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Disaster Risk Reduction and Climate Change: Understanding Threat and Vulnerability, Building Adaptive Capacity

by Pablo González[1]

Introduction

The Intergovernmental Panel on Climate Change (IPCC) was created by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), in 1988. This group issued a first assessment report in 1990, which reflected the views of 400 scientists. The report stated that global warming was real and urged that something be done about it.

The Panel's findings prompted governments to create the United Nations Framework Convention on Climate Change (UNFCCC). And in 1992, the Convention was ready for signature at the United Nations Conference on Environment and Development –known as the "Earth Summit," in Rio de Janeiro. Five years later, in December of 1997, the Kyoto Protocol to the UNFCCC was adopted by consensus at the third session of the Conference of the Parties (COP3). The Protocol, which contains legally binding emissions targets, is a direct response to the Convention's ultimate goal of preventing "dangerous anthropogenic [man-made] interference with the climate system".

Under the Kyoto Protocol developed countries commit themselves to reducing their collective emissions of six key greenhouse gases by at least 5%. This group target would be achieved through cuts of 8% by Switzerland, most Central and East European states, and the European Union (the EU would meet its target by distributing different rates among its member states); 7% by the US; and 6% by Canada, Hungary, Japan, and Poland. Russia, New Zealand, and Ukraine are to stabilize their emissions, while Norway may increase emissions by up to 1%, Australia by up to 8%, and Iceland 10%. The six gases are to be combined in a "basket", with reductions in individual gases translated into "CO_2 equivalents" that are then added up to produce a single figure.

Each country's emissions target must be achieved by the period 2008-2012, and it will be calculated as an average over the five years. "Demonstrable progress" towards meeting the target was to be made by 2005. Cuts in the three most important gases – carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_20) - would be measured against a base year of 1990 (with exceptions for some countries with economies in transition).

In addition, cuts in three long-lived industrial gases – hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6) - would be measured against either a 1990 or 1995 baseline. (A major group of industrial gases, chlorofluorocarbons, or CFCs, are dealt with under the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer.)

While the negotiations over the targets continued throughout the COPs that followed, the IPCC findings in its Third and Fourth Reports concluded, with a high degree of certainty, that even if all targets were to be met, the warming of the atmosphere –due to present level of greenhouse gasses, is unavoidable. The IPCC then concluded in the urgency to move towards increasing adaptive capacity to Climate Change at the national and local level.

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Thus, while we all understand the need to reduce emissions of greenhouse gasses so as to mitigate the adverse impacts of Climate Change, there is consensus among the scientific and policy-making communities in the more urgent need to build capacity to adapt to Climate Change. The Bali Action Plan (COP13, Bali, Indonesia, December, 2007) includes a decision on enhancing action on adaptation, with particular consideration of Risk Management and Risk Reduction strategies, as well as Disaster Reduction strategies and means to address loss and damage associated with Climate Change impacts in developing countries that are particularly vulnerable to the adverse effects of climate change. In Poznan, Poland, at the Fourteenth United Nations Climate Change Conference (COP14), in December of 2008, it was agreed to make the Adaptation Fund a legal entity, granting direct access to developing countries. This later is a clear sign of the commitment towards adaptation and the need to act now on reducing increasing risk to natural disasters.

Still we need to come to a consensus on what we are talking about when we talk about Climate Change. Climate Change under the UNFCCC refers to changes that can be attributed directly or indirectly to human activity, which alters the global composition of the atmosphere, in addition to the observed natural climate variability. Climate Change according to the IPCC refers to any change observed over time, regardless is attributed to a natural variability or to human activity. This later definition is the one we will use in this paper.

In the last few years the international community has made significant progress towards designing and implementing structural and non-structural measures for adapting to Climate Change, and particularly to its effects in water availability. In the Americas, examples are the GEF-IW project that the governments of the la Plata Basin execute with the technical cooperation of UNEP and the GS/OAS, through its Department of Sustainable Development, and projects executed with the financial support of the World Bank and other international cooperation agencies to deal with the shortage of water supply due to the depletion of the icecaps in mountain peaks in the Andes.

While much has been said and discussed about the adverse impacts of Climate Change on extreme hydro-meteorological events that pose a threat to natural hazards –floods and droughts, the challenge to integrate Adaptation to Climate Change within Risk Management practices and strategies still remains. This paper attempts to bring some light on the subject, arguing that the answers are at our reach if we look back at what we have been doing to cope with Climate Variability and the wealth of experience and expertise developed within the implementation of Integrated Water Resources Management (IWRM).

Climate Change: A continuing process of change towards an unreachable equilibrium

The Earth, today we live in, its geomorphology, its ecosystems –soil and water, flora and fauna; hydrological regimes; atmospheric and meteorological systems; and geodynamic; is all the result of a continuing process of change, which seeks an unreachable equilibrium. While magma emerges through the bottom of the Atlantic Ocean, the Earth crust sinks into the Earth mantle towards its core in the Pacific subduction zone, seeking a balance between potential and kinetic energies. Air circulates in the Northern Hemisphere in a West-to-East direction seeking a balance between low and high pressure systems. And water flows throughout oceans, rivers and groundwater aquifers; freezes and melts; evaporates and falls back on to the Earth surface; interacting with the atmosphere, all in pursue of a delicate hydrological balance.

Human-kind interferes with this natural dynamic, becoming part of this continuing process of change. People settle on seismic prone areas and landslide prone slopes, and on the path of low-pressure systems –which provide shelter for cyclones and tropical storms. People settle on low-lands prone to floods, and change evapo-transpiration ratios, as they slash and burn natural vegetation coverage, cover roads with asphalt and concrete, and replace forest with crops and grassland. They change hydrological regimes by altering aquifer recharge and discharge areas, and by exposing soils and changing erosion and sedimentation processes.

So, natural hazards are not the result of natural phenomena, but rather the interference of human activities with them. Uncontrolled population growth, urbanization processes, and lack of land-use planning and development policy and planning, all together have contributed to increasing DISASTERS with each-time more catastrophic impacts. And it is not surprising to note that those most affected are those living in extreme poverty. In the Americas, they are those living in international border areas, far from the capitals and even farther away from national development plans; as well as are those indigenous people, who have been isolated, culturally, socially and economically from national development plans.

Inequitable distribution of and access to natural resources –water and land, exacerbates this situation. In many countries in the Americas, dominant land-tenure systems are characterized by large fractions of land owned by few –known as *latifundios*, which are located in fertile and productive soils, and at relatively no risk due to natural hazards. Concurrently, small fractions of land –known as *minifundios*, are owned by many, mostly poor. These small fractions of land are located in areas where water is scarce, soils have been degraded, and crops, housing and other social and economic infrastructure are at high risk due to natural hazards. Subsistence economies prevail in communities living in these areas, depending heavily on local natural resources and ecosystems. Thus, while they are already highly vulnerable to natural hazards, each disaster results in further environmental degradation and, consequently, in poorer and more vulnerable communities; which, in turn, leads to a vicious circle of poverty – disasters – environmental degradation – and back to more and higher indices of poverty and more disasters, each time more catastrophic.

In the mean time, the gap between wealthy and poor grows wider, and wealthy who have control and access to the every-day more scarce resources increasingly place more stress on natural resources, at the same time they contribute to accelerating the natural process of change, the one today we call Climate Change.

Climate Change is not then the problem, as indeed is a natural process. The problem is that Human-kind has altered the time-scale for change, hampering the ability of ecosystems and all living species – including human beings, to adapt to it.

While we must address the causes of Climate Change by mitigating its effects, reducing emissions of Carbon Dioxide and other green-house gasses, and creating Carbon Dioxide sinks; we must also increase our capacity, and most particularly that of those most vulnerable [to increasing natural hazards of hydro-meteorological origin], to adapt. And in order to do that, we need to down-scale Global Climate Change Scenarios to basin and local scales.

But if we understand that Natural Disasters are actually not natural at all, and instead are the result of a "dysfunctional" relationship between the Environment and Human-kind, then we must first build Development Scenarios. That is, establish development plans and policies based on a Vision built by social consensus. Understanding Climate Scenarios will do very little for us, if we first don't know what our development goals are in 20 or 25 years from now. What kind of society do we envision for ourselves? By what kind of commodities our livelihoods will be driven? What will be our economy base? Are we planning to grow soybean, manufacture clothing, manufacture cars or computer chips, or we are planning to develop the tourism industry based on our natural landscapes? Who are going to be our main partners in a global market, and what do we have to offer them now that may be at risk?

Adaptation to Climate Change won't be achieved by simply looking at future Climate Scenarios, but by looking deep into our Development Processes and Models. What is what we want for ourselves and what we are willing to "change" in order to get it or preserve it? And that is a matter of what Development means to us. In the mean time, we need to protect the lives and livelihood of our country men and women, children and elders, who are most vulnerable, and we won't do that unless we provide for a more equitable distribution of the access and control of our natural resources, so that everyone can have the same opportunities to adapt.

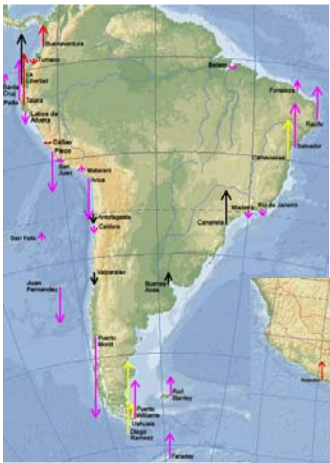
Understanding the Impact of Climate Change on the Hydro-meteorological Threat: Time scales and uncertainty of the models

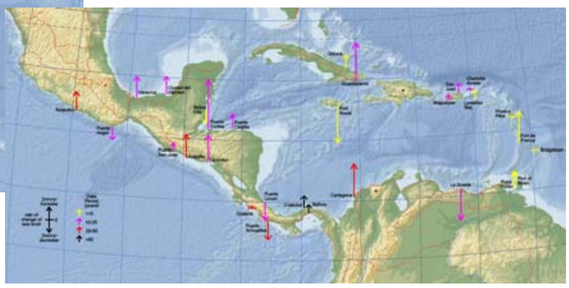
So, let's first look at the impact of Climate Change on hydro-meteorological threats. We will particularly examine the threats of *sea level rise*, which will augment risk to surge-storms and floods in low-lying areas; *increase in extension of drought-affected areas*, which will augment the risk to famine; *increase of frequency of heavy precipitation events*, which will augment flood risk; and *increase in the number and strength of tropical storms*, which will augment the risk not only to catastrophic wind storms, but also to floods and storm surges.

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) leaves no doubt about the increases in temperature and the anthropogenic effects, which have contributed significantly to changes in physical and biological systems. There is a high degree of confidence in the observation of increasing emissions of Carbon Dioxide and similar trends in Air Temperature in the Atmosphere. While these findings build upon past IPCC assessments, they integrate new knowledge gained since the Third Assessment, concluding that “there is high confidence that recent regional changes in temperature have had discernible impacts on many physical and biological systems.”

However, we also know that this assessment relies on a significant amount of data gathered since 1970, spanning a period that fluctuates from 20 years to 35 years, with more than 29,000 observational data series, which were selected from about 80,000 data series from 577 studies. And while the quality of the data sets has improved, it varies widely with a remarkable lack of geographic balance in data and literature on observed changes. It is notable also that gaps in data are mainly observed in developing countries, which are the most vulnerable to natural hazards, and consequently will experience the most negative impacts of Climate Change, increasing even more the already high risk to Climate-related natural hazards. These gaps in data observed in developing countries are also an indicator of lack of development policies and planning. We will get back to this issue later on this paper.

According to the IPCC Fourth Assessment Report impact of Climate Change is drawn from projections of observational data series on Climate variables, such as temperature, Carbon Dioxide, and sea level rise. Thus projected impacts depend heavily in the models and the quality of the data.





For instance, if we take sea level rise observation series will see that the models were developed at a very small scale –or low spatial resolutions, (Global coverage) with data ranging widely in accuracy and data collection methods. While the advent of Global Positioning System (GPS) provides for World-wide coverage to survey any geographic position in the planet, in order to measure see level rise, one needs to compare the altitude of the sea surface at different times. This task presents several difficulties. First, in order to obtain the altitude with a tolerable[2] accuracy it is necessary to count on dense local geodetic networks, since the Z component (in a Cartesian System, X-Y-Z) that GPS provides is referred to an Inertial Geocentric System, while the altitude –measured on the local vertical, is referred to a Gravimetric System. This later varies from site to site, as it is a function of the gravimetric field. Another issue to consider is that in some cases sea level variations have been measured with buoys that register variation on the distance to the sea bottom. In this case errors arise from a moving vertical and systematic errors[3] built in the equipment –often Doppler-based systems. Finally, terrestrial tides –which have been registered all around the Globe, reaching up to 1.50 m in amplitude, may introduce additional errors in measuring sea levels since they present delays compared to sea tides.

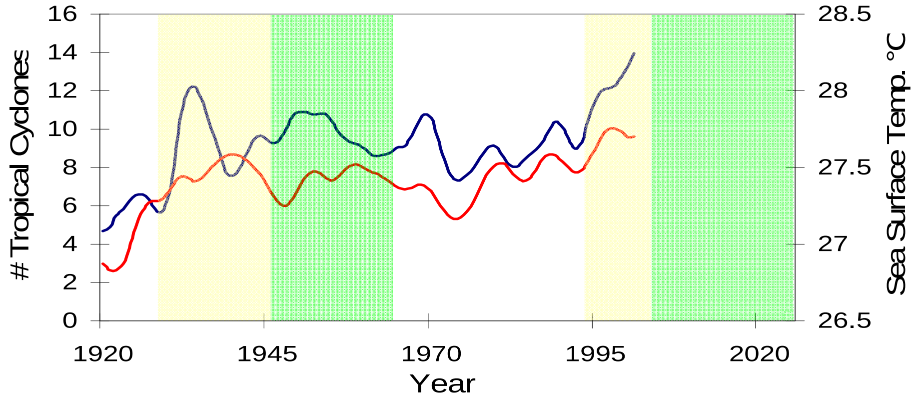
Authors of the IPCC Fourth Assessment Report also explain that the magnitude and timing of the impacts will vary depending on the amount and timing of changes in Climate, and the capacity to adapt. In a recent dialogue on Adaptation to Climate Change organized by the Regional Unit for the Americas of the Secretariat of the UN International Strategy for Disaster Reduction (UN/ISDR), Graciela Magrín, an Argentine scientist and one of the authors of the IPCC Fourth Assessment Report, explained that there is no certainty in the magnitude and timing of the impact of Climate Change in rainfall. Rainfall is the single most important factor responsible for floods and droughts.

[2] Considering the projected scenarios of sea level rise, a tolerable accuracy should be under the projected 4-6 m variations.

[3] Systematic errors are not determined by chance, but by an inaccuracy in the equipment or measurement system. As opposed to random errors, which present a normal distribution, systematic errors are predictable and can be expressed by a numeric function.

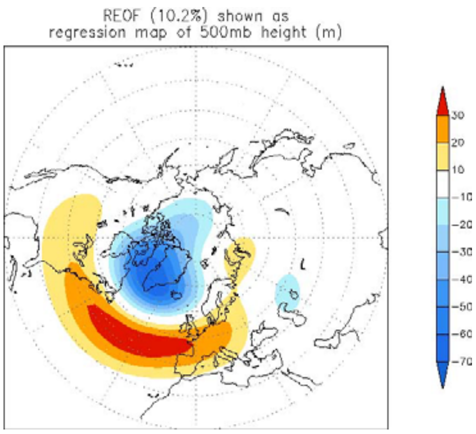
In addition to these considerations, in order to understand the impact of Climate Change on the threat to Climate-related natural hazards, one needs to look into cyclical natural phenomena that mask longer-term Climate Change. For instance, the Atlantic Multi-decadal Oscillation (AMO) and the Pacific Decadal Oscillation (PDO) are two cyclical phenomena that has been relatively recently observed[4] and it is just now that scientists have enough data to explain their impact on Climate. Graph 1[5] shows a time series of total North Atlantic tropical cyclones, in blue; and its correlation with changes in sea surface temperature (SST), in red, since 1920. The yellow shading indicates the warm phase of the AMO, and the white shading indicates the cool phase of the PDO. This later is associated with greater frequency of a La Niña phase of the El Niño Southern Oscillation (ENSO). The green shading shows their overlap.

Graph 1



From Graph 1, one can see that more tropical cyclones are registered during the warm phase of the AMO, even when the PDO is in the cool phase. The AMO is expected to remain in the warm phase, while the PDO is expected to remain in the cool phase, until 2025, which according to the observed correlation between SST and observed tropical cyclones will result in active hurricane seasons for the Caribbean and North America.

The AMO has affected air temperatures and rainfall over much of the Northern Hemisphere, and particularly in North America and Europe. This can be observed in the changes in the frequency of North American droughts and floods, and in the frequency of severe hurricanes. During a warm phase of the AMO, the number of tropical storms that have evolved into severe high category hurricanes is at least twice the number during a cool phase. These oscillations with phases that last between 20 and 40 years mask long-term Climate Change, as it may attenuate or amplify the global increase in temperature due to anthropogenic warming.



Another natural cyclical phenomenon that can mask long-term Climate Change is the North Atlantic Oscillation (NAO), which must not be confused with the above described PDO.

The manifestation of NAO is in fluctuations in the difference of sea-level pressure between the Icelandic Low and the Azores High. A large difference in the pressure at these two sites, which is denoted NAO+, leads to increased westerly winds blowing across the Atlantic and, consequently, cool summers and mild and wet winters in Europe. In contrast, a small difference in pressure, low index or NAO-, suppresses the westerly winds and those regions then suffer cold winters and storms track southerly towards the Mediterranean Sea. This also results in increasing storm activity and rainfall to southern Europe and North Africa.

[4] Instruments have observed AMO cycles only for the last 150 years.
[5] Curry, J., et al, Georgia Institute of Technology, 2007.

If we then consider these cyclical phenomena and their impact in rainfall across the Western Hemisphere –including the ENSO, in addition to the AMO, PDO and NAO just described, it would not be possible for anyone to explain the observed increasing rainfall and number and severity of hurricanes in our Western Hemisphere just with Climate Change. In turn, one could understand that the impact of Climate Change in the threat to Climate-related natural hazards is very uncertain, as we know very little about its timing and magnitude. And let's bear in mind that observation data series of Climate variables used in the IPCC Fourth Assessment Report, in most cases, are within one or two phases of these cyclical phenomena.

Looking back to Ancient Air Temperatures

In contrast with observation data series used in the IPCC Fourth Assessment, which go back only until 1970, "ice cores extracted from the two-mile thick Greenland ice sheet preserve records of ancient air temperatures,"[6] going back to tenth of thousands of years ago.

According to these records air temperature has shifted suddenly several times in time spans as short as a decade. Graph 2, below, shows these sudden changes.

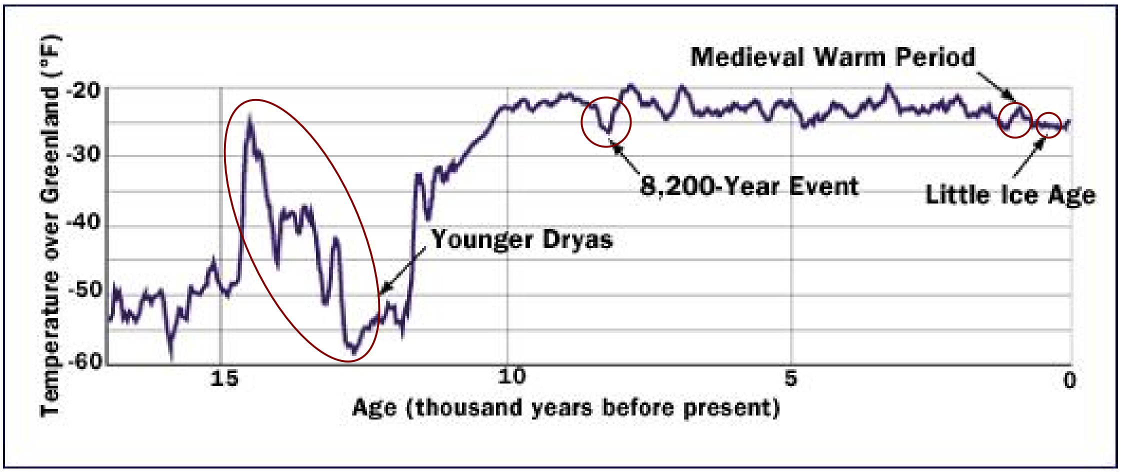
About 12,700 years ago, during an event known as 'The Younger Dryas', average temperatures in the North Atlantic region plunged suddenly nearly 5 °C, and remained at those levels for 1,300 years before rapidly warming up again.

A similar abrupt cooling occurred 8,200 years ago, during an event known as 'The 8,200-Year Event'. This time, it lasted only about a century, and although it was not as severe as the previous one, if a similar cooling event occurred today, it would produce catastrophic consequences.

About 1,000 years ago, during the so called 'Medieval Period', a sudden warming took place. It was during this time that Norse settled in Greenland.

Finally, about only 700 years ago, abrupt cooling of the Climate forced the Norse to abandon Greenland, during what is known as 'The Little Ice Age'. Between 1300 and 1850, severe winters were registered with significant impacts on the agriculture in Europe[7].

Graph 2



These long-time-span observations on air temperature suggest that these abrupt changes may happen again, regardless current anthropogenic warming models. It is also notable that many of these sudden events occurred in time spans much longer than current observation data series of Climate variables.

6 Source: *Woods Hole Oceanographic Institution (WHOI).*

7 Alley, R.B., The Two-Mile Time Machine, 2000.

Inherent and Potential Vulnerability: A function of development

We have explored the impact of Climate Change in the hydro-meteorological threat, concluding that while it is apparent that future scenarios of Climate may pose a higher hydro-meteorological threat to social and economic infrastructure, there are still significant uncertainties.

But threat posed by Climate is just one dependency variable of risk to disasters. The other, which we will argue we know well and we have direct control over, *is vulnerability*.

We know today with a great deal of certainty that poorest are hit hardest and hit more frequently. As explained before, in the Americas, they are located in international border areas, far from the capitals and even farther away from national development plans. They are indigenous people, and socially and economically marginalized groups.

Hurricane Katrina is perhaps the example that tragically supports this argument the best. In 2005, hurricane Katrina hit the US States of Louisiana, Mississippi and Alabama. In the first economy of the World, the combined GDP of these three states was only 61% of the Product of the State of Florida. New Orleans, where more losses were registered, had a poverty rate of 18.40%, significantly higher to the national average by then of 11.00% (ECLAC Bulletin, Issue No. 231, November, 2005).

Another tragic example is provided by hurricane Mitch that in 1998 swept through Central America; this time hitting two of the poorest countries in the continental Americas, Honduras and Nicaragua. Still, once again, not everyone was affected equally, and the poorest got the worst. In Nicaragua, the municipalities affected by hurricane Mitch had the highest levels of poverty in the country, with highest percentage of rural population. According to the Emergency Social Investment Fund (FISE) classification, 40 out of the 58 poorest municipalities in the country, by then, were located in the provinces worst affected by hurricane Mitch (UNDP 1998: 2). In Honduras, although damage spread to all social strata, the greatest number of victims emerged from the most humble communities, such as those of the municipalities of Choloma, La Lima and El Progreso.

Ricardo Zapata Martí, Regional Advisor with the Economic Center for Latin America and the Caribbean (ECLAC), argues that Latin America and the Caribbean countries are particularly vulnerable to natural hazards due to structural characteristics of their development processes[8]. Professor Elizabeth Mansilla, a researcher with the National Autonomous University of Mexico (UNAM), describes the chaotic urbanization, the irrational occupation of the land and the transformation –or degradation, of natural habitats in the cities of New Orleans and Cancun as the main causes of their high vulnerability. In that same line, she describes the extreme poverty of indigenous –and non-indigenous populations in the southeast of Mexico and Guatemala that leads to deforestation, the construction of precarious housing, and the establishment of human settlements in areas highly threatened by natural hazards; all these the result of non-inclusive economic models[9].

Social scientists and researchers go as far as to using Disasters as indicators for measuring deficits in levels of development.

We could continue providing examples from more recent events and from historical records, and they will all confirm that, as opposed to the impact of Climate Change on the threat to hydro-meteorological events, we have a high degree of confidence in our vulnerability assessments, and a clear understanding of the relationships between development processes and vulnerability. Integrating traditionally marginalized communities into national economies and national development plans will reduce their "inherent" vulnerability, and put them in a better position to cope with Climate Variability and adapt to Climate Change.

Finally, a quick note on Adaptation. We tend to believe that survivors of a disaster or social emergency have been able to adapt, confusing Adaptation with survival or coping, at best. And when we understand the difference, we often think of Capacity to Adapt as the ability to deal with an extreme natural event so as to minimize its potential negative impact. The IPCC in its Fourth Assessment Report defines Adaptation Capacity as "the ability of a system to adjust to Climate Change –including climate variability

[8] Zapata Martí, Ricardo, "El impacto de los desastres naturales sobre la población de menores ingresos y las limitaciones de las políticas públicas: los desastres naturales y el desarrollo", ECLAC, 2000.

[9] Mansilla, Elizabeth, "Katrina, Stan y Wilma: tres desastres en busca de un paradigma," Nueva Sociedad 201, 2005.

and extreme events, in order to attenuate the potential damage, take advantage of opportunities that may arise and cope with its consequences." While this later may be a suitable definition for the purpose of the Report, it falls short of capturing the main essence of Adaptation; to what end? And the answer should be, "Adaption to quickly return to the levels of development observed prior to the event and resume the on-going development processes."

In the interest of not getting into an academic argument, we won't offer a new definition. However, we will stress that Adaptive Capacity refers to the ability to maintain on-going development processes, and not to merely return to the physical status prior to the event.

Final Considerations –conclusions

We have analyzed the impact of Climate Change on hydro-meteorological threats, and we have discussed the development processes –or lack of them, that increase vulnerability to natural hazards. Now, we are ready to look at how they come into play when we assess Risk and try to reduce it.

If we then express Risk as a function of Vulnerability and Threat ($R = f(v, t)$), we see that Climate Change impacts on one of its variables. And as we discussed, its impact on the Threat is uncertain –in terms of magnitude and timing, but within the already observed ranges of Climate Variability. On the other hand, we know that many of our communities in the Americas are already highly Vulnerable under current Climate conditions.

While these communities are no longer "capable" to adapt to increasingly more frequent extreme events, their ability to adapt to future Climate Change will depend on building *Capacity* and on the *Timing* this change occurs. The more abrupt the change, the least capable we are to adapt to it. But, again, timing is still very much uncertain, and current capacity does not exist –not even for current Climate conditions, in some of our most vulnerable communities.

Then, the answer to Disaster Risk Reduction and Climate Change seems obvious: *Invest in vulnerability reduction*. While developing local Climate Change scenarios will provide more accurate information about the impact on the hydro-meteorological threat, current Global studies show evidence that they will do little for us.

And if this argument is not strong enough, we should consider the high cost to develop local scenarios. The assessment completed for the wider harbor area of Halifax, Canada (Runnalls, IISD, 2007) to anticipate the impacts of sea level rise and climate variability took several years and its cost exceeded several hundred thousand dollars.

Perhaps assessments such as the one of the wide harbor area of Halifax may need to be undertaken when current levels of resilience may be jeopardized by new investments. But otherwise, and as it is generally the case for most vulnerable communities in the Americas, monies can be better invested in Risk Assessments and Vulnerability Reduction Programs and Projects, since these communities have already experienced the negative impacts of extreme events.

Some plausible actions

By now, we can agree that we need to build Adaptive Capacity at the community and local level, integrating these highly vulnerable communities into national economies, and national development plans. And we have already hinted some ways to do that. Let's now attempt to sum them up.

There is plenty of well-documented experience in addressing Climate Variability within integrated water resources management (IWRM) approaches. In the Americas, where more than 60% of all water basins are transboundary, this approach has been used since the early 90's in major transboundary basins. Examples are the la Plata River Basin (Argentina, Bolivia, Brazil, Paraguay and Uruguay); the Upper Paraguay River Basin and the Sao Francisco River Basin, both in Brazil, whit the participation of multiple states and stakeholders; the San Juan River Basin (Costa Rica and Nicaragua); and the Sixaola River Basin (Costa Rica and Panama); among many others.

These experiences provide policy and decision-makers, water managers, scientists and experts, grass-root organizations, and community members with a wide range of practices and strategies that can be utilized to build Adaptive Capacity to deal with the adverse impacts of Climate Change. Among these practices and strategies, any plausible solution must include *Conflict Resolution / Management* techniques and strategies for dealing with competitive uses over land and water. Techniques such as *Land-use Planning*, *Environmental Impact Assessment (EIA)*, and *Risk Assessment (RA)* have been widely used throughout the Americas with different levels of success, depending on institutional capacity and political processes. And there is enough expertise and successful experiences so that we can utilize them for building Adaptive Capacity.

Finally, the application of these techniques and strategies must be well integrated into a national development policy and planning. Sustainable solutions must lead to integrating international-border-area communities into national and regional economies and trade agreements. Only with a committed political, institutional and financial support from National and sub-national –in the case of federal administration systems, governments, these highly vulnerable communities will be able to sustain their efforts. And only when National and sub-national governments appreciate the value of these communities in their National and sub-national agendas, they will be committed to them.

In the end, the solution lies on inclusive economic policies where everybody is an integral part of the development process.