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**Integrating practices, tools and systems for climate risk assessment  
and management and strategies for disaster risk reduction  
into national policies and programmes**

**Technical paper**

*Summary*

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change has reaffirmed that many climate risks will be exacerbated by climate change and that disaster risk reduction is an important element of adaptation planning. This paper, prepared in the context of the Nairobi work programme on impacts, vulnerability and adaptation to climate change, outlines the needs, practices, tools and systems for advancing the integration of adaptation and disaster risk reduction into national policies and programmes.

Parties may use the information contained in this technical paper as they consider implementing adaptation action under the Convention, including as part of the work of the Nairobi work programme on its focus area of adaptation planning and practices, and of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention on enhanced action on adaptation, in particular on disaster reduction strategies and means to address loss and damage associated with climate change impacts. The information could also be considered by Parties and organizations in their efforts in adaptation to address the adverse effects of climate change, in particular addressing climate risk assessment and management and strategies for disaster risk reduction, at the national and international levels.

## CONTENTS

	<i>Paragraphs</i>	<i>Page</i>
I. EXECUTIVE SUMMARY .....	1–35	4
A. Introduction .....	1–4	4
B. The potential synergy between adaptation and disaster risk reduction.....	5–6	4
C. Concepts that influence integration.....	7	5
D. Good practices in integration: emerging lessons.....	8–18	6
E. Challenges and opportunities in managing the integration process.....	19–25	7
F. Options for special support mechanisms for developing countries.....	26–30	8
G. Final remarks .....	31–35	9
II. INTRODUCTION .....	36–47	10
A. Mandate .....	36	10
B. Objective .....	37–38	10
C. Background.....	39–47	10
III. SIMILARITIES, DIFFERENCES AND SYNERGY BETWEEN ADAPTATION AND DISASTER RISK REDUCTION .....	48–61	12
A. Similarities.....	48–51	12
B. Differences .....	52–55	13
C. Measures to converge adaptation and disaster risk reduction	56–61	16
IV. FACTORS THAT INFLUENCE INTEGRATION IN THE CONTEXT OF CLIMATE CHANGE .....	62–82	16
A. Interplay between adaptation and disaster risk reduction .....	63–64	17
B. Enabling environments conducive to effective adaptation and disaster risk reduction.....	65–82	18
V. GOOD PRACTICES IN INTEGRATION: EMERGING LESSONS	83–116	22
A. Adaptation and disaster risk reduction in action .....	87–93	22
B. Sector level initiatives .....	94–102	25
C. Risk assessment tools for planning .....	103–111	26
D. Concluding observations .....	112–116	28

	<i>Paragraphs</i>	<i>Page</i>
VI. CHALLENGES AND OPPORTUNITIES IN MANAGING THE INTEGRATION PROCESS .....	117–138	29
A. Budgetary support .....	120–124	29
B. Institutional capacity .....	125–132	30
C. Political support for integration .....	133–138	33
VII. OPTIONS FOR SPECIAL SUPPORT MECHANISMS FOR DEVELOPING COUNTRIES.....	139–147	35
A. Scaling up support for integration.....	142–144	35
B. Tools and systems for management of adaptation and disaster risk reduction .....	145–147	36
VIII. FINAL REMARKS.....	148–159	37

#### Annexes

I. List of references.....	40
II. Speech by Secretary-General BAN Ki-moon on risk reduction and climate change, United Nations Headquarters, 29 September 2008.....	43
III. Local coping capacity in disaster risk reduction for drought in Jamaica .....	45
IV. Examples of good practices in dealing with hurricanes.....	47

## I. Executive summary

### A. Introduction

1. This technical paper was mandated by the Subsidiary Body for Scientific and Technological Advice (SBSTA) at its twenty-eighth session<sup>1</sup> as part of the activities of the Nairobi work programme on impacts, vulnerability and adaptation to climate change. Its aim is to assist countries to improve their understanding and assessment of needs, methods, challenges and opportunities regarding the integration of climate risk assessment and management into relevant national policies and programmes. It also aims to assist Parties, in particular developing countries, including the least developed countries (LDCs) and small island developing States (SIDS), to make informed decisions on practical actions and measures to respond to climate change on a sound scientific, technical and socio-economic basis, taking into account current and future climate variability and change.

2. This paper is closely related to the technical papers on physical and socio-economic trends in climate-related risks and extreme events,<sup>2</sup> and on mechanisms that can be used to manage financial risks from direct impacts of climate change.<sup>3</sup> These two technical papers may provide a further understanding of the implications of integrating climate risk assessment and management into relevant national policies and programmes.

3. Climate variability and change are realities that should be urgently addressed in development policy, planning and practice through the integration of adaptation<sup>4</sup> in a way that includes disaster risk reduction (DRR). Climate change increases vulnerability to most forms of climate-related disasters through, in particular, its impacts on ecosystems, livelihoods and health.

4. Although this paper focuses on the role of DRR in adaptation, it is recognized that adaptation is a broad concept and that it addresses a wide range of risks not only associated with disasters. The progressive drying out of continental interiors, the melting of glaciers, sea level rise, changes in ecosystems, including extinction of species, and the salinization of groundwater are examples of climate-related risks that do not manifest themselves in the form of rapid disasters. Similarly, the economic sectors, livelihoods, stakeholders and decision-makers involved in adaptation are not synonymous in all cases with those involved in DRR. In spite of this, the implementation of DRR policies and practices can facilitate adaptation; indeed, the United Nations Secretary-General has described DRR as a first line of defence in adapting to climate change.

### B. The potential synergy between adaptation and disaster risk reduction

5. The potential for synergy between DRR and adaptation exists in a range of policy frameworks and practical methodologies, and has possible implications for sustainable development in particular. Adaptation that is linked with DRR begins by addressing existing vulnerabilities to current climate events, and in so doing provides a window for a 'no regrets' approach to address future uncertainty. The concept of disaster reduction strategies and means to address loss and damage associated with climate change impacts in developing countries that are particularly vulnerable to the adverse effects of climate change is included in decision 1/CP.13 (the Bali Action Plan).

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<sup>1</sup> FCCC/SBSTA/2008/6.

<sup>2</sup> FCCC/TP/2008/3.

<sup>3</sup> FCCC/TP/2008/9.

<sup>4</sup> In this paper, mention of "adaptation" refers to adaptation to the adverse effects of climate change.

6. In some cases, contextual differences mean that it is not possible to design actions that result in both effective adaptation and DRR. However, this document does draw on experience to highlight some generic 'ways to act' that are considered most supportive of adaptation and DRR objectives.

### C. Concepts that influence integration

7. For adaptation and DRR to be most effective, they should be integrated into national policies and programmes. The following approaches to such integration are proposed:

- (a) **Support of the sustainable development agenda in the context of climate change.** This is particularly important in light of the fact that climate change is considered to be a serious threat to development and the attainment of the United Nations Millennium Development Goals (MDGs);
- (b) **Establishment of stable, transparent and effective governing structures.** The emphasis here is on linking top-down and bottom-up methodologies for climate-related risk assessment and implementation. To achieve this, meaningful participation, particularly of vulnerable groups, is important as a first step. Therefore it is suggested that development that neglects to enhance governance as a prerequisite for managing climate change risks will do little to reduce vulnerability to those risks;
- (c) **Promotion of intersectoral dialogue and coordination.** Policies, plans and programmes within all sectors influence vulnerability and the capacity to adapt to the climate-related stresses that communities are exposed to. Furthermore, climate-related risks and extreme events impact upon all sectors and constitute additional and highly significant agents of change. In light of this, the shift by many countries from single-institution mechanisms to more complex, integrated legislative and institutional systems that coordinate actions by a range of sector departments and ministries at different territorial scales is analysed;
- (d) **Building on existing practices, tools and systems.** It is crucial that climate risk assessment and management in the context of climate change draw on existing integration experiences as a basis for the way forward. Caution should be exercised in developing institutions, systems and planning mechanisms to aid integration. This is because experience has demonstrated that there can be a propensity to become side-tracked from ensuring that these are effective and ultimately lead to changes in policy and programming that support resilience on the ground. Thus, taking a pragmatic approach to existing mechanisms in support of sustainable development, such as poverty reduction strategy papers (PRSPs) and other national long-term development planning mechanisms, should be expanded to incorporate the added risks associated with climate change wherever possible;
- (e) **Integration within development budgets.** Assigning a budget for responding to climate-related risks and extreme events across sectors of development helps to ensure that these interventions are appropriately funded over the long term. To help achieve this, the economic argument for adaptation, including the costs of inaction, needs to be communicated widely;
- (f) **Building capacity and required institutional frameworks.** Promoting legal and institutional frameworks to support adaptation, including responses to extreme events, is considered to be vital. Furthermore, to avoid initiatives being derailed by new priorities, it is important to put in place regulatory procedures at the outset of the integration process. Establishing a multi-stakeholder coordination committee to enhance the scope

of activities at various levels and sectors and to manage national adaptation strategies may be an appropriate model.

#### **D. Good practices in integration: emerging lessons**

8. At a practical level, there is evidence of the integration of adaptation and DRR into policy. This is being driven by the goals of sustainable development and climate resilience at the national and regional levels, and by immediate needs at the local and sectoral levels, largely reflected in national frameworks and strategies. These frameworks assist by relating the specific courses of action to the potential roles of stakeholders in reducing climate-related risks and supporting adaptation directly through strengthening organizational structures, hazard-resilient structures, ecosystem protection and restoration, and risk transfer.
9. There is also evidence of efforts at the national, local and regional levels to address climate-related vulnerabilities. These have embraced diverse approaches, centred on stakeholder participation and consultation, shared goals and the establishment of common platforms for action.
10. The recognition that climate variability and change are a reality and will affect growth and development, especially in LDCs and SIDS, is creating a sense of urgency in preparing for their consequences. This focus on limiting or reducing the potential adverse impacts on economy and society facilitates the shaping of a more pragmatic, holistic approach.
11. This pragmatic 'no regrets' approach provides many lessons on the opportunities for and constraints on integration of adaptation and DRR at the sectoral and community levels as well as within the larger sustainable development framework.
12. The recognition of the trans-boundary nature of climate hazards is fostering several regional and subregional strategic frameworks. At least 20 such frameworks, which have many elements in common, have been identified so far in support of the Hyogo Framework of Action. These frameworks seek to:
  - (a) Achieve effective disaster reduction through multilevel, multidimensional and multidisciplinary cooperation and collaboration;
  - (b) Provide reliable risk information (hazard mapping and vulnerability assessment) to inform decision-making;
  - (c) Enhance coordination and integration of stakeholder action through good communication and efficient exchange of relevant and reliable information;
  - (d) Promote the establishment of enabling mechanisms;
  - (e) Engage all levels of society in implementation;
  - (f) Recognize the critical need to engage climate practitioners and processes.
13. Additionally, good practices have been identified in several sectors including agriculture, water and tourism. Adaptation and disaster reduction are also being incorporated into strategic environmental assessment, poverty reduction strategies, enhanced disaster response planning, urban planning and the revisiting of building codes and standards.
14. Documenting good practices is an attempt to map ongoing adaptation and DRR integration measures in relation to direct risks and the underlying livelihood systems. In addition, it informs the points of departure for further integration and highlights the need for ongoing adjustments to development action in response to climate change.

15. Even where similar impacts are being observed in the same regions, a range of adaptation approaches are being taken. This reinforces the importance of context in the framing of risk reduction approaches and the need for flexibility in the application of international support for national and sectoral risk reduction initiatives.

16. It is proposed that monitoring and sharing DRR 'good practices' should be expanded and supported by adaptation practitioners and through work on adaptation carried out under the Convention, including as part of the Nairobi work programme. This sharing of knowledge among regions, communities and sectors is an important factor in formulating strategies to respond to the challenges in achieving sustainable development against a backdrop of climate variability and change.

17. To successfully implement DRR as a part of adaptation will require additional financial resources. Adaptation is a long-term process calling for long-term policy commitments. Given the magnitude of current climate-related risks and the prospect of increased risks in future, the funding needs to be appropriate, sufficient and predictable. The economic costs of climate-related disasters are high, and continuing to rise. Costs totalled USD 1 trillion worldwide in 1980–2003 (CRED, 2006). The estimated investment required in 2015 to strengthen disaster response is projected to be approximately USD 2 billion (UNDP, 2007).

18. A review of the many climate and disaster risk assessment tools is required so as to give guidance on the appropriate context for their use, the synergies to be explored and the capacity required to accelerate their usage. When complemented by information sharing at different levels, these tools can provide multiple benefits in terms of data validation, stakeholder engagement and policy advocacy.

#### **E. Challenges and opportunities in managing the integration process**

19. The document reflects on the challenges in implementing integration of climate risk assessment and management and DRR into development, taking into consideration the additional burden caused by climate change. The key challenges are found in the following areas.

##### *Budgetary support*

20. Many countries, particularly in Africa, have highlighted a lack of resources as a key barrier to implementing the Hyogo Framework for Action priority areas, in particular in ensuring that DRR is a national and local priority with a strong institutional basis for implementation. Concerns have also been expressed over funding levels for adaptation. These concerns relate both to insufficient resources and to the nature of the funds available, which are often considered to be inappropriate for the cross-sectoral, multilevel and flexible approach needed. The lack of dedicated resources from national budgets is seen as inhibiting the operation of appropriate institutional systems and legislation, and therefore undermining potential progress where political momentum does exist.

##### *Institutional capacity*

21. In the view of countries contributing to the United Nations *Disaster Risk Reduction Global Review* in 2007, inadequate institutional arrangements are the single largest barrier to risk reduction. A major effort is therefore required to overcome this. Initiatives to strengthen institutional capacity should address disaster risks and other risks associated with climate change. Furthermore, efforts should build on experiences where progress has already been made; for instance the significant and continued reduction of climate-related mortality risk in a large number of countries. However, the current focus on disaster preparedness and early warning systems may compromise the broader aims of comprehensive risk management, so further progress is needed, particularly in the light of the predicted impacts

associated with the culmination of physical and socio-economic trends.<sup>5</sup> More work in addressing vulnerability and its causes is needed for sustained improvements to people's lives and the resilience of nations.

22. A further challenge that has to be addressed is the application of national plans and policies in more remote provinces and districts. Strategies seem to work well in countries with significant levels of decentralization. Government compartmentalization has also been identified as a major constraint to integration of adaptation. Further, low staff capacity and high staff turnover rates hinder sustained and effective action. Strengthening coordination among different levels of government, across sectors, and with academia and relevant organizations is all the more important in the light of these issues.

#### *Political support for integration*

23. While funding and capacity constraints are commonly flagged as priority concerns, progress in adaptation and DRR also hinges on the political commitment of governments. A culture of prevention has been initiated but not fully established. The reasons for this may include the challenges of globalization, market competitiveness and the problems associated with rapid urbanization, poverty and linking top-down and bottom-up methodologies. One factor that has significant ramifications for adaptation and DRR is the limited involvement of all relevant stakeholders in policy-making processes.

24. In some countries where the coordinating office for DRR is overseen by the highest level of political power, there seems to be a better chance of influencing line ministries and ensuring coherence. However, this is not always true. Even enhanced risk reduction prompted by a major climate-related disaster is only sustained in the longer term, as it needs to be, when it is underpinned by minimum conditions of political, social and economic stability within the context of good governance.

25. Improving the application of climate data to issues pertaining to a nation's sustainable development priorities on an appropriate scale may also enhance the sustainability of high-level political support.

#### **F. Options for special support mechanisms for developing countries**

26. The articulation of special considerations for developing countries within the context of adaptation and DRR provides a unique opportunity to secure their inclusion on the development agenda. This would require greater investment by the international community in harmonizing its policies and financing mechanisms for the provision of development support to these countries, especially LDCs and SIDS. How these processes are managed can have profound implications for sustainability.

27. Recognizing that various adaptation and DRR initiatives already exist in these countries, consideration should be given as to how these can be used to promote engagement, horizontal cooperation and knowledge sharing. Financial assistance will be needed to help developing countries, especially LDCs and SIDS, in this area.

28. Integration of adaptation and DRR into national policies and programmes calls for interventions driven by consultative, participatory, interdisciplinary and multidisciplinary dialogues. These interactions are central to the creation of the appropriate environment for accelerated uptake by vulnerable countries. The technological, human resource and financial challenges faced by most vulnerable countries will require considerable investment in developing model tools and processes to sustain their engagement. Approaches that may facilitate this are proposed in this document. Although many adaptation and DRR integration initiatives exist in developing countries, considerable assistance

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<sup>5</sup> FCCC/TP/2008/3.



will be needed in elaborating harmonization mechanisms, accessing technologies and developing the human capacity to manage and use them effectively.

29. The frequency of climate-related events could provide opportunities for examining the effectiveness of integration policies, strategies and plans and for observing and/or identifying vulnerabilities. This will lead to improvements in integration and opportunities to advance adaptation and integration tools to create resilience. The establishment of post-impact diagnostic teams may be a means to achieve this.

30. It is generally accepted that special consideration should be given to developing countries, especially SIDS and LDCs, in support of adaptation and disaster reduction. The dialogue is now about how to promote and facilitate the integration of these key pillars of climate resilience and the level of resources required to support the process.

### **G. Final remarks**

31. Climate variability and change are realities that should be addressed in development policy, planning and practice through the integration of adaptation. Because climate change is expected to increase the severity of many climate-related hazards and to increase vulnerability to climate-related disasters through its impacts on ecosystems, livelihoods and health, DRR is now recognized as one of the important components of adaptation.

32. Coping with exacerbated climate-related risks will require substantial, streamlined funding, as well as measures that go beyond treating the symptoms of risks to tackling their causes. The propensity of certain groups to suffer most acutely from climate-related risks needs further attention, and the realities that they face at the local level should form the basis of a vulnerability reduction strategy.

33. One important reason why more action to reduce the adverse affects of climate-related events has not yet taken a firm hold in development policy in the majority of States and vulnerable locations lies in deeply rooted perspectives that affect the prioritization process of decision-makers. Development policy decisions need to take greater account of input from sources at the local level, particularly from the groups most at risk. This calls for an appreciation for diversity in knowledge sources (including indigenous knowledge) and promotes interdisciplinary and multidisciplinary dialogue.

34. There is evidence that Parties are beginning efforts to integrate adaptation and DRR into national strategic planning, sectoral planning and sustainable livelihood initiatives. This technical paper presents some specific suggestions for such integration in support of attaining resilience in the face of increasing climate-related risks.

35. These suggestions could also provide inputs into the work of the Nairobi work programme, especially in the area of work on adaptation planning and practices, and the work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA) on enhanced action on adaptation, in particular on disaster reduction strategies and means to address loss and damage associated with climate change impacts in developing countries that are particularly vulnerable to the adverse effects of climate change. The suggestions could also provide inputs into the work by Parties and organizations on integrating practices, tools and systems for climate risk assessment and management and strategies for disaster risk reduction into national policies and programmes at national and international level.

## II. Introduction

### A. Mandate

36. The SBSTA, at its twenty-eighth session, requested the secretariat, in the context of the Nairobi work programme and under its work area on adaptation planning and practices, to prepare a technical paper on integrating practices, tools and systems for climate risk assessment and management and disaster risk reduction strategies, such as those included in the Hyogo Framework for Action (see box 1), into national policies and programmes.<sup>6</sup>

### B. Objective

37. The Nairobi work programme aims to assist all countries, in particular developing countries, including LDCs and SIDS, to improve their understanding and assessment of the impacts of climate change and to make informed decisions on practical adaptation actions and measures. Within this context, the aim of this technical paper is to provide meaningful information to Parties with a view to facilitating their identification of needs, methods, challenges and opportunities regarding the integration of climate risk assessment and management into relevant national policies and programmes.

38. This paper is closely related to a technical paper on physical and socio-economic trends in climate-related risks and extreme events in the context of their implications for sustainable development, mandated under the Nairobi work programme,<sup>7</sup> and a technical paper on mechanisms, including innovative insurance tools, that can be used to manage financial risks from direct impacts of climate change in developing countries, mandated by the AWG-LCA.<sup>8</sup> These two technical papers may provide a further understanding of the implications of integrating climate risk assessment and management into relevant national policies and programmes.

### C. Background

39. The occurrence of climate-related hazards (such as droughts, floods, cyclones and forest fires) in vulnerable environments has repeatedly set back development gains, especially in developing countries, as several studies have found.<sup>9</sup> Climate change threatens to exacerbate the impacts on development and livelihood security in two ways. First, the occurrence of weather-related and climate hazards is likely to increase. Second, the impacts will become more dramatic on account of increases in the vulnerability of communities to natural hazards, particularly as a result of ecosystem degradation, reduction in water and food availability, and changes to livelihoods (UN/ISDR, 2008). This means climate change will increase vulnerability to both climate and non-climate hazards. There is already evidence of increases in extreme conditions for some weather elements in some regions (see the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change).

40. The social and economic debilitation triggered by disaster events has prompted a transformation in the practice and goals of disaster management (see table 1). The change is to a DRR agenda that requires a comprehensive and integrated approach to hazard management, emphasizing the significance of vulnerability to hazards as a fundamental determinant of potential loss.

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<sup>6</sup> FCCC/SBSTA/2008/6.

<sup>7</sup> FCCC/TP/2008/3.

<sup>8</sup> FCCC/TP/2008/9.

<sup>9</sup> “Over the last two decades (1988–2007), 76% of all disaster events were hydrological, meteorological or climatological in nature; these accounted for 45% of the deaths and 79% of the economic losses caused by natural hazards.” (UN/ISDR, 2008).

**Table 1. The established shift of disaster management to a disaster risk reduction agenda**

<b>From:</b>	<b>To:</b>
Focus on hazards	Focus on vulnerability
Reactive	Proactive
Science- or expert-driven	Partnerships with a wide range of stakeholders including those at risk
Response management	Risk management
Symptoms	Causes
Local focus	Broader context

Source: Salter J. 1998. Risk management in the emergency management context. *The Australian Journal of Emergency Management*. 12(4) and Handmer J. 2000. Flood hazard and sustainable development. In: DJ Parker (ed). *Floods: Volume II*. London: Routledge. p.278.

41. At the core of this paradigm shift is the recognition that effectively addressing the issue of disaster-related losses requires DRR to be considered as a development issue. Its underlying values are that development should not engender vulnerability, and that development provides an opportunity to reduce vulnerability as well as the frequency of hazardous events. The challenge of managing the transition from response-centred disaster management activities to preventive, multisectoral initiatives that can be integrated at a national level is now being given greater prominence by those associated with the management of climate change risks.

42. As adaptation is necessary to address impacts of climate change due to past emissions (IPCC, 2007), the integration of adaptation and DRR into national policies and programmes is now imperative, especially for the States and communities that are most vulnerable to climate hazards. Both the Bali Action Plan and the Hyogo Framework for Action (see box 1) recognize this importance. The Bali Action Plan calls for enhanced action on adaptation including consideration of DRR strategies and means to address loss and damage associated with climate change impacts in developing countries that are particularly vulnerable to the adverse effects of climate change.

**Box 1. The Hyogo Framework for Action 2005–2015:  
building the resilience of nations and communities to disasters**

The Hyogo Framework for Action provides a foundation for implementing disaster risk reduction. Agreed at the World Conference on Disaster Reduction in January 2005, in Kobe, Japan, with the support of 168 governments, its intended outcome for the next decade is “the substantial reduction of disaster losses, in lives and in the social, economic and environmental assets of communities and countries”. It identifies the need to “promote the integration of risk reduction associated with existing climate variability and future climate change into strategies for the reduction of disaster risk and adaptation to climate change...”<sup>a</sup>

<sup>a</sup> See section II, part B, and section III, part B, paragraph 4 (i)(c), of the Hyogo Framework for Action. Available at: <<http://www.unisdr.org/eng/hfa/hfa.htm>>.

43. Climate change associated with global warming caused by human-induced environmental changes signals rapid shifts in the temporal and spatial distribution of hydro-climatic hazards. This, combined with socio-economic trends that can make communities and nations vulnerable, complicates the assessment of impacts and the development of policies, plans and programmes to manage them.

44. This vulnerability to climate hazards is already widespread (IDB, 2000; World Bank, 2008). Poorer countries are disproportionately affected, having fewer resources available to deal with hazards and low capacity for risk reduction measures. The small island States are also particularly vulnerable – for example, Grenada’s losses of USD 919 million as a result of Hurricane Ivan in 2004 were equal to 2.5 times its gross domestic product (UN/ISDR, 2008).

45. Unless climate-related risks are managed and reduced in the short, medium and long term, there are likely to be further significant setbacks to development gains, and the potential to achieve the MDGs would be undermined. Adaptation should be integrated into national, social and economic development policy, planning and practices, and reducing vulnerability should therefore be the focus.

46. The integration of adaptation and DRR into development policy and programmes is not a panacea for the development challenges that countries face. However, it offers an opportunity to deal proactively with some of the difficulties of sustainable development that are associated with the adverse impacts of climate change (IUCN et al., 2003). From an integrated adaptation/DRR point of view, it becomes clear that a balance needs to be found between short-term actions to reduce immediate impacts (e.g. through early warning and disaster preparedness) and longer-term actions needed to resolve the underlying causes of vulnerability so that reactive measures and humanitarian aid are not called on indefinitely.

47. Within this context, this document begins by identifying the potential synergy between adaptation and DRR by examining similarities and differences between the two disciplines (chapter III); highlights key concepts of integration applied in the document to the practices, tools and systems for climate risk assessment and management and DRR strategies in relation to national policies and programmes (chapter IV); examines the process of integration, looking at good practices and lessons (chapter V); reflects on challenges and opportunities in operationalizing this integration (chapter VI); and considers options and support mechanisms for assisting developing countries, especially LDCs and SIDS, in this difficult but important process (chapter VII).

### **III. Similarities, differences and synergy between adaptation and disaster risk reduction**

#### **A. Similarities**

48. Adaptation to climate change (including climate variability and extremes) is a broad concept that addresses a wide range of risks, economic and livelihood activities, and environmental services. It requires action at all levels of government, from local to national and international, as well as the involvement of civil society and the private sector. Prominent among the many risks are floods, tropical cyclones and other fast onset hazards, as well as hazards that occur more slowly such as drought, the progressive drying out of semi-arid regions, sea level rise, salinization of groundwater, melting of glaciers and the loss or migration of species. The risks threaten socio-economic and livelihood activities and human health, as well as environmental and infrastructure resources in agriculture, forestry, fisheries and water resources among others. The need for greater adaptation therefore involves a wide range of stakeholders, policymakers and managers. This paper focuses on those risks that manifest in the form of climate-related disasters. While responding to disaster risk is an aspect of adaptation that should be addressed as a priority, it is also recognized that adaptation also addresses other negative consequences that are not considered in this paper.

49. There are a number of important areas of common ground between adaptation and DRR (see table 2). Parties have recognized that existing knowledge and capacities for coping with extreme weather events and variability in the climate should be enhanced in order to adapt to climate change. Enhanced action on adaptation under the Bali Action Plan calls for, inter alia, the consideration of risk management

and risk reduction strategies, including risk sharing and transfer mechanisms such as insurance; and disaster reduction strategies and means to address loss and damage associated with climate change impacts in developing countries that are particularly vulnerable to the adverse effects of climate change.<sup>10</sup>

50. Further, many of the elements for adaptation that are included in the Bali Action Plan are highly relevant to reducing disaster risk, particularly vulnerability assessments, capacity-building and response strategies, as well as integration of actions into sectoral and national planning (UN/ISDR, 2008).

51. To press this matter further, United Nations Secretary-General BAN Ki-moon stated, at a ministerial meeting in New York on 29 September 2008, that climate change is the defining issue of this era, and that natural hazards are a perennial concern. This discussion brings the two issues together, and with good reason: better DRR will help the world adapt to climate change. In his speech, Mr. BAN called on ministers to lead the way at the United Nations Climate Change Conference in Poznan, Poland, and to implement the policies and practices of DRR as a first line of defence in adapting to climate change.<sup>11</sup>

## **B. Differences**

52. Despite the converging agendas and the commonalities highlighted in table 2, there are disparities between adaptation and DRR. These may be real or perceived. A distinctive difference between adaptation and DRR is that DRR encompasses hazards that are not climate-related (e.g. seismic risk), and adaptation tackles issues that are not necessarily directly associated with disasters (e.g. adjustments in the tourism sector, sea level rise, gradual changes in health impacts, etc.).

53. The perceived differences relate to the period under consideration: DRR actors are often perceived to deal predominantly with current short-term risk, whereas adaptation actors are perceived to deal rather with longer-term change and risk. The AR4 confirmed that climate change impacts are not limited to the long term, but are already a reality, as is apparent by the recorded melting of glaciers and other adverse effects. This suggests a key area of knowledge and awareness that should be addressed in the adaptation and DRR integration agenda.

54. The transition to a proactive risk reduction process has been evident in the disaster management community over recent decades. Embracing this DRR agenda requires promotion of resilience (by reducing vulnerability), support for sustainable development and incorporation of local knowledge and coping capacity. Similarly, in adaptation, the observed impacts of climate change call for action now as well as in the future, and this response has to be effective at the local level where impacts are felt.

55. Table 3 outlines the differences between adaptation and DRR while also highlighting possible signs of further convergence.

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<sup>10</sup> In paragraph 1 (c), the Bali Action Plan highlights the significance of DRR, as part of enhanced action on climate change adaptation.

<sup>11</sup> The full text is reproduced in annex II.

**Table 2. Summary of commonalities between adaptation and disaster risk reduction**

<b>Common areas</b>	<b>Explanation</b>
Aim	Both aim to build resilience contributing to sustainable development in the face of hazards
Influence of poverty, and vulnerability and its causes	The severity of the conditions caused by climate change and disasters is influenced by poverty and by vulnerability and its causes
Vulnerability reduction focused on enhancing capacity, including adaptive capacity, and devising responses in all sectors	Assessing risk and vulnerability is fundamental to both subjects. Reducing vulnerability requires multi-stakeholder participation
Integration in development	Both must be integrated into development plans and policies
Local level importance	Measures to relieve risk and adapt to climate change must be effective at the local level
Emphasis on present day conditions	Increasingly it is recognized that the starting point is in current conditions of risk and climate variability (i.e. 'no regrets')
Awareness of need to reduce future impacts	Despite a tradition based on historical evidence and present day circumstances, the aim of disaster risk reduction to build resilience means that it cannot ignore current and future climate change risks
Appropriateness of non-structural measures	The benefits of non-structural measures aid both current and less well understood future risk reduction needs
Full range of established and developing tools	For example: early warning systems; seasonal climate forecasts and outlooks; insurance and related financial risk management; building design codes and standards; land-use planning and management; water management including regional flood management, drainage facilities, flood prevention and flood-resistant agricultural practices; and environmental management, such as beach nourishment, mangrove and wetland protection, and forest management
Converging political agendas	At the international level, the two policy agendas are increasingly being discussed together, including through the Bali Action Plan (decision 1/CP.13) and the Hyogo Framework for Action

*Source:* Includes information from United Nations International Strategy for Disaster Reduction. 2003. *Climate and Disaster Risk Reduction*. Briefing document by the United Nations Inter-Agency Task Force on Disaster Reduction, eighth meeting, Geneva, 5–6 November. Geneva: UN/ISDR. p.4.

**Table 3. Differences between adaptation and disaster risk reduction and signs of convergence**

Differences		Signs of convergence
Disaster risk reduction	Adaptation	
Origin and culture lie in humanitarian assistance following a disaster event	Origin and culture lie in scientific theory and empirical evidence	Disaster risk reduction (DRR) increasingly uses scientific prediction in risk assessment, and new technologies such as remote sensing and geographic information systems
Historical experience used as evidence for need	Future negative impacts used as major catalyst for action	DRR increasingly forward-looking Current climate variability as an entry point for adaptation
Community-based process stemming from experience	Community-based process stemming from policy agenda	
Incremental development	New and emerging agenda	
Extensive practical application at local level	Growing practical application at local level	
Existing risks	Existing and new risks – for example regarding the impacts of climate change associated with adverse environmental impacts, and concerns over potential increase in conflict	DRR increasingly forward-looking Comprehensive risk management as a strategy for encompassing the full range of risks
Relevance to all hazard types	Relevance to climate-related hazards and non-disaster-related concerns	Comprehensive risk management as a strategy for encompassing the full range of hazards, stresses and shocks
Traditional or indigenous knowledge at community level is a basis for resilience	Traditional or indigenous knowledge at community level needs to be strengthened and built upon to enhance resilience to types and scales of risk yet to be experienced	Selected examples where integration of scientific knowledge and traditional knowledge for DRR provides learning opportunities <sup>a</sup>
Political and public recognition often quite weak	Political and public recognition increasingly strong	Climate-related disaster events are now more likely to be analysed and debated, with reference to climate change as an entry point for assessing the expected exacerbation of these events <sup>b</sup>
Funding streams ad hoc and insufficient	Funding streams insufficient	DRR community engaging in new adaptation funding mechanisms
Structural measures designed for safety levels modelled on current and historical evidence <sup>c</sup>	Structural measures designed for safety levels modelled on current and historical evidence, and on predicted changes	DRR increasingly forward-looking

Source: Adapted from Venton P and La Trobe S. 2008. *Linking Climate Change Adaptation and Disaster Risk Reduction*. London: Tearfund/IDS.

<sup>a</sup> For example, “Participatory methods of incorporating scientific with traditional knowledge for volcanic hazard management on Ambae Island, Vanuatu” (Cronin et al. 2004. *Bulletin of Volcanology*. **66**: pp.652–668).

<sup>b</sup> Hurricane Katrina in the United States in 2005 or flooding and heat wave in Europe in 2002 and 2003.

<sup>c</sup> Plus a determination of the ‘level of acceptable risk’: for the Netherlands the impact of flooding is enormous, and therefore flood defences are engineered to withstand worst possible scenarios, whereas in another region the cost of such measures may be considered out of proportion with the additional safety level achieved.

### **C. Measures to converge adaptation and disaster risk reduction**

56. Bearing in mind the significance of similarities between adaptation and DRR, and appreciating where convergence regarding differences is under way or required, how the integration of adaptation and DRR can be best accomplished for mutual support in the aspiration of sustainable development will now be set out. These themes subsequently influence the remaining chapters.

#### *Focus on the characteristics of society and economy through localized vulnerability assessment*

57. Global climate models have been the main tools for predicting future climate conditions. While developments in climate modelling over the years have led to a considerable increase in confidence in projecting future climate change on continental and larger scales, projections at the regional and subregional levels are less reliable. Another commonly used tool is the vulnerability assessment, which seeks to determine where the damages from climate-related events are likely to take place, and helps identify measures to enhance resilience to lessen their impact.

58. This focus on vulnerability assessment may provide common ground for adaptation and DRR perspectives (Dilley, 2002). However, although vulnerability assessments are integral to both adaptation and DRR, there are differences in how they are studied. DRR-based vulnerability assessment usually begins with the current situation, and though future-oriented, is informed by historical and present day conditions.

#### *Sustained alliances within good governance-based environments for disaster risk reduction*

59. Although existing coping mechanisms provide an important basis for adapting to climate change, communities are facing exposure to unprecedented risks before they have accumulated experience to cope with them. Ensuring the economic and social well-being of the vulnerable will require stronger alliances of climate scientists, disaster management specialists and development planners to work together.

#### *Raising awareness of the benefits of adaptation*

60. There is much evidence to suggest that a proactive approach to DRR and the precautionary principle of adaptation could significantly reduce the potential costs of global warming and the impacts of climate-related events (IDB, 2000; Rasmussen, 2004; Stern, 2007). Early action to manage and reduce the potential consequences can bring economic benefits by minimizing disruptions to ecosystems, human health, economic development, property and infrastructure (European Commission, 2007). This depends on adequate policies being put in place.

61. In this regard, fortunately, adaptation and DRR measures are already being implemented in many regions, States and communities; and the experiences and lessons identified can help to better inform the integration process (see chapter V). Although adaptation and DRR have different histories, there is a growing recognition that they have common theoretical and methodological components. Additionally, their strengths and weaknesses may be seen not as competing but as complementary. Efforts should be made to explore the potential for convergence if climate-resilient development is to be achieved. In so doing, DRR could be seen as a 'no regrets' approach to adaptation.

## **IV. Factors that influence integration in the context of climate change**

62. This chapter draws on experience to highlight factors that support the integration of adaptation and DRR within sustainable development. This is followed by a discussion on the enabling environment conducive to the application of these concepts, particularly in support of integrating climate risk assessment and management into national policies and programmes.



### A. Interplay between adaptation and disaster risk reduction

63. A set of basic guiding concepts for implementing DRR has been documented (UN/ISDR, 2007, pp.4–5). While implementing activities to reduce risks and adapt to climate change will always be highly context-specific, these concepts may also apply to adaptation, and this has been reflected as follows:

- (a) **States have the primary responsibility for adaptation and DRR.** They have the power and the responsibility to protect citizens and their national assets. However, effective adaptation and DRR relies on the efforts of many different stakeholders, not just the national government;
- (b) **Adaptation and DRR should be integrated into development activities.** States can minimize losses by integrating adaptation and DRR into development strategies, assessing potential risks as part of development planning, and allocating resources for risk reduction. This, of course, resonates with the main theme and purpose of this document;
- (c) **A multi-hazard approach can improve effectiveness.** Cumulative risk cannot be tackled effectively if actors only plan for selected hazardous events;
- (d) **Capacity development is a central strategy for adaptation and reducing disaster risk;**
- (e) **Decentralizing responsibility and budgets for adaptation and DRR helps respond to specific local needs.** Many adaptation and DRR activities need to be implemented at provincial, municipal and local levels, as the hazards faced and the populations exposed are specific to particular geographical areas. Decentralization may also motivate increased local participation;
- (f) **Effective adaptation and DRR requires community participation.** Community involvement in the design and implementation of activities helps to ensure that they are tailored to the actual vulnerabilities and needs of the affected people. Participatory approaches can more effectively capitalize on existing coping mechanisms and are effective at strengthening community knowledge and capacities. They are usually more sensitive to gender, cultural and other context-specific issues that can affect whether particular groups and individuals take locally-based action;
- (g) **Gender is a key factor in adaptive capacity and disaster risk and in the implementation of adaptation and DRR.** Gender-differentiated information should be used to ensure that adaptation and risk reduction strategies are correctly targeted at the most vulnerable groups and are effectively implemented through the roles of women and men;
- (h) **Public–private partnerships are an important tool for adaptation and DRR;**
- (i) **Adaptation and DRR should be customized to particular settings.** States vary greatly in their political, socio-economic, cultural, environment and hazard circumstances. Measures that succeed in reducing risk and developing adaptive capacity in one setting may not work in others.

64. The degree to which the ideas mentioned above are applied may influence the effectiveness of adaptation and DRR. It is therefore useful to ask what type of enabling environment is required to maximize the likelihood that they will inform decision-making. This document proposes that they are

most likely to be adhered to when the practical approaches to the integration of adaptation and DRR into national policies and programmes described below are followed.

## **B. Enabling environments conducive to effective adaptation and disaster risk reduction**

### 1. Support of the sustainable development agenda in the context of climate change

65. Although integrating adaptation and DRR into development is an important step for addressing climate-related risks and climate change, development per se has not automatically led to risk reduction (indeed, it has sometimes led to risk creation), as evidenced by the occurrence of numerous disaster events despite large sums being spent over many years on improvements in water resource management, health, infrastructure and so on.

66. Explaining the relationship between ‘climate proofing’ and development policies, the Asian Development Bank (ADB) states:

“Climate change is largely the result of greenhouse gas emissions associated with human activities. The latter are driven by socio-economic development patterns characterized by economic growth, technology uptake and application, population growth and migration and adjustments in governance. In turn, these socio-economic development patterns influence vulnerability to climate change as well as the human capacity for mitigation and adaptation. The cycle is completed as a result of climate change impacting on human and natural systems, to influence socio-economic development patterns and thereby greenhouse gas emissions. The artificial separation of these activities results in missed opportunities for synergies, in unrecognized and undesirable trade-offs and in mutual interference in ensuring successful outcomes. The benefits arising from integrating climate policy into wider development policies can be greater than the sum of concurrent but independent policy initiatives.” (ADB, 2005, p.112).

67. Furthermore, climate change has been characterized as a serious long-term threat to development and the attainment of the United Nations MDGs. It follows that building adaptive capacity and resilience to climate-related risks is essential for meeting development goals that aim to address issues such as poverty alleviation, hunger, access to water and human health.<sup>12</sup>

### 2. Establishment of stable, transparent and effective governing structures

68. Although climate change models are predominantly calculated on a global and regional scale, impacts of climate change will always be directly felt at the local level. Vulnerability to climate change, rather than hazard occurrence, is the most significant determinant of impacts in most cases. While most natural hazards can be mapped on a large scale (e.g. storms, fault lines and river basins that extend beyond national borders), vulnerability varies town by town, community by community, household by household. Therefore, national strategies intended to manage risk are highly dependent upon the engagement of local stakeholders.

69. It is thus important for national governments to appreciate that top-down and bottom-up methodologies should be linked to enable integrated adaptation assessments (UNDP, 2004; UNFCCC, 2007, p.18) and the implementation of appropriate activities. While top-down activities should be focused on creating a favourable enabling environment, bottom-up activities need to be founded on meaningful participation<sup>13</sup> and empowering key players (ADB, 2005, p.118). This is a governance-

<sup>12</sup> FCCC/SBSTA/2007/7, paragraph 53.

<sup>13</sup> See Arnstein’s “A ladder of citizen participation” (1969), which highlights the difference between meaningless and meaningful participation: from the bottom rung, where there is no participation, to the top rung, where there is true participation, the rungs of the ladder are described as manipulation, therapy (making people feel good), informing, consultation, placation, partnership, delegation and citizen control.

related issue as key features of good governance stem from “public authorities’ fundamental political commitment to safeguard human life” (Thompson and Gaviria, 2004). Submissions by Parties indicate a shortage of information on community-based adaptation at the government level and the need to increase the flow of knowledge from the bottom up.<sup>14</sup>

70. Good governance that supports participation, particularly of vulnerable groups, is the first step towards integrating climate risk assessment and management, including DDR, into development decision-making.<sup>15</sup> An example of this is the work of the Global Change System for Analysis, Research and Training (START) in building the capacity of local communities to self-assess their vulnerability and report this to municipal and national authorities. However, concern is often expressed that simply placing people at the centre of risk reduction falls short of a proper integration into decision-making processes.

71. True integration requires not only participation of the most vulnerable groups but also: freedom of, and access to, information on policies, rights and major decisions; decentralization for stronger local governance; legally enforceable responsibilities for risk reduction; access to justice; and accountability (Action Aid, 2005).

72. In relation to the assessment of adaptation practices, options, constraints and capacity, the AR4 concludes that “a high priority should be given to increasing the capacity of countries, regions, communities and social groups to adapt to climate change in ways that are synergistic with wider societal goals of sustainable development” (IPCC, 2007, p.737). What this means in practice is that a focus on development that neglects to enhance governance as a prerequisite for managing climate change risks will, in all likelihood, do little to reduce vulnerability to those risks (O’Brien et al., 2006, p.64).

### 3. Promotion of dialogue and coordination between sectors

73. People’s lives and livelihoods are dependent upon a complex interaction across all sectors, where a change in one (e.g. availability of safe drinking water) has implications for others (e.g. health and thus ability to carry out livelihood activities). Climate change will impact upon all sectors and is therefore an additional and highly significant agent of change to existing conditions. Similarly, policies, plans and programmes made in different sectors influence people’s vulnerability to climate-related stresses and their capacity to respond.

74. Within this context, it has been highlighted that a broad range of stakeholders should be involved in climate change policymaking and programmes. Indicating the breadth of entry points for climate risk assessment and management of climate change, identified priority areas for adaptation activities include the following: water resources management; land management; agriculture; health, and improving the monitoring of diseases and vectors affected by climate change; infrastructure development; fragile ecosystems (including mountain ecosystems); integrated coastal zone management; supporting capacity-building, including institutional capacity, for preparedness for and management of disasters related to climate change; and establishing and supporting national and regional networks for rapid responses to extreme weather events.<sup>16</sup>

75. In the past, institutional mechanisms to deal with disasters mainly consisted of ‘stand-alone’ offices or institutions, with mandates for disaster management (especially emergency response and preparedness) or civil defence and protection. Likewise, climate change was thought of as a stand-alone

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<sup>14</sup> FCCC/SBSTA/2007/9, paragraph 20.

<sup>15</sup> Anju Sharma, representative of the Sustainable Environment and Ecological Development Society (SEEDS), in a presentation titled “Mainstreaming Disaster Risk Management” at University College London, 21 April 2005.

<sup>16</sup> See decisions 5/CP.7 and 5/CP.9.

environmental issue.<sup>17</sup> Many countries have now moved to more complex, integrated legislative and institutional systems that coordinate actions through a range of sector departments and ministries at different territorial scales (United Nations, 2007, p.39). This is an important step forward for the integration of adaptation into national policies and programmes.

76. Setting up intersectoral systems and frameworks has not automatically resulted in intersectoral action. Along with the other issues covered in this chapter, strong and clear coordination mechanisms amid such a complex web of stakeholders are needed so as to avoid the emergence of numerous isolated, dispersed and ad hoc initiatives.<sup>18</sup>

#### 4. Building on existing practices, tools and systems

77. Integration of a subject in support of sustainable development is not a new concept. The environment, gender and HIV/AIDS, for example, are increasingly accepted as important issues that cut across – and influence – different sectors of development at all levels. As with climate change and DRR today, this is because addressing these issues effectively requires comprehensive integrated policies, plans and programmes. It is crucial that climate risk assessment and management draw on these experiences.

78. It should be emphasized in this discussion that integration is a means to an end, and that focusing on the development of institutions, systems and planning mechanisms to aid integration can create a danger of overlooking the need to ensure that these lead to changes in policy and programming that sustain resilience on the ground (O'Brien et al., 2006, p.67). In this case, the ultimate purpose for integration is to enable development to be resilient in the face of climate change. The setting up of institutions, systems and planning should not become a goal in itself or a pseudo-indicator of success; it is the effects that they may, or may not, cause that provide the basis for considering success. However, this is difficult to achieve. In the words of former United Nations Secretary-General Kofi Annan, “Building a culture of prevention is not easy. While the costs of prevention have to be paid in the present, its benefits lie in a distant future. Moreover, the benefits are not tangible; they are the disasters that did not happen” (United Nations, 1999).

79. The emergence of climate change as an additional burden on development requires a pragmatic approach that makes use of existing mechanisms in support of sustainable development, such as PRSPs and other national long-term development planning mechanisms. Such an approach should be expanded to incorporate the added risks associated with climate change wherever possible (box 2). In their submissions to the secretariat on adaptation planning and practices, Parties also highlighted the importance of identifying co-benefits of existing work programmes.<sup>19</sup>

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<sup>17</sup> It is arguable that in smaller countries without environment ministries, such as some SIDS, the emergence of climate change as a cross-cutting issue requiring adaptation provisions across sectors is less constrained by departmental segregation, which can hinder integration.

<sup>18</sup> FCCC/SBSTA/2007/9, paragraph 60.

<sup>19</sup> FCCC/SBSTA/2007/9, paragraph 19.

**Box 2. The integration of disaster risk reduction within poverty reduction strategy papers**

“An increasing number of PRSPs [poverty reduction strategy papers] explicitly recognise that natural hazards and related vulnerability play a role in determining forms and levels of poverty and in influencing broader macroeconomic performance. Over 15 of them include related disaster risk management measures. However, these measures are typically very narrowly and traditionally conceived. For instance, they outline plans to strengthen warning systems and disaster response capabilities and to target relief and rehabilitation assistance towards the poor (e.g. Ghana, Malawi, Mozambique) and/or to strengthen the resilience of the agricultural sector (e.g. Malawi, Mozambique), for example by the adoption of improved seeds. Very few go that fundamental step further, seeking to integrate disaster risk management concerns into broader development strategies and programmes and to tackle it more holistically (notable exceptions include Bangladesh and Cambodia). Moreover, there are some glaring omissions, involving highly disaster-prone countries where the impact of recent disaster events on levels of poverty may be mentioned in passing but there is no discussion of measures to reduce risk.”

*Source:* Twigg J and Benson C. 2007. *Tools for Mainstreaming Disaster Risk Reduction: Guidance Notes for Development Organisations*. Geneva: IFRC/ProVention Consortium. Guidance Note 3, p.32.

**5. Integration within development budgets**

80. Assigning a budget for adaptation and DRR across different sectors of development helps to ensure that they will be appropriately funded in the long term. However, these activities are balanced against other priorities, particularly when seen as additional stand-alone activities rather than adjustments to existing development operations. They can also be seen as competing with one another for existing development resources in an attempt to prevent resources from being diverted to disaster recovery and rehabilitation (ADB, 2005, p.117). Therefore, when making the case for adaptation, the economic argument should be communicated widely (Tearfund, 2006, p.4); in general terms such as encapsulated within the Stern Review (Stern, 2007) or more specifically in relation to different adaptation options. In doing so it should be recognized that new mechanisms and sources of support may be created under the Bali Action Plan, from which additional financial resources could be allocated to adaptation.

**6. Building capacity and required institutional frameworks**

81. In order to successfully carry out a country-driven approach and to integrate adaptation and DRR strategies across all sectors of national sustainable development policymaking, including through PRSPs, it is vital to set up legal and institutional frameworks. However, despite progress in some countries, a significant gap in capacity-building efforts lies in building and strengthening these frameworks in developing countries (Kramer, 2007). In this regard, efforts to create enabling environments at the national level through the promotion of national legislative, economic and institutional frameworks that are adequate to address climate change challenges need further attention (UNEP, 2007, paras. 33–35).

82. At the forefront of methods deployed and recommended to facilitate climate risk assessment and management may be the establishment of a multi-stakeholder coordination committee to increase the scope of activities at various levels and sectors and to manage national adaptation strategies (Tearfund, 2006, p.4; FCCC/SBSTA/2007/9, para. 65 (g)), as despite the environmental basis of the challenge, the consequences of climate change cannot be addressed solely through environmental means. A new multidisciplinary approach is required, and this depends on significant resources and influence that may go beyond the traditional remit of the environmental sector (Union of the Comoros, 2006).

## V. Good practices in integration: emerging lessons

83. This chapter examines good practices in climate risk assessment and management, including DRR, that have facilitated or can facilitate their integration in support of climate-resilient development, and suggests opportunities for replication and awareness-building.

84. The integration process underpinned by the concepts articulated in chapter IV has two mainstays. One addresses existing vulnerabilities to climate hazards and the other is the establishment of a common vocabulary to facilitate dialogue. There is much evidence of efforts at the national, local and regional levels to address climate-related vulnerabilities. These have taken a range of approaches centred on stakeholder participation and consultation, shared goals and the establishment of common platforms for action.

85. Although less progress has been made in establishing a common vocabulary (terminology) within the adaptation and DRR community, this has not hampered the integration approach. The terms “vulnerability”, “risk mitigation” and “disaster mitigation” as used in adaptation and DRR may have different implications in the two disciplines,<sup>20</sup> but they share a common goal: the avoidance or limitation of impacts of hazards on society and the economy.

86. The recognition that climate change and variability are a reality and will impact on growth and development, especially in LDCs and SIDS, is creating a sense of urgency in preparing for their consequences. This focus on limiting or reducing potential impact on economy and society is shaping a more pragmatic, holistic approach to managing climate-related disasters. This pragmatic ‘no regrets’ approach provides many lessons on the opportunities for and constraints on integrating adaptation and DRR at the sectoral and community levels as well as within the larger sustainable development framework. It has also given rise to a number of initiatives that demonstrate the benefits of harmonizing and aligning adaptation and DRR for countries, communities and sectors.

### A. Adaptation and disaster risk reduction in action

#### 1. Regional frameworks

87. Recognition of the trans-boundary nature of climate hazards has resulted in several regional and subregional strategic frameworks designed to minimize impacts of these hazards on sustainable development. The Comprehensive Disaster Management Strategy of the CARICOM (Caribbean Community), Comprehensive Hazard And Risk Management (CHARM) in the South Pacific and the Comprehensive Disaster Risk Management Framework in South-East Asia reflect this trend (see box 3).

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<sup>20</sup> In DRR, “vulnerability” refers to the propensity of elements exposed to a natural hazard event to suffer damage (Dilley, 2002). This concept, fundamental to DRR policy and practice, is well defined and operational among disaster management practitioners. A desire for the development and application of policies, strategies and practices to avoid (prevention) or to limit (mitigation and preparedness) the impact of hazards within the larger framework of sustainable development is apparent.

### **Box 3. Regional strategic frameworks in comprehensive disaster risk reduction**

#### *Caribbean Community – Comprehensive Disaster Management Strategy*

Articulated within a programme based on a ‘results-driven’ framework, the purpose is “to strengthen regional, national and community level capacity for mitigation, management, and coordinated response to natural and technological hazards, and the effects of climate change”. The four priority outcomes are:

- (a) Enhanced institutional support for implementation of clean development mechanisms programmes at national and regional levels;
- (b) An effective mechanism and programme for management of comprehensive disaster management knowledge has been established;
- (c) Disaster risk management has been mainstreamed at national levels and incorporated into key sectors of national economies (including tourism, health, agriculture and nutrition);
- (d) Enhanced community resilience in Caribbean Disaster Emergency Response Agency States and territories to mitigate and respond to the adverse effects of climate change and disasters.

#### *South Pacific – Comprehensive Hazard And Risk Management (CHARM)*

Seeks to manage unacceptable risks associated with major hazards by adopting a holistic risk management containment strategy linked to national development strategy. It seeks to involve all stakeholders, national and regional. Its value is that it:

- (a) Involves monitoring and review at all stages of the process;
- (b) Provides clear definition of primary and secondary threats;
- (c) Is linked to national development planning;
- (d) Is linked to existing national and regional institutional mechanisms and programmes;
- (e) Includes a specific focus on climate-related hazards.

#### *South-East Asia – Comprehensive Disaster Risk Management Framework*

The integrated, multi-hazard comprehensive approach to disaster management is also being pursued in South-East Asia. The Comprehensive Disaster Risk Management Framework has the following characteristics:

- (a) Covers all aspects of disaster management;
- (b) Vertically and horizontally integrated into all sectors and stakeholders;
- (c) Emphasis on community preparedness through the development of capacity towards self-sufficiency and self-reliance.

Its strategic goal is sustainable development and the building of resilient communities.

*Source:* Extracted from Caribbean Disaster Emergency Response Agency (CDERA). 2003. Climate variability and change in the Caribbean and South-East Asia: managing hazard risk for the tourism, urban water, agriculture and fisheries sectors. *Report of the Seminar on Climate Change and Severe Weather Events in the Caribbean and Asia*. Barbados, 24–25 July 2003. Available at: <[http://www.iotws.org/file\\_download.php/Climate-Change.pdf?URL\\_ID=1809&filename=11407487721Climate-Change.pdf&filetype=application%2Fpdf&filesize=532232&name=Climate-Change.pdf&location=user-S/](http://www.iotws.org/file_download.php/Climate-Change.pdf?URL_ID=1809&filename=11407487721Climate-Change.pdf&filetype=application%2Fpdf&filesize=532232&name=Climate-Change.pdf&location=user-S/)>.

88. These comprehensive disaster management strategies and frameworks have many elements in common. They seek to:

- (a) Achieve effective disaster reduction through multilevel, multidimensional and multidisciplinary cooperation and collaboration;
- (b) Provide reliable risk information (hazard mapping and vulnerability assessment) to inform decision-making;
- (c) Enhance coordination and integration of stakeholder action through good communication and efficient exchange of relevant and reliable information;
- (d) Promote the establishment of enabling mechanisms;
- (e) Engage all levels of society in the implementation process;
- (f) Recognize the critical need to engage the climate practitioners and processes.

89. It is also interesting to note that the regions cited in box 3 above, although not including Africa, are among the most disaster-prone in the world. This supports an emerging belief that the integration process for adaptation and DRR should begin with the events that are already being experienced (or are likely to be experienced) by the target beneficiaries of the process (IUCN et al., 2003).

90. An initial effort by ISDR to map disaster reduction frameworks that exist at the regional and subregional level reveals at least 20 such initiatives. This mapping exercise could provide an assessment of the level and extent of the adaptation/DRR engagement process at these strategic levels, and a way to share good practices. Given that these processes seek to engage a diversity of stakeholders there will also be a need for broad-based stakeholder agreement on what are the appropriate indicators for defining the 'level of engagement'.

## 2. National frameworks

91. Many countries have begun to integrate DRR into their development agendas. The initiatives have been varied and may be structural or non-structural. For instance, Guyana has initiated an action plan (see box 4) to address the threat from sea level rise to its population and urban centres, which are primarily coastal and low-lying. The World Bank, through the Global Environment Facility, supported capacity-building and mainstreaming adaptation into national development plans and strategies in Kiribati as well as the integration of climate risk awareness and responsiveness into economic and operational planning (UN-OHRLLS, 2007).

92. The Government of Maldives, with the support of the United Nations Development Programme (UNDP), has developed a countrywide programme to address the current and anticipated adverse effects of climate change, including extreme events and climate variability. Its goal is to provide a framework to coordinate and implement adaptation initiatives through participation and by building synergies with other relevant programmes (UNDP/GEF and Government of Maldives).

93. Orindi and Eriksen (2005) explored a framework for integrating climate change into the development process in Uganda. The study sought to build on the national communications, which have largely focused on climate obstacles to development and less on the socio-economic issue of livelihood security. It suggests that there may be a need to refocus this analysis in national communications on existing adjustments and vulnerability to climate change in order to provide better support for local coping capacity. National communications and national adaptation programmes of action (NAPAs)



could therefore potentially act as catalysts for initiating the mainstreaming of climate change adaptation into development planning.<sup>21</sup>

**Box 4. Disaster risk reduction and adaptation frameworks:  
a case study of the Integrated Coastal Zone Management Action Plan in Guyana<sup>a</sup>**

The Action Plan for Integrated Coastal Zone Management (ICZM)<sup>b</sup> is intended to guide the work of stakeholders involved in ICZM either directly or indirectly in an effort to foster a more coordinated and integrated approach to management of the coastal zone. Its objectives are: (1) to strengthen the capacity of key national institutions to execute effective ICZM programmes; (2) to promote and support sustainable development of coastal resources; (3) to increase public awareness and education on ICZM; (4) to improve data compilation, management and sharing; (5) to facilitate research and training in ICZM; and (6) to provide guidelines towards the adverse impacts on the coastal zone with specific reference to sea level rise.

<sup>a</sup> United Nations Development Programme. 2007. *Human Development Report 2007/2008. Fighting Climate Change: Human Solidarity in a Divided World*. Available at: <<http://hdr.undp.org/en/reports/global/hdr2007-2008>>.

<sup>b</sup> Guyana Environmental Planning Agency. 2000. *Integrated Coastal Zone Management: Action Plan*. Georgetown: Guyana Environmental Planning Agency.

## B. Sector level initiatives

### 1. Water

94. Parties are already initiating national action plans to address the challenges associated with water resource management. In the Comoros, initiatives have focused on improving water quality for the rural poor, including setting up water treatment plants and infrastructure, providing training on water treatment and setting up protection perimeters around water resources. In Mauritania, although there have been initiatives to improve water quality, the emphasis has been on establishing monitoring networks, identifying new water sources and creating new water capture devices (UN-OHRLLS, 2007). In both Jamaica and the Philippines, water is critical for tourism and agriculture. In the Philippines, the focus has been on addressing the capacity of the key water management institutions, whereas in Jamaica it has been on addressing coping mechanisms.

95. These initiatives emphasize the importance of context in planning climate-related risk reduction measures and the need for flexibility in articulating international support for national and sectoral risk reduction initiatives.

### 2. Agriculture

96. The impacts of climate-related hazards have been particularly visible in the agriculture sector. Droughts in Africa have been frequent, and devastating to rural communities. Flooding in South-East Asia is also recurrent. In Latin America drought and floods are posing challenges to rural communities, with substantial disruption to livelihoods.

97. These vulnerable communities have developed a wide range of coping skills for climate-related hazards. Through a regional study, the Food and Agriculture Organization of the United Nations has begun to document these good practices as a first step in helping to improve local preparedness in Caribbean countries that are highly prone to hydro-meteorological hazards. In Jamaica, 19 good

<sup>21</sup> FCCC/AWGLCA/2008/11, paragraphs 30–35.

practices were identified for coping with floods, landslides, drought and forest fires. The practices involved structural and non-structural mitigation measures, and were informed by application of indigenous knowledge (Spence, 2007). The table in annex III outlines the measures taken to deal with drought. It shows the comprehensiveness of this exercise for the drought hazard. Additional analysis was also undertaken for floods, landslides and forest fires.

98. These efforts represent attempts to map ongoing adaptation and DRR integration measures in relation to direct risks they address and the underlying livelihood systems. They suggest that current realities require ongoing adjustments that are not captured in existing DRR or adaptation policy or development action.

99. The studies offer an opportunity to assess the potential of these practices and initiatives for shared learning and possible replication. The studies also suggest that incorporating scientific knowledge into local practices can bring benefits to local communities.

### 3. Tourism

100. The tourism sector is a major source of revenue for many States, including in the Caribbean, South-East Asia, the South Pacific and coastal states of the United States of America. A number of initiatives are emerging to combat the projected damage to coral reefs from coastal flooding and sea level rise, and promote sustainable tourism at the same time (Simpson and Gladin, 2008).

101. An initial inventory of good practices in DRR in the tourism sector in Africa, the Caribbean, Central America, South-East Asia and the United States highlighted a diversity of interventions including eco-engineering, increased development setbacks of coastal settlements, enhanced contingency planning, risk mapping and vulnerability assessment. The good practices were evident at the strategic level (policy – government, line ministries, regional organizations); tactical level (interpretation – destination managers, national representative associations); and operational level (on the ground – business managers, developers, local authorities) (Simpson and Gladin, 2008, p.17).

102. The study results suggest that the ‘no regrets’ approach dominates the adaptation process (the table in annex IV shows an example of this in relation to dealing with hurricanes). This approach is addressing immediate needs in the tourism sector and is linked to DRR.

#### **C. Risk assessment tools for planning**

103. Hazard mapping (see Twigg and Benson, 2007, Guidance Note 2) and vulnerability assessments can maximize the synergy between adaptation and development planning. Global climate change models, when downscaled to the regional level, can provide important inputs into development planning. In particular, the outputs or generated scenarios contribute to structuring the development options for a community. A pilot initiative undertaken in Barbados and Jamaica used the outputs of models to prepare township planning strategies for storm surges. It provided an opportunity for climate change scientists, development planners and disaster management officials to engage collectively in examining the possibilities and threats for future development in these heavily developed coastal urban centres. The key output was a tool kit to replicate the process (see box 5).

### Box 5. Storm surge tool kit for township planning strategies

The “tool kit” is a technical information package based on the findings of a pilot study of storm surge risk in two townships in the Caribbean: Portmore Municipality in Jamaica and St Peter in Barbados. The study, which was commissioned in February 2006 by the Inter-American Development Bank, addresses four thematic areas:

1. Risk assessments through: (a) hazard maps; (b) vulnerability assessments; and (c) risk assessments as a function of hazard and vulnerability, and their validation by review panels.
2. Institutional issues, such as criteria for the analysis of the adequacy of: (a) the legal and organization framework; (b) land-use regulations; and (c) monitoring and forecasting.
3. Awareness-raising and improved preparedness through: (a) communication systems; (b) early warning contingency planning; and (c) shelters.
4. Potential prevention and mitigation measures, such as (a) structural mitigation works; (b) land-use planning and building codes; and (c) cost-effective use of economic incentives.

104. The tool kit is intended to assist town planners, emergency managers, community leaders and risk transfer providers to enhance their adaptation and DRR capabilities. It is expected that this tool kit will make a contribution to the understanding and practice of disaster risk management in the region. A possible weakness of the tool kit is that it does not appear to fully evaluate the role of ecosystems in mitigating the impact of storm surge.

105. Climate and disaster risk assessment are the foundation of decision-making processes to incorporate loss reduction considerations into national and sectoral development planning (see Twigg and Benson, 2007, Guidance Note 9). Risk assessment tools have been developed for diverse purposes and audiences. The International Federation of Red Cross and Red Crescent Societies has developed a Vulnerability and Capacity Assessment (VCA) tool to support community-based risk assessment. This is one of many community risk assessment methodologies.<sup>22</sup> The VCA is being reviewed to incorporate climate change issues. More recently, a multi-agency initiative – the Global Risk Assessment Programme (GRIP) – was launched to assist this development of risk assessment methodologies and their execution, especially in developing countries. GRIP is based in the UNDP Bureau for Crisis Prevention and Recovery.<sup>23</sup>

106. A review of the many climate and disaster risk assessment tools could offer guidance on the appropriate context for their use, the synergies to be explored and capacity requirements to accelerate usage. This is especially needed because capacity-building and vulnerability assessments are a vital part of solutions envisaged for adaptation and DRR. When complemented by information sharing they can offer multiple benefits in terms of data validation, stakeholder engagement and policy advocacy (Moench and Dixit, 2007, p.161).

107. Climate risk assessment in the computation of probable maximum loss is a central component of risk transfer mechanisms. The Caribbean Catastrophe Risk Insurance Facility (CCRIF) is such a mechanism. The elaboration of risk transfer mechanisms requires the effective integration of climate risk and disaster risk assessments.

108. Climate risk assessment in DRR is especially noticeable in early warning systems. The reassessment of flood-prone areas, or critical infrastructure protection, especially in coastal areas

<sup>22</sup> See the Community Risk Assessment Toolkit of the ProVention Consortium for the most comprehensive coverage. Available at <<http://www.proventionconsortium.org/?pageid=39>>.

<sup>23</sup> See <[www.gri-p.net](http://www.gri-p.net)>.

and flood plains, provides an ideal environment for DRR and adaptation cooperation. Similarly, a pilot project for the collaboration of hydrological and meteorological scientists, disaster management officials and local community members in establishing early flood-warning systems in Barbados, Saint Vincent and the Grenadines, and Trinidad and Tobago, demonstrates the benefits to vulnerable communities of exploring the synergies between adaptation and DRR (CDERA, 2005).

109. Climate risk assessments are also being used to study the adequacy of response planning systems in the wake of potential increases in the frequency and magnitude of climate-related hazards, as well as changes in their spatial distribution (Moench and Dixit, 2007; Orindi and Eriksen, 2005; World Bank, 2008).

110. Support provided by multilateral financial institutions and bilateral development partners in financing and leading these integration efforts is also important. The World Bank, Inter-American Development Bank, ADB and Caribbean Development Bank have each established facilities and programmes that support adaptation and DRR cooperation, and their integration into poverty reduction and other development initiatives. Similarly the Department for International Development of the United Kingdom of Great Britain and Northern Ireland, the Canadian International Development Agency, the Japan International Cooperation Agency, the European Commission and others are providing support for comprehensive approaches to adaptation and DRR, and to their integration into regional and national programmes.

111. It is recognized that the scale and time frames of adaptation and DRR integration differ worldwide. The World Bank (2008) has documented more than 45 initiatives in cities in East Asia, Europe and the United States that deal with strategic frameworks, local planning, and health and water sectors, in time frames ranging from less than a year to over three years.

#### **D. Concluding observations**

112. At a practical level, there is evidence of adaptation and DRR integration within policy. This is being driven by the higher order goals of sustainable development and climate resilience at the national and regional levels and by immediate needs at the local and sectoral levels, largely reflected in national frameworks and strategies. These frameworks support integration by relating specific courses of action to the potential roles of stakeholders in reducing risks and supporting adaptation directly through organizational strengthening, hazard-resilient structures, ecosystem protection and restoration, and risk transfer.

113. An assessment of the depth, effectiveness and practicability of these integration efforts at all levels is required, and should be undertaken in close collaboration with Parties and those organizations that have been engaged in climate-related risk management, potentially within the context of Nairobi work programme. This is essential if the benefits and lessons of hazard-specific activities and projects are to be sustained.

114. Strategic policy and programming frameworks within global action plans appear to be drivers for the integration of adaptation and DRR at the national and regional levels. There are examples of integration in national sectoral programming that have been funded by resource commitments through the development assistance community. There will be a need for more resources to sustain this process, especially in SIDS and LDCs.

115. The downscaling of climate change models is allowing for the development of regional standards and building codes (see Twigg and Benson, 2007, Guidance Note 12). Similarly, there is an opportunity to view existing and emerging assessment tools as potential instruments of standardization across regions and projects in the adaptation and DRR integration process.

116. Environmental impact assessments now take into account natural hazard adaptation considerations, placing people and environment increasingly centre stage.

## **VI. Challenges and opportunities in managing the integration process**

117. This chapter highlights the major challenges of integrating climate risk assessment and management and DRR into national policies and programmes, taking into consideration the additional burden of climate change. Specific examples of good practice most pertinent to climate risk assessment and management, and relevant adaptation action to climate change are included.

118. There are many obstacles that hinder application of the ideas of adaptation and DRR mentioned in chapter IV above in all countries. Even when adaptation and DRR are considered as imperative by States, other challenges can hinder progress, such as a lack of funding. Therefore, despite the cases mentioned in the previous chapter, there are still relatively few examples of successful integration of climate change risk into development planning (IPCC, 2007, p.732). The effectiveness of an integration process will depend on the unique characteristics of a country, making it harder to develop experience-based step-by-step guidance for wider use.

119. This chapter responds to some of the important questions raised by Parties,<sup>24</sup> including:

- What are the effective ways to enhance coordination and integration across sectors and between different levels of governance? How are institutional barriers cleared?
- How can local adaptation initiatives be integrated into, and supported by, national and sectoral planning? What are the mechanisms that can increase knowledge flow from the bottom up?

### **A. Budgetary support**

120. Many countries, particularly in Africa, have highlighted a lack of resources as a key barrier to implementing the Hyogo Framework for Action priority areas, in particular in ensuring that DRR is a national and local priority with a strong institutional basis for implementation (United Nations, 2007, p. 46). Concerns have also been expressed over funding levels for adaptation, in light of the added burden of responding to climate change impacts.<sup>25</sup> Several estimates of the costs of adaptation have been made (e.g. by the UNFCCC secretariat, the Stern Review, the World Bank, the Organisation for Economic Co-operation and Development, Oxfam and UNDP). The Stern Review presents the lowest estimate of USD 4 billion per year, and the highest estimate of USD 86–109 billion per year is made by UNDP. All these analyses demonstrate that the costs of adaptation are significant, and additional to the already insufficient resources for development.

121. Concerns over financial barriers to adaptation and DRR relate both to the insufficiency of funds and to the nature of the funds available, which are often referred to as inappropriate for the kind of cross-sectoral, multilevel and flexible approach needed.<sup>26</sup> While political momentum may exist to create new institutional systems and legislation for reducing risks, a lack of dedicated resources from national budgets (and of trained personnel to implement plans) may inhibit the operation of such systems (United Nations, 2007, p.ix). In the case of South Africa, for example, it was found that integrating climate risk into development planning and approval processes by incorporating guidelines into existing legislation was time-consuming and costly.<sup>27</sup>

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<sup>24</sup> FCCC/SBSTA/2007/9, paragraph 66.

<sup>25</sup> FCCC/AWGLCA/2008/11, paragraph 33.

<sup>26</sup> FCCC/SBSTA/2007/9, paragraph 64.

<sup>27</sup> FCCC/SBSTA/2007/9, paragraph 18.

122. However, regardless of whether new or existing systems are the preferred basis of reform, given the additionality of climate change, new resources are needed to support the integration of adaptation into national policies and programmes. This should move in parallel with the provision of sufficient and predictable resources for implementation of adaptation.

123. A pragmatic approach that recognizes the urgent needs for accelerated action on adaptation suggests that:

“Current international resources for adaptation should be used to leverage maximum adaptation results within existing development activities and investments. This means identifying, in particular, DRR, poverty reduction and natural resource management programmes which could most easily, and economically, be adapted to address climate change vulnerability. It is therefore also vital that in addition to using adaptation funds and frameworks, climate change adaptation also be integrated into poverty reduction strategies and other development programmes to leverage greater finance.”  
(Tearfund, 2006, p.22)

124. Finally, to support the argument for greater investment in adaptation, research institutes and economic organizations should increase their efforts to develop and apply methods for assessing the costs and benefits of climate adaptation options and the costs of inaction in all sectors. This assessment should include non-monetary costs associated with impacts on ecosystem services and indigenous cultures (FCCC/SBSTA/2007/7, para. 77 (c); ProAct Network, 2008).

## **B. Institutional capacity**

125. Countries contributing to the United Nations *Disaster Risk Reduction Global Review* (United Nations, 2007)<sup>28</sup> claim that inadequate institutional arrangements remain the single largest challenge for risk reduction. Existing arrangements were noted to have different degrees of effectiveness, depending on their positioning within the national government, their degree of decentralization and multisectoral participation, the level of political support and their share of national budgets. A major effort is therefore required to design, test, promote and support institutional arrangements that are integrated into national development planning and public investment. Any such initiatives should address risks associated with climate change.

126. Some progress has been made in developing adequate institutional arrangements. For example, China, the Islamic Republic of Iran, Japan, New Zealand and Switzerland have absorbed former ad hoc national committees into established governmental institutions so as to ensure closer association with national planning processes, and therefore more sustained attention to risk reduction.<sup>29</sup> The effect of this is that the measures are contributing, along with emergency preparedness, to a significant and continued reduction of climate-related mortality risk in a large number of countries (United Nations, 2007, p.71).

127. However, any complacency over progress in developing institutional capacity for climate-related risk reduction (particularly by establishing national institutional frameworks) is premature in the light of additional climate change impacts. The protection of lives through appropriate institutional systems in support of effective disaster preparedness is not sufficient. Comprehensive risk management is required to tackle vulnerability and its causes and bring about sustained improvements to people's lives and the resilience of States.

128. For instance, the existence of a national disaster organization in a capital city could be considered progress in nations where disaster risk related organizations and legislation were previously

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<sup>28</sup> While important, this report is not indicative of the current status of DRR globally, as less than one quarter of countries have submitted findings to it.

<sup>29</sup> United Nations document A/CONF.206/L.1.

weak or absent, for example in LDCs, but this appears to have little impact on risk accumulation processes in remote provinces or districts (O'Brien et al., 2006, p.73). Persistence is required in order to overcome the significant challenges of scale in applying national plans and policies: the uptake of environmental impact assessment is a good example of this. However, despite the difficulties, a large number of countries are striving to develop institutional structures and strategies at the local level also. In general, these strategies seem to work well in countries with significant levels of decentralization (United Nations, 2007, p.40).

129. Another institutional barrier to effective climate-related risk reduction is that professionals in the health, agriculture, urban planning, disaster management and local governance sectors are not necessarily aware of, or engaged in, national adaptation planning (Helmer et al., 2008). In many cases, they are often not part of higher-level decision-making processes. In fact, governmental compartmentalization has been identified as a significant constraint on integration of adaptation (Agrawala and van Aalst, 2005). Low staff capacity is also a concern in many developing countries (UNFCCC, 2007, p.44). This lack of capacity makes it difficult to demonstrate that climate change considerations are important to development processes, and therefore they do not attract a budgetary allocation (Tearfund, 2006, p.13). Another concern is the problem of retaining highly skilled staff in competition with other job markets, especially in developing countries.<sup>30</sup>

130. Besides capacity and budget constraints, one of the greatest challenges at the national level is achieving coordination among different levels of government, across sectors, and with academia and relevant organizations; another is a lack of mechanisms for sustained interaction among a wide range of stakeholders.<sup>31</sup> In this regard, environmental and sectoral institutions need to be strengthened in order to deal with the complexities of implementing adaptation action (UNFCCC, 2007, p.44). Policy and development planners require effective tools and frameworks for developing, disseminating and building capacity for adaptation and integrating it into policy at all levels.

131. For example, the Climate Change Adaptation Programme for the Pacific, funded by ADB, led to the production of a set of guidelines on mainstreaming adaptation focusing on its integration to DRR strategies (ADB, 2005). These guidelines aim to assist governments and other relevant stakeholders to implement policies, plans, and operational procedures that result in adaptation to climate variability and change becoming an integral and sustainable part of national, state and local development planning, decision-making and operations. The innovative methodologies and tools, as well as the findings, are considered by ADB to be applicable to all SIDS, and even to larger developing and developed countries. The guidelines approved for Cook Islands and the Federated States of Micronesia are listed in box 6.

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<sup>30</sup> FCCC/SBSTA/2007/9, paragraph 64.

<sup>31</sup> FCCC/SBSTA/2007/9, paragraph 18.

**Box 6. The Climate Change Adaptation Program for the Pacific: guidelines on mainstreaming adaptation**

*Guidelines relating to ideas underpinning the mainstreaming of adaptation*

1. Manage climate risks as an integral part of sustainable development;
2. Ensure intergenerational equity with regard to climate risks. Any climate-related risks that present generations may find unacceptable must not be imposed onto future generations;
3. Adopt a coordinated, integrated, and long-term approach to adaptation;
4. Achieve the full potential of partnerships;
5. Adaptation should exploit the potential of sustainable technologies;
6. Base decisions on credible, comparable, and objective information;
7. Maximize the use of existing information and management systems;
8. Strengthen and utilize in-country expertise;
9. Strengthen and maximize use of existing regulations, codes, and tools.

*Guidelines relating to enhancing the enabling environment for adaptation*

10. 'Climate proof' relevant legislation and regulations;
11. Strengthen institutions to support the 'climate proofing' of development;
12. Ensure that macroeconomic policies and conditions favour 'climate proofing';
13. Ensure favourable access to affordable financing of climate-proofed development initiatives.

*Guidelines relating to the process of mainstreaming adaptation*

14. Characterize climate-related risks that require sustained attention;
15. Replicate the knowledge, motivation, and skills that facilitate successful adaptation;
16. Enhance the capacity for continuous adaptation;
17. Ensure that 'climate proofing' activities complement other development initiatives;
18. Initiate a process of continual improvement in adaptation outcomes.

*Source:* Asian Development Bank. 2005. *Climate Proofing: A Risk-based Approach to Adaptation*. Philippines: Asian Development Bank Pacific Studies Series. Available at: <<http://www.adb.org/Documents/Reports/Climate-Proofing/climate-proofing.pdf>>.

132. Lack of cooperation among ministries hinders significantly the coordination needed for effective integration of adaptation and DRR into policy and programming. In order to make real progress, key governmental departments (such as ministries of planning and finance) need to be involved in the development of adaptation strategies (UNFCCC, 2007, p.44). Box 7 gives a positive example of an initiative where the need for coordination and cooperation was fundamental.



### Box 7. Coordination across ministries in the Andean region

“While many examples are concentrated in single ministries or within a few sectors, countries involved in the Andean Development Corporation have adopted a wider approach. By working through the Andean Regional Programme for Risk Prevention and Reduction formed after the El Niño event of 1997–1998, several sectoral approaches to vulnerability and disaster risk reduction have been coordinated across various ministries, with common purpose expressed throughout the participating countries. This Andean experience is one of several that demonstrate the many skills, abilities and techniques available and widely practiced that can reduce people’s exposure to disaster risks. Further efforts to consolidate and share technologies and apply existing institutional abilities or resources, especially with developing countries and those in special circumstances, need to be encouraged and supported.”

Source: United Nations document A/CONF.206/L.1.

### C. Political support for integration

133. It is said that progress in DRR and adaptation depends on the political commitment of governments (United Nations, 2007, p.36). However, while many countries have incorporated the language of mainstreaming risk reduction concerns into development policies and national frameworks,<sup>32</sup> few national reports submitted for the *Disaster Risk Reduction Global Review* in 2007 contain evidence of risk reduction approaches being integrated into institutional practices at national and local levels (United Nations, 2007, p.36). A culture of prevention may have been initiated but it has not yet become established and so integration across levels and sectors may not be happening. This is not a new problem. Ensuring political buy-in in support of adaptation and DRR has been identified as a recurrent challenge.<sup>33</sup>

134. With political support, other challenges, such as the need for budgetary support and institutional capacity, could be more easily overcome. There are a number of reasons why the political commitment to reduce risk often falls short of requirements, resulting in disaster impacts, increased vulnerability to climate change and variability, and ultimately, further disasters and other negative outcomes. The influence of globalization, market competitiveness and the problems associated with rapid urbanization, poverty and other social challenges all test the political will to act now to create resilient communities and nations. This accounts for much of the historical emphasis upon technological and engineered forms of risk reduction, despite their tendency to be expensive, sometimes prone to catastrophic failure and lacking in co-benefits (when compared with some environmental management solutions, for example) (ProAct Network, 2008).

135. Progress made on adaptation and DRR by Bangladesh is commonly cited as a good example, not least because of the country’s experience of climate-related disasters. These experiences and the predictions of increasing pressures have driven the Government to establish an inter-ministerial committee on climate change. This seeks to integrate climate change into policy documents. The Minister for Environment and Forests heads the committee (with representation from relevant Government ministries and departments as well as key non-governmental organizations and research institutions). It is conceivable that in countries with less direct links with climate change impacts and established strategies for dealing with disaster risk, the lack of official representation by the Prime Minister’s Office or the Finance and Planning Ministries could be a major constraint to mainstreaming

<sup>32</sup> More detailed analysis of the Global Review reporting indicates that often the development of institutional systems for DRR is still primarily focused on saving lives and reducing mortality risk (United Nations, 2007, p.40).

<sup>33</sup> FCCC/SBSTA/2007/9, paragraph 18.

adaptation (Huq et al., 2003). This is because, if external to such a committee, the highest level decision-makers may view climate change as less of a national priority and more of an environmental issue or an 'add-on'.<sup>34</sup>

136. The capacity to engage and sustain political support for DRR over the medium to long term is another challenge. Political commitment to DRR in most countries seems to be cyclical, and driven by the occurrence of large-scale disasters that require a political response (United Nations, 2007, p.47). However, when a major climate-related disaster acts as a catalyst for enhanced risk reduction, this is only sustained in the long term when underpinned by political, social and economic stability within the context of good governance. Many countries have gone through time-consuming processes to create or update legislation, policies and plans, sometimes with the active support and participation of highly positioned political figures. But often, implementing such laws and plans is still an ongoing task in many countries, as they may be affected by decreasing political support and, in some cases, interrupted by conflict and political instability. The sustainability of political support for risk reduction is thus hindered by divergent outlooks between planning for long-term impacts of climate change and planning and policymaking for the short to medium term.<sup>35</sup> Where climate change is not mainstreamed into national development planning there is a high risk of maladaptive policies that increase vulnerability. These practices may favour short-term 'solutions', such as rebuilding with insurance and aid in exposed locations. Instead, a 'no regrets' approach is required that combines the need to address existing concerns with reducing risk in the long term.

137. Improving the level of political buy-in over the long term can be encouraged through a 'no regrets' strategy that manages climate variability. In their submissions on adaptation planning and practices, Parties frequently recommend the early engagement of stakeholders,<sup>36</sup> preferably during the diagnosis stage. For example, the process of preparing NAPAs<sup>37</sup> by bringing together community, national and international stakeholders to develop adaptation programmes and policies has been seen to raise awareness among national policymakers of the urgent need to address adaptation.

138. Another method to enhance the sustainability of high-level political support is to improve the interface between climate data and issues pertaining to a nation's sustainable development priorities.<sup>38</sup> In this regard, more progress is needed, in both spatial and temporal terms, to integrate hazard exposure and vulnerability information in order to generate risk information that is accessible to planners and decision makers (United Nations, 2007, p.76). Regional scenarios used in climate change models need to match the scale of socio-economic scenarios, for example, and the different timescales needed depending on the climate-related problem.<sup>39</sup> An example of a positive experience is the process of compiling Local Climate Impacts Profiles under the United Kingdom Climate Impacts Programme, which was found to be very useful in creating awareness among council officers and politicians of the kind of work they might face when responding to severe weather events.<sup>40</sup> The submissions by Parties also highlight the importance of calculating the social and financial cost of inaction when assessing the need for change.<sup>41</sup>

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<sup>34</sup> FCCC/SBSTA/2007/9, paragraph 62.

<sup>35</sup> FCCC/SBSTA/2007/9, paragraph 63.

<sup>36</sup> FCCC/SBSTA/2007/9, paragraph 62.

<sup>37</sup> As at November 2008, 38 NAPAs had been submitted to the secretariat.

<sup>38</sup> Agrawala and van Aalst (2005) identified the relevance of climate information for development-related decisions and uncertainty of climate information as major constraints regarding the integration of adaptation.

<sup>39</sup> FCCC/SBSTA/2007/9, paragraph 63.

<sup>40</sup> FCCC/SBSTA/2007/9, paragraph 23.

<sup>41</sup> FCCC/SBSTA/2007/9, paragraph 19.

## VII. Options for special support mechanisms for developing countries

139. Developing countries, especially LDCs and SIDS, are among the most vulnerable to climate change, and will need significant assistance if they are to adapt effectively. The prognosis suggests that the already significant development challenges of particularly vulnerable countries will be considerably exacerbated by “shocks and crisis agents” triggered or compounded by climate change (Humanitarian Futures Programme, 2007). There is also a general recognition that these countries need assistance in pursuit of their general development goals and in managing their current hazard risks.

140. Discussions of the AWG-LCA on enhanced action on adaptation have so far converged on a framework to support, facilitate and implement adaptation in four possible areas of focus (national planning for adaptation, streamlining and scaling up financial and technological support, enhancing knowledge sharing and institutional frameworks for adaptation).<sup>42</sup> National planning for adaptation in particular presents an opportunity for integration at many levels (as discussed in chapter VI above).

141. The constraints on effective adaptation in developing countries, especially SIDS and LDCs, have been well articulated.<sup>43</sup> These include technical issues, such as inadequate climate data and limitations in technology to monitor climate and downscale General Circulation Models, as well as barriers to an effective enabling environment for adaptation, such as inadequate capacity for managing climate-related disasters, limited or inadequate financial resources and an absence of sustained political support. Designing win-win solutions that build long-term capacity for adaptation recognizes the impacts of climate-related hazards that are already affecting vulnerable countries.

### A. Scaling up support for integration

142. Many developing countries lack sufficient financial resources for generating data, building capacity, accessing technology and sharing experiences. Building up capacity in these areas is a fundamental part of sustainable development and the integration of adaptation and DRR. The following measures are proposed for supporting this process of capacity enhancement, grouped under the two themes of financing and knowledge sharing.

#### *Establishing, streamlining and scaling up financial support for adaptation*

143. Financial barriers to adaptation and DRR relate both to the insufficiency of funds and to the nature of the funds available (see chapter VI above). The following measures may address this:

- (a) Create a database of existing funding facilities for financing adaptation, with information on conditions of access, to be shared with developing countries. This is critical for building platforms for DRR and adaptation action and integration;
- (b) Strengthen training programmes in writing proposals for accessing these facilities;
- (c) Expand or create new financial facilities for adaptation and simplify the procedures for accessing them;
- (d) Explore the level of support among the private sector for the establishment of special funds for responding to climate-related hazards;

<sup>42</sup> FCCC/AWGLCA/2008/11, paragraph 29.

<sup>43</sup> See, for example, document FCCC/SBI/2007/11, paragraphs 8–9.

- (e) Explore possibilities for establishing and refining risk transfer mechanisms, such as the CCRIF in SIDS, and expand the number of climate-related hazards covered by such facilities;
- (f) Devise processes for harmonizing different sources of donor support and channelling it towards priority elements of national adaptation and DRR programmes, or priority integration activities, in order to enhance the effectiveness of aid;
- (g) Promote means to incentivize the implementation of adaptation actions on the basis of sustainable development policies, including through innovative means of funding to assist developing country Parties that are particularly vulnerable to the adverse impacts of climate change in meeting the cost of adaptation.

*Enhancing knowledge sharing at national, regional and international levels*

144. Integration of adaptation and DRR into national policies and programmes calls for interventions driven by consultative, participatory, interdisciplinary and multidisciplinary dialogues. These interactions are central to the creation of the appropriate environment for accelerated uptake by vulnerable countries. Therefore the following measures may be considered:

- (a) Facilitate the establishment of regional centres of excellence dedicated to demonstrating adaptation and DRR integration in developing countries. Such centres of excellence could foster inter- and intra-regional exchange of, for example, lessons learned, good practice and reliable monitoring and evaluation systems;
- (b) Support research in traditional coping mechanisms and knowledge, with the aim of documenting, sharing and applying this information as part of integrating adaptation and DRR into development policies and programmes. This could be achieved through South–South and/or North–South technology development, and partnerships among academic and research institutions;
- (c) Assist developing countries in improving their baseline data on the effects of climate change and in developing and implementing strategies for reducing climate-related risks;
- (d) Foster political dialogue and common understanding, in particular among SIDS and LDCs, in order to facilitate the use of information and communications technology to develop trans-boundary mechanisms for collecting and disseminating reliable data on the history, distribution, impacts and lessons learned of climate-related hazards;
- (e) Develop harmonized adaptation and DRR awareness-raising strategies for a diverse target audience.

**B. Tools and systems for management of adaptation and disaster risk reduction**

145. To respond more effectively to the technological, human resource and financial challenges faced by vulnerable countries in adaptation, substantial investment in developing and deploying model tools is needed. This section presents measures that could be taken to support the development of tools and processes.

146. The measures could include:

- (a) Secure resources for promoting forecasting techniques, climate modelling and agro-meteorological modelling. A key area of focus could be the improvement of early warning systems for floods and droughts, with emphasis on community-based systems;

- (b) Develop pilot model processes for the formulation of national sustainable development programmes that incorporate adaptation and DRR considerations, as well as processes for facilitating implementation of these programmes. These could be focused at the subregional level and seek to enhance countries' capacity to develop (and execute) national strategic risk management frameworks and programmes;
- (c) Promote analysis of national communications, NAPAs and various existing DRR reports for coherence, convergence and the identification of areas where the synergy between adaptation and DRR can be strengthened. This can contribute to finding areas where adaptation and DRR are complementary in order to minimize the demands on the limited technical capacity of vulnerable countries;
- (d) Revise standards, guidelines and protocols that guide the implementation of national development policies and programmes in the light of climate variability and climate change assessments.

147. Actions by Parties to integrate adaptation and DRR into national development strategies, such as poverty reduction strategies, country assistance strategies, United Nations Development Assistance Frameworks and NAPAs, can be further facilitated through the following measures:

- (a) Promote assessment by the development community of the existing climate risk assessment and vulnerability assessment tools, in order to provide guidance on their strengths and weaknesses, the appropriate scale and scope of application, and the potential for increasing synergy between adaptation and DRR;
- (b) Develop model tool kits and guidelines through South–South cooperation and North–South partnerships to assist countries in efforts to consider adaptation and DRR together as well as to integrate them into planning at the national and sectoral levels;
- (c) Review by the development assistance community of its programme support and delivery mechanisms for adaptation, to assess the effectiveness of these mechanisms in promoting integration. The aim would be to align the commitment and expansion of resources by the development community with the changing priorities of vulnerable countries.

### **VIII. Final remarks**

148. This paper has reinforced the view that climate variability and change is a reality that should be addressed by integrating adaptation into development policy, planning and practice. Furthermore, because climate change is expected to increase the severity of most climate-related natural hazards and to worsen vulnerability to climate-related disasters through its impacts on ecosystems, livelihoods and health, DRR has been recognized as one of the core components of adaptation.

149. Disasters already cause huge loss of life and economic cost. In an attempt to improve the resilience of nations and communities, a paradigm shift has occurred, from reactive disaster management to proactive DRR. The experience in DRR provides important input into the process of adaptation to climate change.

150. However, although there have been successes, notably improved disaster preparedness and early warning systems, coping with exacerbated climate-related risks will require substantial, streamlined funding. In addition, measures are needed that go beyond treating the symptoms of risks to addressing their causes. The propensity of certain groups to suffer most acutely from climate-related risks needs further attention, and the realities that they face at the local level should form the basis of a vulnerability

reduction strategy. This is particularly important for the most vulnerable, who are often the poorest groups in society.

151. Hazard and vulnerability assessments for informing medium- to long-term development planning are beginning to incorporate the inputs of climate risk assessments. These are being used to shape disaster response requirements, retrofitting and relocation considerations. Through this process, people and the environment are increasingly taking centre stage.

152. A large part of the work on adaptation needs to address existing vulnerabilities to current climate events. This provides the opportunity for a 'no regrets' approach to adaptation by embracing links with DRR: such collaboration provides immediate benefits for vulnerable States and communities, while building their capacity to cope with the extremes and uncertainty associated with climate variability and change.

153. When harnessed to the common agenda of sustainable development, adaptation and DRR can generate important synergies that can be channelled towards resilience. However, integrating both adaptation and DRR within national development policies and programmes faces many challenges. This paper discusses specific challenges and some generic guiding 'ideas' that are likely to facilitate effective implementation, which in themselves appear to indicate what a supportive enabling environment would look like.

154. One important reason why more action to reduce the negative effects of climate-related events has not yet taken a firm hold in development policy in the majority of States and vulnerable locations lies in deeply rooted perspectives that affect the prioritization process of decision-makers. Development policy decisions need to take account of input from sources at the local level, particularly from the groups most at risk. More progress in joining top-down and bottom-up methodologies for risk assessment and implementation of action plans is highly desirable. This calls for an appreciation for diversity in knowledge sources (including indigenous knowledge) and promotes interdisciplinary and multidisciplinary dialogue.

155. Other challenges to wider integration of adaptation and DRR arise from a lack of clarity and understanding across sectors and at different levels regarding what needs to be done, and how this is to be accomplished. As noted in this document, the technical, human resource, institutional capacity and financial constraints on DRR and especially on adaptation are also significant. However, although there may be a need for greater clarity, there is already a global sense of the needs that exist and the urgency that is required in adapting to climate change and dealing with current climate risks.

156. There is evidence that Parties are beginning efforts to integrate adaptation and DRR into national strategic planning, sectoral planning and sustainable livelihood initiatives. New and improved metrics for measuring progress in adaptation and DRR integration would be helpful.

157. Further measures at the national level to increase collaboration and integration may include:

- (a) Establishment and strengthening of inter-ministerial committees to ensure intersectoral, multi-stakeholder coordination;
- (b) Inclusion of DRR policymakers and experts in national climate change adaptation policy teams and/or climate change committees;
- (c) Inclusion of adaptation policymakers and practitioners on national platforms for DRR, and formal linking of these platforms with national climate change teams;
- (d) Support for measures that increase the flow of knowledge, especially from the community level.

158. Measures to increase collaboration and integration at the international level may include:
- (a) Special support measures for LDCs and SIDS, as detailed in chapter VII above;
  - (b) Efforts by research institutes and economic organizations to develop and apply methods for assessing the costs and benefits of climate adaptation options and the costs of inaction in all sectors. These could include non-monetary costs associated with impacts on ecosystem services and indigenous cultures;
  - (c) Review of climate and disaster risk assessment tools, in order to provide guidance on the appropriate context that the tools should be used in, possible synergies and the level of capacity required to accelerate their use.
159. This technical paper presents some specific suggestions for integrating adaptation and DRR practices, tools and systems into national policies and programmes in support of attaining resilience in the face of climate-related risks. The suggestions presented could provide inputs into:
- (a) The technical workshop on integrating practices, tools and systems for climate risk assessment and management and disaster risk reduction strategies into national policies and programmes, which was mandated by the SBSTA to be held before its thirtieth session as part of the Nairobi work programme,<sup>44</sup> as well as further work conducted under the Nairobi work programme on its focus area of adaptation planning and practice;
  - (b) The in-session workshop on risk management and risk reduction strategies, including risk sharing and transfer mechanisms, to be held at the fourth session of the AWG-LCA,<sup>45</sup> as well as negotiations on the element in the Bali Action Plan on enhanced action on adaptation;
  - (c) The work by Parties and organizations on integrating practices, tools and systems for climate risk assessment and management and strategies for disaster risk reduction into national policies and programmes at national and international level.

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<sup>44</sup> FCCC/SBSTA/2008/6, paragraph 57.

<sup>45</sup> FCCC/AWGLCA/2008/3, annex I.

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Annex II**Speech by Secretary-General BAN Ki-moon on  
risk reduction and climate change, United Nations Headquarters,  
29 September 2008****Remarks to the Ministerial Meeting on Reducing Disaster Risks in a Changing Climate<sup>1</sup>**

Ministers, Excellencies, distinguished delegates, ladies and gentlemen,

I am pleased to welcome all of you to this meeting.

Climate change is the defining issue of our era. Natural hazards are a perennial concern. This discussion brings the two issues together, and with good reason: Better disaster risk reduction will also help us adapt to climate change.

Almost every day brings reports of serious damage and loss of life during a storm, flood, drought or other natural hazard. In the last few weeks alone, we have seen massive flooding in northern India and extensive damage from tropical storms Gustav, Hanna and Ike in the Gulf of Mexico. Millions of people have been affected.

Climate change will make matters worse. Without concerted action, we could see natural catastrophes on an unprecedented scale, which could even become threats to international security and inter-state relations.

But such dire scenarios need not come to pass. Prudent policies and well-informed community action can save lives and avert damage.

For example, death rates from floods and droughts plummeted worldwide in the 20th century as a result of improved systems for river management, early warning and evacuation, and food security.

Wise land-use planning and the enforcement of sound building codes have also reduced impacts and costs. These are practical and cost-effective everyday solutions.

Unfortunately, no matter how much we do in the next few years to control greenhouse gas emissions -- and we must do a lot -- the global climate will continue to change.

More extreme weather is in store: more heat waves, droughts and water shortages; more intense rainfalls, flooding and landslides.

Such changes have started already. The frequency of disasters caused by floods and storms has risen steadily in recent years. The average annual price tag -- more than 80 billion dollars -- makes this the largest source of disaster costs. It is more urgent than ever to step up our preparations.

The good news is that a natural hazard does not automatically have to lead to a disaster. Countries such as Bangladesh, Cuba, Jamaica, Madagascar and the Philippines have shown that good building designs, proper land-use planning, public education, community preparedness and effective early warning systems can reduce the impact of severe weather events.

Indeed, a large body of successful experience in reducing disaster risks offers important tools and lessons for our efforts to adapt to climate change.

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<sup>1</sup> <[http://www.un.org/apps/news/infocus/sgspeeches/search\\_full.asp?statID=340](http://www.un.org/apps/news/infocus/sgspeeches/search_full.asp?statID=340)>.

Risk reduction not only saves lives, it is also less expensive than responding to a disaster. Estimates suggest that incorporating comprehensive disaster protection into new health facilities and schools would add only 4 percent to their cost.

A number of countries have reduced the impact of disasters by investing in measures such as flood control, hurricane-proof building design, and protection of coastal ecosystems, including mangroves and coral reefs. I hope to hear more about such experiences from you today.

Almost four years have passed since the adoption of the Hyogo Framework for Action. Many states have made good progress in integrating risk reduction into national development plans and poverty reduction strategies.

UN agencies have sought to ensure that their efforts are in line with the Hyogo Framework. Still, the world is not yet on track to achieve the Framework's desired outcome of a substantial reduction of losses by 2015. A major scaling up of efforts and resources is needed.

I am heartened that the Bali Action Plan of the Framework Convention on Climate Change includes specific language on disaster risk reduction. The subject will be the focus of a workshop at the climate change meeting in Poznan in December.

I call on you to lead the way in championing disaster risk reduction as a core element of climate change adaptation. I also urge you to implement the policies and practices of disaster risk reduction as a first line defence in adapting to climate change. These are important investments in the protection of your people.

I assure you of my strong commitment to this effort, and I look forward to working with you in response to this quintessential global challenge.

Thank you very much.

Annex III

**Local coping capacity in disaster risk reduction for drought in Jamaica**

<b>Good practice</b>	<b>Farming system</b>	<b>Contribution to disaster risk reduction</b>	<b>Improvements</b>	<b>Benefits</b>	<b>Sustainability</b>	<b>Land management</b>	<b>Implementation needs</b>	<b>Institutional needs</b>
Grass mulching	All	Soil conservation, pest management, windbreaks	Plastic mulch, drip irrigation	Increased production, consistent production, increased output	Easily replicated in all agriculture export zones (AEZ)	Soil nutrient conservation, improve soil structure, reduce reliance on agrochemicals, weed control, improved water quality	Grass mulch technology transfer, drip irrigation subsidy	Expansion of Rural Agricultural Development Authority (RADA) capacity to deliver extension service
Drip irrigation	All	Reduced crop loss from drought	Grass mulch, rainwater harvesting	Year-round production, increased yield, improved crop quality	Easily replicated in flatland AEZ	Water conservation	Drip irrigation subsidy, subsidy for water storage facilities for harvesting rainwater	Expansion of RADA capacity to deliver extension service
Firebreaks	Sugar cane monoculture, dry-land farming using grass mulch	Reduce spread of bush fires	Training, provision of fire-resistant seedlings for firebreak	Reduce crop loss from bush fires	Replicable in all AEZ vulnerable to bush fires	Reduce destruction of vegetation by fires	Education/training	Community-level fire hazard reduction planning
Rainwater harvesting and storage	Small-scale mixed farming	Drought impact reduction	Larger capacity household water tanks, community water catchments	Year-round production, increased yield, improved crop quality	Replicable in most AEZ	No information	Subsidy for building water storage/catchment facilities	No information

**Table** (continued)

<b>Good practice</b>	<b>Farming system</b>	<b>Contribution to DRR</b>	<b>Improvements</b>	<b>Benefits</b>	<b>Sustainability</b>	<b>Land management</b>	<b>Implementation needs</b>	<b>Institutional needs</b>
Aquifer recharge	Large-scale monoculture, mixed cropping	Drought, flood and saline intrusion mitigation	No information	Sustained water supply, prevention of well collapse	Replicable in most flatland environments with medium to near-surface aquifer	Maintain water quality, prevent saline accumulation in soils, prevent degradation of soil quality	No information	No information
Timing of crop establishment	Mixed cropping especially of annuals	Drought impact reduction	Integration of other good practices such as grass mulching and drip irrigation	Reduced crop loss from drought and bush fires	Replicable in all rain-fed environments especially for annuals	Maximization of soil moisture resource	Technological transfer of grass mulching, drip irrigation	Expanded extension service
Seasonal breeding (livestock)	Beef/ dairy production	Drought impact reduction	No information	Synchronization between nutritional requirements of livestock and feed availability	Replicable in large-scale livestock rearing AEZ	No information	No information	No information
Planting of drought-tolerant crops	Mixed cropping	Drought impact reduction	No information	Crop loss reduction from drought	Replicable in all moisture deficit AEZ	Maximization of soil moisture resource	No information	Extension/ training

Source: Spence B. 2007. *Good Practices for Hazard Risk Management in Agriculture*. (Summary Report Jamaica, Project Phase I). Available at: <<ftp://ftp.fao.org/docrep/fao/010/ai147e/ai147e00.pdf>>. p.64.

Annex IV

**Examples of good practices in dealing with hurricanes**

<b>Specific good practice</b>	<b>Location</b>	<b>Summary of good practice</b>	<b>Benefits</b>	<b>Drawbacks</b>
Enhanced building code	Cayman Islands	Construction standards were increased to ensure new buildings are designed to withstand hurricanes and associated winds	More resistant buildings, reduction in hazard exposure	Older buildings are excluded
Changes in development and planning regulations	Cayman Islands	Coastal setback for waterfront properties was changed from low-water mark to the high-water mark island-wide, in the hotel/tourism zone setback was increased from 100 feet to 130 feet	Reduction in storm surge vulnerability, reduced impact cost, reduced property loss	Costly to relocate existing property, legal implications for existing properties
Improve and enforce building codes	United States	Establish more stringent building codes to mitigate impact of winds and flood and also enforce strict testing for improvement in the quality of building material	Hurricane loss reduction	None
Coastal hazard mapping	United States	Development of hazard maps for coastal development zones and using these maps to inform type of appropriate development	Reduction of tourism-related impacts and zoning of coastal activities	None
Disaster insurance/risk transfer	United States	Hazard mapping used to inform variations in coastal site vulnerability, insurance premiums based on level of vulnerability and associated risk	Risk mitigation construction measures for building and disincentive for occupation of vulnerable sites	Cost
Vulnerability assessment to inform structural and non-structural mitigation	United States	Vulnerability assessment undertaken to determine appropriate mitigation measures for coastal sites as well as provision of funding for undertaking mitigation measures by users of vulnerable sites	Mitigation measure informed by vulnerability analysis, loss reduction through provision of funds (retrofitting etc.) for mitigation	Cost

*Source:* Simpson MC and Gladin E. 2008. *Good Practices: Natural Hazard Risk Management in the Caribbean Tourism Sector*. Caribbean Regional Sustainable Tourism Development Programme (CRSTDP), Caribbean Tourism Organization, Barbados.