TECHNICAL STUDY ON INTEGRATING CLIMATE CHANGE ADAPTATION AND DISASTER RISK MANAGEMENT IN DEVELOPMENT POLICY AND PLANNING.

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Contents

Abbreviations

- CCA – Climate Change Adaptation
- CCM – Climate Change Mitigation
- CDM – Clean Development Mechanism
- COP – Conference of the Parties
- DRM – Disaster Risk Management
- DRR – Disaster Risk Reduction
- GHG – Green House Gases
- IDB – Inter American Development Bank
- INE/ECC – Sustainable Energy and Climate Change Unit of the IDB
- INE/RND –Environment, Rural Development and Disaster Risk Management Division, IDB
- IPCC – Intergovernmental Panel on Climate Change
- LAC – Latin America and the Caribbean
- NGO – Non-Governmental Organization
- SECCI – Sustainable Energy and Climate Change Initiative of the IDB
- UNDP – United Nations Development Programme
- UNFCCC – United Nations Framework Convention on Climate Change
- UN ISDR – United Nations International Strategy for Disaster Reduction
- VARG – Vulnerability and Adaptability Resource Group

Executive Summary

1. Climate change, due to a combination of anthropogenic and natural causes, is now fully accepted to be a significant fact with ongoing impacts and serious projected consequences over the next century. Climate Change Adaptation (CCA) although present as a limited concern since the beginning of the United Nations Framework Convention for Climate Change (UNFCCC) process, comes on the scene as a major concern with the UNFCCC Marrakesh Conference of the Parties (COP) meeting in 2001 and is further decidedly promoted in relationship to Disaster Risk Management (DRM) by the COP Bali meeting in 2007 and the later Nairobi Work Agreements in 2008.

2. Climate change impacts have already been felt in the Latin American and Caribbean region (LAC) and given the slow and so far inadequate nature of response via climate change mitigation, the promotion or facilitation of adaptation measures have gained increasing importance in international and national political discourse. CCA covers an array of very different adjustment needs of both natural and human systems, including the adjustment to current and projected climactic conditions, especially regarding climate averages and weather extremes, as well as the loss of polar and glacier ice and subsequent sea level rise and fresh water deficit problems. Many of the aspects of concern to CCA are clearly related to pre-existing Disaster Risk Reduction (DRR) concerns and demand a close and individual consideration when seen from the DRM perspective.

3. The objective of the present document is to examine how the CCA, DRM, and development planning nexus is and could be established and, on the basis of the examination of a limited number of national case studies and existing international guidelines, consider where we must go in further fostering such a relationship and the concepts, guidelines, checklists, and other tools that can help us get there.

4. DRR is a primary goal and defining variable of sustainable development planning, where the reduction and control of physical hazard, social exposure and vulnerability are of central concern. DRM comprises the process and strategy by which risk and risk factors are reduced correctively or anticipated proactively or prospectively. It covers both risk prevention and mitigation concerns and the risk associated with disaster occurrence and rehabilitation and reconstruction. It is increasingly seen as a component of sector and territorial development planning, which must be closely integrated into such endeavors and be based itself on development attributes and strategies. This signifies multi institutional arrangements where coordination and synergy are required and development planning and financial institutions play an increasingly important role alongside more traditional disaster response organizations. Mainstreaming of DRR considerations into sector and territorial planning and public and private sector development concerns is imperative.

5. The policy position and instrumental framework for IDB approaches to DRM and CCA have evolved particularly between 2005 and 2009, with important antecedents from 1999 to 2005, and have culminated with the development of major policy and action statements. The preexisting concerns for DRM were amplified with CCA concerns with the production of a 2007 White Paper on "Responding to Climate Change in LAC", and with the subsequent incorporation of CCA concerns in DRM policy documents and finally with the creation of the Sustainable Energy and Climate Change Initiative (SECCI) in 2007, and its accompanying operational unit and network in 2009. IDB disaster risk policy, in placing increased emphasis on proactive stances for anticipating and dealing with both existing and future risk as opposed to an exclusive reliance on disaster response, has automatically anticipated many CCA concerns, particularly in dealing with extreme, non-routine events and their role in diminishing sustainability options, all within the framework of ongoing, every day climate risk.

6. The SECCI network has already organized two regional meetings on financing mechanisms and the integration of CCA with DRM and development planning. The latter meeting, celebrated in Panama in June, 2009, is an immediate prelude to the development of this present technical document. The Regional Policy Dialogue meeting provided an opportunity to review current adaptation policy and instruments in Jamaica, Argentina, Peru, Honduras, Mexico and Colombia and to consider in preliminary fashion check list aspects relevant to the agriculture, water and tourism sectors, considering risk monitoring, identification and evaluation, as well as policy and institutional frameworks and development practice.

7. The climate change scenario in the LAC region may be depicted in a number of succinct facts. Average temperatures have increased 1^{o} C over the last century and sea level rise can be measured in terms of 2 to 3 millimeters per year. Loss of glacial ice in the Andes is already causing stress amongst increasing numbers of producers and families dependent on such water supplies. The El Nino Southern Oscillation (ENSO) phenomenon has tended to grow in intensity over the last decades with dramatic effects in 1997-98, whilst the incidence of Caribbean hurricanes has increased especially as regards level 4 and 5 storms, in periods of warmer sea temperatures.

8. Projected climate changes include changes to climate factor averages and the quantity and intensity of extreme and other non routine climatic events, as well as sea level rise and continued loss of glacial ice masses. Climate sensitive sectors and regions exist throughout the LAC region. Amongst the more pervasive concerns in an environment of considerable scenario uncertainty, threats to the tourist industry in the Caribbean due to sea level rise, coral bleaching and increased numbers and intensities of extreme events; reduction of productivity in agriculture due to increases in average temperatures and consequent food security concerns; loss of glacial ice and the threat to millions of water users dependent on this important source; and the creation of savanna conditions in the Amazon region and other tropical environments, are

amongst the most commonly mentioned. Other areas of particular stress have been identified in the Mexican Southern Gulf Wetland Zone, high mountain ecosystems in the Andes and the increase in disease vectors in many areas of LAC.

9. The problem of model uncertainty and complexity as well as the financial and technological issues in down-scaling regional climate scenarios are two major problems that limit the provision of adequate knowledge and projections as to change at a local and sub-regional level. The complexities of modeling climate change as such are compounded by insufficient modeling of changing vulnerability and exposure due to ongoing social and economic processes. This singular fact has led an increasing number of experts to suggest that we must work with today's climate related problems and patterns and, on this basis, successively build in new aspects to address projected changes. The cost benefit equation and uncertainty associated with dealing with climate variability and vulnerability patterns outweigh predictive, speculative reasoning and interventions, although the introduction of future scenarios in decision making will be absolutely necessary in many high profile, high cost investments and schemes.

10. The UNFCCC Bali COP meeting in 2007 established officially for the first time the significant importance of DRM for climate change adaptation. This was followed up on by the 2008 UNFCCC Nairobi Work Plan and the call for the study and documentation of options and needs regarding the integration of CCA and DRM around the theme of extreme events and disasters. These calls have led to a dramatic increase in interest in the theme and in the production of a good deal of scientific and practical literature on the relationships. In 2008, under the auspices of the Government of Norway, the International Strategy for Disaster Reduction (ISDR) and the Inter-Governmental Panel for Climate Change (IPCC) the decision was taken to pursue a major study on Managing Extreme Events and Disasters for Advancing CCA. This study will take 2 years to complete and is expected to be ready by September 2011.

11. Although DRM and CCA are not the same (the former covering many more hazard contexts than the latter and the latter covering topics not considered in the umbrella of DRM), there are important areas in common when dealing with the social response to the causes of loss and damage associated with extreme and other non-routine events and the responses to these if and when they do occur. Basically, climate change signifies a shift in the parameters of many hydro-meteorological events but not in their essence, such that DRM principles and practice are still highly relevant although there is a need to employ updated and modified methods and instruments of control.

12. In terms of climate change implications regarding the changing parameters and contexts for DRM, the increase in uncertainty, the merging of problems associated with changing climate averages and extremes and the new stress conditions this signifies, the changing hazard patterns in already affected areas and new areas of affectation are amongst the most obvious. Such changes and the breakdown of the

separation between “non-problematic” averages and more problematic “extremes” will probably signify that we must evolve towards a total, holistic, integral way of conceiving the management of development under climate change conditions where averages, extremes, and social implications are all considered together in the same planning matrix.

13. Any opportunity to advance the integration of DRM and CCA concerns will also depend on a breakdown of the existing organizational and institutional divisions between the two topics. The logical position for such concerns is in planning and finance ministries with strong and complimentary components in sector agencies. Systems that promote wide-ranging interest, social participation at all levels and stakeholder involvement are expected be substantially more successful than field-specific approaches.

14. The search to promote DRM and CCA integration into development planning has led to numerous treatises on the conditioning or favoring factors for achieving such a goal. Amongst these publications, five recent and very important texts are quoted in this document. They cover specific needs for policy formulation, programming, financing, instrumental aspects including methodologies for risk analysis, decentralization and the need for local participation, full social participation and stakeholder involvement, the building on existing concerns and problems, climate patterns and their relationship to loss and damage, and screening for projected climate change impacts. They do not constitute examples of ongoing practice but rather postulations and recommendations as to needed contexts, situations and parameters that could foster objectives of CCA, DRM and development planning integration.

15. Almost all major texts on the topic including the IPCC reports accept that the on the ground promotion of integrated schemes is still extremely scarce and ephemeral especially at planning and policy levels as opposed to individual project levels. CCA is a young, emergent field, and the country case studies reviewed in this study demonstrate this clearly via the general scarcity of tangible, on the ground examples to draw from.

16. It could be argued that CCA is not really “adaptation” at this point, but rather “vulnerability reduction”, in a couple of different senses: first, to reduce the risks of any future adaptation it is imperative to have solid data to base decisions upon, and second, many of the tangible examples of adaptation up to this point have been driven by more generic risk reduction goals and later ascribed the label of adaptation. In the first case, it appears that most work up to this date in CCA involves quantification and analysis of the problem domain, and not in actual implementation of adaptation. In the second case, existing DRR capacities produce an ongoing stream of vulnerability reduction projects, some of which fit the CCA mold, and are appropriated as such. The space between these two is the “Capacity Building” phase that CCA is undergoing in order to link theory with practice. The development of adaptive capacity to “climate

vulnerability" has two primary facets: vulnerability identification and vulnerability reduction. For a variety of reasons, up to this point there has been a primary focus within the CCA community on vulnerability identification, a sizable task in itself due to the complex nature of the subject.

17. As to how this climate change oriented vulnerability reduction should take place on the ground, who should implement it, who should pay for it, and myriad more issues, there are many possibilities and ideas circulating, but there is little in the way of concrete "adaptation" on the ground. Specifically, we find that what goes by CCA today in LAC consists primarily of: the generation of research, data, and theories to help identify climate change vulnerabilities at both the high and low levels of resolution, and these are driven primarily by international sources, with some participation from more limited national resources; the establishing of international and national entities that will build capacities against the identified climate change vulnerabilities ; ephemeral integration-mainstreaming of CCA into development policy and planning at the national and ministerial levels; the search for ways to fund adaptation measures at the national level, and to a lesser extent, at the international level; the creation of adaptation ideas and pilot projects at local and community levels to "test" what works on the ground prior to attempting these on a larger scale ; a substantial amount of grass-roots, locally based, and/or NGO funded DRR that is on-going and driven by tangible community needs, perceptions, and culture.

18. The country case studies reveal the following salient features:

19. In Jamaica, the high levels of exposure of the tourism sector infrastructure to hurricanes, coupled with the substantial dependence on climatically vulnerable agriculture translate to an environment in which a single large event can cause losses totaling a substantial portion of annual GDP. However, in recent years Jamaica has been hit by much more than just a single large event. Over the past five years alone there have been 13 major disaster events totaling losses of over US$1 billion (15% of nominal GDP). This has caused substantial setbacks to development goals.

20. In 2007, Jamaica was chosen as one of ten pilot countries in the UNDP-GEF Community Based Adaptation (CBA) programme for the period 2008-2012. The CBA seeks to bring climate change adaptation to the local level, as this is where climate change impacts will be manifested, by co-funding 8-20 small projects (less than US$50,000 each) via its Small Grants Programme (SGP). The programme has several interesting components, from its use of qualitative (via Vulnerability Reduction Assessments – VRAs) and quantitative (via Impact Assessment System - SGP-IAS) measurement tools, to its novel integration of CCA, CCM & DRR via a focus on the local level.

21. The progress made, challenges, opportunities in Jamaica may be summarized in the following manner: Progress: technology needs assessment has been completed;

grassroots information dissemination has been achieved; progress has been made by individual ministries: tourism, agriculture, education. Challenges: the lack of financial resources; the lack of technology for assessing risks (ocean, weather monitoring; down-scaled climate modeling); the need for beach profiling, tidal gauging, and GIS systems, among others. Opportunities: use of grass-roots information dissemination mechanisms appear to be effective, low cost adaptation measures; further participation in UNDP-GEF Community Based Adaptation (CBA) programme will slowly add up to substantial level of adaptation; the Caribbean Catastrophe Risk Insurance Facility (CCRIF) functions as a highly efficient risk transfer based adaptation measure with low upfront investment costs.

22. Mexico is a large country with several, different CC vulnerability areas: SE coastal areas are susceptible to saltwater infiltration into groundwater supplies; both Pacific and Atlantic coasts are susceptible to hurricanes; the Central region is susceptible to reduced rainfall as most of the area is already mostly arid and receives limited rainfall; a fair percentage of aquifers are over-used and being depleted, and CC projections will further intensify this issue.

23. The history and evolution of climate change politics in Mexico helps to put government priorities in context. Climate Change has ascended in priority primarily due to the revenue opportunities from risk transfer mechanisms such as the UNFCCC's Clean Development Mechanism (CDM) and leadership in the renewable energy industry from such unlikely sources as the Mexican national oil company, PEMEX. On the other hand, Disaster Risk Management has benefitted from no such revenue generating scheme as natural hazards are endemic to each particular region while climate change hazards arise primarily from a more global set of interrelationships that require the partnering of developed and developing countries.

24. The linkage that must be established is that until adequate climate change mitigation measures are in place, DRM may well be called upon in an increasing manner to respond pragmatically to the increased vulnerability that comes with climate change enhanced hazards. Since DRM and climate change fall under different ministries, one can expect that an integration of the two fields into a single area of inquiry may well be a long time in coming; until then the transversalization of DRM would seem to be a reasonable stop-gap in mainstreaming CCA in Mexico.

25. The progress, challenges and opportunities related to the Mexican case may be summarized as follows: Progress: battling air and water pollution, a more localized type of "climate change", have a long history in Mexico; early advocacy for the UNFCCC and backing from the national oil corporation, PEMEX to further such goals; local-level World Bank Pilot projects in the Yucatan peninsula; work on multi-hazard mapping at state level for the whole country. Challenges: Interest is largely driven by interest in CDM related funds from selling carbon credits, which has obvious effects on adaptation promotion as such funds are needed to execute

adaptation projects; multiple government ministries have overlapping and competing CC responsibilities, leading to duplication of efforts and internal power struggles, with fewer resources left over for adaptation projects; substantial pollution problems keep the focus on more immediate problems, particularly among NGOs and regional/local governments. Opportunities: Due to Mexico's size, it could become a regional leader in adaptation technologies and thus benefit the export potential of such advances; strong institutional and grant-writing capabilities lead to many ground-breaking projects in CC for LAC; close ties with US could lead to new adaptation partnerships and options, especially if the US rejoins the table and thus reopens the door for CDM related funds that could fund Mexican progress in CCA.

26. The best way to describe Peru's situation is that it is on the vanguard of not one but both primary transmission mechanisms of climate change – slow onset events and extreme variability events. In the mountains, warming and precipitation trends are quickly reducing the size of its glaciers, and thus Peru's access to fresh water supplies. On the coast, the manifestations of El Nino Southern Oscillation are the most extreme of those experienced by any of the countries affected by this phenomenon, causing economic losses of 4.5% of GDP (US $3.5 billion) in the 1997-98 event alone. Whereas today climate change is primarily an intellectual exercise for most countries, it is an extremely serious topic in Peru; where other countries will be in ten to twenty years should trends continue, Peru is there today

27. In May, 2008, the National Environment Ministry (Ministerio Nacional del Ambiente – MINAM) was established as the administrative authority over the environmental sector, with management at national, regional and local government levels. MINAM has of five strategic objectives: Insure that the natural heritage is to be used and preserved via the use of economic efficiency, social equity and environmental sustainability; maintain a level of environmental quality and a risk management that protect people's health and safety; insure a high degree of environmental awareness and culture among the population; provide the natural and social capital for eco-efficient and competitive development of environmental goods and services in the domestic and international markets; insure that the National Environmental Management System works effectively.

28. The progress, challenges and opportunities in Peru may be summarized in the following way: Progress: loss of glacier mass over past 50 years is well documented; the country has passed constitutional amendments requiring government to handle climate change, for which the ENCC (Estrategia Nacional de Cambio Climatico) was established; the study areas of highest vulnerability for potential future adaptability measures is well advanced; the PROCLIM (Programa de Fortalecimiento de Capacidades Nacionales para Manejar el Cambio Climatico y la Contaminacion del Aire) model for iteratively building capabilities and technical expertise in CC, adaptation takes real-world difficulties in advances in stride. Challenges: Peru is highly susceptible to climate change effects; mining and other natural resource

interests have strong political sway, often against climate change mitigation initiatives; large quantity of fragile forests and ecosystems are at risk; climate models don't downscale well and in particular in Peru where high elevation regions have little available modeled data and are highly vulnerable. Opportunities: potential leadership role due to early need to adapt; El Niño episodes have created a culture of adaptation that leads to widespread grassroots support for mitigation and adaptation measures; extensive forests, constituting large natural CO2 sinks, could provide a much needed revenue stream to fund adaptation measures.

29. With regard to the development of sector check lists for incorporating CCA and DRM criteria into development planning, a basic premise is that a checklist for CCA should build on existing checklists for DRM, bringing them up to date with regard to changing hazard and vulnerability circumstances.

30. In particular, new aspects must be able to cover: new institutional demands and competencies; challenges to scenario building under conditions of growing uncertainty; holistic planning needs associated with joint consideration of changing averages and extremes; new hazards in new areas; new multi hazard scenarios.

31. The overall conclusions and recommendations from the study are that:

- CCA is incipient as a practice and little exists on the ground on real integration with DRM and development planning together. Concept and theory are more advanced than real practice. The problems of uncertainty and scenario scales of resolution mean that management and adaptation are more likely to be successful if present climate variability is the basis for action and change is introduced successively over time.

- Where adaptation schemes exist these are more likely to be in the form of individual, small-scale projects as opposed to policy, strategy or overall instrument based approaches.

- The more holistic the planning and implementation process the better. This means a total climate approach where existing variability is the basis for action, changing averages and extremes are considered together and climate change and variability are seen within the general overall framework of sustainable development planning and other ongoing societal stresses and problems

- The IDB, as is the case with other international supporters of CCA and DRM, must insure that their loan, grant, or support policies take due note of the integration needs and provide guidelines and action formats that guarantee that

these policies are implemented not only at the project level but more importantly at the general policy and strategy levels.

- The mainstreaming of CCA into development planning can take DRM ideas, notions, experience and criteria as a good starting point for much adaptation work, thereby avoiding the re-invention of existing methods and tools. Thus, such instruments as check lists and screening should be driven by existing DRM mechanisms.

- Conclusions regarding the construction of CCA check lists include: while some factors are sector specific it is accepted that others are inter-sectoral and should be considered in that way; check list factors must cover data and monitoring needs, institutional, planning and instrumental aspects and forms of relationship to development sectors

- It is difficult if not impossible at this time to construct accurate cost/benefit analyses for adaptation projects due to the high levels of uncertainty regarding future CC scenarios. Until we reach a higher level of understanding regarding the interrelationship of the many applicable variables for projected CC implications, the best way to insure high cost/benefit ratios in projects that are undertaken is to piggyback CCA onto DRM projects that already have acceptable cost/benefit ratios, thereby making such projects even more justified.

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I. Introduction

1.1 *Overview*

32. Climate change, pushed by greenhouse gas emissions (GHG), land use changes, the urban heat island effect and natural processes, is a manifest reality today according to the Inter Governmental Panel on Climate Change (IPCC). In the future, even if a reduction is achieved in gas emissions as a result of agreements reached at the December 2009 Copenhagen climate conference or decisions taken at the national level, climate change will have important effects and impacts for at least the next 50-100 years due to existing levels of gases and their future trend. Amongst the existing and projected contexts, an increase in the number, incidence, severity and impact of "extreme" and other non routine weather events is expected. Under such circumstances the disaster risk problem as we know it today and have experienced it in the recent past will be exacerbated and existing concepts, projections, methods, and instruments will need to evolve and adjust to the changing context. This will occur in a context also marked by changing climate factor averages (temperature, precipitation, wind, etc.), loss of polar and glacier ice masses and increasing sea levels. These latter factors will inevitably also lead to new climate and environmental stresses affecting populations and economies. The overall situation with changing climate averages, changing extremes and other levels of damaging events, decreased ice and changing sea levels needs to be dealt with collectively by individuals, families, social groups, local and national governments and international development agencies. Adjustment or adaptation of human populations and their livelihoods will and must occur if we are to avoid increasingly unacceptable levels of risk.

33. From an early emphasis on the mitigation of greenhouse gas emissions, both the United Nations Framework Convention for Climate Change (UNFCCC) and IPCC concerns have expanded to incorporate a serious consideration of so called human "adaptation" measures. This concern has grown during the present decade and was increasingly supported and expressed in the 3rd and 4th Evaluation Reports of the IPCC. Adaptation has been developed as an overarching concept that covers many different aspects of human adjustment, including the problem of reaction or response to climate extremes and other types of non routine hydro-meteorological events. Given this, adaptation clearly touches on aspects traditionally dealt with in sector and territorial development planning and disaster risk management-DRM- practice. Whilst the manifestations and direct causal processes of climate change are clearly physical and their study and understanding requires a fundamental contribution from the physical sciences, the less obvious root causes lie in skewed development processes, as well as energy generation and consumption processes and patterns. At the same time, many of the more important impacts of change will be on development parameters, potential and opportunities, with particular concern for the impacts on poorer and more vulnerable populations.

34. Under these circumstances there is a clear need to promote, encourage, enact and prepare for synergies and complementarities between what are known as climate change adaptation (CCA) and DRM, and between these and sustainable development and sustainable development planning requirements at the sector and territorial levels. The challenges that disaster risk and disaster, and now climate change, present for the achievement of the UN Millennium Development goals is increasingly highlighted in many different forums and publications. This challenge must be recognized and overcome through, amongst other things, a more rational approach to the enactment of clearly complimentary intervention schemes and planning practices.

1.2 *Objectives*

35. The Terms of Reference for the present document state that the central objective is the elaboration of a technical study on the integration of CCA and DRM into national development policy and planning in Latin America and the Caribbean-LAC. It also establishes that the study should clearly demonstrate the level at which national policy frameworks and strategies are contributing to such integration. Specifically, it is important to know how these frameworks are assisting in relating specific courses of action to the potential role of stakeholders in reducing climate related risks and supporting adaptation through the strengthening of organizational structures, social and economic infrastructure, ecosystem protection and restoration and risk transfer and retention.

36. This technical study was set up as a desk study to be carried out over a 24 day period, including revision by IDB and finalization. This included a literature review on current and future projected climate impacts in the LAC region, on current approaches of the IDB to DRM and CCA and their integration and on international perspectives and recommendations as to merging the two topics and integrating them with development planning; the compilation and analysis of approaches at the policy, planning and instrumental level for addressing development risk from an integrated CCA-DRM perspective, with a focus on sector and national approaches, using Mexico, Peru and Jamaica as case studies. The latter should lead to a comprehensive listing and associated descriptions of the primary planning and policy instruments and tools that are currently used for mainstreaming CCA and DRM in an integrated manner, indicating how these tools have or may be used, and providing recommendations of other instruments and practical tools that could enhance this process whilst also identifying challenges, gaps and opportunities, especially in national organizational structures and implementation mechanisms.

37. Finally the TORs call for the development of detailed sector checklists of the necessary actions to be taken by countries to facilitate the seamless integration of CCA and DRM into national development policy, national strategic planning, sector planning and sustainable livelihoods initiatives for the water, tourism and agriculture

sectors. This was to be done by reviewing and enhancing the preliminary checklists that derived from the Sustainable Energy and Climate Change Initiative (SECCI) of the IDB's regional policy dialogue (RPD) meeting held in Panama in June 2009. The IDB would provide relevant documentation in order to facilitate completion of the consultancy, including background information for the report from the Panama RPD Meeting and relevant IDB environmental and disaster risk policy documents.

38. It is important to note that as the UNFCCC 15th Conference of the Parties (COP) meeting in Copenhagen in December 2009 approached, the number of texts and contributions associated with the issues of CCA and DRM increase geometrically. Moreover, while this technical study is being undertaken (November 2009) the first author meeting of the proposed new IPCC Special Study on Managing Extreme Events and Disasters to Advance Climate Change Adaptation is taking place in Panama. This latter study hopes to advance our understanding and knowledge of the adaptation-disaster risk management nexus and will, as with other forthcoming studies, provide important information and advice on the integration of these themes with development planning concerns.

39. The content of this document is based finally on a review of a wide ranging series of documents and information, spanning from work published by the IDB, to international scientific and economic data (4th IPCC Evaluation Report, the Stern Report, to UN programs (UNDP, UNFCCC and ISDR), to regional agencies, to national governments, for a total of 183 reviewed documents. A comprehensive fully annotated bibliography of essential texts, as well as a fuller range of consulted texts may be found in the References Annexes. Due to project constraints and the wish to leave the text relatively clear of citations and references, a limited number of references are noted in-line, but all sources consulted or used are noted in the References Annex. The range, scope, and sheer quantity of documents are themselves indicative of the amount of research, documentation, and exploration that is presently taking place in the CCA and DRM fields.

1.3 ***Structure***

40. Section II of this report provides definitions for Climate Change Adaptation and Disaster Risk Management. Section III summarizes recent IDB approaches and policies with regard to DRM and CCA and their development since 2005. Section IV summarizes projected and currently experienced social, development and environmental impacts of global warming and climate change in the Latin American and Caribbean (LAC) region. This information provides a back drop for a consideration of priority areas of intervention on a sector and territorial level and provides an overview of significant impacts as well as more concentrated information on a number of IDB designated priority countries.

41. Section V provides an overview of the noted similarities, differences and synergies that are considered to exist between CCA and DRM. Moreover, the potential and real impact of the CCA theme on DRM practice is noted and clear guidelines are provided in terms of overlaps, complementarities and differences. Section VI provides a cursory summary of 5 of the more important studies (amongst dozens that now exist-see references annex) that have been forthcoming in the recent past at the academic, practitioner and international forum and discussion level regarding the integration of DRM and CCA, and the implementation of CCA-DRM guided development planning, highlighting the contexts that permit or impede progress on this matter.

42. Section VII reviews and summarizes selected efforts and approaches, policies and instruments for incorporating CCA and DRM practice in development planning in the LAC area with examples from Mexico, Peru and Jamaica. It is important to note here from the beginning that **the topic of integration is extremely new and advances are more in terms of postulations and pilot projects than fully fledged schemes and programs, signifying that the gaps, challenges and opportunities are far greater than the integration achieved to date**. Section VIII provides a suggested check list of factors to be taken into account when promoting sector directed CCA-DRM-sustainable development initiatives. This is anteceded by a series of conceptual considerations, and the final product represents an enhancement and modification of the conclusions reached at the Panama Policy Dialogue Meeting of June 2009.

II. Definitions

2.1 *Disaster Risk Reduction and Disaster Risk Management*

43. Disaster Risk Management (DRM) and Disaster Risk Reduction (DRR) provide a framework and strategy for both reducing existing and controlling future disaster risk factors (hazard, vulnerability and exposure) and for responding to and reconstructing post event impact. **Increasingly informed by notions of sustainable development, the incorporation of risk reduction strategies and actions in development planning is now seen to be of paramount importance**. Decentralization, multi-institutional frameworks and vulnerability reduction, and social, gender sensitive approaches are all considered of fundamental importance. From the Bank's policy perspective, the reduction of risk, following and integrated with development formats, is of greater importance today than the traditional disaster or emergency response aspects which have dominated the approaches of so-called Disaster Management in the past and which are generally dealt with through other institutional mechanisms.

44. **DRM and DRR concentrate on and are defined by efforts to reduce (correctively or reactively) or control (prospectively or proactively) potential losses and impacts associated with the occurrence of natural and humanly induced physical events that are depicted to be of an "extreme", "anomalous", "extraordinary", or "non routine" type.** That is to say, those events that are outside of the environmental averages and norms as such, and are part of environmental (climatic, geological, hydrological etc.) variability. When dealing with climate related factors they are referred to as part of "climate variability" and are in fact considered part of normal climate, subject to different return periods according to their differing intensities and magnitudes.

45. The overall goal of DRM can be considered to be **the minimization of human, economic, social, environmental, cultural and historical loss and damage associated with the occurrence of potentially damaging environmental events**. Such events may be of the extreme type with a long to very long period of return or of lower levels, with highly recurrent and accumulatively erosive events that lead to reduced development opportunities and continually damaged or weakened livelihoods. The goal of risk reduction and control must be achieved in the framework of societies and communities whose normal daily existence and livelihoods are dictated and determined in great measure by existing environmental averages, whether these be climatic, geological or geomorphologic. That is to say, environmental averages are the most pervasive influence on human settlement and development whilst the extremes, the non routine natural physical events comprise a sub set of environmental factors that circumscribe, limit and at times endanger or seriously endanger "normal" development.

46. **In order to achieve the risk reduction goal, recourse is made to different methods and techniques that allow society to rationalize its decisions on levels of acceptable risk and the mechanisms available for attaining this.** When dealing with formal, advanced economic and social sectors this will typically include such calculations as the average rate of return of damaging physical events of differing magnitudes and intensities and cost benefit considerations for judging the efficacy of different mitigation or prevention measures. When dealing with the poorer, excluded sectors such measures and methods are rarely applicable and decisions are taken within the framework of the daily or chronic risk factors they suffer, and where the integration of risk reduction aspects in poverty reduction and livelihood strengthening processes are critical.

47. There are two important aspects to keep in mind when considering the DRM - CCA link and these will be taken up on in more detail later. Firstly, DRM deals with a multitude of hazards that go beyond climate and hydrology whilst many times different geographical areas are subject to multi-hazard contexts. Secondly, despite inaccuracies and uncertainties regarding the return periods for different types of events, traditionally DRM has built up a vast amount of knowledge on such rhythms, under the normal ongoing conditions of the physical environment. **Climate change as a factor of instability inevitably leads to far greater uncertainty and far lower predictability of the expected return rates of different types of hydro-meteorological events and even regarding the expected future average conditions and norms.**

2.2 *Climate Change & Climate Change Adaptation*

48. The Intergovernmental Panel on Climate Change (IPCC) defines Climate Change as "a change in the state of the climate that can be identified… by changes in the mean or the variability of its properties, and that persists for an extended period, typically decades or longer" (IPCC, 2007). Such change may be associated with natural cyclical processes or, as is the case today, with the generation and emission of green house gases, land use changes and the urban heat island effect. These latter socially generated situations seriously increases the rate and magnitude of change and are one important reason for current concern as regards Climate Change Adaptation, as **the rate of change is seen to far exceed the autonomous or regular adaptive capacity of human and natural systems, leading to unknown and at times unpredictable stresses on both.**

49. The Climate Change problematic and the demand for CCA, understood as the adjustment of human and natural systems to existing or predicted changes in climate, has come to cover various different if related contexts or situations, including some that are not climate defined as such. Thus **"adaptation" is called for as regards changing climate averages or norms and changing climate variability expressed**

in the suggested and projected increase in magnitude and intensity, recurrence and re-incidence of so-called "extreme", "damaging" or non routine events of differing magnitudes and intensities. And, it is also called for when faced with the projected slow-onset, long-term increases in sea levels caused by the loss of polar and glacier ice sheets and masses or warm water surges. The problems associated with these different conditions remit to a consideration of human settlement patterns and building practices, agricultural production, access to water resources for production and consumption, human migration, human health, livelihood and food security, loss of ecosystem resources, amongst others.

50. The range of different contexts, conditions and problems that have been grouped under the "adaptation" label creates its own problems, problems that have a history in existing social practices and interventions such as DRM. It is acknowledged that the problems presented by CCA constitute in many cases relatively new and unknown circumstances, however, the problem of extreme, non-routine, or damaging events is not new and **as DRM has evolved over the years, it has developed a thorough series of methods, techniques and intervention strategies that deal with such circumstances**. Much of this can be used in the newly emergent science of CCA. At the same time **Climate Change introduces new challenges and uncertainties to the extreme and non routine event scene in general, so DRM must evolve to handle these future events. The challenge of the integration of the two schools of thought and practice lies precisely in the evolution that will take place over the next few years as CCA continues to gain traction and DRM tools evolve to meet the new Climate Change driven needs.**

III. The IDB Approach and Policy for DRM & CCA

51. Between 1998, and the occurrence of Hurricane Mitch in Central America, and 2009 the IDB has very seriously vamped up its interest and policy definition as regards disaster risk and disaster. **Between 1998 and 2004 actions were taken with little consideration of climate change factors and circumstances and activities could be seen to be transformational and definitional as regards approaches to disaster risk**. These included the 1998-99 revision of disaster policy in a search to incorporate more ex ante actions and create a post impact reconstruction facility; the post Mitch 2000 document titled The Challenge of Natural Disasters in Latin America and the Caribbean: the IADB Action Plan, which presented a first conceptual framework for a proactive approach to disaster risk management; the establishment of focal points for risk management in Bank units from 2000 onwards; the 2001 creation of the Sectoral Facility for Disaster Prevention; the promotion of analytical and strategic capabilities from 2001 onwards including the development of risk indicators, analysis of financial markets and increased understanding of requirements for local risk management; the creation of the Natural Disasters Policy Dialogue Network from 2002 onwards; the 2003 to 2004 evaluation of the disaster policy at the Bank in the search for a more proactive stance and which gave rise to the preparation of a first policy profile and the preparation of a first Action Plan in 2005.

52. Taking the 1998-2004 actions as a base line, the IDB approach to Disaster Risk Reduction and Climate Change Adaptation and the institutional requirements for undertaking these may be reconstructed historically in a series of internal Bank policy and white papers or technical documents, dating essentially from 2005. These commence with the publication of the first Risk Management Action Plan for Improving Disaster Risk Management and a checklist of factors to be taken into account in development financing, both produced in 2005. This was followed by the approval of a Disaster Risk Management Policy in February 2007 (GN-2354-5), the preparation of a White Paper – "Responding to Climate Change in LAC - The Role of the IDB" and the establishment of the Sustainable Energy and Climate Change Initiative – SECCI (GN-2435-3) that same year. Policy and practice were further refined and defined with the production of the Bank's Integrated Disaster Risk Management and Financial Approach (GN-2354-7, OP-47) discussion document in February 2008; the DRM Policy Guidelines (GN 2354-11) in March 2008, the creation of the Sustainable Energy and Climate Change Unit (INE/ECC in 2009 and following this the establishment of a Sustainable Energy, Climate Change and Disaster Risk Management Network of the Bank's Regional Policy Dialogue Initiative (2009); and, the hosting of a Regional Policy Dialogue on Integrating CCA and DRM in Development Policy and Planning in June 2009 in Panama City, Panama.

53. Given the interest in the relations between CCA and DRM the analysis presented below will begin with the 2005 Action Plan given that prior to this date little if any joint mention of the two topics can be found.

3.1 *Action Plan for Improving Disaster Risk Management 2005-2008 (GN 2339-1) (2005)*

54. The Action Plan was launched towards the end of March 2005 and implemented over the period 2005 – 2008, with support from the Japan Special Fund. **The central issue dealt with relates to the promotion of an ex ante, proactive stance on the part of the Bank as opposed to the traditional reactive approach once disaster occurs, and the Plan emphasizes preventive measures in priority areas.** The Plan committed the Bank to provide support to governments in high risk countries in order to assess potential losses, the capacity of countries to finance recovery and reconstruction, the vulnerability of specific geographical areas and critical infrastructure and the government's capacity to manage risk. Dialogue with countries would explicitly address the issue of disaster risk management in country strategy and programming documents. Disaster risk management should become an integral part of projects involving infrastructure, housing, energy, agriculture, water and sanitation. The plan called for a strengthening of the decentralized approach and the role of Bank focal points in respective country offices and departments and established performance indicators for three priority areas: (i) country programming and portfolio management; (ii) Bank's policy, procedures and financial products; and (iii) an organizational approach that focuses on ex ante risk reduction.

3.2 *Disaster Risk Management Checklist (February, 2005)*

55. The implementation of Bank policy with regard to disaster risk reduction was facilitated by the preparation of a check list of relevant factors to be taken into account when designing programs and projects. This list is anteceded by a frame of reference whereby an evaluation is made of the following aspects relating to risk reduction: the existence of adequate government policies, technical norms and rules; the existence of national, local and sector entities with a necessary minimum capacity to manage risks; the existence of adequate financial strategies for the management of risk, that are applicable in the context of the project; and, the existence of sufficient information in order to determine the existence, frequency and potential impact of hazards on the components of a project. Where the response to any one of these four areas of inquiry is negative, the formal check list procedure is invoked, generating a series of reports that are integrated into the project and later followed up on and reviewed.

56. **Specific questions in the check list relate to existing structural and non-structural measures for risk reduction, such as: existing institutional settings, coordination and planning mechanisms, incentives and program monitoring, as well as feasibility studies including technical, institutional, socio-economic and financial aspects**. The answers to the check list questions help project teams in borrowing countries and at the Bank to identify the necessary information needed to adequately address disaster risk management issues in project design and implementation.

57. At this early point, neither with the check list or Action Plan document is mention made of CCA or its integration into DRM; .the CCA integration problematic appears to have entered the conceptual stage but had yet to be considered in policy or framework documents.

3.3 *Integrated Disaster Risk Management and Finance Approach GN-2354-7 (February, 2007).*

58. The objective of this Bank discussion document was to report on progress in the implementation of the 2005-2008 Action Plan; to describe the risk finance approach promoted by the IDB including its key features, specific financial instruments and proposed implementation scheme; and to report on the status of requests for Bank technical assistance and financial support for disaster risk finance (from Mexico and Central America and Caribbean in particular).

59. As regards the implementation of the IDB risk finance approach beginning in 2008 the scheme proposed: **the making available of disaster risk evaluations for high risk countries; the more aggressive dissemination of the objectives and scope of the Disaster Prevention Fund and the Multi Donor Disaster Prevention Trust Fund; and the development of a programme to provide effective coverage for retention, removal, and transfer of losses from natural disaster risk exposure**.

3.4 *Disaster Risk Management Policy – GN-2354-5 (Feb, 2007)*

60. This first policy document recognizes the growth in disaster risk and disaster impacts in the region over the last few years and their negative impacts on development gains and opportunities. It provides options for action that protect development and avoid unnecessary human and economic loss in the future. In order to achieve this, **the policy places emphasis on risk reduction both ex ante and during post impact reconstruction, as opposed to direct support for disaster or emergency response.** Disaster Risk Reduction considered holistically involves risk analysis, prevention and mitigation, financial protection and risk transfer, emergency preparedness and response, and post disaster rehabilitation and reconstruction. The latter must be undertaken so as to not reconstruct risk and vulnerability.

61. Integrating Disaster Risk Reduction into governance, development of institutional capacities and guarantees for full ranging social participation are considered pillars for action as **there is now an explicit recognition that development processes such as urbanization and environmental degradation influence vulnerability and that vulnerability is often gender and poverty specific.**

62. In defining the policy's range of action, **this covers not only large scale, low frequency, high impact natural events but also high frequency, low impact events.** This serves to contrast events with large scale one-off impacts and those that lead to cumulative and continuous small to medium scale loss. Social and political violence and epidemics and pandemics are outside this policy area. Technological hazards and environmental degradation that often leads to new risk factors are considered in other Bank policy directives and not directly in this policy statement.

63. Programming and project directives regarding the analysis and reduction of disaster risk have been laid out for work with both public and private sector projects. **Specific attention is given to the capacity of relevant national institutions to enforce proper design and construction standards and offer financial provisions for the proper maintenance of physical assets commensurate with modeled risks.** Post disaster operations include the options for loan reformulation and reconstruction, as long as it does not rebuild vulnerability.

64. **The 2007 Disaster Risk Management Policy document does not deal with climate change related issues**, despite its recent nature and the obvious relations between the two topics. However, the climate change theme is policy-wise comprehended in other later Bank statements or Initiatives, namely, in the 2007 White Paper titled "Responding to Climate change in LAC: The Role of the IADB"; in more detailed, focused and operative form in the Bank's March, 2007, approved Sustainable Energy and Climate Change Initiative (SECCI), and finally in the 2008 Disaster Risk Management Policy Guidelines (GN-2354-5) and, the Environment and Safeguards Compliance Policy which incorporates considerations regarding the generation of greenhouse gases as part of its wider environmental control concerns.

3.5 *White Paper – "Responding to Climate Change in LAC - The Role of the IDB" (2007)*

65. This first ever IDB "Responding to Climate Change" document provides for:

- **The financing of mitigation and adaptation projects in priority sectors** through mitigation investment, support for adaptation associated with two categories of problems-the reduction of vulnerabilities associated with potentially catastrophic events, channeled through the disaster risk action plan of the institution, the adoption of responses to more gradual, non-catastrophic changes in climate

variables in most at risk areas, and through the delivery of a pipeline of climate change projects with the Global Environmental Facility.

- **Fostering the region's knowledge and capacity in climate change** by building the capacity for climate change policy making, supporting policy maker meetings and in fostering the countries' capacities to meet obligations and opportunities under the UNFCCC.
- **Mainstreaming climate change into the Bank's activities** by means of the adaptation of existing strategies and good practices, internal knowledge building and new strategic partnerships.

3.6 *Energy and Climate Change Initiative – SECCI (GN-2435-3) (March 2007)*

66. **The goals of the SECCI initiative are centered on the provision of comprehensive sustainability options in areas related to the energy, transportation, water and environmental sectors as well as building climate resilience in key priority areas vulnerable to the impacts of climate change**. With direct regard to the adaptation goals, the SECCI priority lines of action include: assisting countries to incorporate adaptation strategies into sector, national, sub-national and/or regional planning; strengthen and build local institutional capacity to identify and assess vulnerability to climate change; provide finance and technical assistance in the design and implementation of strategic and replicable pilots of adaptation measures which actively demonstrate the costs and benefits of adaptation in priority sectors; promote preventive risk management and risk reduction strategies, including risk transfer mechanisms and assist longer term efforts for economic diversification; assist countries in the development and assessment of key policy and regulatory instruments and the incorporation of these within regional, national or sector climate resilient plans and strategies as appropriate.

67. **The SECCI operational framework allows for the development of stand alone products, the mainstreaming of activities into country programming, sector works and projects, knowledge creation and dissemination and policy innovation**. In 2009, SECCI had policy based programs in Mexico, Peru and Colombia including country specific economics of climate change studies, assistance in strengthening environmental ministries responsible for developing CC policies, main-steaming of CC in priority sectors and the development of CC plans for 15 States in Mexico.

68. The Rural Development and Natural Disasters Division of the Bank, responsible for the enactment of the Bank's 2007 Disaster Risk Management Policy, links into the SECCI operational structure as do the other major sector divisions. **In 2009, the Bank created the Sustainable Energy and Climate Change Unit (ECC) to help mainstream the four SECCI pillars into LAC countries' policies.**

69. Coherence in climate change actions may be fostered by this relationship. **This requires that the existing Disaster Risk Management Policy be updated or adjusted accordingly to make specific reference to the climate change problematic and the demands it makes on the present structure and operational framework.** This document provides an initial push toward satisfying this need.

70. From the outset it should be made very apparent that when considering the extreme or damaging events component of the climate change scenario and its potential impacts on sustainable development, **there is no reason to suggest that this should not be done by simply comprehensively updating and modifying the existing policy and check list formats for disaster risk management, searching to manage the problem of increased risk and uncertainty, all within multi-hazard frameworks and scenarios and in the context of additional risk scenarios associated with changing climate norms and averages and the stress this places on the livelihoods of the poor in particular** . A subsequent section of this document takes up on this statement and conclusion.

3.7 *DRM Policy Guidelines GN 2354-11 (March 2008)*

71. **The objective of the guidelines document was to help Bank teams and borrowing member countries implement Bank actions according to the principles of the February 2007 Disaster Risk Management Policy**. The guidelines are part of the Bank's framework for the management of development risk at the country and project level. Policy directives outline the actions to be used by IDB staff and country borrower teams and cover country programming, preparation and execution of new projects, loan reformulations for financing disaster response and preparation and execution of reconstruction projects.

72. **The guidelines apply to all natural hazards, including hydro-meteorological hazards associated with both existing climate variability and the expected change in long term climate conditions.** The guidelines document establishes that "although uncertainty persists, recent advances in downsizing (sic) climate models are allowing disaster managers to better calibrate their risk assessments to understand potential impacts due to climate change at the sub-national level" **The incorporation of CCA considerations in this guideline document represents the first time the CCA challenge is explicitly incorporated in a IDB policy level document.**

3.8 *Sustainable Energy and Climate Change Unit - INE/ECC (2009)*

73. In 2009, the Bank created the Sustainable Energy and Climate Change Unit (ECC) to help:

a) Main-stream the four SECCI pillars of action into LAC countries' policies.

b) Provide new and additional financing for investment in green technologies to mitigate the challenges and increased risks associated with climate change, as an implementing partner of the Climate Investment Funds.

c) Work with eminent research institutions and NGOs in order to provide interactive and dynamic evaluation tools that provide the latest available information on the environmental and social impacts related to project developments

d) Continue to support country efforts to develop more comprehensive policies with a broader consideration of sustainable energy and climate change

3.9 *Sustainable Energy, Climate Change and Disaster Risk Management Network (2009)*

74. **In 2009 the existing IDB Environment Network was combined with its Natural Disasters Network and renamed the Sustainable Energy, Climate Change and Disaster Risk Management Network**. This change reflected the Banks commitment to support is borrowing member countries in addressing critical issues related to climate change and disaster risk management in an integrated development context. To date the Network has celebrated two policy dialogue meetings. The first in Panama on integrating CCA and DRM in Development Policy and Planning in June 2009. And the second in July, 2009 in Mexico City examining the economic impact of climate change and the challenges and opportunities in developing and securing financing for national climate change programmes.

75. The Panama meeting and its country or regional presentations and results were postulated as the back bone of the present technical report, which in itself is the latest step in the ongoing process of searching for action formats to link CCA with DRM in development planning **The Panama Dialogue meeting purported to review the impacts of climate change on disaster risk and management, discuss the experiences of member countries in the development and implementation of climate change adaptation and disaster risk management policies and programs in an integrated fashion and examine available policy and planning strategies and instruments that promote synergies**. General guidelines or check list factors for use by countries for integrating climate change adaptation and DRM into development planning and practice were presented for discussion.

IV. Climate Change Impacts in Latin America and the Caribbean

4.1 *Real Climate Change Impacts in LAC*

76. **The Latin American and Caribbean region has been feeling the effects of climate change for almost a century, and increasingly so for the last couple of decades.** Global warming has raised temperatures in the LAC region by approximately 1^0 degree C over the past century, which is in turn driving a series of other effects[1]. Sea levels in the region have been going up by approximately 2 to 3 mm per year since 1980 (see figure 1 for Panama station results); substantial melting of glaciers in the Andean region is leading to the loss of a significant portion of water resources in the affected countries; reductions in soil moisture content are leading to desertification of previously tropical or semi-tropical areas; coral bleaching is leading to a reduction in the fisheries ecosystem and tourism.

77. **This warming trend and its direct effects are in turn driving other secondary effects.** The El Nino Southern Oscillation (ENSO) has had several particularly strong episodes over the past couple of decades, driven by increased global temperatures, with adverse effects ranging from altered precipitation patterns, to economic losses in affected fisheries, to increases in frequency and severity of extreme weather effects. Reduced access to fresh water resources constrain clean energy generation from hydropower, limit irrigation practices in areas already suffering from more frequent drought conditions, and reduce available potable water reserves.

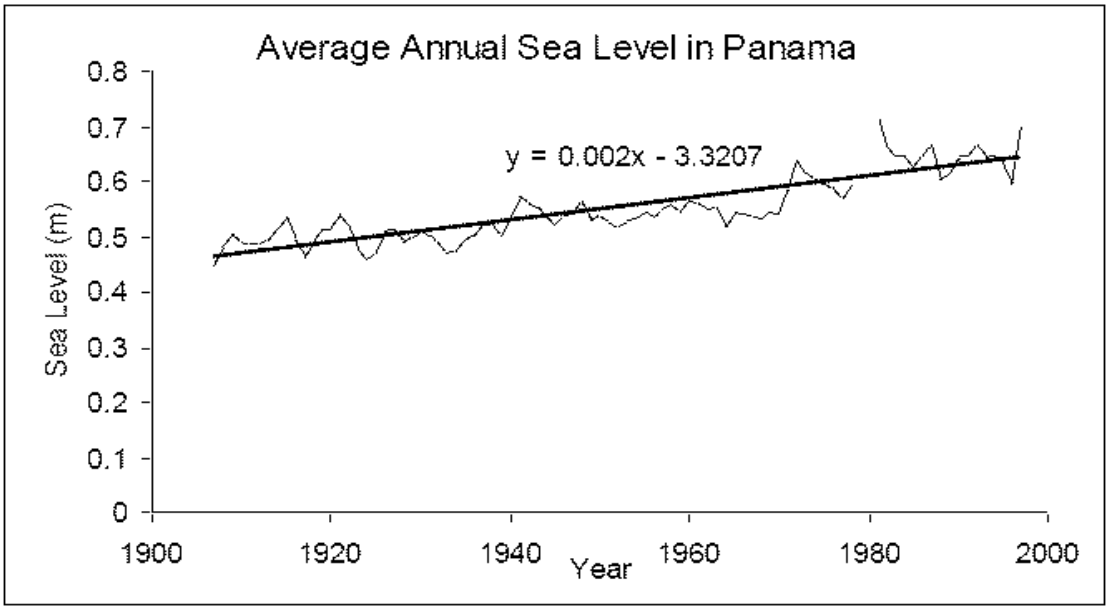
78. **The combination of these primary and secondary effects of climate change is manifested in several key sectors through a series of complex, and still only partially documented relationships**. A thorough analysis of these relationships is beyond the scope of this document. However, a rudimentary example can help illustrate the complex nature of these relationships.

79. The tourism sector in LAC is driven by several variables that help create demand: warm, non-extreme weather, (climate); unspoiled coast lines and natural environments, and biodiversity both on land and at sea (environmental services); reasonable access to basic services (water, energy, sanitation sectors); high levels of personal security (law & code enforcement, income standards), and airports, roads and

[1] Augusto de la Torre, Pablo Fajnzylber, John Nash "Low Carbon, High Growth - Latin American Responses to Climate Change" World Bank, 2009. p.1

ports that provide easy access (transportation infrastructure), and high quality accommodations (building codes, capital availability). This set of interrelationships between sectors, government agencies, private markets, and others is complex enough.

Figure 1. Average annual sea levels for Panama 1900-2000 [2]



80. Warmer average temperatures lead to increased demand for air conditioning, which in turn requires more water resources for hydropower generation, but as water resources are themselves constrained, this leads to higher water and energy costs and/or increased rationing of these resources. This in turn affects the potential for irrigation of crops (which is also necessitated by the warming trend), leading to higher overall food insecurity. Poor and vulnerable groups thus become more vulnerable, leading in many cases to the overexploitation of remaining resources and degradation of the very environmental services that make the tourism sector feasible to begin with. As should

[2] Keith M. Miller "Assessing the Potential Consequences of Climate Destabilization in Latin America" Walter Vergara, ed, World Bank, *LCR Sustainable Development Working Paper No. 32. June 2009. p.90*

be apparent by now, this single example would require a substantial further elaboration before all of the key interrelationships would be enumerated.

4.2 *Projected Climate Change Impacts in LAC*

81. **Table 1: Projected changes and impacts; affected regions & sectors**[3]

Projected change	Expected Impacts	Most affected regions	Most affected sectors
Increase in temperature	More heat spells More droughts	Inland regions (Mexico, S. America)	Health, Water, Agriculture, Energy
	Loss of glaciers Loss of soil moisture	Andean region Mexico, Brazil	Water, Agriculture, Energy
	More vector borne diseases	Tropical areas of C. America, S. America	Health, Sanitation
	Loss of coral reefs Loss of biodiversity	Caribbean island states, Central America	Fisheries, Tourism, Environmental Services
Increase in sea level	More coastal erosion Loss of agricultural land Salinization of water supplies	Caribbean island states, Central America	Water, Agriculture, Tourism, Infrastructure
	Increased storm surges Loss of land	Caribbean island states, Central America	Tourism, Infrastructure
Increase in precipitation variability	More droughts Increased crop losses Reduced crop yields	Inland regions (Mexico, S. America)	Water, Agriculture
	Increased flooding Loss of glaciers Decreased aquifer supplies	Most of LAC	Water, Agriculture, Energy, Infrastructure
Increase in extreme weather events	More, stronger hurricanes Longer storm season	Caribbean, C. America, Mexico	Infrastructure, Tourism
	More flooding More droughts	Most of LAC	Infrastructure, Sanitation
Increased ENSO effects	Altered fish migration patterns	Peru, Ecuador, and other Pacific states	Fisheries

[3] This table was created by the authors from a wide range of sources. The goal was to provide realistic projected changes in LAC without resorting to the degree of specificity found in most source documents as we do not believe that such a degree of specificity can be corroborated by the models currently being used.

	More precipitation variability	Most of LAC	Water, Agriculture, Energy, Infrastructure
	Increased Atlantic storm activity	Caribbean, C. America, Mexico	Infrastructure, Tourism, Sanitation

82. **Projected impacts of climate change in the Latin American and Caribbean region are primarily an extension in scale and intensity of the impacts that are already being felt,** with a few exceptions that don't yet have an impact, such as reduced crop yields (primarily maize and wheat), increases in vector borne diseases (such as malaria, dengue, schistosomiasis, and leishmaniasis), and salinization of fresh water supplies. Table 1 describes the major projected changes, their expected impacts, where they will cause the most impact, and what sectors will be most affected.

83. We have limited the specificity of the expected impacts due to the large level of uncertainty associated with modeling such complex relationships, and thus the inherent inaccuracy in establishing typical financial risk-return projections for bank projects such as VaR (Value at Risk) and RAROC (Risk Adjusted Return on Capital). This is especially pertinent considering that climate change will, amongst other things, manifest itself through disasters, which are chaotic, and many times unpredictable, events:

> Under ordinary market conditions, the behavior of risk factors is relatively less difficult to predict because it does not change significantly in the short and medium term: future behavior can be extrapolated, to some extent, from past performance. However, during stressful conditions, the behavior of risk factors becomes far more unpredictable, and past behavior may offer little help in predicting future behavior. It's at this point that statistically measurable risk threatens to turn into (…) un-measurable uncertainty.[4]

84. **The Latin American and Caribbean region possesses several key geographic features that have led to early manifestations of climate change impacts**, making the region a sort of global "canary in the coal mine" or "Guinea Pig" for climate change impacts, a region with one of the widest ranges of natural exposure to climate

[4] Michel Crouhy, Dan Galai, Robert Mack (2006) "The Essentials of Risk Management" McGraw-Hill. P.6

change and also one of the highest levels of intrinsic vulnerability. **This same position on the vanguard of climate change vulnerabilities will lead the region into unchartered territory in the future as new phenomena and interactions between phenomena start to occur.** For example, Brazil had its first hurricane in recorded history during the middle of the present decade and the Andes are the only region where such a widespread loss of glacier mass, expressed as a percentage of total ice, has been recorded. Thus, it is quite possible that in the future, the LAC region's many vulnerabilities and exposures that are encapsulated into reasonably well understood risk factors, may, during stressful conditions, interact and behave in ways not predicted or modeled from the historical data, leading to unexpected, and thus potentially unacceptable, levels of damage.

Table 2. Key Climate Change Impacts in Latin America and the Caribbean[5]

Climate Hotspot	*Direct effect*	*Immediacy*	*Irreversibility*	*Magnitude of physical impacts*	*Economic consequence*
Coral Biome in the Caribbean	Bleaching and mass mortality of corals	Now	Once temperatures pass the threshold for thermal tolerance, corals will be gone.	Total collapse of ecosystem and wide-ranging extinction of associated species.	Impacts on fisheries, tourism, increased vulnerability of coastal areas.
Mountain ecosystems in the Andes	Warming	Now	The thermal momentum in mountain habitats will result in significant increases in temperature, leading to major uni-directional changes in mountain ecology.	Disappearance of glaciers, drying-up of mountain wetlands, extinction of cold-climate endemic species.	Impacts on water and power supply, displacement of current agriculture and changes in planting patterns (with varying degrees of impacts depending on location, seasonality, and ability to adapt).

[5]Walter Vergara "Assessing the Potential Consequences of Climate Destabilization in Latin America" World Bank, *LCR Sustainable Development Working Paper No. 32. June 2009. p.8*

Wetlands in the Gulf of Mexico	Subsidence and salinisation; increased exposure to extreme weather	This century	Irreversible sea level rises will submerge coastal wetlands, affecting their ecology.	Disappearance of coastal wetlands, displacement and extinction of local and migratory species.	Impacts on coastal infrastructure, fisheries and agriculture.
Amazon Basin	Forest dieback	This century	If rainfall decreases in the basin, biomass densities would also decrease.	Drastic change to the ecosystem, leading to potential savannah.	Impacts on global water circulation patterns, agriculture, water and power supply on a continental scale

85. **The El Niño Southern Oscillation (ENSO), and its counterpart, La Nina, provide us with one of the best proxies for how climate change impacts may be felt throughout the rest of the planet in the next century**[6]: climate change will probably manifest itself through the steady deterioration of some components of the environment (for example, increased incidence of El Niño slowly leading to Andean glacial retreat and reduced aquifer reserves) and at the same time the process works through unpredictable multi-seasonal climatic variability leading to increased disaster incidence (for example, droughts and floods during the active phase of ENSO). The first component will lead to steady increases in vulnerability that make stressful conditions more likely, while the second component will trigger more chaotic increases in exposure as some elements that were previously thought to have low exposure turn out to have a higher exposure due to unexpected relationships between risk factors caused by those stressful conditions.

86. **Once social, demographic and economic changes are factored in, the overwhelming number of variables leads to a field of inquiry that must rely heavily on probabilistic models, with very large margins of error**. **It is largely due to these uncertainties that most progress in Climate Change Adaptation in the LAC region has so far focused on the development of institutional capabilities, information gathering, and the production of research tools.**

[6] Collins, Matthew; *et al.* (2005). "El Niño- or La Niña-like climate change?" *Climate Dynamics* 24 (1): 89–104.

4.3 *Considerations in Climate Change Projections*

87. **It is interesting to note that the climate change mitigation field has been primarily defined by a strong consensus among climatologists, that has led, over the past few years, to a single leading paradigm in regard to mitigation, namely that climate change over the past few decades has been increasingly driven by GHG emissions, and that the solution to this problem is to reduce such emissions**[7,8]. This consensus has led to a fast-tracking of climate change mitigation into a science of its own. Furthermore, it could be argued that the structural nature of this paradigm has already been "proven" via the success of the mitigation of ozone depletion via the reduction of CFC emissions in the past couple of decades[9].

88. **On the other hand, the Climate Change Adaptation field is still a nascent field, where scientists are only beginning to reach the point of competing paradigms: we are still in what could be termed an exploratory, pre-paradigmatic phase, as is evidenced by the type of work that is taking place in this field[10].** For example, global climate models currently only down-scale to 104km^2 plots, a level of resolution that is inadequate for informing regional and local decision making on adaptation projects. Thus, we find a fair amount of work being done in the development of down-scaling tools and higher-resolution models that have regional applicability[11]. Furthermore, costing studies of climate change are modeled over large regions, so impacts to specific countries are not always available[12 13]. **There is still a substantial amount of work to be done in this area before predictions with any substantial degree of projected accuracy can be established.**

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[7] Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change Core Writing Team, Pachauri, R.K. and Reisinger, A. (Eds.) IPCC, Geneva, Switzerland. p. 5

[8] The economics of climate change Volume I: Report. 2005. House of Lords, Select committee on Economic Affairs, 2nd Report of Session 2005-06. P.10-17

[9] Safeguarding the Ozone Layer and the Global Climate System: Issues Related to Hydrofluorocarbons and Perfluorocarbons IPCC/TEAP, 2005 - Bert Metz, Lambert Kuijpers, Susan Solomon, Stephen O. Andersen, Ogunlade Davidson, José Pons, David de Jager, Tahl Kestin, Martin Manning, and Leo Meyer (Eds), Cambridge University Press, UK, p.6

[10] T. S. Kuhn, *The Structure of Scientific Revolutions*, 1st. ed., Chicago: Univ. of Chicago Pr., 1962

[11] Informe de Factibilidad – Economía del cambio climático en Centroamérica UN-CEPAL, 2009. p.15-17

[12] Yohe, G. and Schlesinger, M. (2002): The economic geography of the impacts of climate change; Journal of Economic Geography, v.2, no.3, p.311-41

[13] Abler, D., Shortle, J. Rose, A. and Oladosu, G. (2000): Characterizing regional economic impacts and responses to climate change; global and Planetary change, v.25, no. 1-2, p.67-81

89. An example of this difficulty can be seen in the widely acclaimed if not always accepted, Stern report, where 2004 GDP estimates for LAC are estimated at USD $2,000,000 million (one significant figure), but estimates for 2025 and 2050 are carried to seven significant figures: SRES A2 assumes a 2050 LAC GDP of USD $9,372,519 million[14]., these assumptions in the future aggregate GDP of LAC do not mention the implications of assumptions such as the choice of nominal versus purchase price parity GDP numbers, the GDP effects of global recessions such as what we are currently experiencing, or a host of other variables that can't be included in the models for obvious, pragmatic reasons. There are many other examples of the large number and size of assumptions that go into creating something as complex as a 100-year global climate model, but the "plasticity" of the numbers can also be seen in the manner in which they are broken up: of the many variables that can be isolated, it is common to break down impacts of climate change on agricultural yields to temperature only estimates and temperature plus CO2 fertilization estimates, although a base assumption of global warming is that it is caused by the CO2 emissions, so there must always be increased CO2 if the warming occurs.

90. This begs the question: why break these specific numbers apart and not some other set? These are not trivial examples: each additional assumption that these models must make adds to the level of uncertainty in the final output. **Correlations, positive feedback loops, and other types of relationships that are as of yet not understood radically increase the uncertainty of the projections.** Of course, these values provide the mid-point for a range of possible outcomes, but the larger context is that climate change is an extremely multidisciplinary field in which stakeholders from a wide range of fields need to be engaged as we start to refine our projections into useful data for adaptation investments.

91. One needs to look no further than the current lack of insurance products to address climate change risks: actuaries cannot model that for which they don't have accurate data. For example, insurance companies are able to model risk within a specific generation of people by using statistical tools to pool and distribute risk, but find it very difficult to quantify these same risks between different generations. For example, projections of longevity generated over the past 20 years have almost all substantially underestimated the actual longevity trend, just as fertility rates were assumed to continue declining as countries reached higher human development indexes, but in fact the countries with the highest HDIs are now witnessing rising fertility rates,

[14] Stern Draft: Understanding the potential Impact of climate change and Variability in Latin America and the Carribean. (Authors: Nagy, Caffera, Aparicio, Barrenechee, Bidegain, Gimenez, Lentini, Magrin, Murgida, Nobre, Ponce, Travasso, Villamizar, Wehbe

bringing the average for these countries back up to the replacement fertility rate[15]. As Mervin King, governor of the Bank of England stated, **"No amount of complex demographic modeling can substitute for good judgment about those unknowns"[16]. This same problem needs to be better articulated in the climate change adaptation sphere as adaptation projects cost valuable resources that many nations cannot afford to do in a manner that later turn out to have a negative cost-benefit structure**.

92. For example, new research has divided ENSO into two distinct types of southern oscillation: the Eastern Pacific Warming (EPW), the classical El Niño, and Central Pacific Warming (CPW), a recently discovered variant of El Niño that is manifested in warmer than average water temperatures near the dateline rather than along the eastern pacific. Whereas the EPW typically leads to a suppression of Atlantic cyclone activity, the CPW has a positive tele-connection with Atlantic cyclones, increasing their frequency and chances of landfall in Central America and the gulf of Mexico[17],[18]. **This type of change demonstrates how simple linear extrapolation of current phenomena (such as increased magnitude and frequency of events) could actually lead to adaptation measures that are ineffective.**

93. The large number of such issues in creating reliable adaptation needs projections means that there is still a lot of work to do prior to investing in more than the highest risk/benefit ratio and other self-evident adaptation projects and techniques. **This is exacerbated by the predominant levels of poverty in the region, and thus highly limited resources for adaptation measures that in turn heighten the need to insure that all resources are deployed in the most effective manner possible.**

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[15] Mikko Myrskylä, Hans-Peter Kohler & Francesco C. Billari "Advances in development reverse fertility declines" *Nature* 460, 741-743 (6 August 2009)

[16] Mervyn King, "What Fates Impose: Facing Up to Uncertainty," Eighth British Academy Annual Lecture, Dec. 2004

[17] Zhouhua Wu, Edwin K. Schnieder, Zeng-Zhen Hu, Liqin Cao "The Impact of Global Warming on ENSO Variability in climate Records" pp. 3-6

[18] Hye-Mi Kim, Peter J. Webster, Judith A. Curry, "Impact of Shifting Patterns of Pacific Ocean Warming on North Atlantic Tropical Cyclones" **Science** 3 July 2009: Vol. 325. no. 5936, pp. 77 - 80

V. Disaster Risk Reduction and Climate Change Adaptation: Commonalities and Divergences: The Search for Convergence

5.1 *The International Framework and Context*

94. The Marrakesh 7th UNFCCC COP meeting in 2001 brought adaptation policy and needs to the forefront for the first time on the UNFCCC agenda. The year 2000 marked the beginning of the United Nations International Strategy for Disaster Reduction-UNISDR-a process that, with the signing of the Hyogo Framework for Disaster Reduction in 2005, also put climate change concerns firmly on the risk management agenda, a fact that would be reinforced on the occasion of the 2009 Global Disaster Reduction Platform meeting in Geneva. **The Hyogo Framework for Action specifically identifies the need to "promote the integration of risk reduction associated with present climate variability and future climate change into strategies for the reduction of disaster risk and adaptation to climate change".**

95. Despite passing considerations of the disaster risk reduction problematic in previous UNFCCC meetings and declarations it is with **the 13th Conference of Parties celebrated in Bali in 2007 that the ensuing Action Plan calls for the first time for the consideration of "risk management and risk reduction strategies, including risk sharing and transfer mechanisms, such as insurance".** This need is reiterated in the Nairobi Work Plan of 2008 and also appears in significant recent international policy forum meetings, including the Stockholm Plan of Action for Integrating Disaster Risk and Climate Change Impacts in Poverty Reduction and the Oslo Policy Forum on "Changing the way we Develop: Dealing with Disasters and Climate Change". The early 2009 decision of the IPCC to promote, along with the ISDR, a special study on Managing Climate Extremes and Disasters to Advance Climate Change Adaptation comprehends a final significant move in favor of the searched for integration.

96. This increasing salience given to the topic in international forum, agencies and agreements has led over the last few years to an enormous increase in the academic and practitioner literature available on the integration topic. In the following three sub-sections we will firstly set the limits of what is known as DRM, examine the range of activities contemplated under the adaptation umbrella and attempt to delimit the common areas of concern and relationship between DRM and CCA and their relations to sustainable development planning.

5.2 ***The Interface: Identified Convergence and Divergence.***

97. The existing literature, formal and informal, grey and official, on the DRM and CCA relationships, is now relatively large and growing all the time. Much of this literature highlights the ways in which the two areas have developed with certain autonomy, under differing conceptual and semantic frameworks and criteria, with different expert groups and institutional and financing arrangements. **DRM has clearly existed as a school of thought and practice for far longer than adaptation ideas and practice, has suffered various transitions in thought and paradigms, moving towards a more proactive stance, and has developed a wealth of analytical and intervention instruments and strategies not as yet available to adaptation "science".** Some have described the situation as one where adaptation has far higher political visibility and even social salience but far lesser development of methods and instruments, experience and experiment than is the case with DRM. This includes methods for the analysis of risk and vulnerability, the development of good practices and their dissemination and the development of structural and nonstructural development based intervention strategies and instruments. **Strategies developed around land use planning, environmental planning, livelihood strengthening and improved governance at the urban level, in particular, have been introduced into the risk management field more and more as a compliment to traditional and dominant structural mitigation concerns.** These same strategies or aspects are of course of great concern today to the adaptation caucus and practitioners (see UNISDR Global Assessment Report, 2009).

98. This very situation, combined with the clear juxtaposition and coincidence of various critical areas of enquiry and intervention, are the basis for the search to integrate and synergize between these two analytical and action areas.

99. Taking into consideration the above developed syntheses of the central concerns and precepts of DRM and CCA, and taking into account the rapidly growing literature that deals with the relations of these two areas of thought and practice, the similarities and differences most commonly identified or discussed in the literature may be summarized in the following fashion (various of these are fallacious as will be examined later):

100. **Differences:**

- DRM covers a **wider range of hazard types** than CCA, given it includes geological, oceanographic and geomorphologic, as well as technological hazards. These may exist in mono or multi hazard scenarios.
- CCA deals not only with climate variability and extremes but also with **the impacts of changing climate averages and norms.**

- Gradual sea level rise and loss of glacial and water resources due to increased global and local temperatures and melting are not problems that DRM has traditionally dealt with as such, although **experience with slow onset disasters and with relocation of population post disaster impact suggest that relevant experience exists within the DRM community to offer support under such circumstances**.
- CCA is said to deal with **longer term aspects and more permanent change** and needs, whilst DRM has been interpreted as dealing with in shorter time frameworks related more directly to disaster events, where **short term coping and recovery is seen to be more important.**
- Climate change interventions clearly work in a milieu where greater uncertainty operates as regards hazard and vulnerability patterns, although ongoing adaptation as ongoing risk reduction works in the framework of **already existing environmental and social conditions.**
- The origins and development of the two topics can be found in **different scientific or practitioner communities** and due to this and its institutional consequences the two topics are dealt with by different organizations and institutions at the national level

101. **Similarities:**

- Both are concerned with **new patterns of climate variability expressed in the form of an increased number, intensity, scale or recurrence of damaging hydro-meteorological events that cover a spectrum from extreme to non routine small scale,** affect exposed and vulnerable population, livelihoods and economic production, imposing probable increasing loss and damage. Vulnerability as a source of risk is of fundamental concern to both problematics although only more recently assumed as such by many climate change specialists.
- Both are concerned with **existing patterns of climate and projected future conditions,** their impact on society and how to reduce their effects.
- Both are concerned with loss and damage for which the **risk conditions and factors now exist** and with preventing or anticipating **future risk** by better implementation and control of new investments and development.
- Both consider the challenge of **changing variability within the context of ongoing but changing climate norms and averages**, which generally "determine" ongoing or changing production and settlement options.

102. The discussion around differences and similarities does not however lead to a total clarification of the ways in which these two areas intersect and interrelate nor as to

how to rationalize the apparent discrepancies between them which must be resolved in order to sew them together more convincingly. This is the objective of the following section.

5.3 *Relations and parameters: rethinking the risk management-adaptation relations and overcoming the divergences: towards the notion of total, holistic, integrated climate risk management.*

103. The basic premise which informs the present analysis is that with climate change, government, civil society, ONG, private sector, international development agencies and banks are all **obliged to move towards a breakdown of the apparent CCA and DRM divide or hierarchical relationship (DRM as a means to achieve adaptation, for example) and move towards a concept and practice of integrated and holistic climate risk management, built into a multi hazard risk perspective and integrated into sector, territorial, social, economic and environmental development planning processes and procedures.**

a. The non routine events and the DRM, CCA and development planning link

104. Climate related DRM is and has been directly concerned with the management of risk and disaster associated with non routine physical events that vary between extreme, exceptional or anomalous and regular, recurrent and of small to medium scale. They are not the norm but are part of normal climate variability. Climate Change Adaptation is an overarching, all encompassing concept, that refers to the needed human and natural system adjustments to varied changing climatic and other environmental parameters (sea level rise, loss of glacier ice, etc), including present and future changes in the so-called climate extremes and non routine events. At this level of analysis it is clear that climate change induced patterns of extreme and non routine events and associated disaster probabilities are part and parcel of DRM concerns and experience. That is to say, this aspect of so-called adaptation is already well covered thematically, topically and in terms of past experience. **However, climate change does alter the terms of reference and context of DRM in the future as it potentially leads to both more extreme and more lower-scale non routine events and an increase in their impacts and intensities. Also, it greatly increases the levels of uncertainty associated with the number, intensity, temporal distribution and recurrence patterns of climate events and will most surely increase the uncertainty as regards the development and incidence of human vulnerability.**

105. As long as gas emissions are not stabilized or reduced there can be no conception of a steady state, normal climate as we have experienced in the past and uncertainties will always exist as to what climate will be like in any particular area 2, 5, 10, 20 or 50 years in the future, including the incidence of non routine events. This situation is of course substantially different to what has been experienced historically where, within certain manageable bounds, climate and climate variability could be anticipated for any one area, using historical data and knowledge and calculating return periods for non routine events of different sizes. **This opportunity, fundamental for risk management and development planning, will decrease in the future, unless new models for projecting change are developed and proven useful.**

106. DRM under these circumstances will have to evolve, develop new methods, devise new means to deal with uncertainty and develop new ideas on return periods, amongst other things **but essentially these problems will still be dealt with by risk management institutions and when they fail normal already existing, evolved response agencies will have to assume their increased role.** And, the DRM strategies and instruments will still have to be integrated into normal sector and territorial planning mechanisms according to recent trends with the topic.

107. The implications of future climate change impacts on disaster risk and disaster risk management in Latin America and the Caribbean are still obviously in a nascent stage. Pragmatically speaking, most disaster risk managers realize that the LAC region already suffers from high levels of vulnerability to disaster, **and the mechanisms for reducing this current vulnerability don't really change that much with the introduction of climate with a very wide range of possible outcomes that can't yet be deterministically established.** As such, it becomes very difficult to quantify the best course of action in regard to adaptation: there are so many competing sources of vulnerability, from both traditional risks and the more recently posited climate change risks, that one has to choose between allocating resources toward reducing current vulnerability or toward reducing future vulnerability; in general, the here and now tends to be considered more important, if for nothing else **because adaptation needs when faced with current vulnerabilities are more tangible, and can provide a more accurate cost-benefit ratio, than those based on uncertain or very uncertain future vulnerability projections.**

b. Resolving the apparent short term coping and long term adaptation difference.

108. One difference that has been highlighted by many authors is with regard to the time period in which DRM and Adaptation work. **According to many authors DRM is essentially short term in trajectory whilst adaptation is long term**. Supposedly DRM deals with coping and recovery post impact rather than adaptation per se and CCA with long term permanent changes or real adaptations.

109. **This argument is of course spurious and constructed on a false and static notion of DRM. It seems to assume that DRM is in fact Disaster Management, that is to say dealing with disaster and not disaster risk**. Coping is something that occurs where adverse conditions momentarily require schemes for getting by after disaster impact and with rehabilitation and even reconstruction. This view does not adequately reflect the state of DRM today and the evolution in its principles and methods, goals and central objectives.

110. **As developed over the last 20 or more years DRM has moved from a position dominated by disaster response and post impact recovery to consider more closely the whole disaster risk reduction problem in a framework informed by development principles and goals.** Whereas traditionally, a good part of what was known as disaster prevention and mitigation related to contexts where disaster risk already existed (communities located in hazard zones, hospitals badly constructed, hill slopes denuded and subject to sliding, etc), **new ideas and paradigms have brought to the forefront the notions of proactive, prospective or anticipatory disaster risk management.** This is concerned with anticipating risk and risk factors and attempting to guarantee that new risk is not constructed in new development projects. This inevitably requires the incorporation of risk criteria and control mechanisms in investment decisions and project development, whether this be promoted by government, the private sector or even the population at large.

111. Thus, if we consider the prospective side of DRM, the attempts by Finance or Planning Ministries to incorporate risk factors in investment decisions (as in Peru or Costa Rica, for example), risk transfer mechanisms, environmental planning associated with new projects etc, clearly we are not only dealing with short term concerns, coping and getting by. Rather when designing new projects consideration must be given to time periods that easily go to 30 years ahead and as in the case of seismic security for nuclear plants, up to 10000 years ahead. **With this the flaw in the argument as to the supposed time difference between adaptation actions-medium and long term- and DRM strategies and actions-short term- is clearly revealed and the difference between the two types of concern disappears as regards our management of non routine events, and even normal climate.**

c. The extreme event-normal climate average contrast

112. One further aspect related to climate change that undoubtedly alters the historical balance as regards risk management practice and that will demand new integrated approaches relates to the fact that climate change in the future will signify changes in both climate norms and averages and in the incidence and impact of non routine events and extremes. **The nature and rhythm of both changes will be uncertain in the future**. Unlike historical patterns, the new norms and averages for rainfall and

temperature, wind and transpiration etc will in some cases constitute new risk factors, especially for populations who live in a delicate balance with the environment and where the loss of millimeters of water or an increase of one degree in temperature could spell total disaster. This will require a fundamental modification in risk management and development planning practice. **Planning will have to take place for total climate risk whereby the impacts of changing climate averages are considered at the same time alongside changing variability patterns. Given uncertainty levels planning will require a much greater level of flexibility and scope for decision. Rather than promote on the one hand development planning in function of climate averages and norms and on the other DRM for climate extremes and other non routine events it will probably be necessary to undertake management in an interrelated and integrated development climate risk management format.**

d. Multi-hazard frameworks

113. As is the case today, climate risk management will have to be undertaken in a framework where other environmental hazards are considered at the same time. **That is to say most areas will have to resort to multi-hazard management given that climate risk will not exist isolated from other types of environmental hazards.** Obviously, the balance of hydro-meteorological and non climate hazards will change both in terms of recurrence and seriousness and this will require rethinking in terms of best risk management practice in different areas.

e. Non routine events in traditional disaster prone areas and in new areas

114. A final point that requires some discussion is with regard to the future spatial distribution of non routine and extreme events. Although anomalies and exceptions occur, historically the incidence of disasters and disaster prone areas has been fairly constant as regards both climate related and other hazard types. However, as time passes by an increasing number of anomalous or exceptional events have occurred such as the Brazilian hurricane and the Montevideo wind storms. This then raises the question as to probable or possible new areas of event occurrence and disaster impact where no real historical experience exists of dealing with these. **This will require new criteria, new data collection methods and new projections, all accompanied by innovative strategies and training in new areas. The notion that we start with today and historical disaster incidence and work to the future is valid where experience exists and existing climate patterns are problematic. But where no experience exists and little can be said as to the permanence of a noted change,**

the problem is far greater. Brazil, since the hurricane, has not been affected again. Will it so be in the future? Or was that a one off anomaly?

115. The problem of knowing future patterns of non routine events is even more interesting if we consider the divide between really extreme events and the sum of small scale non routine events associated with small and medium scale, relatively recurrent disaster. **It is highly probable that there will be a far more than proportional increase in some types of recurrent small scale events than in the larger scale ones.** Some of these will occur in areas always affected by large scale event but others may become part of the scenery of areas never affected previously, being transformed into part of the average climate and disaster scene with the consequences this has for erosion of poor livelihoods.

116. The sum of the prior arguments leads us to conclude that even with new climate change induced hazards these are still part of the non routine climate scene and variability and must be dealt with following disaster risk management principles, methods and instruments. **The fact that complexity increases, greater uncertainty prevails, impacts due to increased hazard and vulnerability conditions grow etc. does not change the basic fact that dealing with these non routine, extreme and non extreme events is still most adequately dealt with by disaster risk specialists and their methods and strategies.** It may also be affirmed that dealing with sea level rise and relocation of population and infrastructure can also be well informed by disaster reconstruction experience as can the development of determined conditions associated with the lack or deficit of water due to glacial melt processes.

117. More and more evidence and arguments exist to suggest that **the only real way to deal with new climate change molded hazards is by dealing with existing hazards under existing climate variability conditions.** Uncertainty as to future conditions impedes any real projection into a distant future and decisions based on this, whilst damage and loss are now prevalent with existing conditions and dealing with these will be both cost effective and instructive for future intervention.

118. In sum, although one can in principle define disaster risk management and adaptation as separate areas of concern and action, when we look at the complexity involved and take as a starting point, non routine events, extremes and changing vulnerability patterns, we are basically dealing with the same thing. **Multi-hazard frameworks and the need to consider total climate risk in one format necessarily lead to a merging of two apparently separate topics and concerns.** Given this, dealing with new and uncertain hazards and vulnerability patterns will only require continuity and improvement in existing techniques, strategies and instruments, but not the creation of a new area of social intervention. This also means that **guidelines and check lists for climate change impacts on sectors or regions will require modification and widening of those already existing for disaster risk policy but not the reinvention of the wheel.** Of course risk evaluation will become more uncertain, the need for more

integral schemes for analysis and intervention will become obvious, but this is only the movement and improvement that will be needed to evolve current disaster risk management practice.

VI. Setting the Scene for Concrete Adaptation and Risk Management Strategies and Measures: Factors that Facilitate or Prevent Integration.

119. The last five years have seen an increasing amount of literature published and discussion pursued on the theme of the DRR, CCA and development links. As Copenhagen approaches, so this literature tends to increase in weight and volume. Much of this literature deals with the overall problem of the need for linkage, the structural and contextual problems to be overcome and the necessary conditions for achieving this seen from a macro social, economic, institutional, planning and policy, methodological and/or pragmatic angle. This is a necessary prelude to the fine tuning and honing of particular sector and territory specific mechanisms and instruments. In order to achieve this aim we will summarize the major conclusions and recommendations deriving from a series of five selected studies pertinent to our final aims. Here it is worthwhile pointing out that the theory and concept of integration is far further along than the practice of integration as such. The option to list ongoing policy and instrumental frameworks that do in fact bring these two topics together and then bring these together into development planning are still scarce at both the global and regional level. **The studies synthesized here are stimulus for such integration not examples of integration as such**. They constitute recommendations rather than existing situations.

6.1 *German Committee for Disaster Reduction. 2009. Edited by Jorn Birkmann, Gerhard Tetzlaf and Karl Otto Zentel: "Addressing the Challenge: Recommendations and Quality Criteria for Linking Disaster Risk Reduction and Adaptation to Climate Change"*

120. Amongst their key recommendations the following are particularly important:

- The need to adopt a **cross sector, multi scale and integrative approach** to link DRR and CCA and to mainstream both into other activities on sustainable development in rural and urban areas.

- The need to develop **standardized methods, data bases and quality criteria** for developing forward looking risk, vulnerability, capacities and adaptation assessments.
- **Strengthening the focus on slow-onset changes** which will affect millions when climate change intensifies and which could turn into sudden onset disasters when they pass determined thresholds. (Here the notion of slow onset disaster is moved from the sphere of climate extremes such as drought and into the every-day living conditions associated with deterioration of average environmental conditions. Authors' note)
- The need to translate guiding principles such as resilience and adaptive societies into **more precise goals for different regions**.
- The **coordination** of actors, institutions and organizations to build on existing capacities and explore synergies.
- The creation of **flexible funding schemes** that shift from short term and project oriented finance to the support of forward looking strategies that finally lead to long term sustainability
- The creation of structures and instruments that **improve social learning** and memory.
- The fostering of communication between **different knowledge types**-traditional, modern scientific etc.
- The development of a **comprehensive and internationally accepted framework** that could serve as a conceptual and practical orientation when putting DRM-CCA integration into practice.

121. Quality criteria identified in the document for the above mentioned strategies include:

- Integrative climate change adaptation strategies must include aspects of DRR and **span over different spatial and temporal scales as well as various sectors**.
- **Internationally agreed standards and principles should be in place** that provide orientation, avoid contradictory and parallel processes in target countries, and allow future monitoring and evaluation.
- Disaster response strategies should not be based only on needs and damage assessment but should also include **vulnerability and adaptation assessments** (including the goals for climate change adaptation in reconstruction).
- Mechanisms should be established to **moderate actual or potential conflicts between different norms of various stakeholders**. For example between national and local governments.

- Budgetary schemes for integrated strategies should include **funding for all relevant stakeholders** as well as hard and soft preventive measures.
- A code should be established by donors that **prevents unsustainable practices and people and governments from taking short cuts** that increase their own benefits at the expense of others
- Funding for a specific disaster can also be used for **climate change adaptation** in the region.
- Different institutions and organizations must be eligible for adaptation funding thus ensuring cooperation and provoking types of competition regarding the best ideas and concepts

6.2 *"Integrating practices, tools, and systems for climate risk assessment and management and strategies for disaster risk reduction into national policies and programs", UNFCCC, November, 2008 (produced as part of the Nairobi Work Program).*

122. **I**mportant aspects that frame the integration process must include:

- Support for the **sustainable development agenda** in the context of climate change.
- The establishment of **stable transparent and effective** governing structures where wide-scale social participation is a key factor.
- The promotion of **inter-sector dialogue** and coordination.
- The building on **existing** practices, systems and tools.
- The integration of the risk reduction and adaptation problematic in **development agency budgets**
- The building of capacity and the **required institutional frameworks**.

123. **Holistic and integral inter-sector and territorial approaches** are seen to be fundamental and knowledge sharing amongst regions communities and sectors in order to promote the development of strategies is highlighted. Budgetary support; institutional capacity and political support for integration are indispensable. Moreover, as some have pointed out, **climate risks may not be the most important aspect in poverty reduction and development in general, so climate considerations need to be embedded in a process that considers all risks**. This same consideration has led others to suggest that climate related risks include non disaster risks and disaster risks include non climate risks, therefore a concentration on sector or territorial risks rather than climate or disaster risks as such is recommended.

124. From an integrated adaptation-DRR point of view a **balance always needs to be found between short term actions to reduce immediate impacts and existing risk, and longer term proactive actions needed to resolve underlying causes of vulnerability**.

125. Amongst the measures recommended to encourage convergence between DRM, CCA and development planning, the study indicates the need to:

- focus on the characteristics of society and economy through **localized vulnerability assessment, allowing customization to particular settings**
- maintain and cultivate **sustained alliances** within good governance based environments for DRR
- continually **raise awareness** of the benefits of adaptation

126. And, important factors that influence integration include:

- The recognition that **States have a primary responsibility** for adaptation and DRR.
- The adoption of **multi hazard, total risk approaches**.
- Capacity development.
- The **decentralization** of responsibilities, budgets and participation.
- Community **participation** and gender balance.
- Public private **partnerships.**

6.3 *Economics of Climate Adaptation Working Group. September, 2009. "Shaping Climate Resilient Development: A Framework for Decision Making".*

127. This study provides one of the more succinct and pragmatic statements on the topic, based on potential adaptation case studies in various parts of the world and in varying socio-ecological-demographic areas.

128. Concluding that climate change could increase damage and losses by up to 200% per year over those expected under existing climate patterns (which in themselves suggest a loss of between 1 and 12% per year in GDP, depending on area and climate sensitivity), **adaptation and disaster risk management measures are indispensable and on a cost benefit footing can lead to reductions of between 40 and 68% in annual losses.** Despite the problem of increased uncertainty as to environmental and socio-economic development trajectories in countries and localities, the study concludes that the existence of a **systematic framework** combined with **in depth**

engagement by local experts, officials, private sector and population can provide a strong basis for decision making and a governance environment propitious for this. Moreover, adaptation and risk management measures can strengthen local economic development and the principle of **no regrets policy** is a sound basis for justifying action now. That is to say, an important part of the basis of future climate change adaptation is in disaster risk management today

129. The basis for scenario building, according to this report, is the notion of **"total risk"** whereby analysis takes into account loss and damage that would be associated with existing climate patterns, then considering and adding projections associated with anticipated or projected climate change and changes in development trajectories. Assessment must be based on the **local level** and adaptation measures must be evaluated and based on **local applicability**. Numerous local assessments must be undertaken and the practice of scaling up to the national level from few local level studies is inappropriate.

130. The key stones to effective risk reduction and adaptation in a development frame work rests therefore on **strategies based on tackling existing conditions**, that build in changing climate and development conditions and that are based on participatory local analyses and decision making, supported by higher level arrangements and stimulus.

131. Amongst the more salient steps to be followed in implementing a comprehensive climate resilient development strategy at the national or local level, the study points to the following:

- The creation of an **inclusive, participatory** national and local effort.
- The definition of current and target penetration of the priority measures identified.
- The need to address **existing obstacles to development implementation** such as policy frameworks, institutional capacity and organization.
- The encouragement of **sufficient directed funding** from the international community
- The recognition and mobilization of **different roles for each stakeholder** (public sector, private sector, civil society etc).

6.4 *Norwegian Government, PROVENTION Consortium and UNDP. 2008. "Oslo Policy Forum on Changing the way we Develop: Dealing with Disasters and Climate Change" celebrated in Oslo.*

132. Amongst the important conclusions of this conference, the following are particularly pertinent:

- Bringing together DRR and climate change adaptation **does not mean coming up with new lists of what poor people should do**. It means **empowering** them to do what they want to do more effectively. The acknowledgment of the centrality of community processes will not have an impact on actual programming if we do not break out of project thinking.
- **Avoidance of an overload of checklists and even more mainstreaming exercises should be advocated and efforts should be made to concentrate on selective mainstreaming.** That is to say, focus on countries and portfolios with high levels of risk where the need for climate protection is fairly obvious.
- The need to accept that **the process of DRM-CCA integration is essentially political and not technical** and the role of participatory budgetary planning processes is critical.

133. When dealing with the so-called entrance points for linking themes and problematic at the strategy and instrumental level, the conference conclusions point to land use planning, land tenure, livelihoods and legality. These topics may be expanded and amplified considering other important recent statements on the problem. This is the case for example with the 2009 Global Assessment Report of the UNISDR, where it is affirmed and substantiated that **adaptation, poverty reduction and disaster risk reduction all rely, as do other perverse social and economic contexts, on the resolution of problems associated with bad urban governance, including land use and territorial organization and building norms; environmental degradation; and insecure rural livelihoods.**

134. Finally, the conference report reiterates various now generally accepted points as regards the promotion of integration including national and local development plans as a starting point; **mainstreaming in sectors is key for the poor, children and vulnerable groups; proactive multi stakeholder approaches are required; and DRM and adaptation must be seen to be integral parts of the development process, good governance and donor support are essential.**

6.5 *Linking Climate Change Adaptation and Disaster Risk Management for Sustainable Poverty Reduction. Synthesis Report. 2006. Vulnerability and Adaptation Resource Group. European Union*

135. Based on a four country analysis this study found that barriers to integration included:

- Data shortages.
- Risk assessments short on CC data.

- Impact analysis only carried out in the short term.
- Large gaps in awareness.
- Weak coordination mechanisms at a national institutional and local level
- Underdevelopment of preventive disaster risk approach.
- Discontinuity in policies, structures, programs and plans.
- Projects are fragmented and tend to be donor driven.

136. A quick appraisal of the above mentioned works indicates that what is in play is the fact that **at the same time as there are many structural aspects that can promote integration on the ground, there are also many that at present prevent this. Any consideration of real integration methods and instruments must also think clearly as to how to promote and overcome the structural problems that exist, in a pragmatic fashion.**

137. The above discussed or synthesized aspects offer a good starting point for constructing ideas on guiding investment and loan procedures of the Bank and for check list approaches.

VII. Existing Policies, Strategies and Instruments at the National and Sector Level: Case Studies from Latin America and the Caribbean.

7.1 *Adaptation as Capacity Building*

138. It is important to note up front that **CCA is a young, emergent field, and the following case studies demonstrate this clearly via the general scarcity of tangible, on the ground examples to draw from. It could be argued that CCA is not really "adaptation" at this point, but rather "vulnerability reduction", in a couple of different senses: first, to reduce the risks of any future adaptation it is imperative to have solid data to base decisions upon, and second, many of the tangible examples of adaptation up to this point have been driven by more generic risk reduction goals and later considered as adaptation.**

139. In the first case, it appears that most work up to this date in CCA involves quantification and analysis of the problem domain, and not in actual implementation of adaptation. In the second case, existing DRR capacities produce an ongoing stream of vulnerability reduction projects, some of which fit the CCA mold. The space between these two is the "Capacity Building" phase that CCA is undergoing in order to link theory with practice. This borrows directly from the IPCC's definition of vulnerability:

> "The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude and rate of climate variation to which a system is exposed, its sensitivity and its adaptive capacity".[19]

140. This adaptive capacity to climate change, constituting the vector of advantages and resources from which adaptation actions and investments can be made and the primary point of human influence over the climate related vulnerability equation **has formed the focus of the nascent CCA community over the past few years.** The development of adaptive capacity to "climate vulnerability" has two primary facets: vulnerability identification and vulnerability reduction. For a variety of reasons, up to this point there has been **a primary focus within the CCA community on**

[19] Q.K. Ahmad, Oleg Anisimov, Nigel Arnell, Sandra Brown, Ian Burton et al.(2001)"*Summary for Policymakers – Climate Change 2001: Impacts, Adaptation, and Vulnerability*"IPCC , p.6.

vulnerability identification, a sizable task in itself due to the complex nature of the subject.

141. As to how this climate change oriented vulnerability reduction should take place on the ground, who should implement it, who should pay for it, and myriad more issues, there are many possibilities and ideas circulating, **but there is little in the way of concrete "adaptation" on the ground.** CCA is a young field of inquiry, thus, most of the work has been primarily focused on defining the problem as such and carving out an arena within which to solve it. Specifically, we find that what goes by CCA today in LAC consists primarily of the following:

1. **The generation of research, data, and theories to help identify climate change vulnerabilities** at both the high and low levels of resolution (primarily international, some national resources). This includes international research such as that produced by the IPCC; national reports such as those for the UNFCCC, NAPAs; downscaling of climate models; creation of multi-hazard maps at national & regional levels.

2. **Establishing of international and national entities that will build capacities against the identified climate change vulnerabilities** (international, national resources). These entities have been around for a few years at the international level (IPCC, UNFCCC), but national level entities are still in flux.

3. **Integration, mainstreaming of CCA into development policy & planning (national, ministerial).** This is what is most considered real "adaptation", but has so far produced few tangible advances and it is also hard to track its progress. There is a substantial gap between the creation of a law at the national level and its consistent application, funding and enforcement down to the local level, making this type of CCA harder to see or measure in the little time that CCA has been around as a concept.

4. **The search for ways to fund adaptation measures** (national, some international resources). The focus on mitigation measures so far has in large part been driven by a push from the developing world to find ways to pay for the expected costs of adaptation, especially via transfer mechanisms, development funding and international agencies/NGOs.

5. **The creation of adaptation ideas and pilot projects at local, community levels to "test" what works on the ground** prior to attempting on a larger scale (international, national, local resources). The UNDP-GEF CBA programme is a salient example of this practice.

6. **The substantial amount of grass-roots, locally based, and/or NGO funded DRR that is on-going and driven by community needs, perceptions, and**

culture. Not specific to CCA, but it is an important and substantial component of the reduction in pressing risks.

142. In the following case studies, several common threads emerge relating to these areas of CCA work. Item 1 is primarily handled at the international level (with limited but much needed national input due to the lack of national resources or expertise). Item 2 has seen some progress at the national level, but lack of funding on the adaptation front has hampered the creation of a strong CCA agency in any of the case study countries. Item 3 is hard to track and not always a priority for developing world governments, as is evidenced by the slow progress of DRM from under civil protection and response agencies that received the funding. Item 4 is related to Item 2, and helps keep the focus on the mitigation front where funding is more available via carbon credit schemes. Items 5 and 6 often happen "below the radar" of national level policies, strategies and instruments, and/or it is difficult to trace their influence back up into such policies, strategies and instruments.

143. **Thus, the lack of available published information on policies, strategies and instruments relating to CCA makes analysis much more difficult and time consuming, as research must delve into unofficial and sometimes sporadic information sources, lowering its reliability and the usefulness of the research**. The available, tangible information that could be ascertained with a reasonable degree of verifiability has been included with the goal of painting a picture of the CCA environment, or lack of such environment, in each of the countries. It is acknowledged that in some cases most information presented will not deal specifically with CCA but with the closest proxies to it: in some cases existing, overlapping DRM policies, and in others, more generic climate change and/or mitigation measures.

7.2 *Jamaica*

144. Jamaica, as a small Caribbean island state, suffers from a substantial level of vulnerability to the impacts of climate change. **The high levels of exposure of their tourism sector infrastructure to hurricanes, coupled with their substantial dependence on climatically vulnerable agriculture translate to an environment in which a single large event can cause losses totaling a substantial portion of annual GDP**. However, in recent years Jamaica has been hit by much more than just a single large event. Over the past five years alone there have been 13 major disaster events totaling losses of over US$1 billion (15% of nominal GDP). This has caused substantial setbacks to development goals.

145. Jamaica signed the UNFCCC charter in 1992, and ratified it in 1995. In 2003, Jamaica published its "Initial Climate Change Technology Needs Assessment", with funding from the Global Environmental Fund (GEF) to meet the requirements of the UN FCCC COP 7. This assessment included a short section on adaptation,

specifically on the coastal areas, as **90% of Jamaica's GDP is produced within the coastal zone, 25% of the population is concentrated near the coastline, and a large portion of infrastructure is also located within this zone, particularly in the Kingston area**. This assessment primarily concluded that there is a primary need for data collection systems such as beach profiling, tidal gauging, and GIS systems. It also mentioned the need for basic adaptation measures such as the use of groynes and revetments and the regeneration of mangroves to protect the coastal zones. Initial IPCC estimates (1990) projected the cost of protecting the coastline from a 1 meter sea level rise would be US$462 million.

146. **The National Environment and Planning Agency (NEPA, formerly National Resources Conservation Authority – NRCA) is the main agency involved with climate change adaptation,** and in recent years has moved to integrate climate change and hazard mitigation in to the Environmental Impact Assessment (EIA) process. NEPA has also focused on education and information dissemination processes, probably due to the lower cost of such measures compared to investments in information and adaptation technologies.

147. This has led to a rather novel program, "Voices for climate change Education: A National Climate Change Communication Strategy", conducted through the UNDP, and implemented by the National Environmental Education Committee (NEEC). The project seeks to educate Jamaicans on climate change, and specially adaptation strategies via the use of grassroots techniques, leveraging local leaders, sector leaders and popular artists to disseminate their message.

148. **Due to the lower cost of education and information dissemination strategies and the limited financial resources of Jamaica, one also sees other similar programs aiming at educating different groups of stakeholders in the country**. For example, the use of the internet, specifically through the Jamaica Information Service (JIS) website, appears to be a very cost effective way to disseminate information. Reports from sector leaders on the impacts and potential adaptation techniques are routinely posted to the website. The Ministry of Agriculture and Fisheries is also using this technique to pass along best practice information via its web portal. In 2008 the tourism minister hosted a seminar and exhibition themed "Climate Change and the Bottom-line - The strategic Business Outlook for Jamaica's Tourism Sector". Interestingly, this information and education focus is being extended past just Jamaican citizens: the tourism industry is seeking to move beyond just "climate-proofing" their industry to becoming "climate responsible" by reducing GHGs related to tourist activities, thus providing a sort of experiential knowledge transfer mechanism to help educate tourists, many of which come from leading GHG emitting countries.

149. As a small country with limited resources, one tends to find less progress on adaptation research and measures than in some of the larger LAC countries such as

Mexico or Colombia, and thus **a larger percentage of the available resources have been produced by international agencies and NGOs**. As a result, Jamaica has instead focused on some of the less expensive, grassroots programs that provide higher returns per invested amounts, such as the CBA and JIS.

150. One key adaptation measure that hasn't necessarily been associated with the climate change rubric has been the creation of a parametric insurance scheme between several of the Caribbean island states, a project initiated and led by the Jamaica Social Investment Fund (JSIF). **The Caribbean Catastrophe Risk Insurance Facility (CCRIF)** started operations in 2007 with US$47 in pledged funds from several international sources, and currently provides hurricane and earthquake insurance coverage for member countries. By pooling their risk, Caribbean countries have been able to save approximately 40% from what non-pooled insurance rates would have cost their governments[20]. Furthermore, CCRIF is currently researching the viability of a parametric rainfall based product to mitigate flood risk. **Considering the fact that climate events, particularly hurricanes, can cause damage levels that overwhelm these island states' capabilities to recover, such risk transfer mechanisms constitute not only a valuable adaptation to increased climate risk but also a very cost effective mechanism as it reduces the need for large up front capital investments and thus allows more of their scarce capital to be allocated for other needs, such as reducing underlying sources of vulnerability.**

151. In 2007, Jamaica was chosen as one of ten pilot countries in the UNDP-GEF Community Based Adaptation (CBA) programme for the period 2008-2012. The CBA seeks to bring climate change adaptation to the local level, as this is where climate change impacts will be manifested, by co-funding 8-20 small projects (less than US$50,000 each) via its Small Grants Programme (SGP) in the pilot countries. The programme has several interesting components, from its use of **qualitative (via Vulnerability Reduction Assessments – VRAs) and quantitative (via Impact Assessment System - SGP-IAS) measurement tools to its novel integration of CCA, CCM & DRR via a focus on the local level.**

152. An important element of the CBA programme is that it looks to have projects that are sited in areas where global environmental benefits can be secured and are also vulnerable to climate change. The initial CBA project involves the south coast-Portland Bight zone of Jamaica, and aims to increase the capacity of the targeted farming communities on the slopes of the Blue Mountains to adapt to climate change. The project aims to promote the implementation of sustainable agricultural practices

[20] CCRIF (2009) "What is CCRIF?" [web page: http://www.ccrif.org/main.php?main=9],

that will reduce the vulnerability of the affected communities to climate change-driven increases in soil erosion, decrease climate-driven livelihood pressures that may lead farmers to clear/cultivate protected areas further upslope, and contribute to sustainable agro-ecosystem management in the face of climate change impacts.

7.3 *Mexico*

153. Mexico has a long and complex history of work in the climate change field dating back to the 80's. Interest in climate change was initially driven by a scientists and environmental bureaucrats at the Universidad Nacional Autónoma de México (UNAM), the National Autonomous University of Mexico, and at the Instituto Nacional de Ecología (INE), the Federal Institute of Ecology. Mexico City has a long history of pollution, and in particular, a substantial smog problem, that has been exacerbated by the large number of people living in the city, the concentration of pollution-intensive industry and transportation, and the geographic location of the city which further exacerbates the problem by trapping the large quantity of emissions in the central valley. Thus, **anthropogenic climate change, especially the localized variety experienced in Mexico city, aided in creating a an early, highly receptive audience among academics and bureaucrats, especially those specializing in climate related fields, that were initially stakeholders from the perspective of being affected as individuals by the localized "climate change" and its adverse effects on their, and others, health.**

154. With the negotiation of the UNFCCC in 1992, the added interest of international participation drove a flurry of activity, culminating with several workshops hosted by the nascent Programa Nacional Cientifico sobre Cambio Climatico Global, a joint UNAM and INE program researching the effects of climate change. By 1995, with the ratification of the UNFCCC, we start to see a gradual shift of focus from a predominantly scientific endeavor to a political one. Professor Carlos Gay Garcia of the UNAM, a lead researcher on climate change, ascended to a leadership role in the realm of policy debate, and created an ad-hoc group to coordinate inter-ministerial discussions on the topic which brought together UNAM, INE and SEMARNAT, the Mexican ministry of Environment and Natural Resources. This group prepared materials in advance of UNFCCC Conference of Parties (COP) meetings.

155. By 1997 and the Kyoto COP, climate change and its ensuing policy negotiations at the international level had become hot public and political topics in Mexico, leading to a wider recognition of the problem within the extended ministerial composition of the Mexican government. **This shift from a scientific to a political endeavor marks a distinct point of inflection in the subject for Mexico, with increasing resources dedicated toward taking control of the subject among several competing ministries within the federal government.** The Secretaria de Energia (SENER) became involved, advancing the predominant viewpoint of oil-exporting countries that

were against regulations reducing anthropogenic climate change. Fallout of this escalating ministerial battle is first seen in Profesor. Garcia's removal from the leadership role, and command being transferred to the newly created Comission Intersecretarial de Cambio Climático (CICC – Inter-ministerial Commission on Climate Change) under the coordination of SEMARNAC.

156. The inter-ministerial battle escalated between the Kyoto COP and the ratification of the Kyoto Protocol in 2000, with SENER opposed to ratification and SEMARNAT advocating regulation of climate change. **A key, and rather unique event during this period, was the backing of the Kyoto Protocol by Mexico's national oil company, PEMEX.** Although PEMEX is organizationally under the coordination of SENER, it has historically operated with relative autonomy probably due to the inherent power that comes from its role as a revenue producer for the government. PEMEX then proceeded to pioneer the implementation of a company-wide carbon dioxide emissions reduction target and an internal emissions trading system, the first and only developing country oil company to do so. A large part of this influence came from PEMEX management's proactive attempts to follow, as one of the world's leading oil producers, British Petroleum's leadership position in the climate change arena. Over the past few years, PEMEX has become less actively engaged in the debate, but thanks to this early advocacy, the Mexican government has taken an interest in their emissions trading scheme as well as the carbon trading mechanism of the Kyoto Protocol by insuring that PEMEX be eligible for Clean Development Mechanism (CDM) projects.

157. Around this time, SEMARNAT/CICC also published their Estrategía National de Cambio Climatico, and the FCCC CDM appeared to provide opportunities for Mexico to bring in a substantial amount of revenues that could ostensibly be used for their own mitigation and adaptation needs, necessitating the creation of a CDM project approval agency under the coordination of SEMARNAT/CICC to capitalize on this opportunity. The pull-out of the US from Kyoto substantially lowered the opportunities for Mexico to acquire funds via this risk transfer mechanism, providing a damper on climate change policy progress. The ratification by the EU in 2002 brought some of these incentives back on the table, and coupled with the appointing of Victor Lichntinger as Secretary of Environment reinvigorated Mexico's drive in the area.

158. However, **as the climate change subject has gained prominence, so has the inter-ministerial struggle in Mexico's federal government escalated**. Today, the INE has been stripped of most powers although it retains its research functions, including the submission of Mexico's communications to the UNFCCC. Policy decisions are deliberated via the CICC, which involves stakeholders from the agriculture, transport, social development, environment, energy, economy, and foreign affairs ministries, and is tasked with the creation of both mitigation and adaptation policies. It has in turn produced a National Climate Change Strategy (Estrategia Nacional de Cambio Climático – ENACC), which proposes lines of action, policies and strategies that serve

as a foundation for the Special Climate Change Program 2008-2012 (Programa Especial de Cambio Climático 2008-2012 – PECC). The PECC in turn establishes quantitative mitigation and adaptation actions via consensus of the relevant ministries. This instrument describes the geography, climate, natural resources, demographics, economics, and quantifies GHG emissions by productive sectors of the state. The program identifies the vulnerability to climate change of the productive sectors, geographical areas and population groups, as well as mitigation options for greenhouse gases and climate change adaptation. Goals have been set to reduce GHGs by 8% by 2012 and reductions of 50% over 2000 levels by 2050. **Of primary importance is the creation of a risk atlas for all of the Mexican states as well as support in integrating preventive measures for risk reduction in the face of climate change induced disasters into state and municipal development plans.**

159. Thus, we find that what has been close to a twenty year process for Mexico is finally resulting in tangible climate change mitigation and adaptation goals via the implementation of the PECC. Furthermore, **the PECC has started to bridge the gap between research and policy on the one hand and actual on the ground work to reduce vulnerability on the other by integrating climate change risks into state and municipal development plans.**

160. Up to this point, the primary agency involved in Disaster Risk Reduction has been the National System of Civil Protection (Sistema Nacional de Protección Civil – SINAPROC), which is coordinated by the Ministry of Interior (Secretaría de Gobernación – SEGOB). **In following with the history of disaster risk management in Latin America, where civil protection agencies were first tasked with disaster response and preparedness, and only much later tasked with risk reduction and mitigation mandates as it became obvious that prevention in general provides a much better cost-benefit ratio, SINAPROC has evolved over time to where its mission is now to make use of state and municipal capabilities in tending to emergencies, disasters and restoration in the implementation of such goals.** The National Program for Civil Protection (Programa Nacional de Protección Civil), produced by SEGOB, is the main public policy instrument for disaster prevention, and is comprised of a series of objectives and strategies to regulate and coordinate SINAPROC's actions.

161. **The National Program for Civil Protection relies on more recent conceptions of disaster risk that underscore the need for strategic planning and a comprehensive risk management approach in tackling the complex nature of the creation of disaster risk involving natural, socio-natural and anthropogenic causes**. However, it is interesting to note that SEGOB, and thus SINAPROC, have only been integrated into the CICC as of March of 2009, which seems like a rather late point of integration for the DRR camp, considering the tools and policies they bring to the table with their background in disaster response, preparedness and prevention, and

thus the pragmatic perspective necessary to develop functional adaptation measures at the local level.

162. The Mexican National Plan for Development 2007-2012 (Plan Nacional de Desarrollo) is published by the office of the president of Mexico, a high level plan that integrates five key components based on sustainable human development and based on the Mexican Vision 2030 (Vision Mexico), includes environmental sustainability as one of its top, high level priorities. It is uncertain whether the National Plan for Development had a role in the integration of SINAPROC into CICC, but regardless, **Mexico is making progress toward integrating climate change across a wide swath of ministries. One has to stop and ask, though, why the disaster risk management field hasn't itself been transversalized among these same ministries prior to and as a compliment to the way the CICC does this for climate change.**

163. The history and evolution of climate change politics in Mexico helps to put in context the priorities that the government considers focal. Climate Change has ascended in priority primarily due to the revenue opportunities from risk transfer mechanisms such as the CDM and leadership in the renewable energy industry present to Mexico. Disaster Risk Management has benefitted from no such revenue generating scheme as natural hazards are endemic to each particular region while climate change hazards arise primarily from large and developed countries that have historically contributed to large percentages of current GHGs in the atmosphere, and are thus being driven to bring more to the table in order to get developing countries to limit their emissions. **The linkage that must be established is that until adequate climate change mitigation measures are in place, DRM may well be called upon in an increasing manner to respond pragmatically to the increased vulnerability that comes with climate change enhanced hazards. Since DRM and climate change fall under different ministries, one can expect that an integration of the two fields into a single entity will be a long time in coming; until then the transversalization of DRM would seem to be a reasonable stop-gap.**

164. As opposed to Jamaica, which focuses on low-cost grassroots solutions, **Mexico's answer is in federal and state institutional strengthening and cross-linking**. However, these ministries and agencies need to focus more time and resources on providing on the ground, tangible adaptation measures, and this of course requires financial backing by either international or national sources.

165. **Another area of concern is the lack of significant climate change adaptation work by Mexican NGOs and civil organizations**. Most Mexican NGOs focus their efforts on environmental concerns that are perceived as more pressing and deserving of attention than climate change. They focus on local issues, either "green" conservation issues or "brown" contamination and pollution concerns, and there hasn't been much need to establish linkages with international campaigns in this arena. Although these activities generate climate benefits, the main driver continues to be air pollution

concerns. This unique combination of lack of leadership from either the government or civil organizations may provide opportunities for private sector businesses to capitalize on this vacuum, which could in turn lead to other opportunities in the greater Latin American and Caribbean region.

7.4 *Peru*

166. The best way to describe Peru's situation is that it is on **the vanguard of not one but both primary transmission mechanisms of climate change – slow onset events and extreme variability events.** In the mountains, warming and precipitation trends are quickly reducing the size of its glaciers, and thus Peru's access fresh water supply. On the coast, the manifestations of El Nino Southern Oscillation are the most extreme of those experienced by any of the countries affected by this phenomenon, causing economic losses of 4.5% of GDP in the 97-98 event alone. **Whereas today climate change is primarily an intellectual exercise for most countries, it is a deadly serious topic in Peru; where other countries will be in ten to twenty years should trends continue, Peru is there today.**

167. To further complicate matters, **Peru has one of the most diverse sets of ecosystems, and thus the most diverse sets of climate change vulnerabilities, in the world.** A large part of the Peruvian economy is based on extractive mining activities that not only cause environmental deterioration on their own, but also provide well funded and strong opposition to environmental causes. The combination of these variables have the most profound of implications to Peru's efforts in reducing vulnerability and exposure to hazard; there is no time to waste on ineffective measures, inter-ministerial turf wars, or the hope that the rest of the world will manage to curb its greenhouse gas emissions on its own, yet these are the very issues that confront climate change mitigation and adaptation in the country.

168. **The melting of Peru's glaciers at rates far exceeding the most dire predictions is quickly creating water stress throughout the country**. Many farmers complain that their crops would be twice the size should access to irrigation water, or even just access to the quantity of water that used to be present only a few years ago. Communities in the mountains have typically counted on a steady water supply based on slow melting of winter snows and glacial runoff, but now that the glaciers are disappearing and less snow is falling on the mountains, these communities are having to contend with a much higher level of water variability. Even within 10 miles of the federal government's seat in Lima there is limited access to running water causing poor people to pay five to seven times higher rates for the same water when purchased on the private market and transported in containers. This water is stored and reused due to its cost, causing an indeterminate amount of sanitation and health problems. All this is further exacerbated by unchecked mining facilities that pollute the water source and destroy ecosystems they come in contact with.

169. Far from the mountains and glaciers, the large populations living on coastal desert areas have historically benefitted from one of the richest marine ecosystems in the world, an ecosystem that is highly susceptible to water temperature changes caused by ENSO and induced by bursts of warm water known as Kelvin Waves that travel from the western Pacific and pop up to the surface along the Peruvian coast, causing anomalous water temperatures that are up to 5^0 Celsius hotter than the norm. This in turn drives migratory fish to cooler waters in Chile and causes reductions in other non-migratory species that have trouble adapting to the change of temperature. A large portion of the coastal economy is based on this fishery, especially among middle and lower income portions of the Peruvian demographic, causing extreme stress among those already in a vulnerable socioeconomic condition.

170. On the other hand, Peru has more than 66 million hectares of tropical forests, which constitute a very substantial carbon sink, and facilitate the hydrological cycle by generating humidity and rainfall in the Amazon basin, a zone with more than 50 percent of the biodiversity of the planet. **These ecosystems are fragile and highly susceptible to climate change on the one side as well as large contributors to natural climate change mitigation via their absorption of CO_2., thus providing environmental services to the rest of the world that, although not compensated for financially, do indeed provide value.**

171. Within this socio-natural context, Peru has the unenviable position of charting the waters in terms of actual, pragmatic, effective climate change mitigation; whatever shortcomings that cannot be negotiated or mitigated will be later borne in adaptation and reconstruction costs. As with many of the larger Latin American countries, the Peruvian National Civil Defense Institute (Instituto Nacional de Defensa Civil) has historically been in charge of disaster prevention and mitigation. However, unlike some of the other Latin American countries that haven't yet or are only now beginning to feel the effects of climate change, Peru has needed to pursue other venues in order to mitigate the anthropogenic sources of the risks it has increasingly found itself under.

172. Against this backdrop, **Peru created its first climate change specific entity in 1995, the National Commission on Climate Change (Comision Nacional de Cambio Climatico - CNCC),** created to comply with 1993 UNFCCC requirements. It consists of a technical group governed under the law of the National System of Environmental Management (Sistema Nacional de Gestion Ambiental), and coordinated by the National Advisory Committee on the Environment (Consejo Nacional del Ambiente – CONAM). The CNCC was tasked with, among other things, providing Peru's annual reports to the FCCC starting in 2001.

173. In 1997, Peru created the **National Fund for the Environment** (Fondo Nacional del Ambiente – FONAM), a publicly owned enterprise tasked with encouraging public and private investment in the development of plans, programs, projects and activities

aimed at improving environmental quality, the sustainable use of natural resources, and the strengthening of capacities for effective environmental management. FONAM is the focal point of the World Bank's carbon trading scheme in Peru and helps identify, qualify and manage projects that have potential to be presented before the Clean Development Mechanism (CDM) in order to acquire Certificates of Emissions Reduction (CERs). In addition to its management of the CDM, FONAM focuses its efforts five other sectors: energy, forests, transport, mining, and water/wastewater.

174. In 2002, the National Accord on Governability and Development (Acuerdo Nacional de Gobernabilidad y Desarrollo) established two new laws that define the Peruvian response to climate change: the Poverty Reduction Act and the Sustainable Development and Environmental Management Act. In order to begin to meet these laws, CONAM created the Program of National Capacity Strengthening for the Management of Climate Change and Air Pollution (Programa de Fortalecimiento de Capacidades Nacionales para Manejar el Cambio Climatico y la Contaminacion del Aire – PROCLIM).

175. In 2003, CONAM produced the **National Strategy for Climate Change (Estrategia Nacional de Cambio Climatico – ENCC), with the goal of determining Peru's vulnerabilities to climate change, and incorporating adaptation based solutions into its laws and development plans.** It also sought to educate the Peruvian population about the risks of these changes, and to help improve the efficiency in use of natural resources and reduce emissions without compromising the goal of sustainable development. The strategy seeks to identify vulnerable zones or sectors across the country to implement adaptation projects by first carrying out comprehensive vulnerability and adaptation studies.

176. **In May, 2008, the National Environment Ministry (Ministerio Nacional del Ambiente – MINAM) was established as the administrative authority over the environmental sector, with management at national, regional and local government levels.** To a large extent MINAM seems to have assumed the functions of CONAM, and it is not readily apparent whether CONAM has been dissolved or remains an active organization. MINAM has of five strategic objectives:

- Insure that the natural heritage is to be used and preserved via the use of economic efficiency, social equity and environmental sustainability.
- Maintain a level of environmental quality and a risk management that protect people's health and safety.
- To insure a high degree of environmental awareness and culture among the population.
- Provide the natural and social capital for eco-efficient and competitive development of environmental goods and services in the domestic and international markets.
- That the National Environmental Management System works effectively.

7.5 *Progress, Challenges & Opportunities*

a. Jamaica

- Progress
  - Technology needs assessment
  - Grassroots information dissemination
  - Progress by individual ministries: Tourism, Agriculture, Education
- Challenges
  - Lacking financial resources
  - Lacking technology for assessing risks (ocean, weather monitoring; down-scaled climate modeling)
  - Need for beach profiling, tidal gauging, and GIS systems
- Opportunities
  - Use of grass-roots information dissemination
  - UNDP-GEF Community Based Adaptation (CBA) programme – low-cost local based program seeking to find best practices in CCA from local communities to later disseminate elsewhere
  - Caribbean Catastrophe Risk Insurance Facility (CCRIF) as highly efficient risk transfer based adaptation with no upfront cost

b. Mexico

- Progress
  - Battling air and water pollution, a more localized type of climate change, have a long history in Mexico
  - Early advocacy for UNFCCC, backing for which came from the national oil corporation, Pemex
  - Pilot projects in Yucatan peninsula
- Challenges
  - Primarily interested in CDM related funds from selling carbon credits. This has obvious effects on adaptation promotion
  - Centralized bureaucracy battles for control over $$, no interest in adaptation area
  - Substantial pollution problems keep focus on more immediate problems
- Opportunities
  - Due to size could become regional leader in adaptation technologies
  - Strong grant-writing capabilities lead to many vanguard projects in CC for LAC

- Close ties with US could lead to new adaptation partnerships, options.

c. Peru

- Progress
  - ENCC studying areas of highest vulnerability for potential future adaptability measures
  - Wide-ranging institutional development and change
- Challenges
  - Highly susceptible to climate change effects
  - Mining and other natural resource interests have strong political sway
  - Large quantity of fragile forests and ecosystems at risk
  - Climate models don't downscale well, and in particular in Peru where high elevation regions have little available modeled data and are highly vulnerable
- Opportunities
  - Potential leadership role due to early need to adapt
  - El Niño episodes have created culture of adaptation that leads to widespread grassroots support for mitigation and adaptation measures
  - Extensive forests, constituting large natural CO2 sinks, could provide revenue stream to fund adaptation measures

VIII. Check Lists

8.1 *Preliminary Considerations*

177. Check list exercises are common in guiding decisions of many types of processes, including investment, project and program development. With regard to the climate hazard and risk topics under changing climate conditions, a primary line of questions occur in terms of potential risk associated with project formulation, execution and evaluation. Bank procedures with disaster risk check lists in general has been to follow a process that goes from enquiry as to the primary susceptibility of areas to disaster risk factors (hazard, vulnerability and exposure), through to analysis of:

a. **the existence, or not, of adequate institutional setups** for considering disaster risk, such as policies and risk management organizations at national, regional and local levels, financial strategies, and information availability in order to assess risk;

b. **specific check list questions** with regard to the program such as the existence of hazard contexts and existing structural, non-structural measures for risk reduction;

c. **the execution of the program** (institutional setting, coordination, planning mechanisms, incentives and program monitoring); and

d. **viability** (technical, institutional, socio economic, financial).

178. During the Panama Regional Policy Dialogue, participants were requested to develop sector check lists for integrating DRM-CCA into development policy and practice with regard to the water, tourism and agriculture sectors in the LAC region taking into account the risk identification, monitoring and evaluation, policy and institutional frameworks and development practice topics. The present technical document should, according to the TORs consider these results, build on them and fine tune. However, prior to embarking on this we must pose a number of initial questions and contexts for which a response is required. These derive from the conceptual notions put forward earlier regarding the DRM-CCA-development planning links and the efforts at constructing a check list are very much affected by the conceptual framework one assumes.

179. Firstly, if so-called CCA relating to extreme and non routine damaging physical events is essentially a natural continuation and deepening of DRM as this document has established that it is now practiced, **do we have to do anything more than to update existing disaster risk check lists to take into account the new conditions and variables posed by environmental and social change driven by and in the context of climate change?**

180. Secondly, **how sector specific are the types of questions and checks we need to make and how far are they generic**? Clearly, check lists should broach the risk context as such — existing hazard, exposure and vulnerability conditions with regard to key components of the sector structure and support elements; the existence of an enabling policy, strategy and instrumental environment for reducing or controlling existing and new risk factors, including processes that guarantee participation of diverse stakeholders; the availability of both structural and non structural means for facilitating risk reduction and control with adaptation goals, etc. But are the questions and checks more generic than necessarily specific?

181. Thirdly, given the existing critique and comments as to check lists around climate change aspects **is a checklist the best way to go or is a different approach, such as screening and concentration on obvious climate risk contexts (as is suggested by the Oslo Policy Forum Meeting in 2008), a potentially more effective way?**

182. Where check lists need to be developed beyond ongoing risk parameters and contexts it is clear they must be able to deal with the following new risk or risk context aspects which derive from the conceptual framework we have posited:

- New and much **higher levels of uncertainty** regarding climate change related hazard and vulnerability, but mostly in contexts in which these are already present according to present climate patterns.

- The new interrelations and problems posed by **changing climate averages and norms interacting with more variable extremes** in different loci on a continually changing basis.

- The new interrelationship and problems posed by **changing climate, interacting with other global change problems,** such as sea level rise and glacial water loss in contexts also affected or potentially affected by such things as new disease vectors and conditions.

- **New multi hazard contexts** where climate change variables exist in areas affected by both related and independent hazard contexts.

- The difference between areas traditionally affected by climate related hazards and those where **new patterns will appear** for which there is, as of yet, no significant historical experience.

183. Essentially then, what is in play is the need to "approve" a conceptual framework for dealing with climate change related risk prior to being able to detail and finalize policy and action check list processes or similar schemes for facilitating decision making. If climate change related risk is considered to be a completely new area of intervention than conventional DRM areas, then this is very different to seeing it as a

continuation and deepening of already existing risk processes and intervention procedures. Either way, **an explicit decision as to conceptual frameworks needs to be made prior to developing functional tools such as a checklist**. Given these provisos, the following aspects would seem to be important to consider in future check list for priority sectors.

8.2 *Tourism Sector*

a. Risk Identification, monitoring and evaluation

184. Are there projections of changing climate and seal level conditions and their impact on the recurrence and intensity of hurricanes, storm surges, flooding, landslides, disease vectors and salinisation of water resources in the area?

185. Are any such projections and analysis transformed into or used for?

- GIS systems and data platforms,
- hazard maps,
- land use plans,
- integrated coastal zone management plans,
- carrying capacity assessments,
- mitigation plans,
- development control processes and orders,
- integrated watershed management plans
- individual and accumulative assessment of public sector investment projects?

186. With reference to direct and indirect impacts do systems exist for evaluating risk associated with changing climate and sea level conditions leading to the affectation of the following resources for development in the zone?

- Water for human consumption
- Water for production
- Natural resources including bio diversity of marine and terrestrial systems
- Coastal assets
- Energy provision.
- Foreign exchange resources

187. Are there efforts to incorporate the results of analysis and monitoring in the projections and projects for?:

- Business expansion and continuity
- Food security
- Health security

b. Policy and Institutional Frameworks

188. Do inter-sectoral and inter area commissions or committees exist for promoting CCA and DRM concerns in an integrated and coordinated fashion?

189. Do local level legislation and normative practice exist that demand consideration of DRM and CCA concerns?

190. Do local level development plans consider CC and DR and are these updated regularly?

191. Do plans exist that go beyond the short term and consider scenarios of up to 30 years or more?

192. Do facilities exist for the guaranteed participation of a wide range of social actors in scenario building and decision making as regards CC, DR and development planning concerns

193. Do participatory budgeting procedures exist in the area?

194. Do ongoing procedures for public and private education on CC and DR exist?

195. Do early warning systems exist for taking charge of slow incremental and rapid onset risk conditions?

c. Development Practice

196. Do projections exist of the potential impact of climate change and disaster risk on the potential for development in the zone?

197. Are alternative development scenarios discussed in participatory fashion given projected climate change and sea level scenarios?

198. Are there signs or evidence of changing attitudes to local development and investment on the part of entrepreneurs and what directions do these take?

199. Are there efforts to dimension local and sectoral development plans with CCA and DRM concerns?

200. Do local and national budgeting and financial allocation schemes demand analysis of CC and DR impacts in the zone?

201. Do systems of indicators exist that link project objectives to CCA and DRM policy goals

8.3 ***Water Sector***

a. Risk Identification, monitoring and evaluation

202. Do projections exist of changes in water availability from different sources for domestic and productive uses based on climate change projections?

203. Are adequate monitoring and measurement systems in place to register information with which to understand and project changes in the future?

204. Do projections and monitoring exist as regards the changes in drought and flooding conditions to be expected in different areas?

205. Does subterranean monitoring of water sources take place to control for processes of contamination and salinisation?

b. Policy and Institutional Frameworks

206. Do policy guidelines exist with regard to changing demand and supply of water and changing patterns of climate variability?

207. Is water supply and demand the object of planning procedures and integrated plans? If so do these cover?

- River basin planning
- Demand and supply planning in the domestic and production sectors

208. Are the treatment of changing climate averages and climate variability and their impacts on water supply and demand dealt with by the same or different institutions?

209. How are the joint problems of changing averages and extremes dealt with from a planning perspective?

210. Do instruments of control exist for:

- Regulating negative impacts of water shortage or abundance
- Creating incentives and disincentives for changing consumption and use practices.
- Standardizing practices of water use.
- Developing a common agenda for the protection of sources, efficiency in usage and reduction of impacts in sectors

c. Development Practice

211. Are modifications introduced that improve?:

- Protection of sources
- Water re-usage practices
- Efficiency in irrigation systems
- Controls over deforestation in river basins, over flooding and landslides
- Alternative methods of collecting water, including rainfall
- Promotion of community control and participation.
- Multi-hazard planning procedures.

8.4 *Agriculture Sector*

a. Risk Identification, monitoring and evaluation

212. Has climate change manifested itself in the zone to date?

213. Have the impacts of such changes on productivity and employment been measured and socialized?

214. Are mechanisms in place for measuring and monitoring changes in climate averages and variability, including the incidence of climate extremes and their projection into the near and medium range future?

215. Do mechanisms and methodologies exist for evaluating the vulnerability of the different components of the process of agricultural production, commercialization and service provision when faced with possible climate change and new extreme events?

216. Is climate information regularly produced and distributed amongst farmers at appropriate scales of resolution?

217. Are there mechanisms in place such that participatory schemes of information generation and discussion can take place, future risk scenarios be worked out and decisions taken collectively as to reduction options?

218. Are early warning systems in place for drought, flooding, landslides etc?

b. Policy and Institutional Frameworks

219. Have existing institutions for agricultural planning, weather monitoring and disaster risk reduction been brought together under inter-sector or inter-ministerial schemes, guaranteeing coherence and coordination in terms of intervention?

220. Do such coordination schemes exist such that early warning systems are immediately cognizant of climate information and user demands?

221. Do agricultural insurance mechanisms exist for small, medium and large scale farmers and to what extent do they factor in climate change risk and promote ongoing risk reduction and adaptation measures?

222. Do funding mechanisms for CCA and DRM exist and are they duly coordinated and integrated into development planning mechanisms?

c. Development Practice

223. Do local and sub-regional land use and territorial organization plans exist that take into account climate change and climate variability variables**?**

224. Is there a research capability to develop crops and animal strains that are resistant to climate change conditions in the area?

225. Do mechanisms exist for guaranteeing the importation of good practices from other areas when dealing with climate risk factors?

226. Do plans exist that link production opportunities and needs to such factors as livelihood security, food security, poverty reduction?

227. Have traditional mechanisms for understanding local climate and adjusting production to this been systematized and utilized in agricultural planning?

228. Have mechanisms been introduced to promote actualization of traditional knowledge when faced with changes in environmental variables and bio-indicators?

IX. Recommendations and Options

- CCA is incipient as a practice and little exists on the ground on real integration with DRM and development planning together. Concept and theory are more advanced than real practice. The problems of uncertainty and scenario scales of resolution mean that management and adaptation are more likely to be successful if present climate variability is the basis for action and change is introduced successively over time.

- Where adaptation schemes exist these are more likely to be project not policy, strategy or overall instrument based.

- IAB as other international supporters of CCA and DRM must insure that their loan, grant, or support policies take due note of the integration needs and provide guidelines and action formats that guarantee that these policies are implemented not only at the project level but more importantly at the general policy and strategy levels.

- The CCA mainstreaming into development planning can take DRM ideas, notions, experience and criteria as a good starting point for much adaptation work. Thus, such instruments as check lists and screening can drive from existing DRM mechanisms.

- Conclusions regarding the construction of CCA check lists include: while some factors are sector specific it is accepted that others are inter-sectoral and should be considered in that way; check list factors must cover data and monitoring needs, institutional, planning and instrumental aspects and forms of relationship to development sectors.

- It is difficult if not impossible at this time to construct accurate cost/benefit analyses for adaptation projects due to the high levels of uncertainty regarding future CC scenarios. Until we reach a higher level of understanding regarding the interrelationship of the many applicable variables for projected CC implications, the best way to insure high cost/benefit ratios in projects that are undertaken is to piggyback CCA onto DRM projects that already have acceptable cost/benefit ratios, thereby making such projects even more justified.

- The more holistic the planning and implementation process the better. This means a total climate approach where existing variability is the basis for action, changing averages and extremes are considered together and climate change and variability are seen within the general overall framework of sustainable development planning and other ongoing societal stresses and problems

X. Annexes

Note: Due to the large number of reviewed references for this document, the references have been divided into several sections: primary references, country references, & secondary references. The primary references are fully annotated. However, due to time considerations and unofficial sources for many of the other sources, the country references and secondary references are listed in an abridged annotation format.

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UN Food & Agriculture Organization (FAO) (2008) “Climate Change & Disaster Risk Management”

UN Framework Convention on Climate Change (UN FCCC) (Unknown date) “Disaster Risk Reduction tools for Climate Change Adaptation”

World Bank (2007) “Impact of Sea Level Rise on Developing Countries”. (Dasgupta, et al)

World Bank (2008) “Economics of Adaptation to Climate Change”. [Methodology Report].

World Bank – (2010) “World Development Report – Development & Climate Change”

World Bank – (1999) “Integrating Climate Change Adaptation into Bank work”. (Ian Burton, Martin van Aalst)

10.4 Organizations working on Vulnerability & Adaptation in the LAC region

Regional organizations and initiatives

Water Center for the Humid Tropics of Latin America and the Caribbean (CATHALAC), Panama www.cathalac.org
Caribbean Community Climate Change Centre (CCCCC), Belize www.caribbeanclimate.org
Caribbean Community and Common Market (CARICOM), Guyana www.caricom.org
Consejo Nacional del Ambiente (CONAM), Perú www.conam.gob.pe
Centro de Ciencias Ambientales (EULA), Chile www.eula.cl
Centro de Previsao de Tempo e Estudos Climaticos (CPTEC), Brasil www.cptecinpe.br
Centro de Estudios Sociales y Ambientales, Argentina www.cesam.org.ar
Centro de Investigaciones del Clima y de la Atmosfera (CIMA), Argentina www.cima.at.fcen.uba.ar
Comité Regional de los Recurso Hídricos (CRRH), Costa Rica www.aguayclima.com
Forum of Minister of the Environment of Latin America and the Caribbean www.pnumw.org
Instituto Geofísico del Perú (IGP), Peru www.igp.gov.pe
Instituto de Clima y Agua (INTA), Argentina www.intacya.org
Instituto Nacional de Ecología (INE), México www.ine.gov.mx
Instituto de Meteorología (INSMET), Cuba www.insmet.cu
Instituto de Hidrología, Meteorología y Estudios Ambientales (IDEAM), Colombia www.ideam.gov.co
Instituto de Pesquisa e Prevencao um desastres Naturais (IPEDEN), Brazil www.ipeden.org
Fundacion Bariloche, Argentina www.fundacionbariloche.org.ar
Ministerio del Ambiente, Ecuador www.ambiente.gov.ec
Ministerio del Ambiente y Recursos Naturales (MARENA), Nicaragua www.marena.gov.ni
Recursos e Investigación el Desarrollo Sustentable (RIDES), Chile www.rides.cl
Red Iberoamericana de Oficinas de Cambio Climático (RIOCC) www.mma.es
Universidad Nacional de La Asunción, Paraguay www.una.py
Universidad de la República de Uruguay, Uruguay www.rau.edu.uy/universidad
Universidad de Los Andes, Venezuela www.ula.ve
Universidad Nacional de México (UNAM), México www.unam.mx
Universidad Nacional de Rió Cuarto, Argentina www.unrc.edu.ar
University of Nur, Bolivia www.nur.edu
Universidad Federal do Para, Brasil www.ufpa.br
Universidad del Valle, Colombia www.univalle.edu
Vitae Civiles, Brazil www.vitaecivilis.org.br

Donor and implementing agencies

Canadian International Development Agency (CIDA) www.acdi-cida.gc.ca
German Technical Development Agency (GTZ) www.gtz.de

Global Environment Facility (GEF) www.gefweb.org
InterAmerican Development Bank (IADB) www.iadb.org
Japan International Cooperation Agency (JICA) www.jica.go.jp
Norwegian Development Agency (NORAD) www.norad.no
Swedish International Development Cooperation Agency (SIDA) www.sida.se
UN Environment Programme (UNEP) www.pnuma.org
UN Development Programme (UNDP) www.undp.org/regions/latinamerica
UN International Strategy for Disaster Reduction (UNISDR) www.unisdr.org
UK Department for International Development (DFID) www.dfid.gov.uk
US Agency for International Development (USAID) www.usaid.gov
World Bank www.worldbank.org

Research organizations and NGOs

Assessments of Impacts and Adaptations to Climate Change (AIACC) Project www.aiaccproject.org
Center for Development Research (ZEF), Germany www.zef.de
Center for International Climate and Environmental Research (CICERO), Norway www.cicero.uio.no
Centre for International Cooperation (CIS), Free University of Amsterdam www.cis.vu.nl
Climate Action Network (CAN) www.climatenetwork.org
Institute of Development Studies (IDS), United Kingdom www.ids.ac.uk
Inter American Institute for Global Research (IAI) www.iai.int
Intergovernmental Panel on Climate Change (IPCC) www.ipcc.ch
International Development Research Centre (IDRC) www.idrc.ca
International Institute for Environment and Development (IIED), United Kingdom www.iied.org
International Institute for Sustainable Development (IISD), Canada www.iisd.org
International Research Institute for Climate and Society (IRI), USA http://iri.columbia.edu
International Water Management Institute (IWMI), Sri Lanka www.iwmi.cgiar.org
IUCN - the World Conservation Union www.iucn.org
Mountain Research Initiative (MRI) www.mri.scnatweb.ch
Potsdam Institute for Climate Impact Research (PIK), Germany www.pik-potsdam.de
START - the global change SysTem for Analysis, Research and Training www.start.org
Stockholm Environment Institute (SEI), Sweden www.sei.se
The International Human Dimension Programme on Global Environmental Change (IHDP), Germany www.ihdp.uni-bonn.de
Tyndall Centre for Climate Change Research, United Kingdom www.tyndall.ac.uk
World Wildlife Fund for Nature (WWF) www.panda.org