Unpacking Climate Change Adaptation and Disaster Risk Management: Searching for the Links and the Differences: A Conceptual and Epistemological Critique and Proposal

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(For internal discussion only)

1. Introduction

Our starting point for this discussion is the hypothesis that disaster risk management-DRM-, and, in particular, local disaster risk management-L-DRM-, with their proven conceptual and practical contributions to the reduction and prevention of disaster risk, offer the soundest source of inspiration and guidelines for so-called "adaptation" to climate change-ACC (while we seriously question the use of the term "adaptation" when dealing with human system responses, much preferring the notion of "adjustment", we will continue to use this term throughout the document given its "symbolic" and commonly understood usage). At the same time, we also fully accept that not all that is considered under DRM is relevant to ACC and all that ACC must deal with, as depicted in the ongoing debate on the topic, is relevant to, or could be supported by DRM.

DRM, in the context of climatic and other types of hazard, has a long and often fruitful history, rich in notions and experience, success and failure. In the present paper we will propose and argue that a good part of this experience and the instruments and methods that have been developed to promote and guide disaster risk reduction and control can significantly inform the strategies and practice of climate change "adaptation". Such an affirmation assumes that the climate-society relationship is a continuum, that the future is constructed on the basis of the present, in iterative and sequenced ways, that experience with the past is a logical entry point for prospective or proactive types of intervention, and that managing climate or weather "extremes" can only be adequately achieved when this is done in the framework of the every day life and chronic risk, and every day climate norms and averages that communities and society in general experience in different localities or regions. Chronic risk refers to those ongoing human and economic development deficits that characterize large numbers of people in the world today, principally the poor, such as lack of employment and incomes, inadequate health and sanitary conditions, social and domestic violence; etc.

Our central aim here is to show where and why the two supposedly different topics converge or diverge. And, suggest the organizational and institutional frameworks needed to deal with them in a coordinated and holistic manner.

In order to achieve our central aim, we first propose and argue an extensive series of contextual and conceptual questions which, at the same time that they question a number of commonly held positions on the subject of "adaptation", also offer a perspective for establishing real and potential relations between disaster risk management and adaptation, serving as a possible guide or outline for revealing the most appropriate type of action that should be taken in the future. This is achieved by "unpacking" the question of "adaptation", as discussed to date, attempting to identify its different components and challenges and thus be in a position to relate these to the DRM problematic and its different types of concern. This allows us to overcome the problem of dealing with aggregated and at times highly complex and diverse notions such as "adaptation" and DRM. Here we are assuming that both ACC and DRM are not monolithic topics but, rather, diverse in their aims, approaches and content. Our document represents a flow of ideas that diverts from the central theme every now and again to deal with substantial conceptual and semantic aspects. This non focused approach is deliberate as the paper is a type of "flow of conscience" on the topic, many of the ideas being the result of writing the paper as such.

Our document is structured in the following way.

A first section discusses what is DRM, how it has evolved, what are its principle components and approaches and the definition, relevance and deficiencies of the debate and on environmental "extremes". This is followed by a third section on climate change related aspects, including the very notion of "adaptation" and its perceived failings; problems of definition; the themes of mitigation and adaptation, their significance and relations when seen from a development perspective; the question as to what are we adapting to-climate averages, climate extremes, sea level rise, lost polar and glacial ice-; and the debate around climate extremes seen in the light of more recurrent small and medium scale events. A fourth section is dedicated to bringing together the strands and components revealed in former sections, proposing a concrete framework or notion as regards the ACC and DRM topics and their merging. A final section provides a synthesis of the main points of our argument and some principle conclusions.

2. Disaster Risk Management: Definition and Preliminary Debates on Scope.

2.1. Disaster Risk Management: A Basic Definition *(see Lavell, 2004, 2007 and 2009, for greater details and specifications of use in the Latin American context).*

The concept, process and practice of **disaster risk management,** as discussed and increasingly accepted today, are relatively new. They comprise a position or argument on the subject of risk and disaster deriving from debates and discussions particularly during the last 20 years in Latin America and during the last 10 years in particular, following Hurricane Mitch and its devastating effects in Central America. From earlier positions where disaster itself (typified by significant economic and social loss, damage and disruption) and its "management" or "administration" dominated both concept and practice, there has been an evolution in paradigms such that a more widespread concern now predominates as regards **disaster risk** – the latent probability of future loss and

damage associated with the occurrence of damaging physical events, the exposure of social elements to their impacts and the presence of diverse causes and manifestations of so-called social or human vulnerability-that is to say, the predisposition of a social element to suffer loss or damage. With this change in position or paradigm, the options for social intervention have been increasingly recognized, and greatly extended and fortified and new arguments and options for the prevention and mitigation of "primary" or "structural" risk factors now exist (see Wisner et al, 2004 for a thorough analysis of such aspects).

This postulation or positioning neither denies nor removes the need to improve preparedness and response to disasters, but, rather, locates the disaster problematic in a context of greater out-reach and significance, whereby risk is seen as a process and reality under continuous change and transformation, assuming different levels and "forms" over time, of which disaster is but one. Moreover, the shift of paradigm has been accompanied by a fundamental recognition that risk, and consequently disaster, is the product to a great extent of processes of "social construction", determined by and deriving in good part from existing and historical modes of social and economic "development". This means that the understanding and management of disaster risk cannot be achieved without the establishment of a close and binding, integral and holistic relationship with sector and territorial, social and environmental processes and development planning.

In essence, when dealing with the causes and conditions of the stress associated with climate anomalies and weather "extremes" (hurricanes, tornadoes, drought, intensive flooding etc.) and linked hydro-meteorological processes (landslides, removal in mass, etc.), disaster risk management, considered as a social process, includes (this is equally applicable to non climatic hazards):

- the need to understand risk, its component factors and causal processes
- the building of consciousness as regards existing and possible future conditions of risk and risk factors and their role in restricting development options at the national and local levels,
- the identification, elaboration, promotion and implementation of policies, strategies, instruments and actions that permit society to face up to or anticipate such extremes or anomalies, as well as the accumulative effects of many non extreme events.

The achievement of these aims and goals takes place in the framework and context of societal "normalcy" and "routine", and one seeks for loss and damage, associated with climatic extremes and climate variability in general, to be restricted to a minimum over determined periods of time (short, medium and long) and under existing social, economic, cultural and political conditions and strictures.

Prior to pursuing our central argument further, it is important to digress a while with reference to two basic associated matters that are of great importance for the DRM and ACC themes in general and which derive from concepts used in the former paragraph.

Firstly, when speaking of "climatic variability" we are referring to the range of differentiated conditions of climate that disobey the norms or averages of the primary climate factors (wind speeds, temperature, rainfall, transpiration etc.). While the norms

or averages serve in good part to define the climate type as such and the category we assign it (temperate mid-latitude; tropical-humid; tropical-dry, Mediterranean etc.), there are facets of the climate that disobey the norm, in extreme or not so extreme form, as is the case of hurricanes, extreme and prolonged rainfall, tornadoes, drought etc. These events are part of the "normal" climate but they disobey the norms as such. When climate, seen as a series of norms or averages changes, one can also expect that the types, regularity and characteristics of the anomalies or extremes will also change. This is of fundamental importance for the subject of Climate Change, as we will examine later.

The Intergovernmental Panel on Climate Change- IPCC- official definition of climate variability refers to variations in the mean state and other statistics (such as standard deviations, statistics of extremes, etc.) of the *climate* on all temporal and spatial scales beyond that of individual weather events. Variability may be due to natural internal processes within the *climate system* (internal variability*)*, or to variations in natural or *anthropogenic* external forcing (external variability).

Secondly, when referring to "climatic, weather or hydro-meteorological extremes" one is normally referring to conditions or occasions of climate or hydrology that in a purely physical sense, exceed or disobey the norm and are located on the limits of the associated, measured scales of intensity and energy discharge. Thus, with hurricanes, for example, the extremes are established to date by the existence of category 5 storms with sustained wind speeds of over 280 kilometers per hour (the minimum is hurricanes level 1 with sustained winds of 117 kilometers per hour). When dealing with seismic "extremes" these are established by the limit of the Richter scale, and ranges around 9.5-10 on this scale.

The IPCC definition of weather extremes is "an event that is rare within its statistical reference distribution at a particular place. Definitions of 'rare' vary, but an extreme weather event would normally be as rare as or rarer than the 10^{th} or 90th percentile. By definition, the characteristics of what is called 'extreme weather' may vary from place to place".

Nevertheless, we must recognize that the use of the notion of climate or weather "extremes" (or seismic, volcanic extremes etc.) is somewhat imprecise and lax and it is frequently used in the disaster and adaptation literature and debate more to refer to events that cause damage than to real "extremes". Here it is not difficult to appreciate that "extremes" are not the only ones that present a potential hazard for society. Hurricanes of level 2 or 3, that are not in any exact sense "extreme" events (in fact they are nearer to being normal than extreme especially in the hurricane season), also lead many times to extensive damage and loss. In this sense in the present paper it must be recognized that in using such a notion we are not limiting ourselves to a consideration of the true extremes of climate but rather to a range of physical manifestations that fall outside the norm and which may present some degree of hazard for society.

Having established the physical definition and parameters of "extreme events", we must, thus, also recognize that when dealing with the subject of disaster risk management and adaptation in an integral way, going beyond the frame of the physical world, that it is not only the physical properties of events that determines their level of "extremeness". Rather, our interest must be positioned in terms of "events of high or

extreme social impact" or more simply "harmful events". With this we accept that it is not only the level of discharged energy that explains loss and damage, but rather, the levels of exposure and vulnerability of the affected society, combined with the level of that energy (see Hewitt, 1983, for a forceful critique of what he calls "physicalist" arguments that suggest the unilateral importance of the physical energy in explaining damage to a "neutral" and "innocent" society).

For disaster risk management and "adaptation" it is of fundamental importance to recognize that a physical event, with lower discharge of energy can lead to more damage and loss than one with greater energy levels, if the associated conditions of exposure and vulnerability are higher in the first than in the second case. And, in order to achieve disaster risk management goals, it is also very important (as we will examine later) to recognize that the sequenced recurrence and impact of a series of small or medium scale events, affecting poor and vulnerable communities, can have a greater accumulated effect than the impact of a single large scale event which recurs at time intervals of decades or centuries (see ISDR, 2009, for a recent discussion of the related concepts of "intensive" and "extensive" risk).

The singular fact that more and more small scale events are leading to more and more accumulated damage and loss is part of the explanation for increasing disaster losses over the last four decades, when no significant increase in "extreme" events can be found in the historical record.

Following this argument, we may reach the conclusion that the notion of "extreme" events has essentially been introduced by the geo-science community and with good reason given their interest in the physical processes and parameters of geophysical phenomenon. For disaster risk management, however, and the subject of adaptation, the more important parameter relates to the degree of hazard or threat associated with these events, where the levels of exposure and vulnerability will be key in any explanation, unless we are in fact dealing with the real extremes of nature (9.5-10 R. earthquakes, violent volcanic eruptions, level 5 hurricanes affecting densely populated, poor areas, 40 metre tsunamis, large meteorites reaching earth, etc.) where it is difficult to see exposed society protecting itself no matter how many resources and technical options it manages.

Therefore, rather than worry about the subject of "extreme events" in a physical sense we need to recognize that the central concern comprises "high impact events and contexts", where we are obliged to analyze and understand the social conditioning factors associated with risk and loss. Thus, for the sciences of development or the social sciences in general an "extreme" event is not one where there is the greatest discharge of physical energy, but, rather, one where there is more associated damage and loss. This is, or should be amongst the center of disaster risk management and climate change adaptation concerns and implies a consideration of the social, economic, political, historical and cultural conditions that lead to the vulnerability which affects very large numbers of people and their livelihoods, principally the poor.

This disenchantment with the prevalent concern for "extreme events", and the "physicalist" connotations it transmits, as opposed to the interest and emphasis on the social conditioning factors of vulnerability and risk, is one of the principle reasons why we find the ISDR and IPCC decision to place emphasis on Extreme Events and

Disasters in their recently agreed on title and scoping study of the relations between DRM and ACC, both inadequate and potentially damaging as such. It returns us to the period in disaster study history when the physical elements were paramount and society interpreted as being subject to their impacts, without choice. The title could transmit to the external observer the idea that those that promote the study really believe that it is extreme physical events and disasters what links DRM and ACC communities, whereas in reality it is hazard, vulnerability and risk and overall development levels what really links them. The topic of the titles given to studies on such issues will be considered later when looking at other "inappropriate" and even sensationalist usages, which tend to distract from the central issues at hand. Rather than Extreme Events and Disasters we should be talking about extreme exposure, vulnerability and disaster.

2.2. The Fundamental Emphases of Disaster Risk Management.

The "confrontation" of society with risk can occur in two fundamental and complimentary dimensions or directions.

Firstly, with reference to existing or anticipated future risk. Existing risk is the product of probable, potentially harmful physical events interacting with already existing exposed and vulnerable population, livelihoods and infrastructure. In the case of intervention in existing risk, we refer to **corrective, compensatory or mitigation based risk management** (see Lavell, 1998, 2004, 2009). On the other hand, the prevision and prevention of possible new, future, conditions of risk, is the theme of so-called **prospective or proactive risk management** (we will return to these categories later, in more detail).

Secondly, intervention can be conceived with reference to the phases or "moments" of risk, where risk is seen as a continuum, in constant movement and flux, transformation and change (see, Lavell, 2004, for a development of the risk continuum argument). Thus, latent risk exists prior to the impact of any particular hazardous event and its actualization as disaster loss, and this risk can be reduced or mitigated ex ante using corrective risk principles. New conditions of risk are generated once an event occurs and these are faced up to with emergency, humanitarian response and rehabilitation measures. And, at the moment of reconstruction and recovery activities risk considerations newly emerge and must be dealt with in order to guarantee that disaster risk is not reconstructed in society through faulty rehabilitation and reconstruction practices. In each one of these phases or "moments" of risk (pre-disaster mitigation and prevention, preparedness, response, rehabilitation and reconstruction) principles of corrective or prospective risk management may be applied.

2.3. Weather "Extremes" and Climate Norms and the Formulation of Disaster Risk Management Schemes.

"Extremes" must be considered part of "normal" climate and weather, as we have stated previously. That is to say, they are a constituent part of its existence, and of fundamental importance in the regulation of energy and climate. Nevertheless, whilst they are part of that normalcy, they also disobey the "norm" or the "average" as regards the basic defining factors or parameters of climate- temperature, rainfall, wind speed,

solar exposure and intensity, humidity, etc. Climate is defined essentially by the averages and norms and not by the "extremes", although these are part of the variability it exhibits, that characterize it in important ways and are part of weather seen as a temporal expression of climate. Thus, for example, although summer thunder storms and heavy winter snowfall may be experienced in areas subject to a Mediterranean climate, the definition of this type of climate will be expressed in dictionaries or geography texts more in terms of warm, wet winters and hot, dry summers, the norms, than by recourse to the naming of such "extremes".

When considering the human motivations and parameters for the location of production, housing, infrastructure, transport, commerce and services, among others, these are, in general, geared up to and influenced by the averages and norms of climate (and, also, with reference to other physical conditioning factors, such as the return period and scale of earthquakes and volcanic eruptions, geomorphologic processes, natural erosion, tides etc.), which limit, condition or favor secure and sustainable human development, and not by the nature and presence of "extremes". That is to say, societal "development" adjusts to and is influenced by normal conditions, as they provide the milieu that guarantees, over determined periods of time, conditions of security for production and location, within established and fixed parameters.

Stated another way, the fundamental decisions as to the direction of the development process are taken in lieu of, and guided by the existence of resources, whether these be natural, location, economic, cultural or social. Decisions to be are not based on the existence of the potentially dangerous physical events which will undoubtedly occur at certain times in the very same zones, although the presence of potential hazards undoubtedly dissuades location on many occasions (the Panama Canal, for example, was built where it is because of the supposedly lower seismic risk when compared to its "competitor", the Nicaragua-Costa Rica border area). Thus, the resources offered by river, lake and ocean side locations, flood plains, or volcanic slopes explain the location of population and production but can be and are transformed into hazardous areas for society at certain times, when floods, hurricanes or volcanic eruptions occur. This resource-hazard continuum has been discussed by different specialists ever since it was postulated in the early 70's by Robert Kates and others.

In sum, disaster risk management, considered within the context and framework of development planning, operates under circumstances where different zones are simultaneously typified by the existence of resources and hazards for human development. A key or essential aspect of disaster risk management (and this is also true of "adaptation") is to maneuver in this continuum of resources and hazards, attempting to guarantee that the damage and loss associated with the occurrence of harmful physical events (the "extremes") does not offset or eliminate the accumulated benefits that derive from the use of the strategic resources offered by different areas during the relatively or absolutely long periods in which they are not affected by the "extremes".

The saving of life is always essential in this formula to such a degree that it could also be established that the essence of disaster risk management is to guarantee a favorable social and economic balance between gains and losses in the medium and long term, always guaranteeing a minimum loss of human lives and life in general. Due to this, early warning systems are extremely important for disaster risk management, although such mechanisms are essentially the most conservative way of dealing with the problem

of risk. This is so because they resolve an immediate problem associated with the occurrence of damaging events, but do little to change the underlying factors that explain risk in the first place and which probably guarantee that similar evacuation and livelihood losses are once more experienced in the future. Loss of livelihoods and accumulated small scale investment by the poor, in particular, will further add to their survival problems despite the fact their lives were saved. When early warning systems are built into a process that guarantees economic and social advancement for the affected areas, more options for primary risk reduction exist and we move to a more progressive way of dealing with the challenges of risk (see Lavell, 2009).

The physical "extremes" tend to be described or classified by natural and applied scientists in terms of average "periods of return". That is to say, the number of years, on average, that exists between events of a determined, similar level of intensity or magnitude. Thus, for example, we may have a hurricane of level 5 on the Saffir-Simpson scale affecting a zone or region every 150 years on average, and others of lower intensity with shorter periods of return, affecting the same zones or regions. Equally, this will occur with tornados of levels 6, 3 or 2, or differing levels of intense rain and flooding. The period of return is calculated according to available historical information as to the temporal and spatial incidence of events of differing magnitudes or intensities, and through scientific calculation, and it tells us that a probability exists every so many years on average that an event of determined magnitude will occur. This does not mean of course that such an event could not occur two days, two months or two years in a row. The calculation is statistical and probabilistic.

Thus, in the disaster risk management field a range of contexts of "normality" and "abnormality (everything that is above or beneath the norm or average is "abnormal", if not extreme) must be recognized. And, it is in the context of that variability that disaster risk management works, complementing the individual and collective decisions taken in the framework of the positive influences and positioning effects of physical norms and averages and the potential negative influences and effects of the "extremes" and anomalies. It is precisely because the extremes and norms form part of a unique integrated natural and social reality that disaster risk management must be considered an essential and integral component of development planning and not an adjunct to it. We would also argue that this is how climate change adaption must be seen and be promoted both substantively and institutionally.

The current situation, whereby DRM and ACC practice are more likely to be seen as discrete areas of concern and dealt with by discrete types of institution, as opposed to being linked directly and subordinately to development practice and institutional promoting structures must be overcome as soon as possible. This problem of thematic and institutional separation has been widely discussed in the disaster risk management field and is now also prevalent as regards the adaptation topic, where environment ministries and national meteorological offices with their strong physical undertones dominate, as opposed to development based views of the problem led from development promotion institutions.

2.4. Normality and Abnormality and the Decisions on Development and Risk.

With the contrast between normal or average and exceptional, extreme, irregular or abnormal conditions we may well ask how decisions are taken in society in relation to

such contrasting conditions, when the objective is to locate, produce, construct, circulate or journey under conditions that guarantee maximum levels of social and economic output and productivity and the greatest possible levels of security and sustainability. How is the risk associated with "extremes" or "abnormal" conditions managed within a framework where we seek to have optimal social and economic yields, governed by normal, average conditions?

The most common tool or concept used in disaster risk management in order to rationalize the balance and relations between norms and extremes is the notion of "acceptable risk" (this may be used formally and systematically or informally and implicitly) employed in reaching decisions on intervention that search to:

- reduce preexisting levels of risk to acceptable levels, taking into account existing social, economic, cultural, political and historical conditions, and the real options that exist (corrective disaster risk management)
- promote the incorporation of measures that guarantee a suitable level of security and sustainability for new investments and development projects undertaken by government, private sector and civil society in general (prospective or proactive disaster risk management).

Such a notion is normally accompanied by economic cost-benefit type analysis where we are dealing with formal sector investments. In the case of marginal or excluded social groups, the poor or destitute, the notion of acceptable risk is in good measure outweighed or eliminated as an option and replaced by considerations of "accepted risk" where the need to guarantee daily survival and income opportunities, and the lack of resources that permit decisions on "acceptable" risk, amongst others, will determine that many locate in hazardous areas despite their knowledge of such circumstances. Dealing with every day, chronic risk, will deny most options for dealing directly and insistently with disaster risk. And, consequently, dealing with disaster risk (and adaptation) for these populations requires the total integration of such concerns into poverty reduction and general development processes and strategic formulations.

Thus, although it is the daily, monthly and seasonal norms of climate, and other physical variables, that essentially determine the location of human beings and production and the type of production and infrastructure required, the "abnormal" conditions - the "extremes"- will many times be taken into account in order to calculate adequate or acceptable levels of security and sustainability, and the measures required to guarantee these. In the case of the levels of protection that the relevant agencies and institutions of society determine necessary in the case of nuclear energy facilities, for example, the period of return of earthquakes against which protection must be assured may well be placed at the 10000 year level; whereas, for a house, with a depreciation period fixed in the decades, the period of return of events may possible be calculated around 50 years, unless they are houses of incalculable historical value when the period of return could be fixed in the hundreds of years or to eternity.

That is to say, the level of protection sought will be a function of the type of good or production, its strategic importance for society, the risk associated with a failing in its operations, financial availability, and other objective and subjective criteria. The significance of acceptable and accepted risk for the "adaptation" challenge should not be underestimated.

In the end, the art of climate disaster risk management, as with all disaster risk management, is the ability to handle normalcy in the context of the extremes or deviations that define climate variability. Here we should remember that the normalcy or routine of social and economic development and its effects on different social groups is, in addition to being what is interrupted or damaged with disasters, also, and apparently in contradictory fashion, the source of the very risk that is finally actualized in disaster. That is to say, at the same time as disasters interrupt "development" that same "development" is also many times the source of the risk that is possibly later transformed into disaster (see, Lavell, 1999). Such are the dialectics of reality and risk.

In sum, the management of climate disaster risk works in the context of "the extreme" or abnormal characteristics of climate and their relative degrees of hazard, applying formal or informal considerations as to acceptable levels of risk or, in the case of the vast population that have few options of choosing or "adapting", "accepted" risk.

3. Adaptation to Climate Change.

3.1. Climate Change

Climate Change, according to the Inter Governmental Panel on Climate Change- IPCC- refers to any change in *climate* over time, whether due to natural variability or as a result of human activity (this can include the emission of green house gases, the urban heat island effect and rural land use changes and deforestation). This usage differs from that in the *United Nations Framework Convention on Climate Change (UNFCCC)*, which defines 'climate change' as: 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global *atmosphere* and which is in addition to natural climate variability observed over comparable time periods'.

In view of the fact that our interest here is fundamentally centred on the "adaptation" side of the Climate Change equation and not on the physical process of such change, we will adopt here, as a point of departure, the more comprehensive definition offered by the IPCC, which includes both natural and human factors. This of course does not exempt us from recognizing the importance that the rates and characteristics of change, the incognitos as far as its rhythm over the next years and decades, the territoriality of its impacts or effects, among other contextual factors, have as regards decisions on "adaptation". These aspects will influence in a fundamental way decisions on disaster risk management and "adaptation". Thus, for example, to the extent negotiations on the reduction of the rates of emission of gases are successful or not in the next summit in Copenhagen, this will influence the rates and nature of climate change and, consequently, the degree and type of disaster risk management and "adaptation" required. Moreover, as we will comment further on in this paper, the type of disaster risk management or adaptation goals pursued and achieved may very well have significant impacts on the problem of climate change as such.

However, as far as human response to change goes, understanding the process is not as important, inasmuch as it does not matter if the change is "natural" or humanly induced, reactions and answers to it are fundamental in terms of adjusted agricultural or industrial production, commerce and services, use of natural resources, technologies of

production, styles and rates of energy consumption, and as regards the construction and use of housing and infrastructure.

Moreover, in spite of our certainty that human activity contributes in a significant manner to the change, there is no scientific way at this moment to calculate what part of the change relates to human activity, as opposed to nature, nor as to the synergies between both types of influence (deductively and hypothetically we can derive some answer to this question, but not scientifically, in the sense of the use of controlled experiment).

In limiting our interest and definition of the problem in this way, this does not mean we do not recognize the fundamental difference between change induced by human intervention as opposed to natural causes, in the sense that the first is subject to remedial human intervention and is thus controllable, and the second is not.

3.2 The Mitigation of Climate Change

The first pillar of action against Climate Change is so called "mitigation" which according to the Convention, the IPCC and other authorized sources is defined in terms of the reduction and control of the emissions of green house gases, such as carbon dioxide and methane and the provision for so-called carbon "sinks". This definition of "mitigation" is that which is commonly accepted and used amongst climate scientists and many others from the natural and basic sciences. It is part of the terminology established by IPCC and the Convention and their associated scientific communities.

"Mitigation" is therefore defined with reference to the physical processes by which new climatic conditions are constructed, and not, as is the case with disaster risk management, with reference to the reduction of any of the wide range of conditions that explain existing risk-hazards, exposure and vulnerability.

With this difference in usage and interpretation, we may identify a first potential problem of "communication" between the DRM and climate change communities or specialists, a problem now well discussed between these two supposedly existing and "distinct" communities.

We say "potential" because the real significance of the difference very much rests on how the overall problem is established or constructed and the extent to which there is agreement as to the basic processes and concepts that allow us to understand this. That is to say, differences in the definition of particular words, is not as problematic as differences in the understanding of the concepts and processes involved in the construction and study of the problem. If concepts and processes are commonly understood, we can bare with differences of definition of particular words, although common usages would certainly facilitate communication without equivocation.

Furthermore, we should also be very wary of dividing the world into two supposedly opposing or different "communities" with the implicit suggestion that there is total agreement and consensus within, and significant differences between them. This is simply not true and it is very likely that each of these supposed "communities" are in fact various communities with significant differences within themselves on many major

issues, including terminology, concepts and process aspects (we have already examined the "extreme event" notion and we will examine a few other differing uses in the DRM theme later on). At the same time, a much smaller "integrated" community clearly exists, that does not ascribe its preferences or allegiance to one or other of the topic-defined communities mentioned above, but rather comes at the problem from an integral development based angle and the communalities that exist as regards climate and society. The present author ascribes to this idea and practice, although coming out of the DRM and development school of thought.

So, the problem of definition and usage is far more complex than at first suggested and this may only be resolved by reaching common agreements at least on the basic concepts and the common processes involved.

The explanation of the difference in the use of the term "mitigation" between the DRM and Climate Change areas may be explained, we suppose, by the fact that ACC was dominated for a long time by adepts of the climate and atmospheric sciences or related professions, with their preoccupation for the process of change in climate as such, and not so much for the need to reduce the human impacts, loss and damage, associated with this. Thus, the primary appropriation of terminologies occurred at a time prior to the significant presence of social science, development or disaster risk management specialists in the subject. With this, the subject of exposure and vulnerability and risk were not taken into account to any extent, and there was no real problem, in principle, in adopting the notion of "mitigation" to refer solely to the physical side of the equation, to the control or reduction of the physical factors that contribute to change.

When the need for the promotion or facilitation of human adjustment to the change was finally given more credence and the need to find mechanisms to support this fully recognized, the notion of "adaptation" is borne as a complement to the "mitigation" of climate change per se. By then, the mitigation concept had already been monopolized by the physical side of the equation such that it could not be used in a wider social sense to include the mitigation of the conditions and factors of risk in general, including exposure and vulnerability, as is the case with the DRM area. The term adaptation was introduced to fill the gap and refer essentially to what DRM specialists call mitigation, risk reduction and control or more simply, "development". The notion and definition of "adaptation" will be critically examined in our next and following sections.

The problem of the different interpretations and definitions given to the same word, notion or concept has been prevalent (and, at the same time, a reflection of evolution and advance in the topic) during the relatively long history of the DRM field. This has been related to the transitions that have occurred within this theme from the early dominance of humanitarian response and structural engineering based disaster prevention paradigms and the dominant presence of the physical, engineering and medical sciences, through to a greater presence of the social sciences, visions of the social construction of risk and wider interpretations of what disaster risk reduction signifies in development terms (see Lavell, 2004, for a detailing of these transitions and movements).

We have already examined the notion of "extreme" events when seen from the perspective of the earth sciences and from the perspective of the social and development

sciences, and this constitutes but only one of the many terms where differences in approach and definition may be found.

Let us now briefly examine some of these differences in order to help substantiate the idea that concepts are fluid and as knowledge areas are developed and advanced we must expect changes and transformations that are not always unanimously agreed on but which do in fact represent and reflect the type of debates and advances achieved. In the same way this has happened in the DRM and disaster response fields over the last 50 years, we may expect and would hope it also happen in the climate change field in the future.

With the very notion of "risk" employed in disaster risk studies and practice, there have been significant changes and modifications in its use over the last 40 years, all associated with the increased involvement of social sciences in its definition and study. Thus, while the earth and engineering sciences dominated the subject of disaster, risk was used (and continues to be used by many) to define the "probability of the occurrence of a harmful physical event" or the "probability of the occurrence of a hazard". This follows the common usage in the sense we still say "there is a risk it will rain today". Nowadays, however, the more common definition of this term in the DRM field refers to the "probability of future damage and loss in society" as a result of the occurrence of physical events under conditions of human exposure and vulnerability; or to "the combination of the probability of an event and its negative consequences" (ISDR, 2009). That is to say, the definition has lost its essentially physical and probabilistic connotation and has assumed a more openly social content. The physical event is part of the equation of risk but it does not define or determine it as such nowadays.

Another example occurs with the idea of "hazard" which, when the earth sciences dominated, and even today amongst many, reference is made to the physical detonating event of disaster itself, or, for some, all "extreme" physical events. The present ISDR definition of hazard mirrors this "physicalist" approach in defining hazard as "a dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services and economic disruption or environmental damage". The climate change glossaries do not even consider the idea of hazard or risk.

With the increase in the contributions of the social sciences (including psychology and behavioral sciences), hazard has increasingly come to be seen as the latent danger associated with a physical event which, in itself, is determined in good part by existing levels of exposure and vulnerability. That is to say, hazard is not the physical event as such, but rather the absolute or relative danger it represents (here one talks of different hazard levels- high, low, medium, for example— and these of course vary according to vulnerability and exposure levels and not just the physical qualities of the event itself). According to this school of thought, once the physical event occurs it ceases to be a "hazard" or "threat" as such and it becomes a real harmful phenomenon.

The importance of this distinction relates to the fact that the latency of hazard, and risk as such, allows us to predict or anticipate it and intervene ex ante. Moreover, if hazard is the event as such we then have to find another term for the latent threat associated with future probable events because it is only with the identification of this that ex ante

intervention can be considered. The idea that hazard is a quality and quantity, not a thing or event, signifies that all disaster risk management relates to limiting the hazardousness of potentially damaging physical events by means of their direct elimination or distraction as such (building dykes and retention walls against floods and landslides, or avoiding drought using irrigation systems, for example), or through the reduction of the levels of exposure and vulnerability. Managing hazard thus means managing risk. And, the disaster risk equation should really read: existing potential physical events—exposure to these by society under determined and varied levels of vulnerability-- determined levels of hazard or risk-determined levels of disaster loss. This is of course is different to the commonly used formula Risk = Hazard x Vulnerability, at times, some say, divided by capacities.

All in all, the DRM "community" is plagued with differences as to definition and concept, despite the attempts of the ISDR to emit criteria in the form of glossaries and standardized definitions. Following on from and in addition to the differences within the DRM "community" there are important contrasts between them and climate change mainstream thinking, to the extent that in addition to differences as regards the definition of mitigation, the notions of impact and vulnerability are also subject to important differences in interpretation (see, Birkmann, 2009 and Schipper, 2008 for a discussion of some of these differences). And, as we have stated above, the notions of hazard and risk do not even appear in the IPCC glossary on climate change related terms.

One way or another, as has occurred with the term (both inadequate and ideologically constructed) "natural disaster", terms tend to become fixed and inflexible (they make people feel comfortable and secure) and thus permanent, in spite of their limitations, and clear evidence as to their inappropriate nature. Due to this, to the still prevailing dominance of disciplinary visions as regards risk and disaster, and due to the very low level of critical analysis associated with the subject that many times exists, we do not believe that there will be major agreement in these uses until there is a more wider acceptance that the subject is multi and interdisciplinary by nature and that there is the need to construct a common conceptual framework to link the differing disciplinary approaches and perspectives.

At present, despite calls for interdisciplinary and multidisciplinary work and approaches the disaster risk field is still essentially dominated by mono disciplinary contributions and visions, where important differences in interpretation of basic concepts still exists. A move towards more integrated research and action will require a burning of ego, a sacrificing of disciplinary views in favor of more holistic and integral approaches, with more common conceptual frameworks. The advantages will way out way the disadvantages and those we should work for principally, the poor and vulnerable, will receive a greater kick back from our efforts which many times nowadays get archived away with no impact due to their partial approaches and conclusions.

Of course, this same argument also relates to the climate change adaptation "community" in itself and in the relations with the disaster risk management field which, until they are brought together and linked more closely in conceptual and practical terms, will continue to use terms and concepts in different ways and waste time on unnecessary duplication of efforts and practice. Moreover, unless such a move is made we will probably have to live with the idea that there really are two

"communities" and two topics and that these need to find common ground, instead of realizing they **are** the common ground and it is not so much a matter of integrating different themes but rather discovering that in essence it is the same theme, in good part. Deductive as opposed to inductive, holistic as opposed to discrete ways of thinking are needed if we are to overcome the conceptual and definitional debate and differences that exist, and with this more rapidly find success in dealing with climate related risk. The common elements between the two are clearly "development", "exposure" and "vulnerability" and how these play out under varying physical conditions, under constant change.

Returning to the subject of mitigation, the principle concern of this section, when we relate this, and it's relative levels of success or failure, to the subject of adaptation (the human response and adjustments to climate change) it is obvious that adaptation in its real forms and levels will be conditioned by the levels of success and failure with the reduction of the process and course of climate change. That is to say, although "mitigation" and "adaptation" are seen to be two differentiated strategies, they are, in strategic and policy terms, interdependent to a great extent. Society must "adapt" according to the rhythms and expressions of climate change in the territory. Simultaneously, this rate of change is influenced by the type of "adaptation" employed, particularly when this is based on the transformation of the forms of occupation and use of land, changes in the forms of energy consumption and of urban development.

That is to say, the problem of climate, "adaptation" or "mitigation", is essentially a development problem and relates to the modes this assumes. Unlike the historical, "normal" , "uncontaminated" climate, where natural factors dominated causally and were the basis for its patterns and manifestations over time (of course there have always been human influences on the climate-the impact of cities, changes in land use etc.,), the understanding of climate under conditions of decisive human interference now requires "a humanized" climatology. Here, the real **primary** explanation of climate change does not rest so much with the gases themselves, their physical properties, but rather with the development models and human practices that lead to their over production. That is to say, without a fundamental change in the patterns of development or in the technologies and patterns of use of the resources that sustain them, there is no real option for reductions or controls over the levels of emission of green-house gases. Climate science must become an ally and weapon of the development sciences, instead of being an end unto itself, as has been the case on many occasions in the past. The essence of mitigation is the ability to imagine and implement another development model. If it is seen to be related to the modification and "improvement" of existing models and their parameters, then little will be achieved and recourse will have to be made more and more to the so called "adaptation" processes, processes that many in the south see as "resignation" and capitulation, when faced with processes and decisions taken by others from advanced "northern" society.

Thus as with coping and resilience, adaptation can be seen more and more as a term related to neocolonialism and neo-economic imperialism—get on with things as best you can, survive under our conditions and conditioning contexts, as opposed to changing conditions such that so many people don't have to "cope", by "resilient" to crisis or adapt to someone else's world view.

Let us now examine the "adaptation" notion and paradigm more closely.

3.3 "Adaptation" to Climate Change: a Critical and Constructive Examination of the Concept, its Content and its Relevance in the Framework of Disaster Risk Management

The second pillar of action when faced with climate change is so-called "adaptation". According to the UNFCCC, IPCC and the ISDR this refers, to the "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderate harm or exploits beneficial opportunities". A distinction is made in the official literature between: **Anticipatory adaptation** – Adaptation that takes place before impacts of *climate change* are observed and also referred to as proactive adaptation. **Autonomous adaptation** – Adaptation that does not constitute a conscious response to climatic stimuli but is triggered by ecological changes in natural systems and by market or *welfare* changes in *human systems* and also referred to as spontaneous adaptation. **Planned adaptation** – Adaptation that is the result of a deliberate policy decision, based on an awareness that conditions have changed or are about to change and that action is required to return to, maintain, or achieve a desired state.

With this definition, as we have insinuated in the previous section, there is a set of conceptual and practical problems that we need to reveal once and for all, thus making delimitation of our fundamental problem easier and also facilitating the establishment of the limits of the problem and its definition. Adaptation needs to be "unpacked", disaggregated and clarified, allowing us to distinguish its different and differentiated components as these are described and discussed nowadays in mainstream, grey and informal literature. With this we can then hope to project how these may be taken up on in development and disaster risk management frameworks.

Let us examine some of the essential aspects of what we see to be a clear case of conceptual indefinition and misuse and ignorance of the historical significance and previous scientific use of the term.

Firstly, the use of "adaptation" to refer to both human and natural systems, introduces a confusion of levels and processes in referring to two very different, if related systems. This is particularly notorious as reference is made to the "systems" themselves and not to the component parts of these-humans, animals, plants etc- which do all in fact "adapt" over time following similar processes and impulses according to modified Darwinian principles.

We cannot, nor should we assume that the process by which natural systems (those relations and interrelations, flows of energy, between the non human living world, and between this and its natural inert environment) react and change when faced with Climate Change in a similar or comparable fashion to human systems, interpreted as the sum of the social relations of production, consumption and circulation based on human enterprise and the resources offered by the inert natural world ((IPCC defines a human system as "any system in which human organizations play a major role. Often, but not always, the term is synonymous with 'society' or 'social system' e.g., agricultural system, political system, technological system, economic system"). Given the very basic differences in these two processes there is no real justification for placing them under the same conceptual or practical umbrella.

This merging of basically dissimilar things has become increasingly common as we search to justify the notion of a single natural system and the equality of right between nature and humanity. Due to this we have got to a point where we indiscriminately use the same notions for completely different contexts-vulnerability, loss, impacts, hazards, risk etc and now, adaptation. Thus, in the same way as we talk of adaptation of natural and social systems, we also talk of impacts on natural ecosystems and human systems, vulnerability of both, risk to both and hazards without really realizing we are mixing apples and pears, bananas and grapes and using the same terms for very different things, contexts and notions.

The use of a single concept or notion, "adaptation", to cover both adjustments in the human and the natural worlds only creates confusion and generates a lack of specificity and conceptual exactitude and, consequently, creates difficulties in understanding the options for practice and change (here we avoid the obvious fact that nowadays entirely natural systems hardly exist due to direct or indirect human intervention, in addition to the fact that human systems, in estrictus sensus, are themselves part of nature and "natural" systems).

In the case of the "adaptation" of natural systems this is always "spontaneous", "autonomous" or "independent", non deliberate, non-imagined nor facilitated by thought processes (unless human beings take part in changing the direction of the natural processes) whereas, in the case of "human systems" these operate and change mainly under the influence of factors of conscience, power, deliberation, planning and decision. The notion of "spontaneous" or "autonomous" change in human systems is used somewhat differently in the climate change literature to describe those changes inspired or impelled through individual and collective civil society and private sector initiatives with no intentionality as regards climate change, as opposed to planned change, consciously promoted through the development of strategies and policies, instruments and actions inspired in the public sphere of government.

Obviously no planned or anticipatory adaptation can take place in natural systems and the terms are only valid if we assume humans can plan natural system adaptation (later on we examine the idea of anticipatory adaptation in natural systems). Such an idea is of course completely contrary to the very idea of adaptation.

Secondly, when analyzing simultaneously the range of contexts, actions, responses, reactions, "solutions" that are openly included under the notion of "adaptation", we can appreciate that the term lacks specificity to such a degree that its scientific, practical, pragmatic and heuristic value, as well as its epistemic character is diluted or distorted completely (it has been suggested that the same has happened with the "vulnerability" concept which has come to be used like a black box to refer to manifold different things and contexts and which has led to an effort on the part of some researchers to define the concept in a more specific and unequivocal form (see Cannon, 2008; Wisner et al, 2004, Lavell, 2004).

According to the literature available on the theme and ongoing discussions on the issue, "adaptation" applies or is in response to all of the following diverse and disparate circumstances or challenges (the only thing that really unites them is that all relate in

some way or another to increased global temperatures and climate change which, in itself, is not sufficient reason to justify the use of the same term to comprehend all):

- natural and human systems;
- changes in productive systems, location, construction schemes, environmental adjustments, educational, normative and legal action;
- response to increases in disease vectors and new problems of health.
- changes in the availability of water and energy sources, responses to the loss of glacial and polar ice and to increases in sea levels;
- change in climate norms and averages and, at the same time, climate "extremes" or anomalies.
- changes already experienced in climate, and future predicted or unknown change.
- "forced" internal and international migration under conditions of climate stress.

That is to say, "adaptation" purports to include such a wide array of changes and responses that it is basically used as substitute for the notion of "human and economic change and development", or societal change in general, and tends to replace the very notion of sustainable development. It is constructed as a notion that monopolizes the idea of development, instead of being a facilitator of this. It is everything and it is nothing. It is complete in-definition and complete definition. It is the taking refuge in an idea and concept in order to avoid the need to spin finer and adjust concepts, contexts and scenarios in a more precise and exact manner.

The convenience of being "simple" and "comprehensive" is lost as imprecision and vagueness leads to conceptual anarchy. Moreover it disobeys the widely accepted historical and scientific usage of the same term (Darwin, Russell and others would turn in their graves if they could see the imprecision given to a term they used with such accurate and unequivocal precision).

Thirdly, the idea of an "adjustment in… natural systems in response to (actual) or **expected** climatic stimuli or their effects…" is spurious and inoperable in concept and reality.

No natural system adjusts to anticipated or **expected** climatic stimuli or effects, because "anticipation" is only a characteristic of thinking beings (in the cerebral sense), but not of natural systems and their individual components-animals, plants and other such elements. When have we ever seen a forest, a family of insects or foxes, a particular piece of land, an ecosystem modify its behavior, functions and relations in an evolving manner in anticipation of future climate change and overall changed environmental circumstances? Animal and plant behavior that is used to predict such things as future weather or climate, earthquakes etc has been observed and systematized, but this is not what we are talking about here.

Fourthly, with the adjustment to present, actual change, this is based on real stimulus and circumstances, is rational and observable, based on the measurement of, and sensitivity to new existing circumstances and can be measured, monitored and systematized. The measurement of the success and appropriateness of such adjustments can be evaluated ex post. One major problem in responding to actual change relates to

the problem of knowing when "actual" change is in fact permanent and requires more than on going temporary coping strategies. If a region suffers drought 3, 4, 5 or 6 years in a row should it be assumed this is permanent change and that the region is now an arid one, or will normal conditions return after a certain time demanding a return to former production and living practices?

Thus, in adjusting to actual, experienced change in the climate this must consider and incorporate measures and plans for dealing with continuing future change, given we will have to wait a long time until we can be sure that change has stabilized. In some recent literature (see Cristoplos et al, 2009; Birkmann et al, 2009) it is suggested that reaction to extremes or anomalies of climate within the framework of a regular "stable" climate is what is known as "coping"; while adaptation means something undertaken in a medium to long term context, when faced with ongoing, permanent change. The need to implement adjustments when faced with actual existing change and simultaneously consider that there will be further change in the future has not been faced up to or resolved in any of the cases of intervention we know of and this represents a real challenge for communities and promoters of projects- how to adjust to actual felt change leaving open options and means to deal with future, unknown, but predictable, modifications in climate?

Let us recognize, then, that the change or adjustment in human behavior and practice when faced with **actual or real change** will be the result of individual or collective civil society or private sector actions, where knowledge, finance, instruments, imagination, and intelligence are available. It can take advantage of government stimuli should these exist in an attempt to push, persuade and support non State actors.

From a lexical and theoretical perspective, the actions introduced when faced with actual existing change may be comprehended under the terminology increasingly used in DRM- **"corrective", "compensatory" or "mitigation based" management.** That is to say, changes that are introduced when faced with existing conditions of stress or risk and that may occur spontaneously or be inspired and stimulated by government policies and instruments which norm or support civil society or the private sector and which search to reduce existing levels of risk and environmental mal-adjustment. To this terminology and idea we will return later.

When we move our attention to **expected future change** and human reactions to this, the option of ex ante adjustment certainly exists, but not without us first solving and rationalizing important challenges that go way beyond those involved when dealing with real, actual change.

This constitutes a **completely** different human response context, to such a degree that calling both this and the adjustment to existing, actual change, "adaptation" is extremely venturous since the processes and the conditioning factors are very dissimilar. While nobody denies the need to pay significant attention to this process and to devise concrete policies, strategies and approaches, the challenge it signifies is far more complex than that associated with adjustment to real, present change.

What we are faced with is prevision and speculative reaction, searching to maintain flexibility and open options under the lowest conditions of uncertainty possible, but not necessarily adequate adjustment, and much less so, adaptation. We are "playing" with

risk and the notion of "hedging" prevalent in investment fund criteria is equally applicable with regard to anticipating future climate change and needed anticipated reactions.

In order to be able to adjust or instigate change ex ante, individuals, collectivities, private sector and other expressions of civil and political society require access to trustworthy information on projected changes in climate and society during established periods of future time, and at adequate social and territorial scales. Here, when considering future climate scenarios and the changes in the parameters of climate, their possible rates of change, temporality and territoriality we still face high levels of uncertainty. The recent discovery that the scenarios for loss of Arctic ice were severely underestimated is but one palpable expression of uncertainty and the absence of adequate measures for projecting change.

Moreover, the problem of climate change is still dominated by visions from the physical sciences and predominantly seen as a physical, but not necessarily or many times explicitly, a development problem (see, for example, how the subject of climate change is located, in a majority of countries, in the Ministries or Secretariats of Environment or in meteorological institutions and not in those relating to planning, territorial development or economy). In this way the situation mirrors the physical bias given to disaster studies and interventions for many decades, until the true social nature and significance of the topic, seen through the ideas of risk and risk construction, became apparent.

Scenarios of fundamental economic and social change in society over different time periods (population growth and density, development styles, consumption and production patterns, inequality in income distribution, territorial division of production and consumption between north and south, etc.) are not measured or modeled sufficiently, to such an extent that it is illusory to think of designing "adaptation" strategies for the future with any acceptable level of projected accuracy or certainty.

It is worrisome to think that amongst certain sectors adaptation is seen to be the additional cost required to "protect" development as it is conceived nowadays, and to adjust it to the demands of climate change, instead of considering "adaptation" an intrinsic component of a new model of development with alternative patterns of consumption, production, social and territorial division of labour and distribution of income. Adaptation should be more about changing development models than adjusting existing ones to changing climate

It is also worrying to think that under the status quo adaptation argument one could witness a fundamental change in the patterns and technology of energy production, land use and urban development, natural resource use etc., that serve to reduce carbon gas discharges, but simultaneously, witness an increase, or little or no change in the incidence of poverty and the inequitable distribution of income. That is, reduction of the rate of climatic change and "adaptation" without the resolution of the fundamental problems of poverty and development. Change to maintain the status quo.

The absence of trustworthy scenarios of societal behavior and future development signifies a basic lack of information on the possible development of risk in society and it reduces us once more to a model of risk, knowledge and analysis, based essentially on

"knowledge" of climate-the physical event side of the three pronged equation of hazard, exposure and vulnerability. With this no real option exists to understand the type and real degree of risk in the future associated with changing climate averages and extremes, its social impacts, temporality and territoriality.

The information required to project and plan in anticipated fashion is simply not available to the public or to the politician. Scenarios, anticipations, projections etc. have an obvious value, but, to the extent society does not trust or doubts them, due to their level of scientific speculation or in-definition, little action will be taken by one or another part. People in general, and politicians in particular, expect scientists to give hard fact and not speculation, within given and acceptable levels of uncertainty, and, in general, they react to actual and real things and not to speculative and projective thinking (the majority of people are still adverse to risk).

This is the greatest challenge when faced with climate change. The problem is not to confirm and detail how climate has changed to date, but rather to provide accurate and adequate scale information on change in the future. This is just not possible to the level required to promote anticipated action as part of a "planned adaptation strategy".

Uncertainty as regards the future, combined with the value to be ascribed to lessons and experiences of the immediate past and the immediate present, in relationship to normal climate and its variability, is the basis of the hypothesis that **the future is constructed on the present** and the course of human adjustment to new climate stimuli and effects rests **on us constructing on present experiences, in iterative and continuous form,** and not by jumping quinquenniums or decades in the search to define concrete action.

This does not deny the option and need to think strategically, policy-wise, opening channels for the flow of information, the lowering of uncertainty, the maintenance of flexibility and the discussion of alternatives.

Nevertheless, **the change will occur gradually and it will be based on today's experiences, where accumulated knowledge with disaster risk management and risk management in general can offer much, conceptually and practically**. And, amongst the more certain things we have discovered is the fact that disaster risk reduction is almost impossible without, amongst other very important considerations, overall, general decreases in poverty and vulnerability levels, improved land use and territorial organization, decreased environmental degradation and over exploitation of resources and improved governance in general. It is not difficult to assume that this will also be the case with "adaptation" (see ISDR, 2009).

In order to further specify the nature and content of the relations between disaster risk management and adaptation to climate change and their points of convergence or divergence, it is necessary, finally, to respond to the question "To what do we adapt" or rather "to what changes in climate do we adjust". In answering this question we will provide new or confirm old doubts as to the use of the notion "adaptation" in the context of human adjustments to the effects and impacts of climate change.

3.4 Adaptation or Adjustment to what?

Climate Change has been characterized by changes in two types of fundamental parameters-averages or norms and "extremes"- accompanied and explained at times by alterations in other contexts and environments (loss of polar and glacier ice and increase in sea levels, for example). Simultaneously these two types of variable interrelate in certain contexts, one helping explain the other.

The fundamental parameters relate, firstly, to changes in the averages, norms or mediums of those factors that typify "climate" and which will mean new patterns of climate and climate variability in the future (rainfall, temperature, wind etc.). And secondly, the projected increase in the number, intensity, scale or recurrence of so-called "extreme" events or climate or weather anomalies.

The notion of "adaptation", as it appears in official and popular definitions, relates to anyone of the four variables or contexts mentioned above- changing norms or averages, changing extremes, increases in sea levels and loss of polar and glacial ice- and the particular social and economic circumstances they help incite.

Each of these contexts, although in many ways related, is very different. This, as we have commented previously, puts the adaptation concept under stress due to its overly encompassing nature when faced with social change and adjustment.

In the "discourse" on Climate Change it is very probable that the public in general pays more attention to the weather "extremes", to the loss of polar and glacier ice and to increases in sea levels than to the changes in climate norms and averages. They also probably see these as being more significant, despite the fact that changing averages can be seen to be the essence of climate change and will demand important changes in production processes, the spatial incidence of different animal and plant species, use of technologies, location of people, production and infrastructure, health related demands etc.

Historical climate types and patterns have not essentially been defined in terms of the extremes but rather in terms of the climate norms and averages, as we have pointed out previously. But, with climate change we seem to be changing the balance and assigning far more importance to the anomalies and extremes in defining climate. To the extent such features increase and increasingly weigh the average, maybe, if we interpret the popular notion of climate change as being all about new extremes, we will need to start defining climates in terms of the presence or absence of dominant extremes, now converted in averages! Instead of talking on weather reports of "warm, cloudy and humid conditions with intermittent storms" maybe we will get to "heavy rainfall, thunderstorms and high winds, interspersed with short periods of sunshine and clear skies" (here we are using tongue in cheek comment to highlight the absurdity of some forms of expression as regards climate change) .

The contexts or problems associated with the "extremes", polar and glacier ice and rising sea levels are clearly more "sexy" and sensational and this guarantees their elevation to a preponderant position amongst the public in general (and in the mind of politicians). Their promotion is not exempt from "sensationalist" approaches, fomented by some sectors of the press and some "experts" in the subject. Even, if we take such a

well done and serious recent study as that of the World Resources Institute (2007) on the types of approach and strategies developed when faced with climate change, a great part of its content is on "extreme" or anomalous threats, and the title-"Weathering the Storm", - invokes the idea of catastrophe and extremes, rather than changing averages and norms. This fascination with the extremes mirrors then part of the title of the IPCC and ISDR scoping study now under way, and commented previously, "Climate Extremes and Disasters".

With these preliminary reflections in mind, then, we open up a debate in order to be able to provide an answer to our original question: "To what does one adapt?", "to what does one adjust" and in doing this we hope to advance in our definition of the relations, compatibilities and the differences between disaster risk management and "adaptation". Let us now take each of the different contexts we have specified and examine the implications as regards the relations CCA and DRM.

a. ***Melting Ice and Rising Sea Levels.***

The loss of polar ice and the thawing of the northern tundra influence climate per se and are products themselves of rising global and regional temperatures. They also influence sea levels, the opening of marine communication channels in the far north and new opportunities for agricultural production in areas of previous climate extremes.

The loss of glacier ice affects local climate and regular access to summer and spring water sources, from the annual thawing of winter ice. Changes in sea levels have impacts in terms of location, loss of land, salinization of soils etc., and, in some cases, the future loss of small island States. In fact it is with sea level rise and the greater levels of certainty as to such a phenomenon, when compared to projections of local climate changes, that anticipatory action is far easier to plan and justify, whether it be in London or Holland with fears of sea incursions, or with Pacific islands and the need to emigrate. Moreover, only small changes in sea levels can be devastating if you are an island or in an estuarine area with little land above mean sea level, such that adjustment needs are highly sensitive to small changes.

The need for adjustment to these situations is clear and more or less obvious. Some situations will represent new opportunities, others, impossible conditions, that will require new systems of location, production, land and water usage etc. There is no real complication with these phenomena when one talks about the challenges they present, despite their newness as experiences for human society. With but a few exceptions, they are conditions or contexts with which human society has not had to deal in recent times and, in general, few if any "modern" experiences of risk management when faced with such contexts are available. Exceptions do exist, however, related to recent changes and impacts with the adjustment to the loss of water sources due to accelerated processes of glacier loss in the Andes; or adjustments to sea level changes in the Pacific, with the need to migrate to other sites; or the problems faced by animal communities, such as polar bears, with the loss of polar ice, or communities of birds which disappear from their typical habitats, to be occupied by others, already more adapted to the new conditions. Moreover, the challenge of resettlement has been dealt with by DRM on many occasions under conditions where communities or even towns and cities have been destroyed by landslides and earthquakes and have required relocation

But, in general, the most dramatic and generalized changes are predicted for the future and there is no accurate experience with them coming from the recent past.

That is to say, from the perspective of disaster risk management there are contributions that could illuminate the ways of needed adjustment and options in terms of methodological approaches and measures can be gleaned from such work (for example, the need to relate risk adjustment to the local development process, concentrating especially on processes that reduce vulnerability and risk in general; to stimulate real, local participation in the identification of problems and in the identification of possible solutions; to stimulate self consciousness and knowledge of problems; to link local interventions to the wider regional and national contexts and actors etc.). To this we will return later.

b. **Changes in Climate Factor Averages and Norms**.

From our perspective, the essence of climate change is to be found in changing averages and norms. This is so not only because it is with reference to these changes that major societal adjustments must be achieved, but also because it is the changes in averages that will be amongst the direct causes of the new climate variation and extremes that occur. Climate is described and typified by the averages although the extremes are obviously part of the definition. As we have pointed out previously, we are more likely to describe a Mediterranean climate as having warm, wet winters and hot, dry summers than to say it can be described in terms of sporadic thunder storms, wind extremes, snow storms and heat waves.

That is to say, changes in the average rainfall of different places and regions, in the average solar intensity, in diurnal, seasonal and annual temperature averages; in transpiration rates, are the essence of the change. With these changes, changes in the climatic regimes of different zones, in the incidence of climatic drought, in the incidence of humid zones and, in wind speed and constancy levels will supposedly occur. And, these changes will mean, on many occasions, levels of climatic stress for natural animal and plant populations and for humans, including loss of water resources, increase in disease vectors, greater prevalence of drought, reduced productivity of agricultural products etc.

But, on other occasions, new opportunities for human development will be opened up by changing averages: access to solar, wind and other previously non-existing power sources; new water resources in barren or previously semi-dry zones; the creation of new development conditions for the promotion of new products and production; and increases in the access to water for consumption and agricultural production. All these and more situations will be amongst the new conditions to which human populations and natural systems will possibly have to “adapt” or adjust. And all relate to changes in norms and averages, not extremes.

As we understand the problem, if it is possible to speak of “adaptation” this is with reference to changes in averages and norms, which essentially means adjustment and transformation in situ. This is sustained by the argument that it is the norms and averages which essentially determine new modalities of production, use of energy, location etc. Although extremes have to be taken into account, under no circumstances does a consideration of extremes lead to decisions as to what and where to produce and

locate. Rather, the impact is in terms of what definitely not to produce or where not to locate.

To the extent that changes in the parameters and averages become so dramatic or unmanageable that they require migration and relocation of human populations in search of new experiences and livelihood options, we do not believe in estrictus sensus that this mechanism can be compared to adjustment in situ and it should not be considered in the same terms. One way or another, both mechanisms, in situ and extra situ, are reactions to the change, but they are so different one from the other that they deserve to be dealt with in differentiated form, and to be classified and conceptualized differently. Migration should be considered a non adaptation, coping mechanism, as opposed to a type of adaptation. It represents the singular inability to adapt to changed in situ conditions.

Without doubt, disaster risk management as it has been conceptualized in the recent past has not been directly concerned with the promotion of development, agricultural production, water usage and control, industrial development or human location, in the context of climate averages. This is fundamentally a central goal of sector and territorial development planning, or the market mechanism, although, as we have manifested previously, those norms are in fact the datum point for actions associated with disaster risk management and the calculation of acceptable risk. That is to say, while averages explain production and location patterns, in general, disaster risk management helps to maintain adequate levels of sustainability and security when faced with the probability of the occurrence of "extremes".

The way adaptation and disaster risk management fit into the development equation varies, as the first should, in principle, be dealing with changing averages and the other with changing "extremes. What is not in doubt here is that both problems are part of the development planning equation, or should be so, and that it is in the link to development planning processes that climate change work and disaster risk reduction will find a common and compatible working relationship, probably merging into one integrated practice on many fronts.

Historically, transformations, adjustments or changes in society when faced with gradual or even more accelerated natural change in climate variables and extremes has occurred in spontaneous form, and these cases constitute part of the "normal" change in human and productive systems. Examples abound in history, from the changes in occupation patterns and production in the pre-desert and desert Sahara 12 thousand years ago, through the elimination of opportunities for agricultural production in Greenland in the 14th and 15th centuries and the elimination of the widespread production of grape and wine in England in the 15th and 16th centuries, through to today, with the purchase of land in southern England for cultivation of grape in anticipation of future positive changes in temperature and rainfall averages.

Greater and more rapid change in climate variables are expected in the future than have been experience in the past under natural change conditions, but in essence the problem of change is the same as that suffered historically, although the conditions under which it will occur and the speed of change are far different, with far larger contingents of poor, non resilient population, with a lack of important economic resources and options for migration, and the presence of protectionist national states. These factors

qualitatively change the situation and the challenge although the basis problem is the same.

Despite the fact that disaster risk management has not contributed overly to the definition of strategies and approaches to "normal" development under the influence of climate or other physical averages, we must always remember that such management can only be effectively undertaken when it operates in the context of the normalcy of climate and recognizes that normal conditions and every day, chronic, risk are part of the formula in getting to decisions as to how best to reduce losses and damage associated with the "extremes". One way or another, DRM, or actions that take up on its principles, when faced with the new climate and its intrinsic variability, will be operant within the framework of climate "normalcy" and must be associated with, and take it much into account.

Having established this basic principle, we will now consider in more detail the subject of the extremes and what they mean in terms of the debate on "adaptation", adjustment and risk management.

c. Extremes, Anomalies and Climate Variability.

As we have expressed insistently, Climate Change has been typified not only in terms of changing averages and norms but probably more so in terms of increases in intensities, frequencies and impacts of climate "extremes" and "anomalies".

These "anomalies", "variations", "extremes" will comprise part of the new climate, in a similar manner to climate in the past which has always suffered weather extremes. The variations will include aspects related to hurricanes, intense precipitation and gales, floods, drought, tornados and land-slides.

Faced with this bi modal expression of climate (the averages and the extremes) a series of basic questions may be raised with fundamental repercussions in terms of the ways we conceive intervention and risk management, in general.

Can the ways of dealing with the "extremes" be considered a part of adaptation in the same way as dealing with the changing averages, such that climate related disaster risk management simply disappears as a theme being substituted by adaptation theory and practice, even though a good part of this is based on learning and experience from the DRM field? Will we construct an integrated, holistic approach to climate related problems in the future and simply develop a field of Climate Related Risk and Development Management that takes under its wings needed adjustments to averages and reduction of risk associated with extremes?

Or, will climate change adaptation and disaster risk management continue to be considered two different specialized areas of activity, with clear but differentiated roles and relations?

The way these questions are resolved will clearly influence the ways in which we develop our practice in the future, the institutional set ups established to promote them, and, in general the relations we establish between different facets of the self same reality. On this, we return in more detail later.

Do we "adapt" to changing extremes in the same way that we "adapt" to changing averages?

Whilst recognizing the differences between the changes required when faced with changing averages and changing extremes, and also recognizing that these two contexts cannot be treated separately, but rather as a coordinated whole, it is important from the outset to establish that from our perspective, **one simply does not "adapt" to extremes, only to norms and averages.** The uncertain, sporadic, recurrent but irregular nature of the "extremes" means that it is impossible to imagine a context in which permanent productive and living practices could be construed, although extremes clearly influence the decisions on the levels of overall security sought, as we have established previously in this document. In addition, beyond the impossibility of "adapting" to irregular but predictable extremes, a significant number of exceptional or unique (i.e. not experienced before), as opposed to extreme events, have occurred recently and can be expected to occur in the future (consider the Santa Catarina hurricane in Brazil and the wind storm in Montevideo, for example). There is no real way of predicting the occurrence of such anomalies and thus adapting ex ante to their appearance.

Society when faced with climate or other extremes has a limited number of options open to it, including preparing and responding to them, emergent behavior, living with them, increasing resilience and reducing vulnerability to them, taking refuge or fleeing them, but these actions are taken within the framework established by the adjustment or adaptation to changes in the climate averages and norms in affected areas. The response to extremes is part of the overall response of society framed within a model of change basically inspired by the need to adapt and change according to new climate averages. That is to say, the ways we respond to the extremes is an addendum to so-called adaptation, an adjustment, but not adaptation as such.

Reactions or responses, strategies and methods of dealing with the "extremes" are, simply, what we have considered historically to be the objective of the practice of disaster risk management. With increases in frequencies and intensities, the situation will not essentially differ from the past, when extremes have been dealt with as part of risk management practice formulated in the framework of development decisions taken under the influence of climate and other physical averages and norms.

Without doubt, if the prognoses on increases in the parameters of the extreme events are certain, there will be a change in the balance of the decisions and the levels and needs of intervention. Thus, for example, if the hurricane of level 5 no longer recurs every 100 years on average in a determined place, but every 50 years, or that of 50 years now occurs every 25 years, this obviously would have to affect the process of decision making on levels of acceptable risk for society. The same would be the case with floods, tornados, drought and processes of removal in mass.

If the "extremes", of different magnitudes or intensities, become so short in their period of return that the average is more and more heavily influenced by these and they thus become a more influential component of the norm than is the case today; and, if society is incapable of implementing acceptable and sufficient safety measures against this, because the climate becomes generally too adverse, there would be no option

except migration and relocation in search of more propitious conditions (migration in search of new opportunities due to the adverse nature of the existing locations is not adaptation per se as we have argued earlier, but, rather, a response to non adaptation in situ). But, if the extremes are not close to the norm, there is no reason why in principle DRM should disappear. Where the norm is so weighed by the extremes clearly new arrangements will be needed. Then, if we consider changing norms and extremes together in an uncertain future, our conception of the most appropriate institutional and planning set up must vary. We will return to this problem later.

But, what "extremes" or adverse events are we talking about?

Let us assume that the process of Climate Change will be typified, on the one hand, by an increase in the recurrence and intensity of "extremes" in zones already suffering such manifestations and, on the other hand, by the appearance of extremes or anomalies in zones that have no real history of such events. Obviously the problem for adaptation and risk management is different in the two types of zone, because in the first there is historical, cultural, social, and organizational experience with such events and in the second there is not. This difference constitutes a fundamental aspect in a consideration of adjustment mechanisms and an essential element in any typology of impact and intervention zones.

According to the discussions on "extremes" and disasters in the light of climate change, the hurricane, the flood, the drought etc. of a historical period of return of 150 years could be transformed into one of a 75 year return period, the 100 year event into a 50 year event and the 50 year into a 25 year event. That is, we assume a shortening in the period of return of 100% (there is no science which allows us to speak in certain terms on the possible new periods of recurrence). Then, the logic would suggest that the event of 10 years becomes that of 5 years and the year flood, the regular flood of small or medium scale, will become the 6 month flood.

These small and medium, regular and recurrent events, we know, constantly erode the livelihood opportunities of the population but they are coped with many times through existing resilience and recovery mechanisms-social capital, social transfers, including the supports of government and ONGs in the form of "humanitarian aid.

Nevertheless, when analyzing the problem of the return periods more closely, the statistical relation is not necessarily regular when dealing with large scale and small events. After consulting meteorologists and hydrologists as to this problem, it seems that the relation is not likely to be linear or constant. Thus, the event of a year could become the event of 3 months and we would have, instead of one per year, up to 3 or 4 floods, small, but impacting and accumulatively damaging and erosive of local capacity and investment.

What does this mean for the discussion of "adaptation", management of risk and the relations of these with daily, chronic risk?

If nowadays the small and recurrent events constantly erode the development options of poor populations at the local level, then, the situation in the future would be much more onerous and the poor in such affected localities really may not have to seriously think

about the larger events because simply put, the small and medium scale, recurrent ones would eliminate any option of adjustment in situ, and migration would perhaps be the only real option.

Nowadays, the small events are sometimes an opportunity for people because government or NGOs give materials, food, housing, as part of their humanitarian response. Moreover, they offer a "training ground" for larger events. But, with more frequent small scale occurrences, and new occurrences in zones previously not affected, this is not going to happen and the hypothesis can be offered that they will be forgotten communities due to the level and amount of required assistance, which will exceed the limits of local and national governments, overwhelmed by the cost of impacts in general and response to an increased number of larger events as well.

A recent study by Tufts University (Walker et al, 2008) estimates that the demand for humanitarian assistance due to climate change related events could grow between 56 and 1600 percent depending on which parameters you introduce in the prediction model. Since the cost of humanitarian aid nowadays is in the billions of dollars every year, the new cost would be unmanageable if both the "extremes" and the small and medium scale events increase notably. The small and medium events will assume even greater importance in the future than nowadays and the management of the adjustment to climate will have to take them very much into account, in the poorer zones in particular.

Of course, if there were significant changes in the distribution of income, in the reduction of vulnerability, in the capacity to absorb the impacts of regular short scale events, the situation would change. That is to say, the problem continues to be one of development and not of climate and a general decrease in vulnerability levels is the only real manner of getting on top of the problem.

When a larger number of small and medium scale events affecting poor communities occur, and, also, over longer periods, there are a greater number of large events, the balance of the development, management, reduction of poverty and vulnerability equations would change notably.

The incidence and impact of small events would be such that they would almost become part of "the normal" conditions of daily risk, weighing the norm and average of human existence so much that they would stop being considered abnormal and would constitute part of the regularity of life in the communities.

This is, of course, only a hypothesis amongst many possible as to what could happen and it is as uncertain as an hypothesis as are the climate change models put out by different climate scientists. But, changes there will be, the weight on the averages will change and the demands on disaster risk and development management will be different.

4. The Convergences and Divergences between Disaster Risk Management and "Adaptation" to Climate Change.

In this last section of our paper, based on our previously elaborated arguments and contexts, we will attempt to identify and outline the relations that may be seen to exist between disaster risk management and so-called "adaptation".

Firstly, we will identify common and divergent areas of interest as established in the literature from the two specialized areas; secondly, approaches to risk that are in common to both areas will be highlighted; and thirdly the methodological, strategic and instrumental aspects of disaster risk management that are of perceived relevance to CCA will be commented.

4.1. The types of impact and areas of concern seen from the DRM and CCA angles

We have suggested as a working hypothesis that the concepts and experience of DRM can be taken advantage of in reference to "adaptation" to climate change. At the same time, the development of our arguments in previous sections clearly suggests that the nature of this relationship depends on how we see the different aspects of the problem, including the changes required when faced alternatively with changing averages and extremes; with changing sea levels and loss of polar and glacier ice and the different contexts and problems these help generate.

When we approach the problem of relationship from the perspective of the types of problem to be faced and we examine the types of impact or contexts that disaster risk management has traditionally faced up to these are in many cases essentially the same as those identified for climate change adaptation. The major difference comes when dealing with the changes required in function of changing climate factor averages, as we have pointed out in previous sections, particularly when this is related to reductions in productivity and sustainability due to increased temperature averages. At the same time, it is clear that changing averages places new stresses on society and can in fact be considered the source of new risk, even if this is different to the types of disaster risk we are accustomed to deal with. Thus, one way or another, GRD y CCA are both essentially dealing with types of risk management under varying levels of uncertainty.

A recent study by the WRI entitled "Weathering the Storm" identifies the following impacts or contexts that must be dealt with by adaptation strategies (when these coincide with problems dealt with under DRM practice we put the acronym "DRM" in parenthesis):

- Loss of biodiversity.
- Coastal, flash and extensive and glacial lake burst type flooding (DRM.)
- Losses in agricultural, livestock, fowl and fishing productivity (DRM when dealing with events such as El Niño, heat waves and intense rainfall)
- Damage to poor housing (DRM.)
- Drought and aridity and overall water shortage (DRM)
- Land degradation (DRM with erosion and sedimentation of rivers and lakes)
- Land slides (DRM)
- Increases in disease vectors (DRM).

A good number of the themes suggested in the WRI study relate directly to climate "extremes" and associated problems and thus obviously cross over with DRM topics.

4.2. The types of context and risk to be dealt with in both cases

Within the DRM and CCA practices the following relevant contexts can be identified in common:

- the need for a general and specific reduction in vulnerability as a result of development gains, which implies increases in resilience, capacities and opportunities in general, with a direct or indirect influence on the reduction of risk and on the ability to adjust to climate change. Such a development based approach leads to individual and collective risk reduction and adaptation benefits that are not necessarily deliberate or planned for. This corresponds to what is called "serendipidous" adaptation in the document Weathering the Storm (WRI, 2009), autonomous adaptation by the IPCC and the reduction of every day, chronic risk factors, or simply, "development" in DRM terms.

- the need to deliberately reduce **existing** risks for population, production, infrastructure, livelihoods etc which in disaster risk management is more and more known as **corrective disaster risk management** and in the theme of adaptation, "**planned adaptation**" or **"climate proofing"**. In the case of disaster risk management we are dealing with adjustments or "corrections" when faced with foreseeable events occurring within calculated periods of return and existing measurable conditions of hazard and vulnerability, whereas in the adaptation theme the "correction" would take place due to changes in the physical environment associated with already experienced climate change which endanger production, livelihoods, location etc that were originally "adapted" to their environment, but are now under stress due to climate change Both types of intervention are "corrective" but in the case of DRM intervention is undertaken due to historical errors in development and original failings to take into account disaster risk factors, and in the case of CCA because the climate has changed thus endangering existing practices. The two types of intervention are clearly complimentary and may even operate in the same contexts. Thus, a hospital located on a flood plain, for example, may need to be intervened because it was originally badly located and also because with climate change the flood risk stresses have grown commensurately.

Within the concept of corrective management it is also possible to include those adjustments required in location and production, infrastructure etc. that derive from changes in sea level and glacial and polar loss of ice. These constitute new problems for humanity, are not in any strict sense climate problems, but can be remedied, amongst other ways, using experience from DRM. Relocation of population and production has been a major theme with DRM where disasters have required such strategies.

- The anticipation of **future** risk associated with predictable environmental extremes in the case of DRM, and with predicted changes in climate

averages and extremes in the case of CCA. Both types of practice can and are subsumed under the notion of **"prospective or proactive" management**, deal with the anticipation of future risk and attempt to build such considerations into planning principles and new investment decisions. The major difference can be seen in that DRM prospective management has traditionally dealt with predictable extremes using a stable return period and acceptable risk calculation and formulae, whereas CCA has no reliable and established way of establishing the rate and type of change for which one must plan, under reasonable conditions of certainty.

- Humanitarian response to residual risk and the occurrence of disasters. This has traditionally been one of the mainstays of disaster management and will continue to be of great importance in the future as climate change adds new stressors to existing contexts. With regard to CCA it is somewhat disconcerting to see disaster response being seen as an "adaptation" mechanism, in the same way as are adjustments to changing averages and extremes, sea level rise etc. Here we can very simply manifest that such response will be needed in the future, it will comprehend responses to many types of stimulus that go beyond climate and its effects and they will essentially still be part of disaster response mechanisms and institutions as has been the case in the past. To consider disaster response an "adaptation" mechanism as opposed to a support to adaptation or as a mechanism that deals with failed "adaptation" is incorrect. Disaster response is the reply to inadequate development and to inadequate or failed adaptation, as is the migration out of affected areas

4.3. Contributions from DRM for Adaptation to Climate Change

The contribution of DRM theory and practice to CCA may be considered in terms of:

- methodological, procedural or contextual aspects of management or,
- the management and resolution of particular types of context and problem.

4.3.1 Methodological contributions and approaches

DRM comprises a body of specific knowledge which incorporates many years of conceptual and methodological development and design of specific methods. Many of these, one may argue, either directly or with the necessary modification and adjustment, can be applied in other contexts, including adjustments to climate change.

Particular methods and methodologies

As regards particular methods, one may emphasize the relevance of DRM experience with: the construction of risk scenarios at the local and national levels (taking into account hazards, exposure and vulnerability) and with vulnerability and capacities analysis as such; environmental and social monitoring and the design of early warning

systems in a disaster risk management, development based framework; the elaboration of local participatory diagnoses, considering local natural, economic and social factors in the search for common agreement on the nature of problems and their solution; the use of acceptable risk notions and evolving return period analysis.

The advantage of many of these methods is that they have been developed in the framework of normal, daily life in localities and communities and, therefore, are context informed and integral in their approach to understanding and intervention.

The parameters of intervention

Probably of equal relative importance to the particular methods for risk analysis and decision making are the parameters or criteria that have been discussed and elaborated to guide local level risk management in particular and which can be seen to be totally relevant for adaptation planning and decision making:

- The indissoluble nexus that must exist between interventions in favor of risk reduction and control and the goals and methods of sustainable development planning at the sector and territorial levels. This must also take the nexuses between disaster risk and every day, chronic risk closely into consideration.

- The indispensable role and function that real participation of the population and its organizations, the subjects of risk, plays in the recognition and dimensioning of problems and in decisions on the implementation of solutions.

- The importance of establishing working relations between local, regional and national actors given the synergic and causal nexuses that exist between these in the creation and intervention in risk.

4.3.2 In the Resolution of Concrete Actual (corrective management) and Foreseen (prospective management) Problems

a. Corrective Risk Management:

If we assume that contexts already exist where actual climate change demands societal adjustment in practice and behavior, it is clear that mechanisms and opportunities now used and debated in DRM, under the umbrella of so-called "corrective disaster risk management", are fully compatible with many "adaptation" needs. We know from the outset that climate change can mean a change in averages and norms and also in the types of internal variation and expression of extreme events. There will be cases where climate stress is not new to communities and others where this is relatively new.

The strategies, mechanisms, instruments and particular actions available and proven in the case of corrective disaster risk management and of direct relevance to adaptation practice are all based on an understanding of how risk is constructed in society, and include the following:

- Environmental recovery practices (reforestation, sowing of new mangrove swamps, slope stabilization schemes, etc.) in order to slow the process of socio-

natural hazard construction and provide greater natural protection to the population, its production and infrastructure.

- Relocation of population, production and infrastructure in Less hazardous areas.
- Retrofitting of physical structures, including hospitals, schools, life-line systems.
- Adjustment of agricultural production practices and livelihoods to prevailing environmental conditions and demands.
- Mechanisms to protect and to strengthen livelihoods, including micro credit and insurance schemes.
- Early warning systems.
- Physical protection schemes including dykes, terraces, slope stabilizing schemes etc.
- Increases in the consciousness and education as regards risk reduction, local participatory diagnoses and the development of emergency and contingency plans.
- Development of institutional and organizational forms that strengthen risk governance and promote integrated approaches to risk reduction in a development framework.

Such explicit corrective management mechanisms are basically conservative in that they attack the symptoms of risk but not the causes. They may however be accompanied by mechanisms that attempt to get to the root causes of risk, increasing livelihood opportunities for the population and increases in their levels of social well being, thus increasing the opportunities for self and social protection. This goes along with the idea that the only real way to promote adaptation for billions of people is by reducing poverty and vulnerability in general such that options are opened up for more formally rational decision making on the future, including location and production decisions. Moreover, this is the only way to guarantee that change may be commensurate with the permanence of change in climate and environment in different areas.

The mechanisms described above correspond in good measure to those used in what is called "climate proofing" or "planned adaptation" by adaptation specialists. And, if we take up on the idea of an adaptation continuum developed in the WRI study, "Weathering the Storm", such measures are examples of Climate Risk Management, where "information on climate is incorporated in decisions in order to reduce the negative impacts on resources and livelihoods, taking note of the fact that many times the effects of climate change can not easily be distinguished from those hazards that occur within the normal range of climate variability".

b. Prospective or Proactive Management.

With so-called prospective disaster risk management, mechanisms are introduced that allow the planning of future investments and developments that are geared up to deal with predicted climate or other hazard extremes following the principle of acceptable risk, and where return periods have been calculated according to the stability of the environment over relatively long periods of time-that is to say its averages and variations are more or less stable, allowing adequate levels of security in the calculation of return periods for major hazards.

In the case of the adaptation to future climate change, the notion of prospective management can also be applied given that the development of new social and development initiatives to day demands a consideration of changing environments in the future. Where we are dealing with existing livelihoods and infrastructure, production and commerce that will be affected by future change it is possible to see intervention as being both "corrective" and "prospective", although in any strict sense changes introduced in anticipation of future change should be considered prospective. With new investment and development schemes clearly their adjustment to foreseen future conditions is proactive management.

It is with the notion of "prospective" or "proactive" management that we see the two topics, disaster risk management and adaptation, flowing irremediably together. Thus, if we accept that climate will change on a continuous basis in the near and middle terms (until green house gas emissions are stabilized and an equilibrium is reached a regards change), then there will be no "stable" climate, with stable averages and predictable periods of return for extreme events. All will be in constant flux and change as regards climate and the options to apply normal return period analysis and considerations of acceptable risk when faced with these will all but disappear unless climate science can guarantee a predictive model that can adjust to change and provide accurate forecasts for the future. This is not really possible as things are today.

That is to say, the prospective management of disaster risk in the framework of development planning in general, where climate norms and averages and extremes are predictable under determined levels of uncertainty or certainty will no longer exist and decisions will have to be taken with wider degrees of flexibility and under greater conditions of uncertainty. Managing uncertainty will become a far more important consideration than in the past.

With this type of context there is really no point in attempting to distinguish between DRM practice, adaptation practice and development practice in general, as clearly all must merge into a single integrated framework and management scheme. As averages and extremes will be in constant, if slow motion and to a certain extent unpredictable, development planning, whether in civil society or in government, will have to take account of both in attempting to make decisions on future needs, risk management and "adaptation". There will be no point in separating out development planning and adaptation practice in dealing with the options according to averages, and DRM dealing with those extremes that could imperil development based on the averages. All will need to be subsumed into a single integrated planning framework, where changing averages and changing extremes are both associated with new risk and that must be planned for in a holistic and integrated fashion. With this the debate on the relations between DRM and adaptation should disappear because there should be only one single topic and practice- "Development Based Climate Change Management" or "Development Based Climate Risk Management" or some such title. With this it is clear that such a practice must essentially be located institutionally in planning, finance and development ministries and not in environmental, meteorological and emergency commissions.

This will represent a great advantage over today's situation where despite constant arguments over the years in favor of more integral and holistic development based schemes for DRM we are still faced with the separation principle where development is

on one side and disaster and disaster risk management on the other and one is faced with the supposed need of integrating disaster risk management into development planning (as if they were two different things), as opposed to seeing DRM as an essential defining component of this. With climate change on top of us and in constant movement over at least the next 100 years, according to the experts, there will be no other relevant option than to deal with this, with climate averages, norms and extremes all under the same umbrella- development planning, climate risk management.

However, this will not of course lead to the disappearance of DRM as a specific practice because its object of study and action is not only climate and weather extremes, but also hazards and vulnerabilities associated with geology and geomorphology, oceanography, technology and human induced hazards in general. All future development planning will of course have to take such factors and contexts into account.

As regards this aspect, we must realize that environment and human society are an integrated whole and it is impossible to separate off parts in inductive fashion and hope to get the best results. Clearly areas affected by climate change will on many occasions also be affected by other types of natural and humanly induced hazards-earthquakes, tsunamis, non climate related landslides, technological accidents etc. Given this context there will be no other option than multi hazard management where climate change aspects are also dealt with in a development framework that includes a consideration of the sum of the potential and limiting factors. All comes back to the same point—planning for climate and environment in general must be undertaken from holistic, integral development perspectives and not in a compartmentalized fashion reflecting existing institutional feuds and power struggles.

As far as strategies or particular types of instrument available for prospective climate risk management, there are no real significant differences between those discussed and practiced by the DRM community (see ISDR 2009 and Lavell, 2009, for example) and those discussed in the adaptation "community" (see WRI, 2007 for example). These can be summarized in the following way (we can appreciate that these basically correspond to corrective strategies and instruments and only the temporal aspect varies—anticipating instead of correcting):

- Environmental management, natural resource and environmental services management.
- Territorial organization and land use planning.
- Use of protective infrastructure.
- Application of new and traditional technologies and science.
- Strengthening of livelihoods
- Financial mechanisms- micro credit, insurance etc.
- Integral sector and territorial planning
- Environmental and social monitoring systems and early warning systems.
- Education, training, consciousness and participation
- Mechanisms and processes that increase risk governance in general.

Examining these options in the light of discussions carried out on vulnerability and vulnerability reduction by DRM specialists we see that they can all easily be located in one of the five categories of vulnerability reduction processes proposed by Terry Cannon and his colleagues (Cannon, 2007), that is to say:

- Improvements in social living conditions.
- Livelihood strengthening and increases in resilience.
- Self-protection.
- Social protection.
- Governance factors.

c. Management of Residual Risk

Irrespective of the absolute and relative success of corrective and prospective climate related management, there will always be a need to respond to emergencies and crisis situations associated with climate extremes. The level of response will be inversely proportional to the success achieved with the integral planning of risk reduction. As a datum point we may reiterate the conclusions of the Tufts University study in 2008 that shows that according to different scenarios the increase in the cost of humanitarian response under climate change conditions could vary between 56% and 1600% over current levels during the next few decades.

No matter what the real scenario is, response will still be needed and this will not distinguish between climate change adaptation and normal disaster management principles and needs. The same institutions will be involved as have been involved historically, under different organizational arrangements maybe. And these responses are simply humanitarian responses and not, as adaptation literature would like to make out, adaptation strategies! Rather, they are as we have said previously, non adaptation strategies!

5. A Short Concluding Reflection on the Concepts of Adaptation and Adjustment.

Throughout this document there is an evident critique of the notion of adaptation and its use in the particular circumstances of climate change and human system responses. The reasons why the term was chosen in the first place have been broached somewhat tentatively earlier.

Whilst we have no qualms as to the use of adaptation when dealing with natural systems and change stimulated by actual or real changes in environment, its use as regards human systems (not human beings) is openly questioned here. As regards human systems, arguments exist for utilizing a somewhat more adequate and less historically and scientifically committed term.

Moreover, when the defining of “adaptation” requires the use of another historically committed concept such as “adjustment”, which has its own history, and is widely recognized and utilized in environmental studies and geography in very precise ways, we commit a serious error and generate an important epistemological and methodological confusion. If adaptation **is** adjustment as the official definitions suggest (and we don’t believe this is the case) then why not simply use the latter term and avoid any conceptual, scientific and historical confusion?

In addition, the indiscriminate use of the term adaptation shows the lack of knowledge that exists in general with regard to past and present studies and approaches to human change and adjustment to environmental undertaken by outstanding investigators and students of the problem. This includes the human ecology school of thought coming out

of the University Chicago in the second decade of the 1900s under the guidance and inspiration of Professor Harlen Barrows and promoted by Gilbert White and his collaborators with reference to physical hazards and human adjustments to them from the 1930's onwards.

An option that would allow us to distinguish between processes relating to natural systems and those relating to human systems would be to use the term "adaptation" in the first case and "adjustment" in the latter case, as was postulated by White and his colleagues in the 60s and 70s in their works on human responses to hazards. To adjust (positively) is to comply with new conditions gaining benefits from associated opportunities and resources, and reducing or controlling the contradictions, hazards and vulnerabilities. The term seems to be more "adapted", more flexible and less contradictory in depicting the wide and differentiated range of actions and changes that are encompassed nowadays under the notion of "adaptation" to climate change and which we have discussed previously.

In order to consolidate our proposal for conceptual and terminological unification, we can, thus, suggest the use of the notion of **adaptation** for natural systems in their accommodation to new, but not anticipated environmental circumstances; the term **"adjustment"** in order to describe the changes introduced in human practice when faced with already existing, actual climate change, and anticipated changes. In the first case we are faced with a type of **corrective** climate risk management; and, in the second with **prospective, proactive or anticipatory management,** both terms now well used in the disaster risk management area and in part in the CCA area.

6. By way of conclusion.

The principle objective of the present document is to consider the "adaptation" to climate change and disaster risk management themes and the relations and differences between their established subject matters and action themes. The document is written by someone coming out of the development based, disaster risk management school of thought. This colors our analysis and ensures that arguments tend to go from DRM to CCA and not vice versa.

Apart from the basic hypothesis that DRM, it concepts and methods, practice and strategies has much to offer the CCA field, we argue that only by critically unpacking disaster risk management and even more so "adaptation", examining closely their different aims and component parts, can we expect to be able to reach any real conclusion on similarities, differences, relations and divergences. Moreover, any attempt at solving the "puzzle" of relationships requires a critical look at concepts and definitions as used in both fields. In this sense we touch on the notions of mitigation, hazard, risk, vulnerability and adaptation indicating the ways differences not only exist between the two areas, but also within the DRM community itself, in particular. The increasing importance of development based, social science approaches to risk and disaster and the growing notion of social construction of risk, is used to explain these changes and differences within the DRM topic.

DRM is analyzed from the perspective of themes and approaches, from corrective through prospective management; from prevention through reconstruction. Emphasis is placed on the ways DRM works within the bounds of "normal" environment and its averages and norms, utilizing notions of hazard return periods and acceptable risk to take decisions that guarantee that loss and damage associated with so-called "extreme" events is maintained as low as possible given existing social, economic, political, technological and cultural opportunities and constraints. That is to say, it is environmental "extremes" and their damaging effects that have been the subject matter of DRM, but a consideration of these can not lead to positive effects unless they are seen in the context of environmental averages and on going every day life and associated chronic risk. DRM must be seen essentially as a development strategy, an integral part of sustainable development planning. The same applies to CCA.

The notion of "extreme" events is commented and questioned, following the argument that such nomenclature is typical of the physical sciences and relates to discharged energy levels, whereas for the development and social science community more interest must be placed on "high impact or damaging" events where lower levels of energy can be associated with higher levels of loss due to the pervasive influence of exposure and vulnerability. The explicit conclusion arrived at is that risk is socially constructed and the importance of physical events is directly proportional to the existence of higher levels of exposure and vulnerability. Moreover, it has been increasingly argued and proven that accumulated loss and damage associated with recurrent small and medium scale events may exceed the one off losses from large, long return period events. In the end we must accept that in referring to "extreme" events we are in fact widening the notion to consider all those events that are out of the normal or average range and which are associated with some significant levels of probable loss and damage.

Following an initial definition of climate change and its principle factors, the topics of mitigation and adaptation are dealt with, establishing from the outset that both are interrelated in terms of cause-effect and that the basis of any consideration of these "strategies" must be a development approach. That is to say, climate change is essentially a development and not a physical problem, and mitigation and adaptation strategies must be built on development considerations.

The concept of adaptation is criticized throughout this paper with regard to its use when dealing with human systems and preference is shown for the term "adjustment". This criticism is based on the overly encompassing nature of the themes and problems covered by the term, in addition to its use in ways that disobey historical and scientific usage to date.

Support for this argument, as well as information required to analyze DRM and CCA relations, is derived from a critical unpacking of the concept and the types of activity and context to which it supposedly responds. Here we have analyzed the use of adaptation in such diverse contexts as human and natural systems; with reference to changing climate averages and climate extremes; with reference to adjustments to

actual change and to predicted change in climate; with reference to seal level changes and loss of polar and glacier ice, and other diverse contexts. This variety of contexts belies conceptual precision and value. The significance of each of these contexts for the debate on DRM and CCA relations is weeded out. And, due consideration is given to the growing importance of small and medium scale events with climate change and how they could change the balance of considerations related to "extreme" events and the levels of social loss and damage, or the very concept of "normalcy".

Overall it is concluded or suggested that the climate change problem (and "adaptation" or "adjustment" to climate change as such) should be looked at in terms of changing averages and norms and not changing extremes Non average conditions, the extremes and how to deal with them in the framework of normal climatic and development conditions have been and are the topic of DRM under most circumstances. Corrective actions when faced with actual climate change defined in terms of changing averages will thus be accompanied by DRM work when the extremes have changed as well. But when dealing with anticipated change of climate and the ensuing social reactions, DRM and CCA must merge under a single umbrella guided by development principles and development planning frameworks given that there is uncertainty as much as regards changing averages as regards changing extremes. Under stable climate conditions this is not the case and the principles of hazard return periods and acceptable risk can be applied. This planning with regard to anticipated change will have a corrective and prospective bent. Where anticipated future change relates to the affectation of what is already there this will be corrective. And when new investments and developments are looked at from the climate change angle this will be prospective management

Thus, it is concluded that both CCA and DRM have a component that relates to what has been called corrective management, where existing social and economic contexts are threatened by existing and future climate conditions; both have a prospective component where an attempt is made to anticipate risk and change and adjust new investments and actions to these; and both incorporate the need for humanitarian response when risk has not been resolved on the ground. Therefore, in essence both themes have the same major components and can in many ways and areas be merged. Moreover, an analysis of the types of strategy and instruments available to both reveals close similarities, both with corrective and prospective management.

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