Chapter 2
Approaches for Assessing Loss and Damage

2.1 Losses and Damages: Avoidable, Residual, Irreducible and Irreversible

Avoidable loss and damage (L and D) through mitigation and adaptation actions is normally related to both short-term aspects of reducing adverse effects, especially disasters. Mitigation reduces the concentration of GHGs and thus contributes to the reduced potential for climate change and takes a few decades to realize the effects. CCA activities, depending on the scope and scale of relevant activities, cater to reduction of potential impacts of climate change.

Residual L and D is usually the portion that accrues after adjusting for the effects of CCA in the context of adverse impacts. Unavoidable or irreducible damage or inevitable damage is the quantum of L and D, after allowing for the positive effects of CCA and various hazard mitigation (including capacity building, prevention, and governance activities). Since existing mitigation commitments and actions will not prevent dangerous climate change related impacts, residual L and D will follow even after more widespread CCA., The climate change impacts that we are unable to prevent through mitigation and adaptation efforts, will likely be the defining part of the future response to climate change. Warner et al. (2012) illustrate the relevance of the concepts of social vulnerability and social resilience to under-standing how climate change impacts translate into loss and damage for society. Both adaptation deficit and limits to adaptation can result in residual L and D.

Assessment of L and D has to incorporate financial and economic aspects of various hazards and disasters. This Monograph provides a few perspectives in the economic context, and has little of social dimension directly addressed. The key aspect of the social dimension include, but not limited to following, with dire implications for expanding chronic poverty and extreme poverty as a result of disasters: women and children more adversely affected than other sections in any given area, poor are more vulnerable than others in both the vulnerable countries and others (and are more susceptible to fall into chronic poverty and extreme poverty with the implication of least capacity to rise above poverty line), and

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geographically disadvantaged or migratory populations at low incomes suffering more disproportionately. When there is loss of life and/or the likelihood of regaining the original asset and income base (even the meager levels that formed the portfolios of assets and incomes) is very low, the accrual of L and D must be deemed as irreversible. Societies and international arrangements need to pay particular attention to these dire implications (see also Rao 2013).

It is relevant to clarify that not all disasters that occur are contributed by climate change or excessive concentrations of greenhouse gases, and that the international aid processes and resource flows in various channels (bilateral, multi-lateral, aid and relief or other) tend to offset some degree of adverse effects. Thus, all the adverse impacts of climate change may not attract attention for full compensation by the main contributors of climate change. There is a possibility of considerable overlap between the activities of adaptation to climate change and adaptation to natural hazards and disasters. Further development of compensation mechanisms separately and jointly is relevant in this context. As a beginning in the process of devising compensation mechanisms for L and D, it is useful to focus directly on the disaster-proneness and ensure that vulnerable countries are supported for regaining economic, social and environmental resiliency.

2.2 Brief Background at the International Level

In 2007 the Bali Action Plan included concerns by seeking (UNFCCC/CP/2007/6/Add.1) (UNFCCC 2007) 'enhanced action on adaptation', including consideration of risk management and risk reduction strategies, risk sharing and risk transfer mechanisms such as insurance, disaster risk reduction and resources to address loss and damage associated with the adverse impacts of climate change in vulnerable developing countries.

'Loss and Damage' has been introduced under the UNFCCC agenda in 2010 (Decision 1/CP.16). The 2010 Cancun COP launched the work program 'to consider ….approaches to address loss and damage' associated with climate change impacts in developing countries that are particularly vulnerable to the adverse effects of climate change (Decision 1/CP.16 at para 26). The Cancun Adaptation Framework (UNFCCC Decision 1/CP.16) noted that approaches to address loss and damage should consider adverse climatic impacts, including "sea level rise, increasing temperatures, ocean acidification, glacial retreat and related impacts, salinization, land forest degradation, loss of biodiversity, and desertification."

The 2011 Durban COP required (Decision 7/CP.17) "the need to explore a range of possible approaches and potential mechanisms, including an international mechanism, to address loss and damage", with possible recommendations to be considered at the 2012 COP session at Doha. Box 1 provides a summary of the Doha resolutions.

Box 2: COP 18 Decisions on Loss and Damage

Country Parties agree to the following actions, among others:

1. Assess the risk of loss and damage associated with the adverse effects of climate change, including slow onset impacts; identifying options and designing and implementing country-driven risk management strategies and approaches, including risk reduction, and risk transfer and risk-sharing mechanisms; implement comprehensive climate risk management approaches; involving vulnerable communities and populations, and civil society, the private sector and other relevant stakeholders, in the assessment of and response to loss and damage;
2. Identify and develop appropriate approaches to address loss and damage associated with the adverse effects of climate change, including to address slow onset events and extreme weather events, including through risk reduction, risk sharing and risk transfer tools, and approaches to rehabilitate from loss and damage associated with the adverse effects of climate change;
3. Enhance coordination, synergies and linkages among various organizations, institutions and frameworks, to enable the development and support of approaches to address loss and damage, including slow onset events and comprehensive climate risk management strategies, including risk transfer tools;
4. Enhance capacity-building at the national and regional levels to address loss and damage associated with the adverse effects of climate change;
5. Developed country Parties to provide developing country Parties with finance, technology and capacity-building;
6. Establish institutional arrangements, such as an international mechanism, including functions and modalities, …to address loss and damage associated with the impacts of climate change in developing countries that are particularly vulnerable to the adverse effects of climate change.

Source: www.unfccc.int, Document UNFCCC/CP/2012/L.4/Rev.1.

2.3 Trends in 'Normalized' Disaster Losses

Economic losses from disasters will continue to increase around the world. Since 1981, economic loss from disasters is growing faster than GDP per capita in the OECD countries. This means that the risk of losing wealth in weather-related disasters is now exceeding the rate at which the wealth itself is being created (UNISDR 2011). Economic exposures to disasters are faster than per capita GDP (Mitchell et al. 2012), and adverse impacts of climate change will continue to

accelerate incidence of extreme events and their corresponding losses. Low income countries account for large segment of human losses, and middle income countries account for largest economic impacts measured as percentages of GDP.

The magnitude of losses in developing countries is very significant: average annual losses due to disasters were about 9 % of GDP during 1997–2001 (Mahul and Gurenko 2007). Excessive risk impacts and their trends in recent years around the globe suggest the need for better preparedness and loss reduction in all possible scenarios. It is important to note that all losses contributed by disasters can hardly be quantified. A Special Report prepared for G20 Summit 2012 stated (World Bank et al. 2012, p. 13):

1. "Because they are harder to quantify, the indirect consequences are rarely considered, but can have important negative impacts on development achievements and poverty reduction efforts".
2. "The financial consequences of disasters are one of many types of fiscal risk that are faced by governments; because they are difficult to measure, they are often ignored".

Thus, damage estimates of disasters remain underestimated, and the gravity of losses is such that disaster risks need to be integrated into financial resilience assessments of countries, regions, and local areas. Just as the total cost assessment is fraught with data limitations, the quantification of costs of socio–economic vulnerability when extreme events occur remains an area founded on approximations. However, ranking of policies in relation to objectives such as poverty reduction and disaster risk reduction is possible, analytically.

> "The negative fiscal impacts of disasters can hamper longer-term growth and economic development…. In times of constrained public budgets, planning ahead for the financial coverage of future disaster costs becomes….necessary …worldwide" (World Bank et al. 2012).

The above recommendation has both macroeconomic and microeconomic dimensions, in linking various sections of society, their vulnerabilities and aggregative effectiveness of public budgets on socio-economic resilience in addition to fiscal resilience in response to disasters.

Disaster Risk (DR) is a non-linear function, determined by a combined effect of exposure (E), vulnerability (V) and hazard (H):

$$DR = f\ (\ E,V,H\ )$$

The arguments in function f are themselves functions of several parameters. Exposure E is determined by the infrastructure and its access to the poor (such as housing and locations that are less prone to hazards). Vulnerability V can be classified in terms of financial, economic, environmental and social categories of ingredients. V is determined by income levels and socio–economic inequalities, social capital, safety net or other insurance mechanism to protect against severe changes in the economy-environment-hazard frameworks, and sustainable living conditions. Hazard H is an exogenous intervention. The intensity of the effects of

H is influenced by the features that prevail in E and V. Disaster results occur when E and V are both high, and when H itself is high. DR can be minimized largely by addressing V. Vulnerability reduction is a core common element of both CCA and DRR. Vulnerability is an outcome of skewed development processes and scarcity of livelihood options for the poor (IPCC 2012, p. 10). Economic vulnerability refers to the inability of affected individuals and entities to absorb or cushion damages. In this context the role of poverty as a precursor to vulnerability to external shocks—physical and economic- is rather well-known. Life risks and mortality with demographic inequities are accentuated in poorer areas and segments of populations. Also, disasters lead to livelihood risks and to chronic poverty, besides quality of life risks and accentuated inequalities.

As stated in the G20 Special Report (World Bank et al. 2012): (*a*) *disasters are the result of the interaction between hazards, assets, and vulnerability; and,* (*b*) *integration of disaster risk information in national fiscal risk management frameworks can help improve the fiscal resilience of countries*. In general, the dichotomy between fiscal stability/sustainability (with or without spending cuts) and the corresponding objectives with the advent of extreme events needs to be visualized. A balanced approach of interventions for addressing both the *ex ante* and *ex post* scenarios (relative to an extreme event) is called for. Reduction of socioeconomic vulnerability merits priority attention in both scenarios to ensure system stability.

There are discernible differences in the ongoing and potential impacts of climate change around different regions of the world. Much of Sub-Saharan Africa is forecast to experience a reduction in the length of the growing season, with a reduction of at least 20 % by 2100. East Africa is expected to suffer a 20 % loss in maize yields, while West Africa is predicted to suffer a staggering 90 % cut in its bean production. This reflects the likelihood that in a 4 °C world more than one-third of current cropland in east and southern Africa would be unsuitable for cultivation (Thornton et al. 2011).

Losses follow geophysical changes in most cases (Bouwer 2011), and the roles of changes in people-centric vulnerability and exposure. Thus, it is often interpreted (see also Neumayer and Barthel 2011) that disaster losses are not necessarily increasing (as a percentage of GDP in many countries) around the world if we adjust for these contributory factors. An implication of such assessments could sidetrack the ever increasing adverse changes in the climate system and its effects, besides several people-centered activities that contribute the changes in the climate system. Even in those countries that have seen loss and damage (as a percent of respective GDPs) will have less scope enhancing or sustaining their standards of living if no pro-active measures are initiated to address the disaster-related infrastructural imperatives in the next few years. The key issues are how to address the adverse effects at national and international levels, introduce an element of climate justice, and effective governance. It is a joint and simultaneous responsibility for both the groups of countries: the vulnerable and the others. If the potential victim regions or countries do less than the optimum efforts to gear up to

the tasks, any amount of resource transfer or compensation may not solve the real problems on a sustainable basis.

There is a range of challenges which should be taken into account UNFCCC (2012 Document FCCC/TP/2012/1):

(a) Capturing the scope and extent of direct and indirect losses as well as the growing interconnectedness of impacts (such as cascading effects);
(b) Further clarification of the strengths, weaknesses and limitations of the available methods and tools with a view to avoiding misunderstandings and misuse –particularly in the context of uncertainty (climatic and non-climatic); and,
(c) Enhancing methods and tools for assessing the risks from slow onset changes, such as sea level rise, salinization or the degradation of ecosystems and ecosystem services.

L and D assessments associated with climate change need to include both slow onset adversities such as sea level rise, and sudden extreme events such as floods. However, there is no clear definition of loss and damage under the UNFCCC or any other relevant international agreement thus far. UNFCCC (2012a) reviews in its Technical Paper a substantial part of analytical methodologies that could be potentially relevant for assessing losses and damages under varying risk factors in relation climatic and non-climatic factors and their dynamics over time. After a brief review of 18 approaches the Technical Paper narrowed down six of these for further attention:

Catastrophe risk models CATSIM
Comprehensive Approach for Probabilistic Risk Assessment CAPRA
Integrated Assessment Models IAMs
Scenario-driven approaches
UK Climate Change Risk Assessment CCRA
World Risk Index WorldRiskIndex

It is not proposed to dwell upon the details in this Monograph. Perhaps it helps to note that with longer time horizons that are applicable to slow onset events, low or zero discount rate becomes relevant for evaluating future costs and benefits or related portfolios of interventions/investments. Technically, Laplacian Operators (infinite time horizon models) become applicable for computational analysis, but not seen yet in applications. None of these constitute ready-to-use toolkits, however. Besides, financial and economic dimensions of analysis constitute merely one important component of total assessment.

In one of the studies- relevant for an understanding of time horizons of CCA activities, Hallegatte (2009) identified major sectors, time-scales and applicability of no-regrets criteria:

Category A: High Exposure to climate risks
Water infrastructure (dams, reservoirs and such other hardware) (30–200 years)
Land use planning (especially coastal and flood prone) (about 100 years or more)
Coastal flood defenses (about 50 or more years)

Category B: Medium Exposure
Buildings and Housing (30–150 years)
Category C: Low Exposure
Transportation (30–200 years)
Urban structures (about 100 or more years)
Energy production (20–70 years)

The recommended priority sectors and sub-sectors for no-regret strategies include the following:

Development of climate resilient crops
Early warning and evacuation systems
Improvements in public health systems
Institutionalization of perspective planning
Enhancement of water use efficiency
Sustainable land-use planning

These measures, in combination with the critical elements of comprehensive infrastructure development for disaster reduction and management, constitute some of the key elements of foundations and perspectives toward reduction of L and D.

UNFCCC (2012b) report provides a literature review on a broad range of approaches to address loss and damage associated with the adverse effects of climate change. Among these are risk reduction, risk retention, and risk transfer; issues of slow onset phenomena and enabling environments to reduce loss and damage have also been briefly examined, as well as regional priorities around the world. The Report provides an array of approximate qualitative listing of categories costs and benefits potential interventions to address the impending and possibly accelerating adverse impacts. These tabulations are of some use but no numerical estimation or methodological basis can be founded yet. Besides, most analyses, whether arising from the UNFCCC or others, depict deficiencies in not being attentive to the critical role of endogenous responses of various stakeholders to exogenous interventions and to the emerging information about climate change and its applicable effects (as perceived by these actors).

Compensation for L and D remains an issue in the areas of equity and climate justice across communities and nations. Least developed countries (LDCs) are also the least contributors to climate change but ironically the most adversely affected by the phenomenon contributed by other countries. This is a global scale externality and cannot go on uncompensated. It has been suggested UNFCCC (2012d) suggested (at para 72) it is important to find ways of working through the CCA and CCM to facilitate the 'development of a clear narrative for concept of loss and damage, "which is important for prioritizing addressing the issue, including for identifying the means of addressing loss and damage."

Financial and economic elements for assessing L and D.

A 'working definition' (www.loss-and-damage.net) suggests that damage is the set of negative impacts that can be remedied or restored, and loss is the set of negative impacts that cannot be restored to ex-ante scenarios.

There is also the case that a continuum exists between the two, and also between 'slow onset' events and 'sudden extreme' events. A mix of elements applies in each location and time interval, some of which is predictable but much is not entirely predictable at that scale and time specificity.

Other economic elements of assessing L and D include:

Valuing life
Loss of economic potential and productivity
Loss of jobs and business income

At country or regional level as well local levels the implications of incidence of disasters need to be assessed in terms of the potential accrual of chronic poverty and extreme poverty. Although there are large uncertainties in information, cause and effect relationships and stakeholder responses over time in terms of pro-active or reactive measures and capacity building activities and other aspects of adaptation. The role of innovation in technologies, infrastructure planning and development, governance mechanisms remain critical; potential L and D consequences of hazards and disasters (both extreme events and slow onset phenomena) are related to these features.

2.4 Loss and Damage Features and Estimates

People around the world have to face the reality of climate variability and its adverse consequences; most regions tend to experience increased variability. This is not the same thing as mere warming of mean surface temperatures and these variations induce effects for which almost no system is fully prepared for. Direct economic losses relative to national income in developing countries were about twice the corresponding proportions of developed countries during the past quarter century; "planning for both current climate variability and longer-term shifts in climate patterns can help smooth pathways and cushion the negative impacts of loss and damage in the future" (Warner and Zakieldeen 2012).

The following are some of the major sources of assessments of loss and damage, merely to to illustrate trends over time and spatial priorities and magnitudes involved.

1. The nodal agency CRED analysis of indicates (see Guha-Sapir et al. 2012) that the number of victims of disasters has been on the rise over the years: the global total in 2011 stood at 244.65 million people (of which 211.16 million are from Asia); the corresponding average for the period 2001–2010 was 231.95 (and 207.16 million for Asia). The estimates of damages (all at 2011 US$ in billions, not assessing the value of life for lost lives) for the global total in 2011 stood at US$366.12 (with major segment contributed by Asia at US$276.03, whereas the corresponding averages for the period 2001–2010 stood at US$109.35 (with Asia at US$41.61).

2. According to the Harmeling and Eckstein (2012), the *Global Climate Risk Index* ranks Honduras, Myanmar, Nicaragua, Bangladesh, Haiti, and Vietnam as the countries most affected by extreme weather events from 1992 to 2011. In most affected countries (1992–2011) were developing countries in the low-income or lower-middle income country group. In total, more than 530,000 people died as a direct consequence from almost 15,000 extreme weather events, and losses of more than 2.5 trillion USD (in purchasing power parity PPP) occurred from 1992 to 2011 (USD 1.68 trillion overall losses in original values). More than 530,000 people died as a direct consequence of almost 15,000 extreme weather events, and losses of more than USD 2.5 trillion (in PPP) occurred from 1992 to 2011 globally.
3. Climate change and pollution related to carbon-dioxide emissions are reducing the world's gross domestic product (GDP) by 1.6 % a year, about $1.2 trillion, according to DARA International (2012) Report *Climate Variability Monitor*. Climate change may cut GDP in some developing nations by as much as 11 % by 2030, and the worldwide net losses of GDP could be about 3.2 % due to the effects of carbon emissions and climate change. Those losses far exceed the cost of reducing emissions, which the report estimated at about 0.5 % of GDP over the next decade. Climate change was responsible for about 5 million deaths in 2010, including 400,000 related to hunger and diseases and 4.5 million from air pollution, according to the report. Data suggest the increasing frequency and intensity of extreme weather events exacerbating the socio–economic problems of the Least Developed Countries (LDCs) and Small Island Developing States (SIDS) and contributing to political instabilities and chaotic migration.
4. CRED reports and data highlight a few events. The disaster that made the most victims in 2011 was the flood that affected China in June, causing 67.9 million victims. Furthermore, China was affected by a drought from January to May (35 million victims), a storm in April (22 million victims) and another flood in September (20 million victims), further contributing to a total of 159.3 million victims in China in 2011, a figure representing 65.1 % of global reported disaster victims. Droughts and consecutive famines made many victims in Ethiopia (4.8 million), Kenya (4.3 million) and Somalia (4 million). When considering the population size of the country, 42.9 % of Somalia's population was made victim of natural disasters in 2011, mostly due to drought.

In 2011 the number of disaster victims has increased significantly relative to the average of the previous decade (Guha-Sapir et al. 2012). This increase is explained by the larger impact from hydrological disasters. Hydrological disasters caused 139.8 million victims in 2011—or 57.1 % of total disaster victims in 2011—compared to an annual average of 106.7 million hydrological disaster victims from 2001 to 2010. In 2011, 66.8 % of global hydrological disaster victims were from floods and wet mass movements in China.

2.5 Drought and Slow Onset Adverse Effects

2.5.1 Slow-Onset Events

There are differences in the manner in which the disaster risk reduction community and the climate change community conceptualize the term slow onset (Siegel 2012):. The disaster risk reduction community views slow onset hazards as disasters that unfold slowly over months or several years. In the climate change process slow onset time scales are counted in years and decades (even longer time horizons).

The impacts of slow onset events are already being felt in all regions and are exacerbating extreme weather events, but that there is limited readiness to address these impacts, in terms of the institutions and capacities in place at all governance levels. The existing gaps related to knowledge on and tools for addressing such impacts, in comparison with current knowledge on and available tools for addressing extreme weather events, were highlighted at all of the expert meetings coordinated by the UNFCCC; for details, see UNFCCC (2012c). Managing the risks associated with climate change, in particular the risks associated with slow onset events, requires long-term planning and institutional arrangements with appropriate legislation and policies, as well as reliable governance structures across sectors and levels, supported by timely, quality information and sustainable commitments to providing financial resources.

There is an urgent need to improve the understanding of the characteristics of slow onset events, including the linkages with extreme weather events, definitions of baselines for slow onset events, potential tipping points, the capacity and skills needed for quantifying losses, and what types of approach are necessary. Such an improved understanding would lead to raised awareness of the magnitude of the loss and damage resulting from incremental climatic processes, especially among policymakers, and facilitate a clarification of the necessary enabling environment, such as regulatory frameworks, policies and institutional structures. This would, in turn, facilitate the avoidance of institutional fragmentation in addressing slow onset events. While some successful practices were introduced, 21 discussions at the expert meetings for the Latin American region and SIDS highlighted the limitations of using infrastructural measures to address slow onset events at the appropriate temporal and spatial scales. Discussions on ocean acidification and loss of biodiversity as a result of slow onset events drew attention to the permanence of the loss of biodiversity and its impact on livelihoods for current and future generations, which conventional adaptation measures, often project-based approaches, have limited effectiveness in tackling. The relatively short-term cycle of donor funding poses challenges in this regard in terms of enabling the long-term nature of the action often required to address slow onset events.

2.5.2 Drought

The impacts of drought are increasing in magnitude and complexity due to the effects of a changing climate. Unlike other natural hazards such as storms, earthquakes and floods, which occur with a specific period of time and result in concrete damages, drought emerges slowly and quietly and lacks highly visible and structural impacts. When does it begin, when does it end? Geographically speaking, where are the limits of its spatial impacts?

The lack of standardization in drought hazard characterization contributes to the problem of attributing definitive losses. Even if drought information has improved and the methodology applied in EM-DAT has been strengthened, data still remain inconsistent because of the complexity of droughts, especially in terms of measuring the direct human impact. Indeed, the impacts of drought may endure for years, and providing a strict spatial definition is difficult due to the spatial patterns of droughts and the localized nature of precipitation.

Understanding the complex impacts of drought could be the key to enhancing drought mitigation and preparedness. "Data on disaster losses in Africa is low", highlights the UNISDR in its Briefing Note no. 4, entitled "Effective measures to build resilience in Africa to adapt to climate change". This fact does not lessen the evidence showing that GDP growth in African countries is under threat from the impact of natural hazards, particularly agricultural drought. "Drought is predictable and does not happen overnight. Therefore, it should not claim lives nor lead to famine, which results when drought is coupled with policy failure or governance breakdown or both."

The Global Assessment Report on Disaster Risk Reduction (GAR11) of the UNISDR highlights improvements in early warning, preparedness and response. "The massive mortality from Sub-Saharan African droughts in the 1970s has not been repeated". However, compared to other hazards, risks associated with drought remain poorly understood and badly managed, particularly in some African countries. To avoid these gaps, UNISDR released "Drought contingency plans and planning in the Greater Horn of Africa" in early 2012. According to the IPCC, the Sahel and West Africa are among the most vulnerable regions to future climate fluctuation. The food crisis is becoming chronic, because the majority of the population depends on agriculture for the livelihoods. "Maybe more than any other disaster risk, drought risk is constructed by economic decisions and social choices".

Although there has a great deal of understanding on the potential for integrating CCA, DRR, SD and poverty reduction, this is not yet translated into practice. For example, an evaluation study of the UNDP (2011) concluded:

> Although the UNDP strategic priorities acknowledge the links between poverty reduction, SD and DRR, these strategies are not systematically implemented, and the DRR strategy should be revised to more directly address CCA.

The Hyogo Framework of Action (HFA) recognizes the role of institutions and states in the first pillar of action: "Ensure that disaster risk reduction is national and a local priority with a strong institutional basis for implementation". However, the multi-dimensional nature of institutions needs to be reflected in the ongoing updating approaches for the post-2015 development agenda frameworks.

> Integrating CCA into the HFA is a relevant ingredient of post-2015 framework. The UNFCCC process needs to enable such integration, since CCA currently is largely in its mandate. Policy documents of the UNFCCC dating back some years advocate the role of integration but the premise has not been brought into practice so far in a significant manner (Rao 2013a).

Cost-effective forward-looking mechanisms for reducing L and D include the following, besides effective disaster governance: Roles of climate services, Role of extensive use of information and communication technologies (ICTs), Crop insurance, Property and casualty insurance, and Life insurance. None of these policy mechanisms are currently affordable for most of the vulnerable countries (especially the Least Developed countries, LDCs), and the new international mechanisms (whether to be called market mechanisms or other international institutional arrangements) will be most useful if they enable affordability of these technologies and other resources with considerable support from the developed countries. This will create relevant infrastructure, combined with a lot more dynamic international trade policy –especially in environmental goods and services.

There is a significant scope to examine effective (including cost-effective) options about to address L and D in terms of Risk Reduction (Prevention and Governance), Risk Retention and Risk Transfer. This Monograph suggests that the international mechanisms being devised for compensation for L and D must assess the cost-sharing implications under each of these options so that the overall effect of resource support enables the vulnerable less developed regions to form and upgrade relevant national and sub-national systems to cater to the L and D prevention, mitigation and governance.

It is useful to recognize the role of the implicit and explicit relationships governed by the fundamental relationship:

$$\text{Loss and Damage} = \text{f}(\text{Hazard, Vulnerability, Adaptive Capacity})$$

Expanding CCG agendas suggest the potential for embedding DRR into CCA frameworks into those of sustainable development as well as the emerging frameworks of post-2015 development agendas that are in progress.

Identifying country priorities (UNFCCC 2012d) include an assessment of L and D starts in identifying the assets that are at risk due to the adverse effects of climate change. "The multifactor nature of this issue poses a challenge in building bridges between stakeholders from different disciplines when trying to integrate efforts. There is a need to integrate people working on, inter alia, adaptation, disaster, crisis and environmental management, as well as development, not only for

technical cohesion but also for building the environment in which their efforts can be enhanced in a coherent manner."

Detailed micro-studies including household surveys in five countries Bangladesh, Bhutan, The Gambia, Kenya, and Micronesia indicate that adverse impacts of both slow-onset and extreme events impact households currently and considerable effects are felt in relation to their vulnerability (Warner et al. 2012). Losses and damages occur because of the following factors:

Insufficient and ineffective adaptation measures
Cost-effectiveness or benefit-cost ratios not attractive
The measures help in the short-term but cause adverse long-term consequences
Paucity of resources that limit the design and implementation.

The study suggested the need to support community level assessments of risks and their building resilience with enhanced support for local sustainable development and reduction of socio–economic vulnerabilities. The screening of CCA (and some in joint frameworks with CCM) projects and activities must be subject to the L and D criterion, and advance pro-poor gender-sensitive agenda. This reduces the incidence of L and D both in the short-run and in the long-run. Thus, mainstreaming disaster reduction in development and implementation of projects and activities remains a high priority.

Doha outcome that seeks to address some of the concerns of the least developed countries and small island countries is to establish in about one year "institutional arrangements, such as an international mechanism" to address L and D due to the adverse effects of climate change in particularly vulnerable developing countries. Some of the relevant perspectives in this regard are offered in the chapters to follow.

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