e. the pillars of security and stability. It is uncertain at present whether, against the backdrop of more intensive climate impacts, the international community would be able to curb this erosion process effectively.

## 2. Risks for global economic development

Climate change will alter the conditions for regional production processes and supply infrastructures. Regional water scarcity will impede the development of irrigated agriculture and other water-intensive sectors. Drought and soil degradation will result in a drop in agricultural yields. More frequent extreme events such as storms and flooding put industrial sites and the transport, supply and production infrastructures in coastal regions at risk, forcing companies to relocate or close production sites. Depending on the type and intensity of the climate impacts, this could have a significant and adverse effect on the global economy. Unabated climate change is likely to result in substantially reduced rates of growth. This will increasingly limit the economic scope, at national and international level, to address the urgent challenges associated with the Millennium Development Goals.

## 3. Risks of growing international distributional conflicts between the main    drivers of climate change and those most affected

Climate change is mainly caused by the industrialized and newly industrializing countries. The major differences in the per capita emissions of industrialized and developing/newly industrializing countries are increasingly regarded as an "equity gap", especially as the rising costs of climate change are mainly being borne by the developing countries. The greater the damage and the burden of adaptation in the South, the more intensive the distributional conflicts between the main drivers of climate change and those most affected will become. The worst affected countries are likely to invoke the "polluter pays" principle, so international controversy over a global compensation regime for climate change will probably intensify. Beside today's industrialized countries, the major ascendant economies whose emissions are increasing substantially, notably China but also India and Brazil, for example, will also be called to account by the developing countries in future. A key line of conflict in global politics in the 21st century would therefore divide not only the industrialized and the developing countries, but also the rapidly growing newly industrializing countries and the poorer developing countries. The international community is ill-prepared at present for this type of distributional conflict.

## 4. The risk to human rights and the industrialized countries' legitimacy as global governance actors

Unabated climate change could threaten livelihoods, erode human security and thus contribute to the violation of human rights. Against the backdrop of rising temperatures, growing awareness of social climate impacts and inadequate climate change mitigation efforts, the CO2-emitting industrialized countries and, in future, buoyant economies such as China could increasingly be accused of knowingly causing human rights violations, or at least doing so in de facto terms. The international human rights discourse in the United Nations is therefore also likely to focus in the future on the threat that climate impacts pose to human rights. Unabated climate change could thus plunge the industrialized countries in particular into crises of legitimacy and limit their international scope for action.

## 5. Triggering and intensification of migration

Migration is already a major and largely unresolved international policy challenge. Climate change and its social impacts will affect growing numbers of people, so the number of migration hotspots around the world will increase. The associated conflict potential is considerable, especially as "environmental migrants" are currently not provided for in international law. Disputes over compensation payments and the financing of systems to manage refugee crises will increase. In line with the "polluter pays" principle, the industrialized countries will have to face up to their responsibilities. If global temperatures continue to rise unabated, migration could become one of the major fields of conflict in international politics in future.

## 6. Over-stretching of classic security policy

The future social impacts of unabated climate change are unlikely to trigger "classic" inter-state wars; instead, they will probably lead to an increase in destabilization processes and state failure with diffuse conflict structures and security threats in politically and economically overstretched states and societies. The specific conflict constellations, the failure of disaster management systems after extreme weather events and increasing environmental migration will be almost impossible to manage without support from police and military capacities, and therefore pose a challenge to classic security policy. In this context, a well-functioning cooperation between development and security policy will be crucial, as civilian conflict management and reconstruction assistance are reliant on a minimum level of security. At the same time, the largely unsuccessful operations by highly equipped military contingents which have aimed to stabilize and bring peace to weak and fragile states since the 1990s show that "classic" security policy's capacities to act are limited. A climate-induced increase in the number of weak and fragile states or even the destabilization of entire sub-regions would therefore overstretch conventional security policy.

## OVER-STRETCHING THE CAPACITIES OF THE GLOBAL GOVERNANCE SYSTEM

The greater the scale of climate change, the greater the probability that in the coming decades, climate-induced conflict constellations will impact not only on individual countries or sub-regions but also on the global governance system as a whole. These new global risk potentials can only be countered by policies that aim to manage global change. Every one of the six threats to international stability and security, outlined above, is itself hard to manage. The inter-action between these threats intensifies the challenges for international politics. It is almost inconceivable that in the coming years, a global governance system could emerge with the capacity to respond effectively to the conflict constellations identified by WBGU. Against the backdrop of globalization, unabated climate change is likely to over-stretch the capacities of a still insufficient global governance system.

As the climate-induced security risks of the 21st century have their own specific characteristics, they will be difficult to mitigate through classic military interventions. Instead, an intelligent and well-crafted global governance strategy to mitigate these new security risks would initially consist of an effective climate policy, which would then evolve into a core element of preventive security policy in the coming decades. The more climate change advances, the more important adaptation strategies in the affected countries will become and these must be supported by international development policy. At international level, the focus will be on global diplomacy to contain climate-induced conflicts, as well as on the development of compensation mechanisms for those affected by climate change, global migration policy, and measures to stabilize the world economy. The opportunities to establish a well-functioning global governance architecture will narrow as global temperatures rise, revealing a vicious circle: climate change can only be combated effectively through international cooperation, but with advancing climate change, the basis for constructive multilateralism will diminish. Climate change thus poses a challenge to international security, but classic, military-based security policy will be unable to

make any major contributions to resolving the impending climate crises[99].

## The Link between Carrying Capacity and Warfare

Today, carrying capacity, which is the ability for the Earth and its natural ecosystems including social, economic, and cultural systems to support the finite number of people on the planet, is being challenged around the world. As predicted, abrupt climate change is likely to stretch carrying capacity well beyond its already precarious limits. As abrupt climate change lowers the world's carrying capacity aggressive wars are likely to be fought over food, water, and energy. Steven LeBlanc, Harvard archaeologist and author of a new book called Carrying Capacity, describes the relationship between carrying capacity and warfare. Drawing on abundant archaeological and ethnological data, he argues that historically humans conducted organized warfare for a variety of reasons, including warfare over resources and environment. Humans fight when they outstrip the carrying capacity of their natural environment[100]. Peace occurs when carrying capacity goes up. But such peaceful periods are short- lived because population quickly rises to once again push against carrying capacity, and warfare resumes. Indeed, over the millennia most societies define themselves according to their ability to conduct war, and warrior culture becomes deeply ingrained.  With carrying capacity lowered by abrupt climate change, humanity would revert to its norm of constant battles for diminishing resources, which the battles themselves would further reduce even beyond the climatic effects. Once again warfare would define human life. As famine, disease, and weather-related disasters strike due to the abrupt climate change, many countries' needs will exceed their carrying capacity. This will create a sense of desperation, which is likely to lead to offensive aggression in order to reclaim balance[101].

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[99] *Ibid.*

[100] Peter Schwartz and Doug Randall, *An Abrupt Climate Change Scenario and Its   Implications for the United States National Security*, October 2003.
[101]*Ibid.*

**CONCLUSION**

Premised on Newtonian and Cartesian epistemology, the western political and economic thinking employed science to the ends of human beings- a commodious and luxurious life. Not only that, it borrowed the insights of science to view nature as the lifeless other to be exploited for the attainment of these ends. This resulted in defining development based on fossil fuel technology and industrialization, which destroyed the nature with ramifying consequences upon the entire mankind. The result of following the western pattern of development since the beginning of industrialization has been the accumulation of greenhouse gases in the atmosphere with the devastating consequences as noted above. The more a country is industrialized and considered developed, the more greenhouse gases it has emitted to the atmosphere. On this account, the industrialized North through its centuries of progress on this development trajectory has usurped the resources of the atmosphere at the cost of the developing and underdeveloped countries, and polluted the atmosphere. As the rich industrialized countries have unilaterally and inequitably messed up the atmosphere, they have squarely the historic responsibility of disabusing it of the debris. This is the argument put forth in the climate change debate by developing countries in response to American attempt at bringing the former into the task. Today, the debate remains hanging on a crucial contradiction between the principle of inequity the North has been practising since the industrial revolution - the uncontested access to the atmosphere denying the same to the South and at the cost of nature and future generations - and the preaching of equity principle and meaningful participation to the South on the question of cleansing the atmosphere.

The governments of rich countries have set the wrong targets to tackle climate change using outdated science. A paper published in 2006 by climatologist Malte Meinshausen suggests that if greenhouse gases reach a concentration of 550 parts per million (ppm) carbon dioxide equivalent, there is a 63-99 per cent chance that global warming will exceed two degrees. At 475 parts per million the average likelihood is 64 per cent. Only if concentrations are stabilized at 400 parts per million or below is there a low chance

that temperatures will rise by more than two degrees. The IPCC draft report contains similar figures. A concentration of 510 ppm gives a 33 per cent chance of preventing more than two degrees of warming. A concentration of 590 ppm gives a ten per cent chance. The current level of greenhouse gases in the atmosphere is 459 ppm.  To give a high chance to humanity of preventing dangerous climate change, what is needed is a programme so drastic that greenhouse gases in the atmosphere end up below the current concentrations. But no government has set itself this task. The EU and Swedish government have established the world's most stringent target, which is 550ppm. It is of carbon dioxide alone.  But this target gives the human beings a near certainty of an extra 2 degrees C. When other greenhouse gases are included, this translates into 666ppm, carbon dioxide equivalent. According to last autumn's Stern report on the economics of climate change, at 650 ppm, there is a 60-95 per cent chance of 3 degrees C of warming.

In his book *Heat*, George Monbiot estimated that to avoid two degrees of warming a global emission cut of 60 per cent per capita between now and 2030 is highly required. This translates into an 87 per cent cut in the U.K. A recent paper in the journal of Climate Change emphasizes that the sensitivity of global temperatures to greenhouse gas concentrations remains uncertain. But using the average figure, to obtain a 50 per cent chance of preventing more than 2 degrees C of warming requires a global cut of 80 per cent by 2050. This is a cut in total emissions, not in emissions per head. If the population were to rise from 6 billion to 9 billion between now and then, an 87 per cent cut in global emissions per person. If carbon emissions are to be distributed equally, the greater cut must be made by the biggest polluters: rich nations like the US and other western countries. The U.K's emissions per capita would need to fall by 91 per cent. But the rich countries appear to quietly have abandoned their aim of preventing dangerous climate change, condemning millions to death.  What the IPCC report shows is that the time is to stop treating climate change as an urgent issue. The nations of the world have to start treating it as an international emergency. Since the United States contributes about 25% of the world's $CO_2$ emissions, its own policy could make a large difference.

Global climate change is different from other environmental problems. First, emissions of $CO_2$ and other trace gases are almost irreversible; more precisely, their residence time in the atmosphere is measured in centuries. Most environmental problems are mitigated promptly or unfairly short order when the source is cleaned up, as with water pollution, acid rain or sulfur dioxide emissions. Here, reducing emissions today is very valuable to humanity in the distant future. Second, the scale of the externality is truly global; greenhouse gases travel around the world in a few days. This means that the nation-state and its subsidiaries, the typical loci for internalization of externalities, are limited in their remedial ability. The poor countries appear to be most vulnerable to the dangerous climate change, mostly a doing of the rich.

Coming to the very root of the crisis, Science provided the ontological foundation to Political Science to look at the nature and the poor who do not have the wherewithal to have a commodious living as "the other" to be exploited or harnessed for one's end. The entire Earth was looked down upon as a compendium of lifeless raw materials to cater to the materialistic ends of those humans who are propertied or rational in the words of English philosopher Locke, because they have property. To attainment of these goals- wealth production and commodious living by the wealthy few believing in exorbitant consumption and inordinate life style as quintessential of development, the entire Earth has been subjugated and robbed of its bounties at the cost of nature, other humans, non-human living and future generations. That everybody is a self-sufficing and aggrandizing part disjointed from the whole has resulted in a mechanical view of the universe. The concept of development based on this paradigm has been the development of one against the other. Woven into this paradigm was the concept of security, which was the security of one or one group, or one state against the other. Today, the devastating consequences of climate change and its pervasiveness, impacting the very survival of entire humanity, have spurted the traditional security planners into thinking anew what so far they have defined as development and established frame of mind about security in terms of disjointed parts and others as mere objectivities not as inter subjectivities. A profound affirmation of this is found in Eastern insight epitomized in the Indian Upanishads: "The entire universe is like a family" [ Basudheiba kutumbakam].

No man is like an island. Everybody is the inseparable whole. In more mundane terms, as the rich countries and wealthy people have enjoyed, usurped, and destroyed the atmosphere at the cost of the other (humans, nature, living and non-living, and the future generations), they must not only come forward to cut down their consumption, rethink their lifestyle and pattern of development, and follow exemplarily new environmental ethics but also help, support and promote the rest of the world in adapting to the changing planetary system. Martin Parry, a climate scientist with the United Kingdom's Met Office, said destructive changes in temperature, rainfall and agriculture were now forecast to occur several decades earlier than thought. Vulnerable people, such as the old and poor, would be worst affected, and world leaders had not yet accepted that their countries would have to adapt to the likely consequences. Co-chairman of the IPCC working group, Professor Parry said: "We are all used to talking about these impacts coming in the lifetimes of our children and grand children. Now we know that it is us." He added that politicians had wasted a decade by focusing only on ways to cut emissions, and had only recently woken up to the need to adapt. "Mitigation has got all the attention, but we cannot mitigate out of this problem. We now have a choice between a future with a damaged world or a severely damaged world."[102]

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[102] Quoted by David Adam, "How climate change will affect the world", Guardian Newspapers in *The Hindu*, 20 September 2007.