Loss and Damage in Africa

United Nations
Economic Commission for Africa

ClimDev-Africa

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Executive summary

Africa is a hotspot of vulnerability to the adverse impacts of human-induced climate change

Based on existing emissions trends and mitigation pledges, the science shows we are on course to a 4°C world by 2100. At such warming levels, impacts for Africa are expected to be very substantially greater than if warming were held below 2ºC above pre-industrial levels.

- Unusually extreme heat events are projected to increase rapidly, becoming the "new normal" by 2100 in a 4˚C world. At around 1.5°C about 25% of Africa's land area is projected to experience unusual heat extremes in summer, and this rises quickly, exceeding 45% in a 2°C world and 85% in a 4°C world. In central Africa, however, already in a 2°C world such heat extremes would prevail in 60-80% of the summer months.
- Significant increases in, and exacerbation of, water stress are projected under 2˚C in many African countries, rising to very high levels in a 4˚C world. Desert and dry-land areas are projected to increase by 4%, compared to 1% of the land area in a 2°C warmer world.
- By 2100 sea-level rise along Africa's coastlines is projected to be approximately 10% higher than the global mean. In a 4°C world and assuming no adaptation, Egypt, Mozambique and Nigeria would be most affected by sea-level rise in terms of number of people at risk of flooding annually. The largest share of population would be at risk in Guinea-Bissau, Mozambique, and The Gambia, with up to 10% of their national population at risk of being flooded annually.
- The Nile Delta of Egypt is an example of the vulnerability of tourism to inundation and saltwater intrusion associated with sea level rise. For example, 1m of sea-level rise, which could occur in a 4°C world, would increase the area of land below sea level in Alexandria from the current level of about 30% to 60%, exposing valuable cultural sites to storm surges.
- Larger tropical cyclone-induced storm surges are another impact of global climate change, which, in conjunction with sea-level rise, would place more people at risk of coastal flooding. Even in a 2°C world, present 1-in-100-year storm surges of 1.1m could become 1-in-20-year events. Tunisia, Tanzania and Mozambique are among the most exposed in the developing world overall and in terms of proportion of land area, GDP, urban land area, agricultural area and wetlands.
- Increasing ocean acidification and rising temperatures would have severe consequences for coral reefs and ocean ecosystems generally. Most coral reefs are projected to be extinct long before 4°C warming is reached, resulting in loss of associated marine fisheries, tourism, and coastal protection against sea-level rise and storm surges. Increases in coral bleaching may be limited if warming is held to 1.5°C, but would be very substantial even in a 2°C world, posing significant risks to the ongoing survival of reefs in the region.
- At warming around 3°C, virtually all of the present maize, millet, and sorghum cropping areas across Africa could become unviable for the present current crop varieties. Maize and wheat productivity is projected to decline for a below 2°C warming by 5% and 17% respectively for sub-Saharan Africa by the 2050s.
- Rates of undernourishment in the Sub-Saharan African population are projected to increase by 25-90% compared to the present at a warming of around 1.5°C by 2050. The negative impacts of climate change on nutrition are projected to increase the proportion of children severely stunted by 50% compared to a future without human-induced climate change. (Lloyd, Kovats, & Chalabi, 2011)

The need for adaptation measures to cope with these projected impacts is significant even at 1.5-2°C warming. However, the **Loss and Damage in Africa** report shows that under all warming scenarios and despite strong adaptation efforts in the region, considerable adverse effects of climate change will be felt in Africa, resulting in further loss and damage.

Economic Costs

In a 4°C world with weak adaptation and weak mitigation "residual damages" costing up to 6% of Africa's GDP annually by 2080 could be incurred. Even with strong regional adaptation in a 4°C world this would still amount to a cost equivalent to 3% of Africa's projected 2080 GDP annually

- Damages can be reduced by adaptation measures, but not eliminated: "residual damages" will remain at all levels of adaptation

Substantially reducing both financial and non-monetary costs for Africa requires large and early investments in both global mitigation and regional adaption

- Both adaptation costs and residual damages for Africa are projected to be very much higher in a 4°C world than in a 2°C world.
- "Under-investing" in adaptation would result in significantly larger residual damages, compared to one with "economically optimal" levels of adaptation.

Under all mitigation and adaptation scenarios, Africa will continue to experience residual loss and damage. The level of loss and damage and therefore the costs incurred will depend, among others, on the level of ambition of global mitigation actions and the level of investment in adaptation at the local level.

Solutions

Addressing loss and damage requires building preventative resilience, managing risk, assisting in rehabilitation and providing redress in the event of permanent loss

Three areas of coordinated activity are required.

1. Minimizing loss and damage by building preparatory (ex ante) resilience, which can include, for example:

- Hazard mapping
- Measures to make assets more resistant to damage. These could include precautions such as building flood protection walls, or sea walls, and building and retrofitting water retention dams; and non-structural approaches such as strengthening building codes, adjustments in livelihood practices and training.
- Temporarily moving vulnerable assets out of harm's way. This requires the implementation of early warning systems as well as timely and accurate weather information at the local level.

Effective institutional arrangements for loss and damage could support the strengthening of appropriate risk reduction measures where they exist, and facilitate their introduction where they do not exist.

2. Assistance in recovery and rehabilitation from the impacts of climate-related hazards (where it is possible to recover or rehabilitate). This could include, for example:

- Risk pooling: contribute to manage the consequences of risk by aggregating individual risks, for example, through regional catastrophe risk pools.
- Risk transfer: help shift financial consequences of risks of loss and damage from one entity to another, for example, through insurance or reinsurance programmes or insurance–linked securities.

3. Provision of redress in the event of permanent loss where the status quo cannot be restored, for example, where permanent relocation or changes to livelihood activities are required.

The issue of redress for permanent loss, from which recovery and/or rehabilitation are not possible, is uncharted territory from a climate impacts perspective. Established principles for the treatment of transboundary pollution relevant to loss and damage may provide some options.

Existing national and regional arrangements fall short of addressing loss and damage, due to challenges in their operation and limitations in their scope

These challenges and limitations include:

- Lack of funding (especially in low-income and the least developed countries).
- Lack of scientific, technical and technological capacity (which in turn, for example, limits disaster preparedness).
- Limitations of insurance schemes, because of challenges associated with coordinating a regional pooling of risk, and the possibility that the value of the premium, which is a function of risk exposure, could rise faster than a government's ability to pay for the premium, which in turn could destabilize a regional scheme should a country be forced to exit.

The existing institutional arrangements in Africa do not address permanent and non-economic losses and address economic losses of sudden and slow-onset events in a very limited manner. There is a reliance on support from the international community for addressing some of these challenges.

Existing international arrangements fall short of addressing all aspects of loss and damage

- At the operational level, some issues relevant to loss and damage are addressed by the work of some of the existing institutions. However no single specialized body, mechanism or permanent process under the UNFCCC is mandated to assess, address or redress non-economic losses or permanent loss and damage to particularly vulnerable Parties.
- Most of the existing arrangements outside of the UNFCCC are targeted at disaster risk management in relation to present climate variability and related extreme events and not at responding to the impacts of anthropogenic climate change due to for example, human induced changes in extreme events, climate variability, sea level rise and storm surge increases and ocean acidification.
- Impacts arising from human-induced climate change are not explicitly separated from the risks from natural hazards.
- The fragmented approach of the international arrangements outside of the UNFCCC falls far short of providing the African continent with the coordination, consistency, scale, funding, capacity and technology that is needed to bridge the existing gaps.
- The existing international arrangements do not address permanent losses and non-economic losses, and losses from sudden and slow-onset events are only partially addressed.

A new international mechanism is needed to address the full spectrum of loss and damage in an inclusive and systematic manner under the Convention.

This mechanism would provide functions through three elements of its structure to meet the needs for addressing loss and damage under the Convention. It should complement and not replicate the work of other UNFCCC bodies and develop linkages with relevant institutions both inside and outside of the Convention. The key features of such a mechanism could be:

1. **Executive Board.** On a strategic level, the new mechanism would provide an inclusive and systematic framework for assessing and addressing loss and damage from human-induced climate change in a coordinated manner. Guidance is needed to identify possible insurance-related tools that can be applied to assist in risk management and risk transfer, and to identify approaches for addressing market failures, like lack of insurance in some parts of the developing world. Approaches also need to be developed to provide rehabilitation assistance and redress for permanent loss and damage.

2. **Technical Body.** The mechanism should provide need-based technical support to countries and regions, based on identified needs. This could include the collection and collation of information and projections regarding potential loss and damage; the commissioning of research and other work to fill gaps; and the provision of scientific standards accounting for climate risk exposure, definition and inclusion of slow-onset events and separating anthropogenic influences from unperturbed climate baselines regarding climate-change induced increases in frequency or intensity of hazards from natural climate variability. It could also work on identifying appropriate insurance and risk transfer tools to address particular country and regional circumstances, as well as insurance systems that can be utilized at the international or regional level to address market failures or reduce costs.

3. **Financial Facility.** The mechanism should ensure structural, predictable, and balanced funding to address loss and damage. This could involve providing start-up funding and support for insurance schemes and risk reduction initiatives; identifying further funding solutions to maintain arrangements at the national and regional levels; supporting regional country-level risk officers; and providing redress for residual, permanent, or unavoidable loss and damages. It could also serve as a coordinating and catalyzing entity, and source funding from industry, and from multilateral banks and/or the Green Climate Fund (GCF).

Recommendations and next steps after decisions taken at COP 19

This **UNECA/ACPC/Climate Analytics report** on **"Loss and Damage in Africa"** shows how climate change is expected to lead to increasingly strong adverse effects across Africa, resulting in significant loss and damage, under a range of scenarios. The report provides estimates of costs associated with residual damages under different mitigation and adaptation scenarios.

This report's assessment of the limitations of the existing national, regional and international arrangements to address loss and damage in Africa, and its review of unmet needs, provides the basis for a number of recommendations for inclusion in the development of a Workplan on loss and damage under UNFCCC Decision 2/CP.19, as well for consideration in future work on the organisation and governance of the Executive Committee, and for consideration in the structure and functions of the Warsaw Mechanism on loss and damage established under that decision.

Decision 2/CP.19 represents a step forward in the consideration of loss and damage under the UNFCCC from the perspective of the African countries. Its core elements with regard to climate change induced loss and damage are the following:

- Establishment of the Warsaw International Mechanism for Loss and Damage with a mandate to focus on implementation of approaches to address loss and damage associated with impacts of climate change, including extreme events and slow onset events, in developing countries that are particularly vulnerable to the adverse effects of climate change
- Formal acknowledgement that loss and damage associated with the adverse effects of climate change includes, and in some cases involves more than, that which can be reduced by adaptation
- The establishment of an Executive Committee, whose composition and procedures are to be developed by the SBSTA and SBI by December 2014
- The convening of an interim Executive Committee by March 2014 to develop a 2-year workplan for the Executive Committee, for consideration by the Parties in December 2014

The following elements, among others, are mandated to be addressed by the Warsaw International Mechanism for Loss and Damage:

- Enhancing knowledge and understanding of comprehensive risk management approaches;
- Strengthening dialogue, coordination, coherence and synergies among relevant stakeholders;
- Enhancing action and support, including finance, technology and capacity-building.

Despite significant progress made during COP19, there are still a number of issues that need to be addressed in the coming years. In this regard, African countries should seek to ensure the development of a workplan by the interim Executive Committee, as well as a long-term structure for the Warsaw International Mechanism for Loss and Damage, that can address their main priorities and needs in an inclusive, systematic and holistic manner. To achieve the necessary functions, these institutional arrangements should:

- Take a systematic approach to assessing and addressing loss and damage from human-induced climate change;
- Address the full spectrum of needs, from risk reduction, risk management, risk transfer, to rehabilitation and compensation for permanent loss and damage;
- Complement the work of other UNFCCC bodies, and not replicate the functions already undertaken by other bodies and committees,
- Facilitate the development of risk reduction, risk transfer and rehabilitation arrangements in developing countries, by guaranteeing both technical advice and access to sustainable financial support;
- Identify gaps and commission studies, research and development on potential arrangements to address loss and damage at the request of developing countries;
- Advise countries and groups of countries, at their request, on potential technical arrangements and funding to address loss and damage.

Finally, decision 2/CP.19 does not specifically refer to funding for the work of the Warsaw International Mechanism, or identify a process to ensure the ongoing operation of the Executive Committee and its programming to address loss and damage. There is a need therefore for significant emphasis to be placed on identifying adequate and sufficient resources to ensure the sustainable and long-term operation of the Mechanism and its Executive Committee, so that these new institutional arrangements can carry out the strategic, technical and financial functions necessary to address loss and damage in developing countries that are particularly vulnerable to the adverse effects of climate change.

1. Introduction

Africa is anticipated to be confronted with the severest adverse effects of human-induced climate change, compared to most other regions of the world, due to a combination of particularly severe projected impacts and relatively low adaptive capacity (e.g. IPCC AR4, World Bank 2013). The need for adaptation is expected to be high in Africa, especially in light of the existing deficit in adaptation to current climate variability and climate change. However, under any scenario of global mitigation and strong regional adaptation efforts, considerable adverse effects of climate change on Africa will remain, resulting in loss and damage.

In 2010, Parties to the United Nations Framework Convention on Climate Change (UNFCCC) recognized at COP16 "the need to strengthen international cooperation and expertise in order to understand and reduce loss and damage associated with the adverse effects of climate change, including impacts related to extreme weather events and slow onset events."[1] Slow onset events were defined to include sea-level rise, increasing temperatures, salinization, ocean acidification, glacier retreat and related impacts, land and forest degradation, loss of biodiversity and desertification.[2]

Since then, discussions evolved, including through submissions of Parties to the UNFCCC, but views have not necessarily converged on the need, purpose and modalities of addressing loss and damage. The climate talks in Doha (COP18) in December 2012 decided that COP19 would 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." Among other things, the Parties agreed that these arrangements would promote the implementation of approaches to address loss and damage by "enhancing action and support, including finance, technology and capacity building, to address loss and damage associated with the adverse effects of climate change, including slow onset impacts".

With a view of COP19 in Warsaw and beyond, this report shows the wide range of adverse impacts of climate change in Africa and assesses the balance of economic costs, as a function of a range of scenarios including both successful and failed global mitigation efforts, and strong compared to weak implementation of adaptation measures. The economic cost calculations are necessarily limited in nature. While they do not cover all economic costs and climate impacts, and also include non-monetary damages to a very limited extent, they do serve the purpose of showing clearly that loss and damage is a crucial issue for Africa's future.

Negative impacts from variations in climate are not new to Africa, whose societies and ecosystems have long been affected by droughts, floods and desertification. The issue of loss and damage (L & D) has, therefore, a fundamental importance to Africa whose communities and economies are trying to cope with losses for which they have limited capacity to respond. As a result, a range of national and regional arrangements have been developed at various levels across Africa to cope with the negative impacts of natural climate variations and in some cases allow to manage the risks. Such national and regional arrangements are limited in scope while the anthropogenic climate change is projected to bring Africa's climate far outside the range of historic climatic variations and result in very large damages (chapter 2). Within this context, chapter 3 of this report will evaluate the existing institutional arrangements across Africa regarding their potential to effectively address not only the natural climate hazards the continent faces, but also the large new challenges associated with anthropogenic climate change that have started to emerge in the past decades, which will require a systematic look of the

1 Decision 1/CP.16, para. 25, FCCC/CP/2010/7/Add.1, Report of the Report of the Conference of the Parties on its sixteenth session, held in Cancun from 29 November to 10 December 2010.

2 Decision 1/CP.16, para. 25, note 3.

full spectrum of options to address loss and damage, including aspects like non-monetary damages and permanent losses.

Chapter 4 will first give a brief account of international legal considerations and the UNFCCC context, noting that UNFCCC is uniquely equipped to address loss and damage attributed to anthropogenic climate change in an international framework that acknowledges both the responsibilities of countries to the enhanced greenhouse effect and the needs of countries particularly vulnerable to its adverse effects, including many countries in Africa. At the international level as well, a range of instruments, frameworks and arrangements have been developed over the past decades that are focused on managing risks caused by climate hazards. Like the range of national and regional arrangements, these international arrangements to fall short in terms of systematically addressing loss and damage arising from anthropogenic climate change. An inventory of the need to address risk reduction, transfer and permanent losses is followed finally by suggested functions and structure for an international mechanism to address loss and damage. Chapter 5 discussed the recent UNFCCC decisions on the Warsaw International Mechanism for loss and damage in light if these needs and suggested functions and structure.

2. Projected climate-change impacts and costs relevant for loss and damage in Africa

As global average temperature rises, climate-change related extreme and slow-onset events are projected to have an increasingly large effect on the livelihood of most African countries and on the rest of the world. Hence, the Cancun climate agreements specify a long-term global goal of holding global warming below 2°C above pre-industrial temperatures, with a requirement to consider revising this to 1.5°C. However, current international pledges by countries to reduce emissions fall short of what is needed to achieve these goals. Climate-model projections shown in Figure 2.1 confirm the findings of the UNEP Emissions Gap Report (UNEP, 2013) and UNEP Africa's Adaptation Gap report (Schaeffer et al., 2013) that, if mitigation is not substantially strengthened, warming by 2100 would approach 3.5°C[3] above pre-industrial levels for emission reductions currently pledged by individual countries, approach 4°C under a "Policy Reference" scenario assuming only implementation of current climate policies, and potentially higher levels of warming for more pessimistic "business-as-usual" (BAU) scenarios that lack full implementation of current and proposed climate policies worldwide.

The overview below summarizes the assessment of climate-change impacts across Africa in Africa's Adaptation Gap report (Schaeffer et al., 2013) and the World Bank's "Turn Down the Heat" reports (Schellnhuber et al., 2013; World Bank, 2012). Section 2.3 will evaluate the implications of the scenarios depicted in Figure 2.1 for damage costs under various assumptions for adaptation measures.

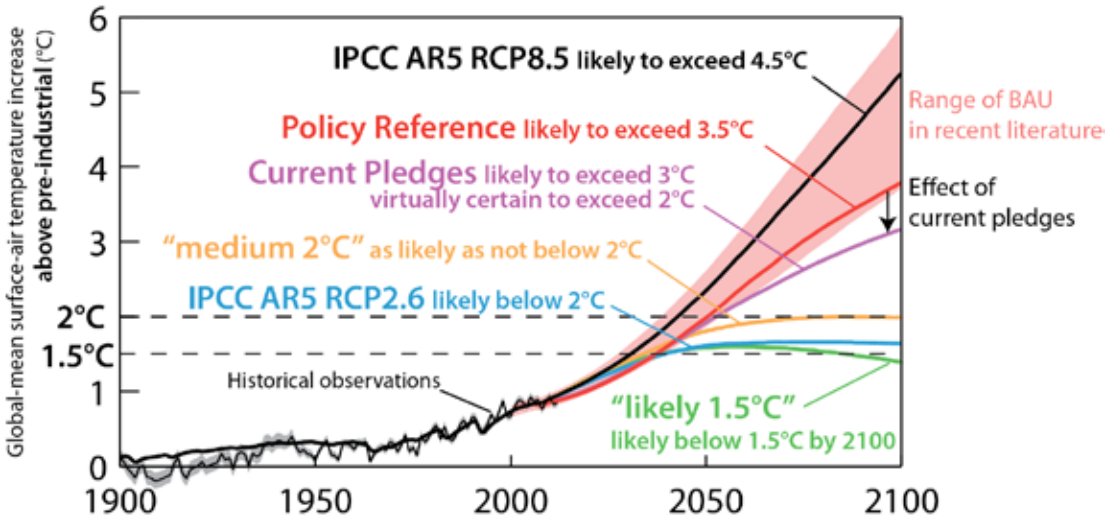


Figure 2.1 Median estimates (lines) from probabilistic projections of global mean warming compared to preindustrial levels for a non-mitigation emission scenario (RCP8.5 prepared for IPCC Fifth Assessment Report – Riahi et al 2011) and Policy Reference (including implemented and planned mitigation – update from Rogelj et al. 2010), both of which come close to, or exceed by a substantial margin, 4°C warming by 2100. The shaded area shows the range of business-as-usual and policy reference scenarios in the recent literature (Schaeffer et al 2013). The results for these scenarios are compared to scenarios in which current pledges are met and to low-emissions mitigation scenarios holding warming below 2°C with a 50 percent chance or more (Hare et al 2011; Rogelj et al. 2010; Schaeffer et al 2012; RCP2.6 prepared for IPCC Fifth Assessment Report – van Vuuren et al 2011). Historical observations from Hansen et al. (2010). (Note that the IPCC presents warming levels for the RCP scenarios for the period 2080-2100, which in the case of rapidly warming scenarios can be significantly lower than the 2100 warming level, but are consistent with the projections here)

3 This applies for the "unconditional pledges, strict rules" case in UNEP (2012).

2.1 Projected climate change relevant for loss and damage in Africa

The incidences of extreme heat events that are classified as highly unusual in today's climate are projected to increase under global warming. In a 4°C warming scenario, these currently highly unusual events are projected to occurring in almost all summer months by 2100. Hence, in a 4°C warming scenario, extreme warm months that are currently highly unusual are projected to effectively become the "new normal". By contrast, at 2°C warming, heat extremes that are currently highly unusual are experienced in 60-80% of the summer months in central Africa only and at much lower frequencies across the rest of the continent. Limiting warming to 1.5°C will further limit the extent and frequency of these extremes.

Droughts are projected to become increasingly likely in central and southern Africa (Schellnhuber et al., 2013), as is a significant decrease in soil moisture (Trenberth, 2010), and a permanent state of severe to extreme values of drought indices by 2100 (Dai, 2012). Through changes to the hydrological cycle, climate change affects the timing, distribution and quantity of water resources (Goulden, Conway, & Persechino, 2009), causing many African countries that are already facing water shortages to experience increased water stress in the coming decades. The total surface area classified by Aridity Index as hyper-arid (desert) and arid (dry) land in Africa is projected to increase by 4% for 4°C warming by 2100, with sub-humid lands and lands without a structural moisture deficit decreasing in area by 5% each. This compares to a much smaller increase in area of hyper-arid and arid land of 1% under 2°C warming by 2100.

By the end of the century, sea-level rise is expected to be approximately 10% higher along Africa's coastlines than the global mean (Schellnhuber et al., 2013). However, the rise is not homogenous along the coastline of the continent. For example, it is projected to be higher in southern Africa than in West Africa and particular North Africa. In a 4°C world and assuming no adaptation, Hinkel et al. (2011) find Egypt, Mozambique and Nigeria to be most affected by sea-level rise in terms of number of people at risk of flooding annually. In terms of proportion, Guinea-Bissau, Mozambique, and The Gambia would likely suffer most, with up to 10% of the national population flooded. Flooding associated with tropical cyclone induced storm surges is another impact of global climate change, which, in conjunction with sea-level rise, will place more people at risk of coastal flooding. For example, Neumann et al. (2013), project that in Maputo, Mozambique a medium sea-level rise scenario of 0.3m by 2050 (associated with close to 2°C warming globally by that time) could increase the frequency of a current 1-in-100-year storm surge event associated with 1.1m surges to once every 20 years. Tunisia, Tanzania and Mozambique emerge as among the most exposed in the developing world (Dasgupta et al., 2011) in terms of overall exposure of a number of indicators such as proportion of land area, GDP, urban land area, agricultural area and wetland exposed.

High emission scenarios would also result in high carbon dioxide (CO2) concentrations and ocean acidification, by absorption of carbon dioxide in the oceans. The increase of CO2 concentration to the present-day value of 390 ppm has caused the ocean-surface pH to drop by 0.1 since preindustrial conditions. This has increased ocean acidity, which because of the logarithmic scale of pH is equivalent to a 30% increase in ocean acidity (concentration of hydrogen ions). The scenarios of 4°C warming or more by 2100 correspond to a further decrease of pH by another 0.3, equivalent to a 150% acidity increase compared to preindustrial levels (World Bank, 2012). Ongoing ocean acidification is likely to have very severe consequences for coral reefs, various species of marine calcifying organisms, and ocean ecosystems generally (Vézina and Hoegh-Guldberg 2008; Hofmann and Schellnhuber 2009).

2.2. Climate change impacts on different sectors

Associated with the projected climate change for the continent, agriculture (crop and livestock), water, biodiversity, human population (mobility, migration, health), tourism and urban areas will be largely negatively affected. Crop yields are expected to fall across much of the continent as optimal growing temperatures are exceeded and growing seasons shortened. The areas that are appropriate for any given crop are expected to shift as a result of changes in local climate patterns. At warming exceeding 3°C globally, virtually all of the present maize, millet, and sorghum cropping areas across Africa could become unviable for current cultivars. Approximately 5% of Sub-Saharan Africa where mixed crop and livestock production currently occurs could undergo a shift to exclusively rangeland, where cropping is no longer viable. Mean yield changes by the 2050s are projected of –17% for wheat, –5% for maize, –15% for sorghum, and –10% for millet (Knox et al.,2012). Southern Africa is ranked as one of the most affected regions, with maize production projected to decline by 20-35% and wheat production by 10-20% (Lobell et al., 2008). Crop production is also affected by extreme events such as floods. Floods could unexpectedly destroy harvests or infrastructure that is critical to the agriculture sector, but not enough data is currently available for a robust assessment of this risk.

Accelerated woody plant encroachment could limit grazing options for both wildlife and animal stock (Buitenwerf, Bond, Stevens, & Trollope, 2012). Livestock production would be affected by changes in feed quality and availability, water availability and increased rates of disease and heat stress (Jones & Thornton, 2009; Morton, 2012). Fish productivity in lakes, rivers and oceans is expected to decline with increased water temperatures, high levels of evaporation, high acidification and decreased nutrient concentration particularly off the coasts of West and North Africa and in the Red Sea (Cheung et al., 2010; Lam, Cheung, Swartz, & Sumaila, 2012; Ndebele-Murisa, Mashonjowa, & Hill, 2011). (Lam et al., 2012) project a potential reduction in annual fish landed value of about 21 per cent by the 2050s when global mean temperature increase reaches 1.9 degrees.

The existing regional differences in water availability across Africa are projected to become more noticeable. In southern Africa, annual precipitation is projected to decrease by up to 30 percent under 4°C warming, which could lead to an overall increase in the risk of drought in the region (Schellnhuber et al., 2013). Parts of west Africa may also experience reductions in groundwater recharge rates of 50–70 percent (Kundzewicz & Döll, 2009). In the Horn of Africa and northern part of east Africa, rainfall is projected by many global climate models to increase in making these areas somewhat less dry (Sillmann, Kharin, Zwiers, Zhang, & Bronaugh, 2013). However, these increases are projected to occur during the rainy seasons, rather than evenly during the year. This increase in precipitation during the wet season may lead to an increase in the risk of floods in the area. At the opposite, high-resolution regional climate models project a tendency towards drier conditions. Furthermore recent studies highlighted that the 2011 Horn of Africa drought, which particularly affected Ethiopia, Kenya and Somalia, is consistent with an increased probability of long-rains failure in a context of climate change (Sheffield, Wood, & Roderick, 2012).

Ecosystem ranges are likely to shift rapidly as warming increases, with a risk of loss of biodiversity as species may be unable to migrate to keep pace. Of the 5197 African plant species studied, 81-97% were projected to experience reductions or shifts in area suitable for these species and 25-42% could lose all suitable area by 2085 under 2°C warming globally (McClean et al., 2005). Most coral reefs are projected to be extinct long before 4°C warming is reached, due to severe coral-bleaching events annually, and chemical stress due to ocean acidification, with the loss of associated marine fisheries, tourism, and coastal protection against sea-level rise and storm surges (Meissner et al., 2012). The projected rates of bleaching are substantially reduced in 2°C changed-world, but would still pose a significant risk to the ongoing survival of reefs in the region.

Rates of undernourishment in the Sub-Saharan African population would increase by 25-90% compared to the present at a warming of 1.2-1.9°C by 2050 (Lloyd et al., 2011). Under nutrition can place people at risk of other health conditions including child stunting, which in turn results in reduced cognitive development and poor health into adulthood. The proportion of severely stunted children, which accounts for 12-20% at present, is projected to decrease by 40% without climate change, due to further development on the continent, but by only 10% if the negative impacts of climate change on nutrition are considered (Lloyd et al., 2011). Overall, human health is projected to be seriously affected, as rates of undernourishment, child stunting, vector-borne diseases (e.g. malaria), and water-borne diseases (e.g. cholera) are altered by climatic changes. Extreme weather events such as flooding and drought can also cause increased morbidity and mortality.

The tourism sector could be affected through factors such as extreme summertime temperatures, loss of biodiversity and natural attractions, and damage to infrastructure as a result of extreme weather events. The tourism industry in Morocco and Tunisia is expected to be significantly affected by increases in temperature that could render summertime and even the off-peak seasons less pleasant (Deutsche Bank Research, 2008). Globally, a shift in tourism activity towards higher latitudes and altitudes is expected (Simpson et al., 2008). Revenue generated from tourism will be directly affected by damage to infrastructure and changes in the length and quality of climate-dependent tourism seasons (Steyn and Spencer, 2012). Mount Kilimajaro in Tanzania – one of the nation's main tourism attractions – is suffering severe melting of glaciers projected to disappear altogether in the coming decades (UNEP 2013). The Nile Delta of Egypt, which is particularly vulnerable to inundation and saltwater intrusion associated with sea level rise, provides an example of the potential impact of sea-level rise on tourism (Michel and Pandya, 2010). Rising sea levels are expected to destroy parts of the protective offshore sand belt, which could damage recreational tourism and beach facilities, in addition to inundating coastal freshwater lagoons and salinating groundwater resources (Batisha, 2012). In Alexandria, the area of land associated with tourism purposes that is below sea level would increase from the current level of 28% to 62% with a sea-level rise of 1m, and valuable cultural sites could be placed at risk by storm surges (Michel and Pandya 2010).

In many cases, urban areas are particularly exposed to a number of risks associated with climate change, including sea-level rise, storm surges and extreme heat events. Informal settlements are highly vulnerable to flooding and the poor urban populations have been found to be the most vulnerable to elevated food prices following disruptions in agricultural production. Disruptions in energy supply could occur as changes in river runoff and increased temperatures affect hydroelectric dams and the cooling systems of thermoelectric power plants.

2.3 Damage costs for Africa in relation to mitigation and adaptation efforts

Adaptation can be a powerful tool in combatting the damages and losses associated with climate change. Adaptation, however, will face technical and financial limitations (for a comprehensive discussion on the limitations to effective adaptation in Africa, see (Schaeffer et al., 2013)). Adaptation could not remove all potential climate-induced impacts, and some important loss and damage - "residual" impacts - will remain. This subsection presents estimates of the costs of damages in different warming/mitigation as well as different adaptation scenarios applying an up-to-date integrated assessment model (IAM) (Fig. 2.1).

Several attempts have been made to assess the damages associated with climate change for various World regions. Many of these damage assessments have been completed within the context of IAMs. In this report we apply the AD-RICE model (de Bruin 2011), which has the advantage that it explicitly considers the role of adaptation in combatting climate change damages. The AD-RICE model is based on the RICE model developed by Nordhaus (see Nordhaus, 2011 for a description of the latest model).

The AD-RICE model includes three forms of adaptation, namely autonomous adaptation, anticipatory adaptation and a separate anticipatory category for sea-level rise adaptation. This distinction has been made to enable a more accurate description of the time dynamics of costs and benefits for each of these different forms of adaptation and hence the development of total adaptation costs in time.

Autonomous adaptation describes adaptation measures that can be taken in reaction to climate change or climate change stimuli. This form of adaptation comes at a relatively low cost and is generally undertaken by individual households and therefore is often referred to as private adaptation. Examples of this form of adaptation are the use of air conditioning and adjusting crop planting times. When autonomous adaptation decisions are made, the decision-maker weighs the direct benefits of adaptation (reduced damages) against the direct costs of adaptation. The costs and benefits fall within the same time period (in this model a decade). The benefits of autonomous adaptation are only felt for one time period, i.e. autonomous adaptation only provides protection from climate change damages for a decade.

Anticipatory adaptation, on the other hand, refers to adaptation measures that require investments long before the effects of climate change are felt. Anticipatory adaptation is modelled as investments made in order to build adaptation capital. The benefits of this capital are not felt immediately but create a stream of benefits in the future. Anticipatory adaptation investments made today will create adaptation capital in the next decade. The adaptation capital reduces damages as long as it still is in place. The adaptation capital depreciates over time, i.e. it does not last forever and will need to be replenished. This form of adaptation usually requires large-scale investments made by governments and therefore is a form of public adaptation. Examples of this form of adaptation are research and development into new crop types or the construction of a dam for irrigation purposes. When the decision-maker decides how much to invest in the building of adaptation capital, he needs to weigh the costs made now against a stream of future benefits. The investment costs are made now whereas the actual benefits in the form of reduced damage are expected in the future. As adaptation capital reduces damages for several decades, the decision-maker will need to sum and discount the future benefits and weigh these against the investment cost.

The final form of adaptation, sea-level rise adaptation, falls under the category of anticipatory adaptation, but is distinguished due to its uniquely high effectiveness. The construction of seawalls is considered to be a highly effective way of avoiding a large amount of potential damages. Moreover, the damages of sea-level rise and the associated adaptation costs depend on the level of sea-level rise and not the temperature level.

Distinguishing between these very broad categories of adaptation measures is useful in the context of loss and damages, because the level of "optimal" adaptation (see section 2.2.1) differs for each of these categories and hence the level of residual damages. In addition, insufficient action on adaptation leads to "under adaptation", which increases loss and damage to an extent that is also different for these adaptation categories, as is demonstrated in section 2.2.2.

2.2.1. Residual damages and adaptation costs in the case of optimal adaptation

In the AD-RICE model the three different forms of adaptation can be applied to reduce the damages felt at a given level of climate change. The damages that occur without adaptation (so called gross damages) are reduced to "residual damages". The levels of emissions and hence climate change assumed will determine the level of gross damages. The "optimal" levels of adaptation are established by an "optimal" balance between adaptation costs and residual damages, minimizing the total costs (i.e. the sum of these). Figure 2.2.1 shows the optimal adaptation costs (i.e. the costs of adapting at the optimal level) for Africa for the sea-level rise sector (land and capital losses due to sea level rise) and Figure 2.2.2 for all other sectors (such as health, agriculture, energy, water, biodiversity). Both figures show costs in terms of percentage of Gross Domestic Product (GDP).

Figure 2.2.1: Adaptation costs the sea-level rise sector as a percentage of GDP for different emissions scenarios. Source: own calculations using the AD-RICE model

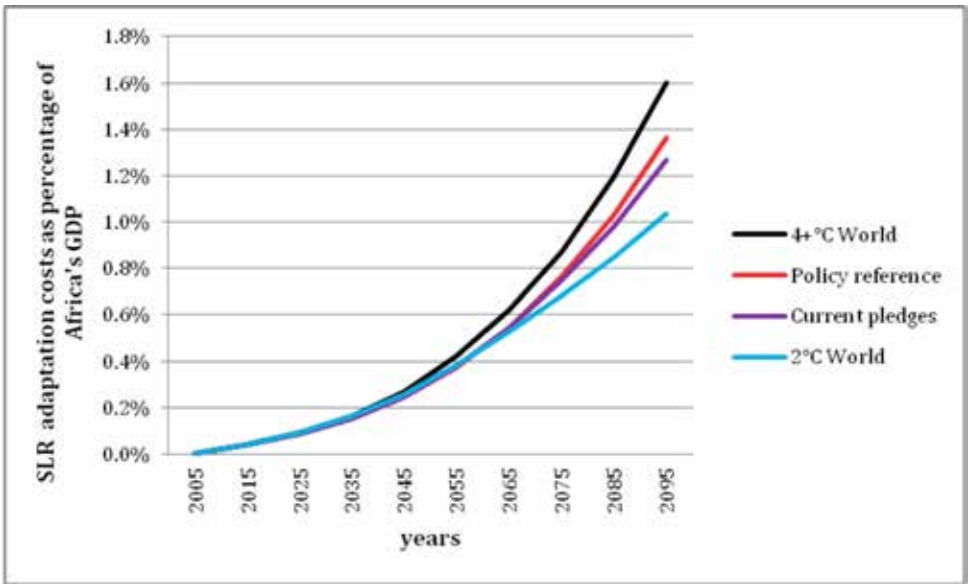
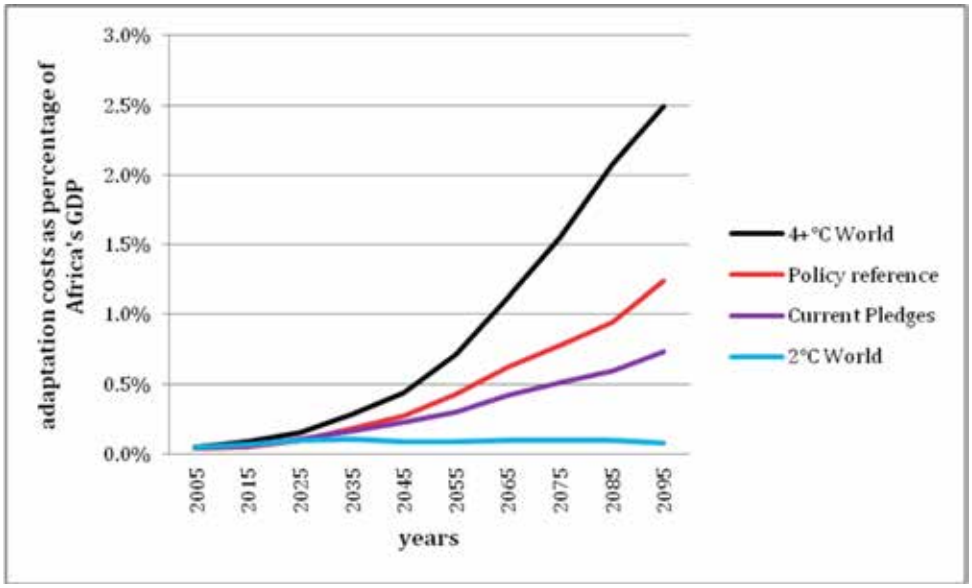


Figure 2.2.2: Total adaptation costs in all sectors excluding the sea-level rise sector as a percentage of Africa's GDP for different emissions scenarios. Source: own calculations using the AD-RICE model.



These figures clearly show that adaptation costs increase steeply over time. Furthermore, scenarios with higher emission levels lead to larger adaptation costs. The increase of adaptation costs in higher emission scenarios is much greater in the case of damages from sectors other than sea-level rise (ranging from 0.1% of GDP in "2°C World" to 2.5% of GDP in "4+°C World" by 2100). This is because damages from sea-level rise are a function of the amount of sea level rise and damages in other sectors by the amount of temperature change. Due to the large inertia of the oceans and polar ice sheets, the future sea-level and associated damages are determined to a larger degree by past emissions and the relative effect of future emission reductions is smaller over the first few decades of mitigation. For adaptation to sea-level rise the estimates range from 1% of GDP in "2°C World" to 1.6% of GDP in "4+°C World" by 2100.

Figure 2.2.3 shows the residual damages for the sea-level rise sector and and 2.2.4 for all other sectors. Like adaptation costs, residual damages increase sharply over time and for higher emission

scenarios. Again, the spread of residual damages across emission scenarios is larger in non sea-level rise sectors (ranging from 1% of GDP in "2°C World" to 5% of GDP in "4+°C World" by 2100) than in the sea-level rise sector (ranging from 0.06% of GDP in "2°C World" to 0.1% of GDP in "4+°C World" by 2100). The model projects that the residual damages in the sea-level rise sector are small in comparison to the adaptation costs. This is due to the extreme cost effectiveness of adaptation in the model's sea-level rise sector, i.e. large amounts of residual damages can be avoided at relatively small adaptation costs. In all other sectors residual damages are far higher than adaptation costs reflecting the limitation of adaptation to effectively reduce large amounts of residual damages.

Figure 2.2.3: Residual damages in the sea-level rise sector as a percentage of GDP for different emissions scenarios. Source: own calculations using the AD-RICE model.

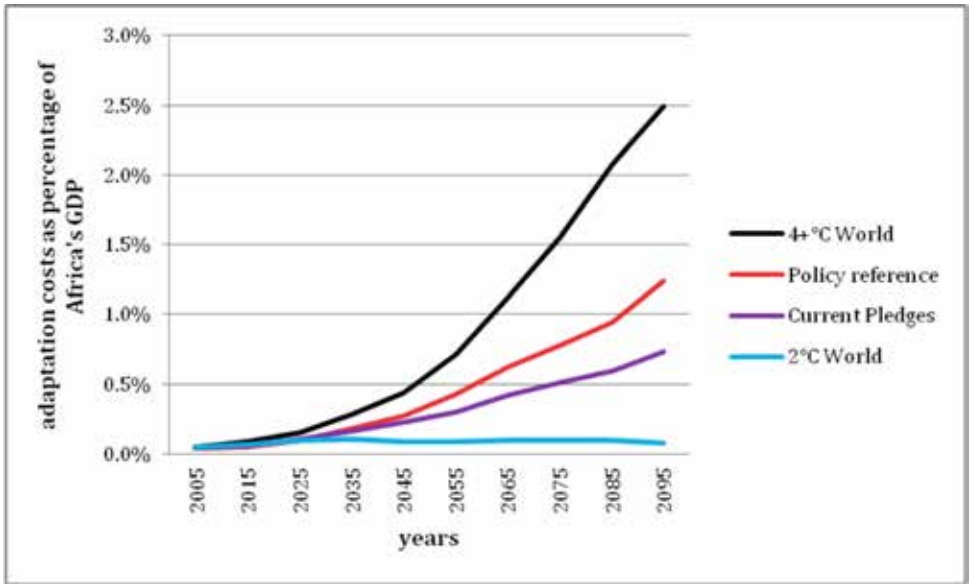
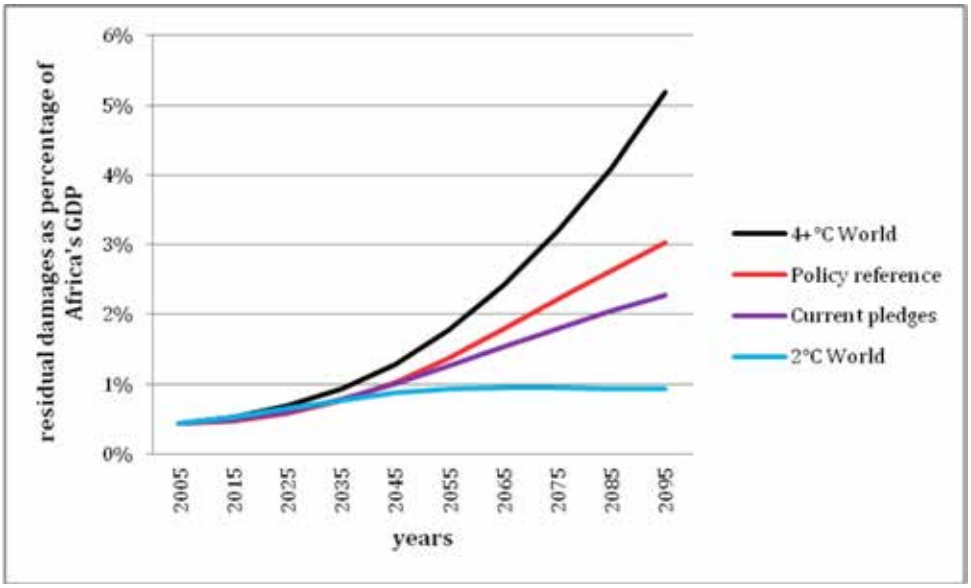


Figure 2.2.4: Total residual damages in all sectors excluding the sea-level rise sector as a percentage of GDP for different emissions scenarios. Source: own calculations using the AD-RICE model.



2.2.2. The costs of "over adaptation" and "under adaptation"

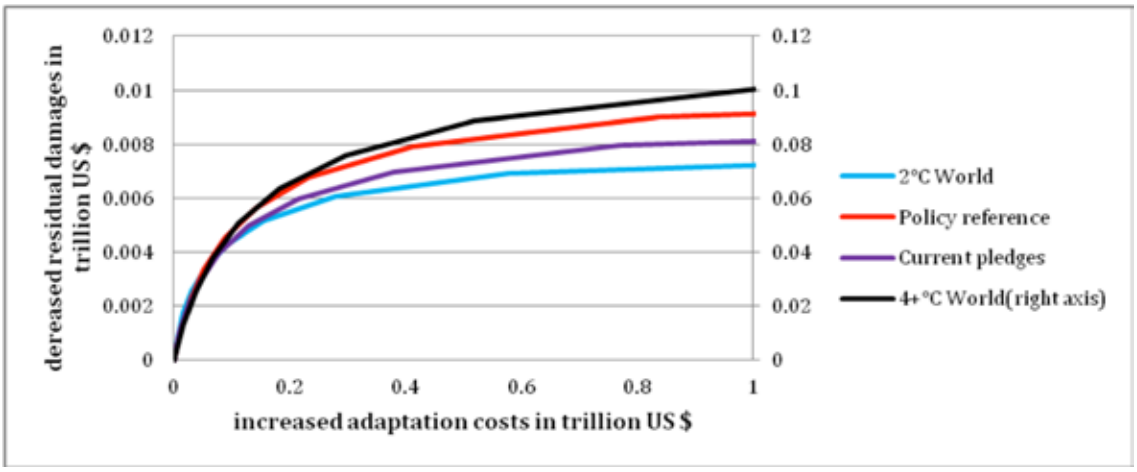
In this section we examine the costs of "over adaptation" and "under adaptation", these concept are defined in reference to so called optimal adaptation.

Optimal adaptation refers to the level of adaptation where adaptation costs and reduced damages from adaptation re balanced, i.e. you adapt to the point where addition adaptation would incur more costs than benefits. "Over adaptation" then refers to an adaptation level above the optimal level, where too much adaptation is applied compared to what would result in the least costs (residual damages plus adaptation costs). "Under adaptation" refers to an adaptation level that is under this optimal level, where too little adaptation is applied.

As discussed, the AD-RICE model distinguishes between damages due to sea-level rise and other damages. Due to the model's limitations, adaptation to sea-level rise can only be set at two levels, i.e. 'optimal' and 'no adaptation' (the complete absence of adaptation, where no changes are made to limit gross damages). To investigate the effects of intermediate degrees of limitations to adaptation, e.g. a basic assessment of the implications of "under adaptation", we necessarily focus on other climate change damages (besides sea-level rise).

Figure 2.2.5 shows the trade-off between further decreasing residual damages and further increasing adaptation costs from the "optimal" adaptation level for the emission scenarios. This reflects the rapidly rising additional adaptation costs (in US$) to reduce residual damages (in US$) to a level below the optimal level. In the optimum (the origin of figure 2.2.5) a dollar spent on adaptation will decrease residual damages by one dollar, hence there will be no net effect on total climate costs. However, for adaptation levels above the "optimal" level, each additional dollar spent on adaptation will lead to less than one dollar decrease in residual damages. As can be seen from the figure reducing residual damages beyond the optimum becomes increasingly expensive in terms of adaptation costs. Increased adaptation spending (i.e. over-adapting) could greatly increase total climate change costs, where up to 100 US of adaptation is needed to reduce 1 US$ of residual damages (an additional one trillion US$ of adaptation leads to 0,01 US$ dollar of reduced damages). This accentuates the importance of focussing on reducing total costs of climate change and not only residual damages. Furthermore, since residual damages are already much lower in terms of dollars for lower emission scenarios, reducing these further by a dollar requires a higher additional adaptation costs than for high emission scenarios. In absolute terms it is relatively less costly to reduce residual damages in high emission (damage) scenarios, However, reducing residual damages would be much cheaper in low emissions scenarios, e.g. cutting residual damages in half from levels associated with "optimal" adaptation levels would require only half the additional adaptation costs in a "2°C World" compared to a "4+°C World" (not shown).

Figure 2.2.5: Increased total adaptation costs associated with decreased amounts of residual damages in all sectors excluding the sea-level rise sector in USD2005 for different emissions scenarios. Source: own calculations using the AD-RICE model



Though over-adaptation can be highly inefficient in reducing the total costs of climate change (where costs outweigh benefits), it does not seem likely to occur in Africa. Adaptation in Africa will face many challenges and a situation of under adaptation is more likely, In the case of anticipatory adaptation the challenges are predominantly financial and technical limitations, while in the case of autonomous adaptation these are predominantly lack of knowledge, means and know-how to adapt to climate change. For example, though adaptation in agriculture can be highly effective, farmers often lack the knowledge or means to change their crop types or irrigation techniques. These limitations will lead to lower levels of adaptation spending than is optimal. Figures 2.2.6a for the 2050s and 2.2.6b for the end of the century illustrate the effects that restricting anticipatory adaptation, i.e. under-adaptation will have on residual damages. In these scenarios the level of anticipatory adaptation costs is constrained (in terms of percentage of the optimal levels) while the level of autonomous adaptation is assumed to stay at the same level. The figures show that residual damages increase steeply when anticipatory adaptation falls short of its optimum level. The consequences for residual damages of adaptation limits are larger in the long run (2100 compared to 2050). Moreover, for a low emission scenario such as "2°C World" (RCP2.6), limiting anticipatory adaptation in the long run has a small effect due to the low levels of climate change, whereas in a high emission scenario such as "4+°C World" (RCP8.5) restricting adaptation has large effects. This reflects the substitution between adaptation and mitigation, where low levels of mitigation will increase the need for adaptation and hence the damage costs of limiting adaptation.

Figure 2.2.6a: Increased residual damages in all sectors excluding the sea-level rise sector in percentage of GDP for different emissions scenarios and anticipatory adaptation limitations in 2050. Source: own calculations using the AD-RICE model

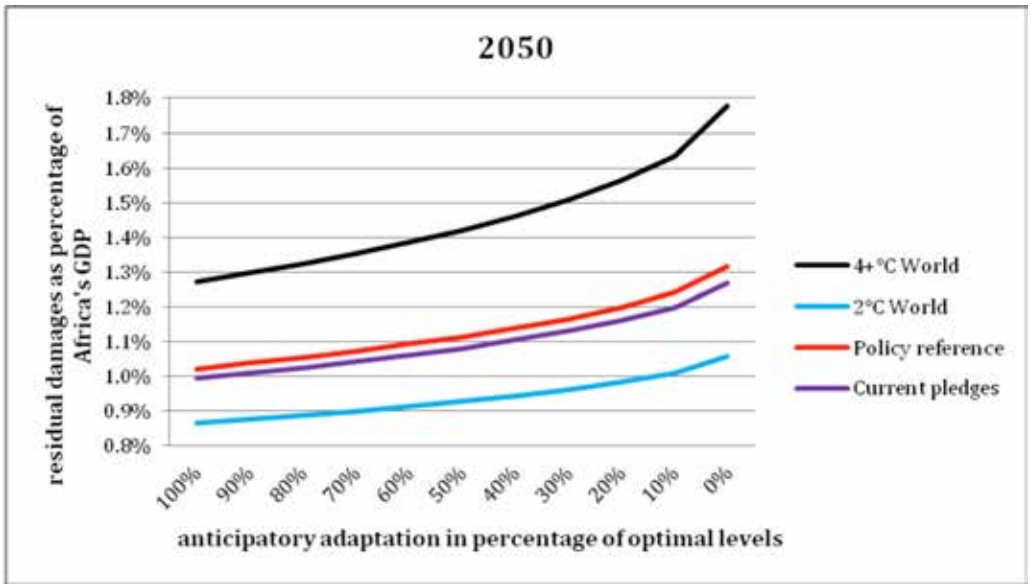
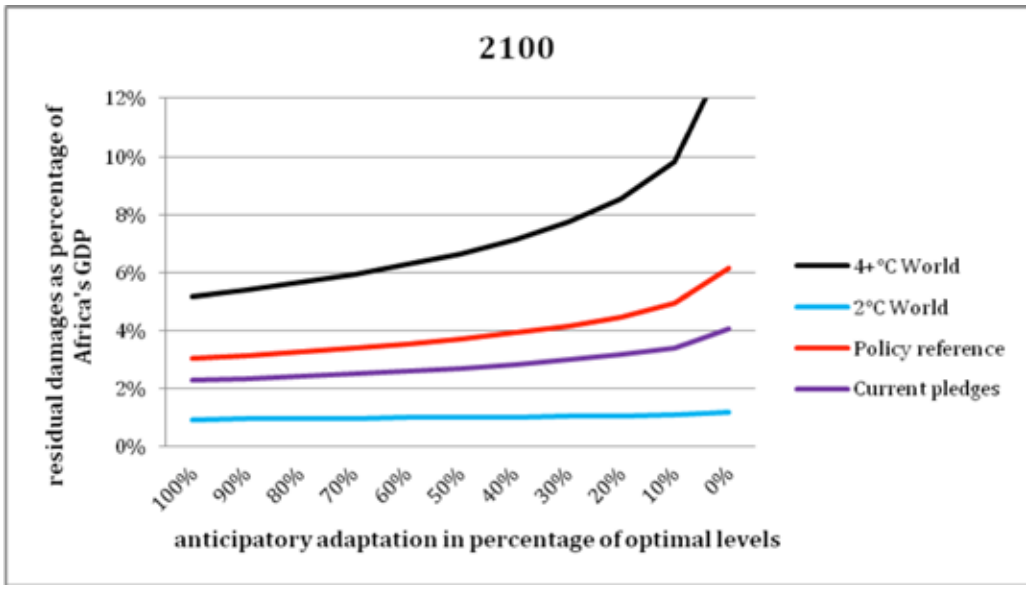


Figure 2.2.6b: Increased residual damages in all sectors excluding the sea-level rise sector in percentage of GDP for different emissions scenarios and anticipatory adaptation limitations in 2100. Source: own calculations using the AD-RICE model



Figures 2.2.7a and 2.2.8b display the effects of limiting both anticipatory and autonomous adaptation. Though the residual damages increase when autonomous adaptation is also restricted, the increase compared to only restricting anticipatory adaptation is small. This reflects the dominant importance of anticipatory adaptation in limiting the damages of climate change in Africa.

Figure 2.2.7a: Increased residual damages in all sectors excluding the sea-level rise sector in percentage of GDP for different emissions scenarios and adaptation limitations (both anticipatory and autonomous) in 2050. Source: own calculations using the AD-RICE model

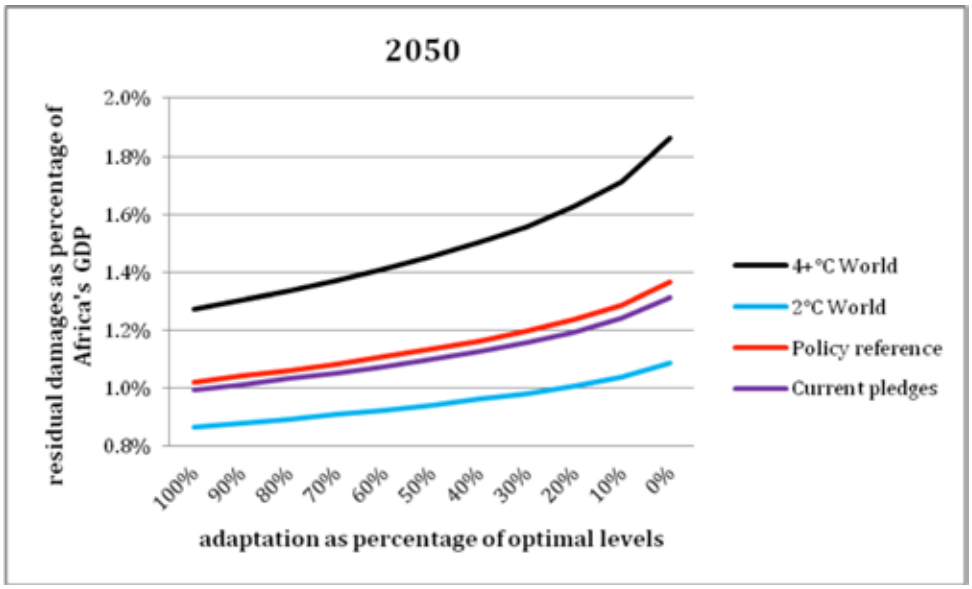


Figure 2.2.7b: Increased residual damages in all sectors excluding the sea-level rise sector in percentage of GDP for different emissions scenarios and adaptation limitations (both anticipatory and autonomous) in 2100. Source: own calculations using the AD-RICE model

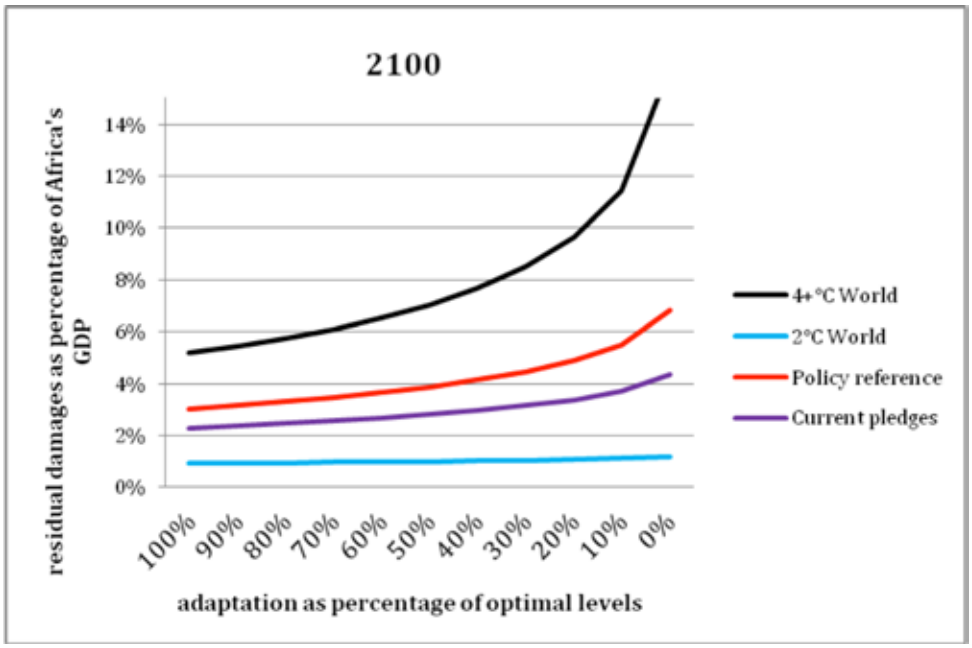
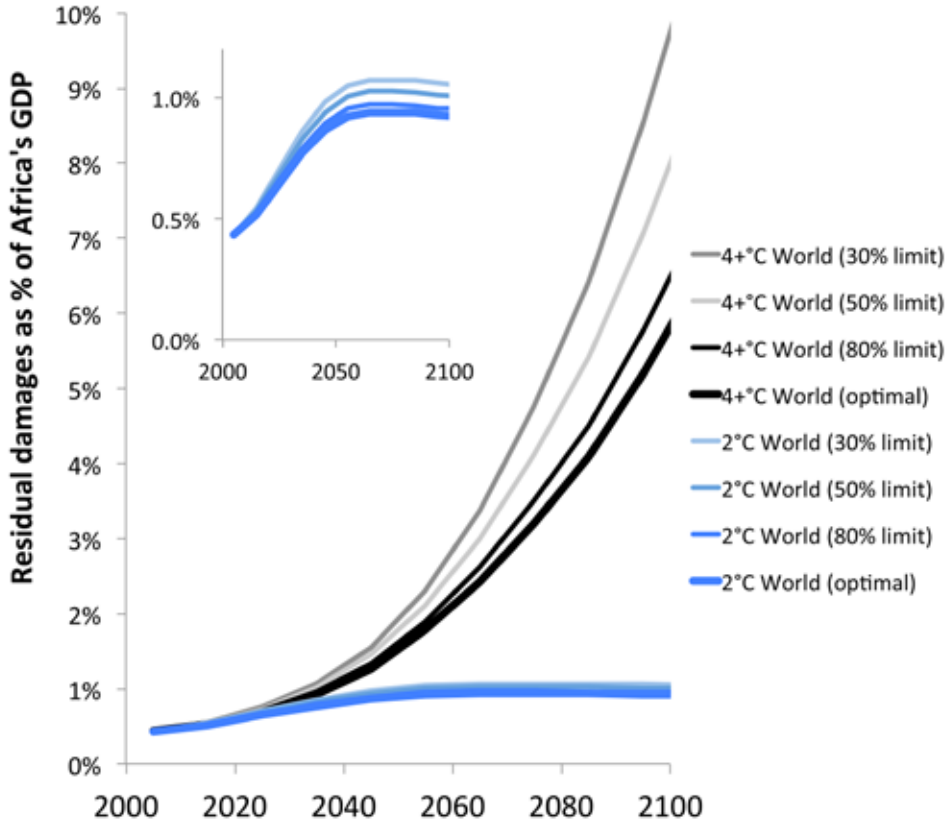


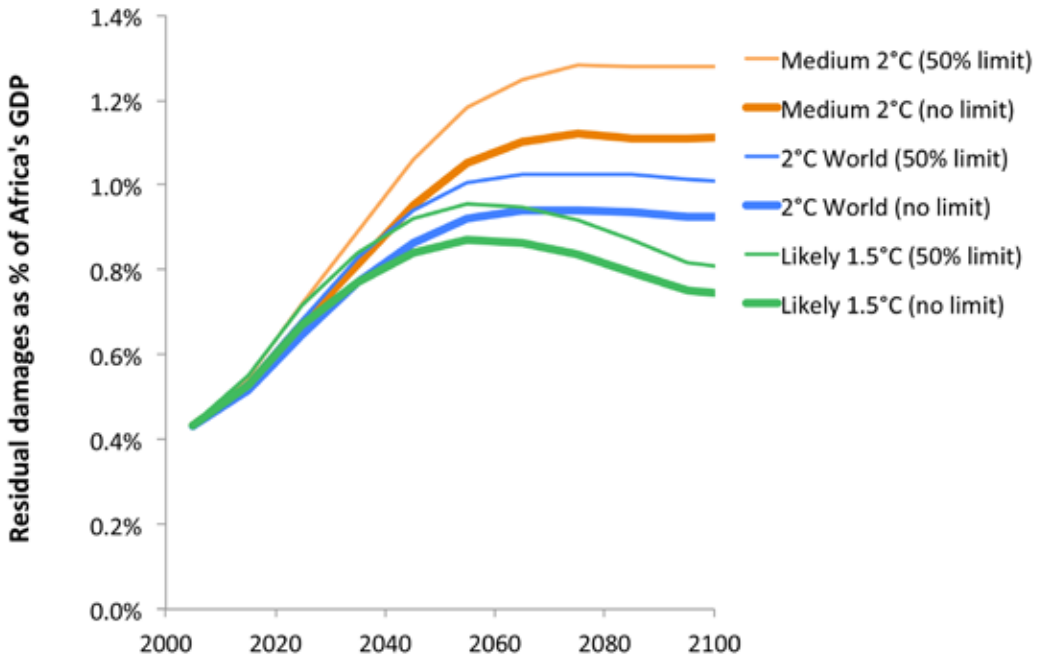
Figure 2.2.8 illustrates how restriction or limitations on anticipatory adaptation will affect residual damages differently depending on the emission scenario over time. The increase in residual damages due to restrictions in adaptation is larger in the high emission scenario. Adaptation restrictions or under adaptation will hence be more harmful if emissions are not controlled and would shift the focus of Africa's reliance on international finance dramatically from adaptation funding to an arrangement to cope with residual damages. For both the high (4+°C World) and low (2°C World) scenarios total costs would decrease in the short term (not shown). This is because of decreased adaptation investments that are to be made in the short term, but only pay off in terms of reducing residual damages in the long run. While this short-term decrease in the high emission scenario is stronger, as that scenario calls for more anticipatory adaptation costs, the costs increase in the long run for both scenarios, but more so in the high emission scenario.

Figure 2.2.8: Residual damages for Africa in percentage of GDP over time for a range of "under adaptation" cases (80% of optimal, 50% of optimal and 30% of optimal) for a high emission scenario (4+°C World) and a low emission scenario (2°C World). Source: own calculations using the AD-RICE model



While there is a large difference between low and high emissions scenarios in absolute levels of damages and in the effects of under-adaptation, the effects for different low-emission scenarios are more similar. Figure 2.2.9 shows the effects of under adaptation by 50% (adaptation costs are 50% of the optimal level) compared to no limit (adaptation is optimal) for a "median 2°C" scenario, 2°C World and a 1.5°C scenario (see also Figure 2.1).

Figure 2.2.9: Percentage change in total climate change costs (adaptation costs and residual damages) over time for different anticipatory adaptation limits (optimal and 50% of optimal) for three low emission scenario: likely 1.5°C, 2°C World and medium 2°C. Source: own calculations using the AD-RICE model



2.2.3. Discussion: Caveats and Implications of cost estimates

As mentioned before, assessing future climate change adaptation costs is a complex undertaking that involves a large amount of uncertainty. Though the estimates in this section can give us a better understanding of the adaptation costs and residual damages facing Africa in the future, they have their limitations.

The most prominent limitations are uncertainties about the impacts of climate change, incomplete inclusion of the role of institutions and the characterisation of the decision-maker. It is impossible to predict climate change damages with certainty and opinions differ on the expected level of climate change damages. The model used in this chapter is an applied economic model, which tries to capture the complexities of future climate change and its impacts. Naturally it is not possible to capture all details, characteristics and mechanisms involved.

Specifically for the loss and damage discussion, not all climate-change damages and affected sectors are included in our assessment. For instance, the effects of ocean acidification are not included, while this is a key "slow-onset event" leading to loss and damage discussed in UNFCCC context. In addition, non-financial aspects of impacts, damages and adaptation are controversial to define in an economic framework. This does, however, imply that our estimates of "residual damages", while serving as an approximate estimate of the monetary costs, do not cover other aspects, such as culture, loss of sovereignty and only partly other less tangible impacts of climate change, like loss of life and biodiversity. As explained earlier in this chapter "economically optimal adaptation" is the level of adaptation that achieves the overall lowest total of adaptation costs and residual damages. An additional dollar invested to enhance adaptation would result in less than a dollar of further reduced residual damages. However, to call this level of adaptation "optimal" is a very narrow definition of "optimal". Non-monetary damages might well lead to decision makers targeting higher levels of

adaptation than "economically optimal", to reduce these non-monetary damages. The cost estimates in this chapter need thus be interpreted as conservative.

Keeping the caveats and limitations of the economic assessment in mind, figure 2.2.10 shows the basic relations between mitigation, adaptation and (residual) damages for Africa based on the calculations in this chapter (excluding sea-level rise). In general, adaptation reduces damages, but significant residual damages remain. For a 4+°C World (two left column bars Figure 2.2.10), residual damages are extremely high for under adaptations and remain at about two-thirds of total costs at the point where adaptation expenditures reach a level of "economically optimal adaptation".

However, if the same absolute level of adaptation of this economically optimal "4+°C adaptation" were achieved in a "2°C world", residual damages would be reduced dramatically (third bar in Figure 2.2.10). Although adaptation measures in a 2°C world are not necessarily the same as in a 4°C world, over-investing in adaptation in a 2°C world is far less economically inefficient than under-investing in adaptation in a 4°C world. This illustrates that combined successful global mitigation and successful strong adaptation are together most effective for reducing residual damages for Africa, leading in a sense to the proverbial "aim for 2 degrees and prepare for 4".

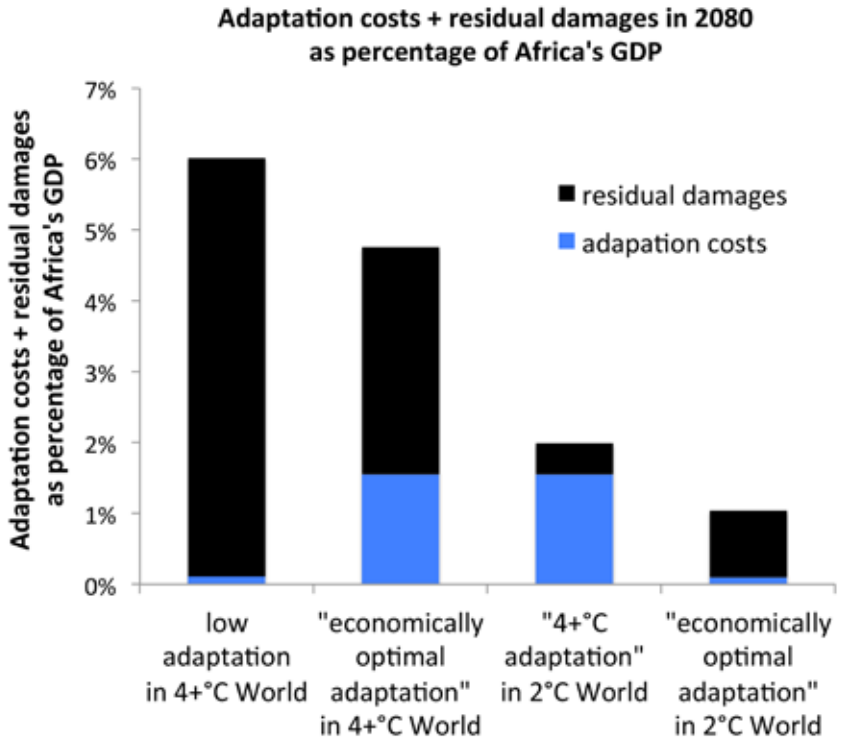
If, on the other hand, adaptation were limited to the (lower) level that is economically optimal in a 2°C world (right-most bar), total costs would be lower, but residual damages significantly higher and this would lead to a greater dependence on a mechanism or on arrangements to address loss and damage.

This overview leads us to a set of key observations:

- Climate costs (adaptation + damages) for Africa are very much higher in a "4+°C world" compared to a "2°C world"
- Higher levels of adaptation than "economically optimal" lead to dramatically reduced residual damages compared to a 4°C world and might also be preferable to limit non-monetary damages
- However, even in a 2°C world, lower levels of adaptation, like the "economically optimal" level, significantly increase residual damages and shift the focus of costs for Africa again towards residual damages

Taken together, these observations imply that low levels of mitigation (i.e. high warming), as well as lower levels of adaptation shift the focus of costs rapidly to the loss & damage side of the negotiations. In other words, if global mitigation efforts remain inadequate, damages for Africa increase strongly, even with increased adaptation efforts. Damages for Africa also increase strongly if adaptation falls short, even under strong global mitigation efforts. Hence, it is in the interest of Africa to strive for a global agreement that is strong on both mitigation and international finance for adaptation. Although loss and damage remains significant in Africa under any level of mitigation and adaptation, a failure to address and heavily invest in any one of these two would put the fate of Africa completely in the hands of a mechanism, or arrangements, to address loss and damage. Hence, the characteristics of these mechanism or arrangements are of paramount importance for Africa and will be assessed in the next two chapters.

Figure 2.2.10: Overview of adaptation costs and residual damages for Africa in relation to two mitigation scenarios and various adaptation cases. Costs do not include those related to sea-level rise due to limited options in the model to address a varying level of adaptation for sea-level rise sectors. Source: own calculations using the AD-RICE model



3. Challenges and limitations of existing institutional Arrangements

This chapter provides an assessment of existing national and regional arrangements in Africa to answer the question whether these arrangements have the potential to address loss and damage related to anthropogenic climate change.

3.1. Conceptual framework

An effective response to loss and damage from climate change has to be based on the recognition that the extent of these losses and damages are, in part, the result of the inherent vulnerability[4] of the affected countries and assets (IPCC, 2007). Some of this vulnerability is due to natural and physical factors, which cannot be changed e.g. exposure to sea level rise as a result of the location of country along a coastline. Others are due to human activities and actions, which may have the potential for modification to increase resilience[5] (IPCC, 2007).

A comprehensive response to loss and damage therefore, has to address three challenges, viz:

a. the ex-ante potential for reducing losses through resilience building; and
b. the ex-post challenges of recovery and rehabilitation from the loss and damage, where possible; and
c. the challenges of having to cope with permanent losses, where the pre-impact status quo, or any semblance thereof, cannot be restored, due to the permanent nature of the changes brought about by the climate change impact.

This requires that at the operational level, institutional arrangements and mechanisms to address loss and damage will have to be able to deliver specific outcomes in the following areas, viz:

a. Minimise loss and damage by building ex-ante resilience;
b. Assist in recovery and rehabilitation from the impacts of climate-related hazards, from which it is possible to recover or rehabilitate; and
c. Provide redress in the event of a permanent loss in which the pre-hazard status quo cannot be restored e.g. requires permanent relocation, or adjustment and change in livelihood.

The arrangements will also have to be flexible in design and would vary in application, as impacts and losses will vary depending on the specific country or region that is impacted, as well as the types of hazards that impact the country or region. As an example, the response for a country or region that has been impacted by desertification would be fundamentally different from that for an island or coastal country that has suffered losses from ocean acidification or sea level rise.

4 Lately, the IPCC has defined vulnerability as the predisposition or the propensity to be adversely affected (see, IPCC SREX 2012). Earlier, vulnerability was defined as the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity. The elements of the old IPCC definition (sensitivity, exposure and adaptive capacity) are embedded in the larger context of propensity and predisposition.

5 Resilience is defined as the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt to stress and change.

3.1.1. Minimising loss and damage through building ex ante resilience

There are a range of tools and modalities currently available for minimising loss and damage through the building of ex-ante resilience, which contributes to reducing risk. Many of the existing tools, developed by the disaster risk management community, either seek to reduce risk, or to take deliberate measures to reduce the impact of the disaster on the vulnerable community or country.

Examples of measures to reduce risk include structural approaches like flood protection walls/sea walls, building retrofitting and water retention dams; and non-structural approaches like strengthening building codes; adjustments in livelihood practices and education.

Examples for reducing impacts include relocation to move the vulnerable assets out of harm's way; the implementation of early warning systems; and provision of timely and accurate weather information at the local level.

Both categories of measures to build ex-ante resilience require hazard mapping (Lashley and Warner, 2013; Orie and Stahel, 2013). These options, if appropriately deployed at the local level, strengthen resilience in advance of the impact and help to reduce the level of losses and damages that would result, than would otherwise have been the case.

Effective institutional arrangements for loss and damage could therefore support the strengthening of appropriate risk reduction measures where they exist and facilitate their introduction, where they do not exist.

3.1.2. Supporting recovery and rehabilitation

Existing approaches for supporting recovery and rehabilitation focus on the accumulation of resources that will become available to support communities and countries in the occurrence of a disaster. These generally fall into two categories – risk retention approaches and risk transfer approaches. These approaches do not reduce risk or prevent damage, but assist in recovering from the losses and damages after they have been incurred.

Risk retention approaches are characterised by the fact that the affected communities or countries assume the responsibility for providing the resources to recover from the impacts of the disasters (Cummins and Mahul, 2009). Examples of such arrangements include social safety nets; use of tools like reserve funds for offsetting unexpected financial burdens associated with impacts from disasters; and reallocation of governmental budgets in the event of an impact[6].

Risk transfer approaches help shift the financial risks of loss and damage from one entity to another (Cummins & Mahul, 2009). The most common examples are traditional insurance or reinsurance products (of which a variety of parametric and indemnity products exist at the micro, meso and macro levels); or insurance-linked securities (Linnerooth-Bayer and Hochrainer-Stigler, 2013).

Effective institutional arrangements for loss and damage could therefore support the strengthening of appropriate risk retention and/or risk transfer measures where they exist and facilitate their introduction, where they do not exist.

6 Countries may receive assistance from other countries and/or agencies in accessing the needed resources and establishing the requisite mechanisms

3.1.3. Responding to permanent loss

The issue of redress for permanent loss, from which recovery and/or rehabilitation are not possible, is uncharted territory, from a climate impacts perspective. However, there are established principles from the treatment of transboundary pollution that are relevant to loss and damage and may provide some options for further consideration. These are relevant to the loss and damage debate, as the causes of the increasing loss and damage being experienced are the result of transboundary pollution, where greenhouse gases emitted in one country are resulting in damage in other countries (Verheyen, 2005).

3.2. Existing institutional arrangements in Africa

Institutional arrangements that can play a role in addressing loss and damage from climate-related impacts in Africa are in operation at both national and regional levels. Most of these have been developed in the context of disaster risk management programming and Table 3.2.1 provides a non-exhaustive summary of these institutional arrangements.

3.2.1. Minimising loss and damage through building ex-ante resilience

Existing institutional arrangements in Africa building ex-ante resilience through risk and impacts reduction (Table 3.2.1) were presented at the United Nations Framework Convention on Climate Change (UNFCCC) workshop on loss and damage held in Addis Ababa, from 13 to 15 June 2012 (UNFCCC, 2012a).

National Initiatives

Some countries have initiated national level programmes to build ex-ante resilience through risk reduction and risk avoidance measures. Examples of these initiatives include:

a. *The Mozambique Flood Risk Management Program* – This is a flood early-warning system coordinated by the institutes of water management, disaster management and meteorology. Local committees in villages and communities are trained to carry out evacuations, once the meteorology department advises of the potential for damaging floods.

b. *The Mozambique Sustainable Land Use Planning for Integrated Land and Water Management for Disaster Preparedness and Vulnerability Reduction in the Limpopo Basin*. This focuses on the implementation of structural disaster reduction by the construction of shelters for the community during floods, which serve as classrooms or agricultural centers during normal periods.

c. *UNDP Mozambique and UNDP's Bureau for Crisis Response and Recovery (BCPR) Joint Programme Strengthening Disaster Risk Reduction (DRR) and Emergency Preparedness Programme* to strengthen DRR and preparedness of country's most vulnerable populations by reducing risk exposure and mitigating their impacts. It includes an evaluation of the projected impacts, a risk information and management system and large-scale disaster simulation.

d. *Ethiopia's Livelihood Early Assessment and Protection (LEAP) or Kenya's Early Warning System* - are early-warning system (EWS) or the national Early Warning Systems (SAP: Système d'Alerte Précoce) in the Sahel and West African countries that are members of CILSS (Permanent Inter-State Committee for Drought Control in the Sahel)[7]. LEAP and the SAPs are are integrated systems whose objective is to anticipate food security crises by monitoring agro-meteorological data and providing forecasts and early warnings of potential impacts.

7 www.cilss.bf

e. ***Senegal's Adaptation to coastal erosion*** in vulnerable areas (INTAC project) is an adaptation to climate change type of project that consists of the protection of coastal communities and cultural sites and infrastructure against the consequences of climate change induced sea-level rise and groundwater salinization (Adaptation Fund Board, 2010).

Regional Initiatives

There are also regional level programming that is aimed at strengthening ex-ante resilience and minimising losses. These include:

a. Shared Protocol on Water Courses - Regional cooperation on watercourses through the Southern Africa Development Community (SADC), which is comprised of fifteen (15) African countries[8], to strengthen security from water-related disasters and climate resilience. SADC members also cooperate in the implementation of programmes and projects aimed at early detection, early warning and mitigation of disaster effects, although the SADC has not developed a protocol on disaster risk reduction or management[9].

b. Africa Risk Capacity (ARC) -The ARC is a multi-country facility that contributes to risk assessment at the national level and risk transfer at the regional and international levels.

c. Regional centres to assess agriculture or other climate related risks on populations and livelihoods in Africa, including:

   i. CIGHAD (Intergovernmental Authority on Development) Climate Prediction and Applications Centre (ICPAC),

   ii. Intergovernmental Authority on Development (IGAD) Climate Prediction and Applications Centre (ICPAC),

   iii. African Climate Policy Centre (ACPC),

   iv. Southern African Development Community (SADC),

   v. African Centre of Meteorological Application for Development (ACMAD) and

   vi. AGRHYMET Center, a specialized institute of the Permanent Inter-State Committee for Drought Control in the Sahel (CILSS), ,

g. Strategy for Flood Management for the Kafue River Basin, developed in a collaborative and participatory process between the World Meteorological Organization, a Zambian expert team and key stakeholders including Government Ministries, local organizations, researchers, NGO's, and local farmers' and fishing associations. It facilitates national cooperation on floods of the Kafue River to strengthen security from water-related disasters and climate resilience.

h. The Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA). Their work have incorporated climate change adaptation strategies into their national development plans

i. Permanent Inter-State Committee for Drought Control in the Sahel (CILSS)

j. The mandate of the CILSS is to strengthen food security, combat desertification and the impacts of droughts in the Sahelian countries. In this regard, the CILSS can formulate and coordinate strategies and policies; build scientific and technical capacities; collect and manage information; contribute to experience and good practices sharing; and support the implementation of strategies, policies and programmes in the Sahelian countries.

8 Angola, Botswana, Democratic Republic of the Congo, Lesotho. Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe.

9 http://www.sadc.int/themes/disaster-risk-management/

Table 3.2.1: Existing Institutional Arrangements building ex-ante resilience through reduction of risk or impacts

National Arrangements	▪ Mozambique Flood Risk Management ▪ Mozambique Sustainable Land Use Planning for Integrated Land and Water Management for Disaster Preparedness and Vulnerability Reduction in the Limpopo Basin ▪ Strengthening Local Risk Management), UNDP Mozambique and (BCPR) and Joint Programme Strengthening DRR and Emergency Preparedness Programme ▪ Early Warning Systems - Ethiopia Livelihood Early Assessment and Protection EWS/Kenya ▪ Senegal Adaptation to coastal erosion in vulnerable areas - "INTAC project" (Adaptation Fund Board, 2010) ▪ National Early Warning Systems (SAP=Système d'Alerte Précoce) in the Sahel and West African countries that are members of CILSS
Regional Arrangements	▪ Shared Protocol on water courses ▪ SADC cooperation on Disaster Risk Management ▪ Africa Risk Capacity (African Union, 2013) ▪ Regional centres to assess agriculture or climate related risks on populations in Africa ▪ Strategy for Flood Management for the Kafue River Basin ▪ Association for strengthening Agricultural Research in Eastern and Central Africa (ASARECA) ▪ AGRHYMET Center, a specialized institute of the Permanent Inter-State Committee for Drought Control in the Sahel (CILSS)

3.2.2. Supporting recovery and rehabilitation

The UNFCCC workshop mentioned above on loss and damage (UNFCCC, 2012a) also included a presentation of existing institutional arrangements in Africa supporting recovery and rehabilitation through risk retention, risk transfer and risk pooling (see Table 3.2.2).

National Initiatives

National initiatives to support recovery and rehabilitation include:

a. *Ethiopia Productive Safety Net program (PSNP), Malawi Cash Transfer Program* - Social safety nets programmes are defined as non-contributory transfer programs targeted to poor households and groups. Poor households can benefit of the programme in two ways through public works or direct support. Through the public works programme, which constitutes the larger part of the programme, selected beneficiaries receive a defined amount of money per day worked for projects whose objectives are to improve community assets. Through the direct support programme beneficiaries, who cannot contribute to public works, only receive support from the PSNP. Beneficiaries either receive cash or an equivalent payment in staple food.

b. *Indexed insurance schemes* primarily for agriculture sector, housing and public infrastructure[10]. The difference between conventional and index-based insurances is defined as "whereas conventional insurance is written against actual losses, index-based (or parametric) insurance is written again physical or economic triggers" (Linnerooth-Bayer & Mechler, 2008). One such scheme is the HARITA, a hybrid micro insurance/social safety net programme in Ethiopia, in which smallholders can purchase insurance to cover their risk against weather related events such as drought, in exchange of a premium by their work, or financially.

c. *Use of Reserve Funds* – These are financial reserves constituted by countries and/or donor organisations to hedge the risk supported by first layer risk transfer mechanisms such as insurance or micro-insurance schemes.

10 Ibid

Regional Initiatives

At the regional level, there is only one initiative to support recovery and rehabilitation, namely the Africa Risk Capacity (ARC). This is a multi-country risk pooling facility that contributes to risk assessment at the country level and risk transfer at the regional and international levels.

Since the 23rd of November 2012, the ARC has been a specialized agency of the African Union. In 2012, 18 countries[11] signed the establishment agreement that started up the ARC. Later in 2013, four new countries[12] joined the agreement (African Risk Facility, 2013). The African Risk Capacity is an index-based risk transfer mechanism that would act as a "pan-African contingency funding mechanisms for extreme weather emergencies" (African Union, 2013). At the initial stage, only severe droughts for which triggers are defined at the country level are covered. Later, more weather risks such as floods or cyclones could be covered by the ARC. According to the African Union and the World Food Programme (WFP), which together established the ARC, the facility has three main objectives: offering access to a summary of risks (including costs and impacts projections); establishing a contingent funding mechanism through a risk pool; and finally reducing the costs of insurance coverage by pooling risk (African Union, 2013).

Table 3.2.2: Existing Institutional Arrangements supporting recovery and rehabilitation through risk retention, risk transfer or risk pooling.

National Arrangements	▪ Ethiopia Productive Safety Net program (World Bank, 2013) and Malawi Cash Transfer Program ▪ Indexed insurance schemes primarily for agriculture sector, housing and public infrastructure (Linnerooth-Bayer, Mechler, & Hochrainer-Stigler, 2011) ▪ Reserve funds
Regional Arrangements	▪ Africa Risk Capacity (African Union, 2013; D. J. Clarke & Hill, 2013)

3.2.3. Addressing permanent Loss

To the best of our knowledge, there are currently no formal, explicit institutional arrangements in place to address permanent loss from climatic impacts.

Such institutional arrangements will become important in the future as the losses from climate change become more evident. These losses will include economic losses from climate change impacts, especially from extreme events and slow onset events like sea level rise, ocean acidification, desertification and glacial melt, as well as non-economic losses to individuals, society and the environment. These non-economic losses would include "...losses of, inter alia, life, health, displacement and human mobility, territory, cultural heritage, indigenous/local knowledge, biodiversity and ecosystem services".[13]

The establishment of mechanisms and institutions to address permanent loss from climatic impacts is a new field of endeavour, which is being pioneered at the level of the UNFCCC. There are no functional examples to reference.

Establishment of such mechanisms will require, inter alia, significant amounts of data on climate

11 Burkina Faso, Burundi, Central African Republic, Chad, Republic of Congo, Djibouti, The Gambia, Guinea, Liberia, Libya, Malawi, Mozambique, Niger, Rwanda, Sahrawi Arab Democratic Republic, Senegal, Togo, Zimbabwe

12 Kenya, Mauritania, Cote d'Ivoire, Comoros

13 UNFCCC Technical Paper on Non-Economic Losses. Advanced Unedited Version. September 2013

trends, extreme and slow onset events and related physical and socio-economic impacts, as well as evidence that the impacts that have occurred can be attributed to climate change resulting from anthropogenic greenhouse gas emissions.

In summary, despite the great variety of risk assessment, reduction, transfer or pooling mechanisms currently being used in Africa, populations and livelihoods are still strongly affected by the consequences of extreme weather events and are projected to be even more affected in the coming years and decades (Shepherd et al., 2013).

The following subsection reviews the limitations and challenges of the reviewed existing arrangements.

Table 3.2.3: Existing Institutional Arrangements redressing for permanent losses.

National Arrangements	▪ None
Regional Arrangements	▪ None

3.3. Challenges and limitations of existing national and regional institutional arrangements

The existing institutional arrangements in Africa face challenges in terms of financial resources, institutions and scientific, technical and technological capacity that limit their ability in addressing both permanent and non-economic losses and only partly addressing economic losses of sudden- and slow-onset events.

3.3.1. Challenges of existing institutional arrangements to address economic losses

The national and regional mechanisms and arrangements to address economic losses and the consequences of catastrophic sudden onset events that have been reviewed share similar challenges. The main limitation faced by the majority of the existing mechanisms in Africa is the lack of funding. Lack of adequate and sustainable funding has several implications:

- It may limit potential replication and scaling up of existing successful programmes,
- it limits the constitution of sufficiently funded reserves, to purchase reinsurance on the international markets, etc.
- It may also limit governments' ability to establish proper disaster risk plans, and build adequate infrastructure, for example, for early-warning systems.

The lack of adequate and sustainable sources of funding is particularly important for the social safety nets as the cost of the programme can be fully or partly covered by the government budget. This therefore constitutes a major challenge in low-income countries and least developed countries.

Similarly, the lack of scientific, technical and technological capacity is another challenge faced by the existing arrangements in Africa. Risk assessment is often realised by international organisations or private companies from developed countries as well as the design of the risk transfer or reduction instruments. At the local level, the lack of technical capacity limits populations' capacity to build disaster resistant infrastructure and implement other measures that could mitigate their risk exposure.

More sophisticated risk transfer or pooling institutional arrangements face three main challenges:

- Regional risk pooling mechanisms exclusively relies on the willingness of countries of the same region to cooperate
- If the risk profile of a country, which has a great influence on the calculation of of the premium paid by the country, rises faster than the governmental financial capacity – that government may not be able to afford the annual premium and may drop out of the mechanism.
- As with any other financial tool, institutional arrangements face the risk of fund mismanagement or even bankruptcy if they happen to be not well designed or managed.

As a consequence of a country leaving a regional risk pool, the premium paid by the other countries may increase as the level of diversification of the pool would lower, potentially affecting the long-term sustainability of the pool.

Finally, insurance and even more microinsurance and index-based microinsurance services and products face particular challenges: basis risk, low insurance uptake in developing countries (D. Clarke, 2011; Dercon, Hill, Clarke, Outes-Leon, & Taffesse, 2013).

3.3.2. Limitations of existing institutional arrangements to address non-economic and permanent losses

The objective of the current negotiations on loss and damage at the UNFCCC is to address the adverse effects of catastrophic events as well as slow onset events and to address economic as well as permanent and non-economic losses. None of the national and regional institutional arrangements reviewed above have been designed to address permanent and non-economic losses.

In Africa, adaptation to climate change measures are currently being implemented against desertification (see for example the Green Belt in the Sahel region) or ocean acidification (e.g. aquaculture) or sea-level rise, e.g. construction of seawalls and dykes (see (Schaeffer et al., 2013)). Despite the implementation of these measures, permanent and non-economic losses such as the loss of sovereignty and territory in low-lying areas, biodiversity or people's life as a consequence of slow- and sudden onset disasters are still projected to occur.

The absence of mechanisms and arrangements for non-economic and permanent losses by the existing national and regional arrangements is a major limitation to their capacity to address the full spectrum of climate change loss and damage in Africa. In order to address the challenges and limitations of the existing institutional mechanisms and arrangements, international organisations and bodies under and outside UNFCCC have been established and/or proposed. The next chapter will assess if existing and proposed international organisations and bodies under the UNFCCC meet the challenges and limitations identified above, either on their own or by complementing, strengthening or catalysing national and regional arrangements.

4. Options for Institutional arrangements on loss and damage under the UNFCCC

4.1. International legal context and UNFCCC

Countries that are particularly vulnerable to the adverse impacts of climate change have called for the UNFCCC process to address the unavoided and unavoidable loss and damage they are now experiencing and will experience from the added burden of human-induced climate change. These countries emphasize that they are being asked to bear a disproportionate burden relative to their contribution to global emissions and base their arguments for financial and technical support to address loss and damage on general principles of international law and the language of the UNFCCC itself.

Both Principle 21 of the Stockholm Declaration and Principle 2 of the Rio Declaration address transboundary pollution and provide that States have the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction. A State's breach of a due diligence standard and consequent obligations under the "no-harm" rule not to cause damage, to prevent harm, or to minimize sufficiently the risk of harm occurring, constitutes an intentionally wrongful act which entails the international responsibility of that State (Verheyen & Roderick, 2008). A breaching State has duties of cessation and non-repetition and owes an impacted State a duty of reparation.[14]

Under Principle 22 of the Stockholm Declaration and Principle 13 of the Rio Declaration, States have agreed to cooperate in an expeditious manner to further develop international law regarding liability and compensation for adverse effects of environmental damage caused by activities within their jurisdiction or control to areas beyond their jurisdiction.[15]

The text of the UNFCCC draws a clear causal link between emissions and impacts. The preamble recalls the Stockholm and Rio Declarations, notes that the largest share of historical and current global emissions have originated in developed countries and notes that increasing concentrations of Green House Gases (GHGs) will result in additional warming that may adversely affect natural systems and humankind.[16] Implicitly recognizing the greater responsibility and capacity of developed country Parties, the UNFCCC provides that developed countries should take the lead in combating the adverse effects of climate change. Developed countries agree under Article 4.3 to provide funding to developing countries for the agreed full incremental costs of adaptation measures. Under Article 4.4, developed countries additionally agree to provide assistance to developing countries that are particularly vulnerable to the adverse effects of climate change in meeting the costs of adaptation. Under Article 4.8, all Parties agree to give full consideration to what actions are needed under the Convention to meet the specific needs and concerns of developing countries arising from the adverse

14 See Draft Articles on Responsibility of States for Internationally Wrongful Acts (2001), adopted by the International Law Commission at its 53rd session Draft Articles 30 and 31. Under Draft Article 34, full reparation is to take the form of restitution, compensation and satisfaction, either singly or in combination. http://www.refworld.org/pdfid/3ddb8f804.pdf

15 The suggestion has been made that existing liability and compensation regimes may have lessons to offer for the climate change regime, in the ways in which they use insurance-related tools to pool and share risk, even though they are typically designed to address pollution accidents rather than cumulative pollution. See Linnerooth-Bayer/Mace/Verheyen, Insurance-related Actions and Risk Assessment in the Context of the UNFCCC, Background Paper, May 2003 (commissioned by the UNFCCC Secretariat for back-to-back workshops on risk assessment and insurance in 2003), available at http://unfccc.int/adaptation/adverse_effects_and_response_measures_art_48/items/3959.php; Verheyen and Roderick at 25-26. Among the relevant existing regimes are those that address nuclear damage, oil spills from marine transport, spills of hazardous substances.

16 UNFCCC Preambular paragraphs 2, 3, 7 and 8.

effects of climate change with respect to funding, insurance[17] and the transfer of technology.

The UNFCCC requires all Parties to take measures to mitigate emissions and to adapt to the negative impacts of climate change, but explicitly recognizes that the extent to which developing country Parties will effectively implement their commitments will depend on the effective implementation by developed country Parties of their commitments related to financial resources and transfer of technology.[18]

In 2010, by decision 1/CP.16, Parties to the UNFCCC recognized the need to strengthen international cooperation and expertise in order to understand and reduce loss and damage associated with the adverse effects of climate change, including impacts related to extreme weather events and slow onset events.[19] Slow onset events were defined to include sea-level rise, increasing temperatures, salinization, ocean acidification, glacier retreat and related impacts, land and forest degradation, loss of biodiversity and desertification.[20] The COP agreed to establish a work programme to consider approaches to address loss and damage and invited views and information on what elements should be included in the work programme, including

a. Possible development of a climate risk insurance facility to address impacts associated with severe weather events;
b. Options for risk management and reduction, risk sharing and transfer mechanisms such as insurance, including options for micro-insurance, and resilience building, including through economic diversification;
c. Approaches for addressing rehabilitation measures associated with slow onset events;
d. Engagement of stakeholders with relevant specialized expertise.

Subsequently, in 2012, Parties decided to establish, at COP19, "institutional arrangements, such as an international mechanism, including functions and modalities . . . to address loss and damage associated with the adverse effects of climate change in developing countries that are particularly vulnerable to the adverse effects of climate change."[21] These functions and modalities would be elaborated in accordance with the role of the Convention and would include, among other things:: "(a) Enhancing knowledge and understanding of comprehensive risk management approaches to address loss and damage associated with the adverse effects of climate change, including slow onset impacts; (b) Strengthening dialogue, coordination, coherence and synergies among relevant stakeholders; and (c) Enhancing action and support, including finance, technology and capacity-building, to address loss and damage associated with the adverse effects of climate change."[22]

Countries hold different views on how decision 3/CP.18's mandate should be met. Some insist that the implementation of mitigation and adaptation measures is the best way to address loss and damage. The EU, for example, has stated that "both mitigation and adaptation efforts are part of a comprehensive risk management process to address the risk for climate change and the risk of climate change and addressing loss and damage should be seen in the context of mitigation and adaptation

17 The reference to insurance derives from an earlier AOSIS proposal for establishment of an Insurance Pool to assist developing countries in mitigating the adverse consequences of sea level rise. See A/AC.237/15 at 80.

18 UNFCCC Articles 4.1 and 4.7.

19 Decision 1/CP.16, para. 25, FCCC/CP/2010/7/Add.1, Report of the Report of the Conference of the Parties on its sixteenth session, held in Cancun from 29 November to 10 December 2010, page 6. .

20 Decision 1/CP.16, para. 25, n.3.

21 Decision 3/CP.18, para. 9.

22 Decision 3/CP.18, para. 5.

and not as a separate issue."[23] The United States has stated its strong view that "opportunities for adaptation are far from exhausted. There is still significant room for increasing adaptive capacity and, as a result, considerable opportunity to reduce the risk of loss and damage."[24] Norway also has stated that approaches to reduce the risk of loss and damage are an integrated part of mitigation and adaptation efforts. [25] But it concedes that according to the IPCC AR4 there are limits to adaptation both related to natural, managed and human systems. Further for some gradual changes such as ocean acidification, mitigation remains the only viable option to reduce the risk of loss and damage. As a result losses and damages to nature and human systems may occur.[26]

Chapter 2 of this report showed that under any scenario of mitigation and adaptation, large economic damages remain, at least for Africa, so that addressing loss and damage remains crucial, in addition to addressing mitigation and adaptation. Some countries believe existing institutions under the UNFCCC are sufficient and no new formal international mechanism is needed to address loss and damage.[27] Some contend that it may be possible to expand the mandates of existing bodies and draw upon external expertise. Others, primarily vulnerable developing country Parties, emphasize that existing institutional arrangements both inside and outside the UNFCCC are insufficient to address existing needs and gaps and that relying on existing bodies, even with expanded mandates, will not address the full range of their concerns.

Whereas Chapter 3 focused on challenges and limitations of national and regional arrangements, Chapter 4 will assess existing and proposed elements of international mechanisms and arrangements and show these to fall short. Consequently, the last section of this chapter will suggest elements that need to be included in any new international mechanism intended to cover the full breadth of loss and damage as expressed by the submissions of UNFCCC Parties, in particular vulnerable developing country Parties.

4.2 Existing international arrangements

4.2.1 Existing Bodies under the UNFCCC

There is currently no specialised body, mechanism or permanent process under the Convention mandated to assess, address or redress permanent loss and damage to particularly vulnerable Parties from the unavoided and unavoidable adverse effects of human-induced climate.

The table below sets out existing bodies, their mandates, and gaps with respect to loss and damage needs.

23 See Submission by Cyprus and the European Commission on behalf of the European Union and its Member States, 5 November 2012 (Work programme on loss and damage), available at http://unfccc.int/files/documentation/submissions_from_parties/application/pdf/eu_updated.pdf; See also Submission by Norway, 2 October 2012 (Work Programme on loss and damage) (Loss and damage associated with climate change impacts is to Norway's understanding the residual risk when mitigation is insufficient to prevent dangerous anthropogenic interference with the climate system, and when the full potential of adaptation to reduce the risks associated with the effects of climate change is met. The risk of loss and damage can be substantially reduced by mitigation and adapting to a changing climate.

24 Submission by the United States, 16 November 2012 (Work Programme on loss and damage) available at http://unfccc.int/files/documentation/submissions_from_parties/application/pdf/us.pdf

25 Submission of Norway, 2 October 2012, FCCC/SBI/2012/MISC.14, available at http://unfccc.int/resource/docs/2012/sbi/eng/misc14.pdf

26 Id.

27 See, e.g., FCCC/SBI/2011/MISC.8 (Views and information on the thematic areas in the implementation of the work programme)

Table 4.2.1: Mandates of Existing Bodies under the Convention

Existing Bodies under the Convention and Protocol		
Body	**Mandate**	**Gaps / limitations with respect to loss and damage needs**
Adaptation Committee	Promote the implementation of enhanced action on adaptation in a coherent manner under the Convention[1]	No express mandate to assess or address loss and damage; loss and damage requires responses far beyond adaptation; loss and damage key problem particularly in case of under adaptation which by definition cannot be resolved by adaptation committee; no institutionalized work on loss and damage; no funding for work on loss and damage. [2]
Technology Mechanism	Facilitate technology development and transfer to support action on mitigation and adaptation	No express mandate to assess or address loss and damage
Adaptation Fund and Board (AFB)	Finance concrete adaptation projects and programmes in developing countries that are parties to the Kyoto Protocol and are particularly vulnerable to the adverse effects of climate change[3]	Project-based; no express mandate to assess or address loss and damage; insufficient funding to fund approved projects; work is supported by voluntary funding and a small and diminishing share of the proceeds from Kyoto activities and transfers of Kyoto units
Least Developed Countries Expert Group (LEG)	Provide technical guidance and advice on the preparation and revision of national adaptation programmes of action (NAPAs), provide guidance to facilitate the integration of actions into development planning, and identify medium and long-term adaptation needs and facilitate their integration into development planning[4]	Limited to LDCs, primarily assists in updating NAPAs and mainstreaming NAPA actions into development planning; no express mandate to assess or address loss and damage; work is supported by voluntary funding only; no link with finance; essentially provides training and develop materials
Green Climate Fund (GCF)	Make a significant and ambitious contribution to the global efforts towards attaining the goals set by the international community to combat climate change[5]	No funding window to address loss and damage; no express mandate to assess or address loss and damage
Nairobi Work Programme on Impacts Vulnerability and Adaptation (NWP)	Assist all Parties to improve their understanding and assessment of impacts, vulnerability and adaptation to climate change and make informed decisions on practical adaptation actions and measures to respond to climate change	Voluntary information-sharing process that invites informational inputs from intergovernmental and non-governmental organisations, the private sector, communities and Parties in response to identified areas of focus. No link to finance
Work programme on loss and damage	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	Not an institutionalized process; finite duration; modalities limited to workshops, papers; no link to means of implementation
National Adaptation Plan (NAP) process	Enable Parties to formulate and implement national adaptation plans (NAPs) as a means of identifying medium- and long-term adaptation needs and developing and implementing strategies and programmes to address those needs [6]	Current modalities developed under the Convention designed for LDCs; LDC support for NAPs preparation to come from voluntary contributions to LDC Fund; clarity on financial support for implementation for LDC yet to be developed; modalities not yet developed for non-LDCs wishing to prepare NAPs, likely to also be voluntary and dependent of the under-funded Special Climate Change Fund or other voluntary funds

None of these existing bodies is expressly mandated to provide assessments of loss and damage resulting from human-induced climate change in specific sectors. None is tasked to provide expertise and finance for the development of insurance-related tools (despite the extensive work done on insurance in the process – see TP/2008/9). Finally, none of these existing bodies is mandated to address permanent loss and damage resulting from the impacts of extreme weather events or slow-onset events. A systematic and comprehensive approach is lacking. There is no clear channel for the systematic provision of necessary technical expertise and financial support related to loss and damage, or systematic support to national efforts and institutions (e.g., for data collection or provision). For the most part, current support on these issues is ad hoc and project-based.

4.2.2 Existing bodies outside the convention

Some countries have questioned the need for a new international mechanism, suggesting that many of the concerns of vulnerable developing countries with respect to loss and damage can be, or are being, addressed by existing institutions and processes outside the UNFCCC (Verheyen, 2012).28 Mentioned most frequently are the International Strategy for Disaster Reduction (ISDR) and the Hyogo Framework for Action (HFA)29, as well as the ongoing work of the Convention on Biological Diversity, the Convention to Combat Desertification and the Global Framework for Climate Services.

In response to calls for views on loss and damage, some of these same bodies have identified gaps at the international level that require attention in their submissions to the UNFCCC process.30 Table 4.2.2 below captures these and other gaps in the work of relevant existing bodies.

28 See, e.g., Verheyen, "Tackling Loss & Damage – A new role for the climate regime?", (November 2012) at pages 6-7 (prepared for the 'Loss and Damage in Vulnerable Countries Initiative', part of the Climate and Development Knowledge Network, available at http://www.lossanddamage.net/4805) (noting resistance by certain developed countries, especially the United States, to the inclusion of loss and damage in negotiations within the climate regime, arguing, among other things, that mitigation and adaptation must remain the priority; the Convention only deals with anthropogenic climate change, which cannot be divided from impacts of natural climate change; there are no instances of actual damage due to climate change which must be addressed; the issue is well-vested within the framework of disaster risk reduction; there is no need to address this issue internationally as national risk reduction and management tools will be sufficient; further financial requests must be stopped). Submissions contained in FCCC/SBI/2011/MISC.8 and FCCC/SBI/2011/MISC.8/Add.1 (including EU, US, Switzerland).

29 See http://www.unisdr.org/eng/hfa/hfa.htm

30 Submissions from observer organisations are collected on the UNFCCC website at http://unfccc.int/parties_observers/igo/submissions/items/3714.php See Views and information from Parties and relevant organizations and other stakeholders, taking into account the outcomes of the implementation of the work programme on loss and damage prior to the submission, on the possible elements to be included in the recommendations on loss and damage in accordance with decision 1/CP.16 (2012); 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 to enhance adaptive capacity (2011); Views and information on elements to be included in the work programme on loss and damage (2011).

Table 4.2.2: Inputs received from Bodies outside the Convention on needs with respect to loss and damage under the UNFCCC

Body	Responsibility	Focus	Gaps / needs with respect to loss and damage identified in body submissions to UNFCCC process
UNISDR - UN International Strategy for Disaster Reduction	Focal point in the United Nations system for the coordination of disaster risk reduction and to ensure synergies among disaster risk reduction activities, tasked to support implementation of the Hyogo Framework for Action	Disaster risk reduction	Existing risk assessments for natural hazards need to incorporate changing dynamics of weather-related hazards due to climate change Support is needed to expand and support the network of national disaster loss databases so climate-related losses can be accounted for in more precise, robust, harmonized manner allowing cross country comparisons Standard methodologies are required for assessing drought risk and recording drought impacts across sectors; there is low capacity to monitor drought risk and impacts effectively Existing regional approaches, strategies and policy frameworks to reduce disaster and climate change impacts, including trans-boundary losses and damages, need to be better integrated into discussions Institutional mechanism for loss and damages should build on existing capacities and initiatives globally, regionally and nationally and promote local and national-owned disaster loss data and related risk assessments to support planning and prioritization of adaptation actions
World Bank[7]	Promotes long-term economic development and poverty reduction by providing technical and financial support to help countries reform particular sectors or implement specific projects	Finance	UNFCCC should seek to integrate economic development with disaster risk management, climate change adaptation, risk financing and post-disaster reconstruction as a continuum within a unified policy, institutional and management framework UNFCCC can provide a platform and mechanism for strengthening national and regional capacity across the full continuum of the loss and damage agenda, from enabling critical data acquisition, analysis and sharing and developing management capacity, to establishing national and regional risk financing frameworks, being able to conduct needs assessments and formulate concrete risk reduction and climate adaptation policies and investments, and to mobilizing the needed resources to follow through with such investments
UNHCR -Office of the UN High Commissioner for Refugees,[8] IOM - International Organisation for Migration,[9] UNU - United Nations University,[10] NRC - Norwegian Refugee Council [11]	Organisations responsible for refugees, internally-displaced persons, migration, human security and welfare	Migration Human Security	Existing institutional frameworks are insufficient to address population movements related to climate change impacts. National and international responses and the legal/normative framework applicable to human mobility challenges, particularly disaster-induced cross-border displacement, remain inadequate, creating a barrier to developing effective responses [12] COP has role in facilitating assessment of actual and potential human mobility linked to climatic stressors COP has role in facilitating development of approaches to address actual and potential human mobility linked to extreme weather and gradual climatic processes via appropriate funding COP has role in coordinating greater coherence of policy and action - possibly through an international platform or series of regional risk management platforms to address human mobility

Body	Responsibility	Focus	Gaps / needs with respect to loss and damage identified in body submissions to UNFCCC process
WHO - World Health Organisation	UN's coordinating authority for health, responsible for providing leadership on global health matters, shaping the health research agenda, setting norms and standards, articulating evidence-based policy options, providing technical support to countries and monitoring and assessing health trends.[13]	Health	Major knowledge gap exists on economic losses resulting from health impacts, including the cost of premature death, impact on productive capacity and burden borne by health systems to deal with increased caseload No health economic study systematically examines all the health damage cost categories across all diseases/health impacts at global level[14] International efforts to address loss and damage must go beyond just risk transfer to spread the cost of shocks Strengthening of health protection needed through disaster risk reduction, humanitarian preparedness and response and, potentially, use of insurance and other risk transfer mechanisms, for example in relation to health facilities COP should support health actors in assessing and addressing loss and damage from climate change in health, as well as in economic and environmental terms, and design appropriate response measures
UNDP - United Nations Development Programme	UN's global development network, advocating for change and connecting countries to knowledge, experience and resources to help people build a better life.	Development	Historical hazard event data is insufficient for assessing risks of future losses and damages; additional data is needed on exposed assets, their vulnerabilities to specific hazards, and hazard event return periods factoring in future climate scenarios More work needed related to slow-onset events and the incremental costs of climatic changes and accounting of non-economic impacts Serious capacity gaps at national level to continually assess the risk of loss and damage from a changing climate and a need for sustained support at the national level Several countries have recognized the need to strengthen capacities for institutions to engage with insurance schemes as a means for risk transfer
UNCBD - United Nations Convention on Biological Diversity	Objectives are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources	Biodiversity	UNCBD addresses only national, sub-national and local level implementation; contains only aspirational goals and targets at the global level and a flexible framework for the establishment of national or regional targets, with the COP encouraging Parties to set their own national targets[15]
UNCCD - United Nations Convention to Combat Desertification	Objective of this Convention is to combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification, particularly in Africa, supported by international cooperation and partnership arrangements,	Desertification	UNCCD offers only limited funding support, directed to planning process and reporting with a ceiling on support[16]

Body	Responsibility	Focus	Gaps / needs with respect to loss and damage identified in body submissions to UNFCCC process
Global Framework for Climate Services	Enable better management of the risks of climate variability and change and adaptation to climate change, through the development and incorporation of science-based climate information and prediction into planning, policy and practice on the global, regional and national scale."		Has four priority areas: Agriculture and Food Security, Disaster Risk Reduction, Health and Water

These external frameworks fail to address certain of the key concerns raised by African countries in the context of loss and damage resulting from human-induced climate change. These include the need for systematic external technical and financial support to enable Parties, and in turn the international community, to assess and address the climate-change related impacts of increasingly frequent and severe extreme weather events and slow onset processes, as well as to provide support for rehabilitation and compensation from climate-induced, permanent, loss and damage.

4.3 Proposals under the UNFCCC for establishing an international mechanism to address loss and damage

The African Group within the international climate change negotiations has provided its clear view on the necessary functions and modalities of an international mechanism to address loss and damage, as have the Group of Least Developed Countries (LDCs) and the Alliance of Small Island developing States (AOSIS). Short summaries of these and other proposals are set out in Table 4.3.1.

The African Group has emphasized that the UNFCCC is the relevant policy forum for addressing loss and damage from the adverse effects of climate change. In its view, the COP should maintain oversight, control and guidance over relevant processes on loss and damage.[31] Addressing loss and damage will require not just the use of existing institutions and mechanisms under the Convention but also additional efforts and institutions, to systematically consider and address the needs of developing countries.

The LDC Group and AOSIS have both provided proposals regarding an international mechanism to address loss and damage. LDCs state that the existing significant gaps cannot be overcome with an uncoordinated, loose set of activities and that a UNFCCC work programme, an expert group or a permanent agenda item will not be not be sufficient. Both groups have proposed the establishment of an international mechanism as a permanent, more institutionalised and coherent response to address loss and damage, to work as an umbrella for the necessary elements and activities.

In 2008, the UNFCCC commissioned a Technical Paper on mechanisms to manage financial risks from direct impacts of climate change in developing countries.[32] That paper concluded that

31 Submission by the Kingdom of Swaziland on behalf of the African Group on work programme on 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, submitted in response to the 2012 invitation for the submission of views. Available at http://unfccc.int/files/documentation/submissions_from_parties/application/pdf/africa_group__submission_on_loss_and_damage[1].pdf

32 Mechanisms to manage financial risks from direct impacts of climate change in developing countries, FCCC/TP/2008/9 (21

market insurance and other financial risk transfer solutions can be part of an adaptation strategy. Nevertheless, access to conventional financing approaches has proven insufficient to meet the needs of developing countries in reducing their exposure to climate risks and assuring timely capital for disaster reconstruction and adaptation measures.[33] In addition to considering conventional insurance and index-based instruments, there is room for considering non-insurance instruments as part of an approach to adaptation.

The Technical Paper found that developing countries require a portfolio of mechanisms, which may include insurance, as no one mechanism can meet the range of circumstances required by all countries. But even with the successful development and deployment of existing and new risk transfer mechanisms, the vulnerable would still be at risk from climate hazards. Although costs could be significantly reduced by risk reduction measures, resilience building and climate change adaptation, this would still leave a residual risk which would have a particularly harsh impact on the poor.[34] The paper found that it is therefore cost-effective as well as equitable for the international community to contribute to managing these risks.[35]

After reviewing options for managing financial risk from the impacts of climate change, the paper proposed three "innovative financial mechanisms" with potential to provide a meaningful risk transfer option for countries.[36] **Scheme A** could be applied in single country situations, where the underlying risks are insurable, but the insurance market has not started up owing to regulatory or informational barriers. It consists of removing the constraints with external support, such as database compilation, technical training, improved regulatory framework and financial risk management advice; and transferring as much risk as is feasible and efficient to the global reinsurance markets. **Scheme B** would be built on the participation of several interested countries or sets of countries and here the paper notes as an example, SIDS, LDCs and/or countries in Africa. The scheme would apply where a group of countries has insurable risks, but the insurance market has not developed due to barriers that can be resolved with external support. The scheme addresses risk arising from different types of hazards and assets, diversifying risks geographically, by sector and by assets, to provide a critical mass of negotiating power in the international financial markets. **Scheme C** is built on the participation and support of larger parts of the international community, to enable the insurance of risks that may otherwise be uninsurable, especially in LDCs, SIDS and countries in Africa. It has two fundamental components: a technical advisory facility and an optional financial facility. The technical facility provides advice to countries on risk management techniques in the context of climate change. It advises on financial subjects and physical modelling of the risk and could be the backbone of the risk management strategy for each set of participating countries. It could provide the link with multilateral support entities and risk reduction agencies. The optional financial facility gives countries access to better premiums and greater coverage by regulating the use of a responsibility fund that accumulates resources provided by industrialized countries and by premiums from countries that decide to use the vehicle as a reinsurance facility.

November 2008), available at http://unfccc.int/resource/docs/2008/tp/09.pdf.

33 FCCC/TP/2008/9 at 4

34 FCCC/TP/2008/9 at 5.

35 FCCC/TP/2008/9 at 6.

36 Under Scheme C, the participating country manages risks associated with population losses (crops and housing) and government losses (infrastructure and liquidity for emergency expenses). Local populations can channel their risks into the international financial markets through an intermediary: either local cooperatives supported by non-governmental organizations (NGOs), government and multilateral organizations or in some countries through insurance companies. See FCCC/2008/9 at 7-9. Scheme C is outlined in Table 4.3.1.

Table 4.3.1: Proposals and inputs regarding functions and modalities of an international mechanism to address loss and damage from Country and other Groupings

Party Grouping	Views on, or proposal for functions and modalities of an international mechanism
African Group[17]	1. Financial assistance • research and development, • start-up funds for regional and national risk reduction, • compensation for residual or unavoidable loss and damage from the adverse effects of climate change and from slow-onset processes, • rehabilitation and compensation support to address loss and damage and lost development opportunities. 2. Coordination and cooperation on technical and capacity needs • enhance data collection, • enhance the ability of countries to conduct needs assessment and baseline assessments to be able to analyze and make informed decisions, including methods for slow onset events at national and regional levels • enhance the ability of countries to establish institutional and operational modalities at the local, national and regional level to channel support after disasters. 3. Support approaches to address loss and damage with support by Annex I countries to developing country Parties. • technical assistance related to adaptation, disaster risk reduction and specific approaches to address loss and damage associated with climate change impacts; • strengthen social safety networks and resilience-building efforts including support under the GCF; • enhance understanding, coordination and support for economic and non-economic losses.
LDC Group [18]	Three functions: 1. promote improved assessment regarding loss and damage at the national/regional and global levels; 2. promote a range of approaches to address the full continuum of loss and damage (such as risk reduction, risk retention, risk transfer, slow-onset processes), including finance and modalities for (a) Implementing proactive adaptation measures which can reduce loss and damage; (b) Rapid delivery for disaster relief activities (c) Funding for rehabilitation (d) Compensating residual or unavoidable loss and damage (incl. for individuals) 3. promote exchange, interaction and coherence between relevant political and other processes with relevance to loss and damage.
AOSIS[19]	Three mutually reinforcing components: 1. A Risk Management Component to support and promote risk assessment and risk management tools and facilitate and inform the Insurance Component and Rehabilitation/ Compensatory Component. 2. An Insurance Component to help SIDS and other particularly vulnerable developing countries manage financial risk from increasingly frequent and severe extreme weather events. Many SIDS either cannot access insurance or find it increasingly difficult to afford commercial insurance to address impacts on national economies and require support in addressing the burden of increasing risks due to climate change. 3. A Rehabilitation/Compensatory Component to address the progressive negative impacts of climate change, such as sea level rise, increasing land and sea surface temperatures, and ocean acidification, which result in loss and damage. A Board would provide oversight and have a transparent governance structure. Institutional arrangements for the mechanism would include technical, financial and administrative functions. A Technical Advisory Facility would provide advice and assistance, and receive input from the insurance and reinsurance sectors, the disaster risk reduction community, UN agencies and other organisations. A Financial Facility would manage funds held by the Mechanism and would be created inside the UNFCCC but could be housed in a financial institution outside the UNFCCC. The UNFCCC Secretariat would provide administrative support.

Party Grouping	Views on, or proposal for functions and modalities of an international mechanism
Swiss Proposal 2008[20]	Global solidarity fund to finance adaptation on the basis of the polluter pays principle, contributions according to economic capacity and responsibility through a proposed levy on CO2 emissions. Two pillars: • A Prevention Pillar to co-finance climate proof policies including disaster risk reduction measures, risk responsive planning and design of settlements, infrastructures and of land use. • An Insurance Pillar to insure preserving/restoring public goods in case of severe weather events related to climate change, compensating damages – otherwise non-insurable – of extreme, climate change related weather events (storms, floods and droughts) to infrastructure and productive capital assets, pilot projects linking regional authorities, micro insurance initiatives and private insurers to design common solutions. Fund could also support development of data basis required for such schemes.
MCII[21]	Functions Two-pillar international risk-management programme, which would be fully financed by developed country Parties: 1. A risk prevention pillar would directly support risk-reduction measures; 2. A two-tiered insurance pillar would address high- and medium-layers of risk. The first tier would take the form of a climate insurance pool, which indemnifies victims of extreme catastrophes in non-Annex I Parties by a percentage of their losses. A second tier would address medium-level risks not covered by Tier 1. This second tier would take the form of a climate insurance assistance facility that enables micro- and national insurance systems in vulnerable developing countries by providing technical assistance, capacity-building and possibly absorbing a portion of the insurance costs. Low-level risks would be dealt with by preventive measures.
UNFCC Technical Paper Scheme C[22]	Two components 1. Technical advisory facility to provide advice on risk modelling and management, and on relevant financial issues 2. Financial vehicle that gives access to better premiums and greater coverage. Regulates the use of a responsibility fund, which is a reserve fund including contributions from Annex II Parties, that supplements premiums from beneficiary countries. Part of the fund would be allocated to incentivizing retrofitting efforts.

4.4. Implications of identified gaps and need for a new international mechanism

Many gaps and needs have been identified both by Parties and by existing bodies to for work in sectors impacted by climate change. There are many commonalities among the proposals made by Parties over the years. .

Firstly, strategic and solution-based guidance is needed for addressing loss and damage at all levels of governance, recognizing that much expertise is available at all these levels for at least parts of the loss and damage issue. For instance, Party submissions show a need for understanding and messaging of the scale of the problem of human-induced impacts, leading to international recognition, and defining an international space for loss and damage under the Convention. This will help to develop a systematic approach, with oversight and coordination at the international level. There is also a benefit in projecting the findings of both top-down and bottom-up assessments widely, at all levels, in order to incentivize greater attention to adaptation and mitigation. Guidance is further needed to identify possible insurance-related tools that can be applied to assist in risk management and risk transfer, but also to identify a way to address situations in which underlying risks are insurable but insurance markets are undeveloped, or where the underlying risks are uninsurable. High-level coordination is required to initiate a process to consider means to provide rehabilitation assistance and compensation for permanent losses due to human-induced climate impacts.

Secondly, there are a series of technical gaps that need to be addressed. Gaps exist with respect to definition and inclusion of slow onset events and parameters with which to measure climate change, separating anthropogenic influences from unperturbed climate baselines and climate-change induced increases in frequency or intensity of hazards from natural climate variability. Other technical gaps include structured risk assessments (both for short term gaps and long term scenarios), which requires strengthening national and regional research capacity and data collection.

Thirdly, financial support is needed to systematically address current and future loss and damage at the national and regional levels. Reliance on existing mechanisms will not deliver all elements identified by Parties (risk reduction, risk management and transfer, and rehabilitation and compensation). Financial assistance is needed to identify, setup, or extend possible insurance-related tools that can be applied to assist in risk management and risk transfer. Support is also needed to address rehabilitation and compensation for the permanent loss and damage occasioned by human-induced climate change. All this requires a coordination function on funding, e.g. with respect to insurance, premium payments, start up funding, compensatory funding, solidarity funding, public source funding, funding from industry, and from multilateral banks and/or the GEF or GCF. Such a coordination function should lead to funding that is predictable and that can be used to address loss and damage – including compensation, rehabilitation and migration needs – and gain access to a spectrum of insurance products and expertise where applicable to help manage financial risks and impacts.

In sum, an international mechanism should: deliver a targeted and systematic response to the needs and concerns identified by Parties and relevant organisations; complement the roles of other international bodies, as well as national and regional arrangements, and fill gaps; bring necessary expertise into the UNFCCC process; and target financial support to address identified needs.

4.4.1. Functions of a new international mechanism

Given the gaps and needs identified in the previous sections, new institutional arrangements should include a range of functions. These functions fall into three broad categories: strategic functions, technical functions and financial functions. The overall objective of these institutional arrangements should be to address strategically the full spectrum of loss and damage in developing countries by offering, or catalysing, tailored technical solutions that include access to predictable and sustainable funding.

Strategically addressing the full spectrum of loss and damage

The international climate negotiations, technical papers and workshops have highlighted a diversity of tools and approaches that can be used to address loss and damage, at different levels, through activities and mechanisms to support disaster risk reduction, risk transfer, rehabilitation and compensation. Despite the existence of a diversity of tools to address various aspects of the full spectrum of loss and damage, it appears that many countries and regions still do not benefit from the array instruments that have been designed and implemented elsewhere at different levels to address different types of risks.

The new institutional arrangements established to address loss and damage under the Convention should have the capacity to address the developing countries' needs for loss and damage in an inclusive, systemic and holistic manner. To achieve this overall strategic function, these institutional arrangements should:

- Take a systematic approach to assessing and addressing loss and damage from human-induced climate change,
- Address the full spectrum from risk reduction, risk management, risk transfer, to rehabilitation and compensation for permanent loss and damage,
- Complement work of other UNFCCC bodies, and should not replicate the functions already undertaken by other bodies, and committees,
- Facilitate the development of risk reduction, risk transfer and rehabilitation arrangements in developing countries, by guaranteeing both technical advice and access to sustainable financial support,
- Identify gaps and commission studies, research and development on potential arrangements to address loss and damage at the request of developing countries
- Advise countries and groups of countries, at their request, on the potential technical arrangements and funding to address loss and damage.

Providing need-based technical support and scientific standardisation

As highlighted in section 3, a wide range of technical solutions and arrangements exist that can be applied to address various aspects of loss and damage in vulnerable developing countries. The most promising solutions should be adapted to the specific needs, economic context and climate risk exposure of vulnerable countries for implementation, with the institutional arrangements ultimately established under the UNFCCC providing need-based technical support. Furthermore, in order to facilitate comparison and optimisation of technical support and the definition of needs in developing countries, scientific standards accounting for climate risk exposure have to be collected, harmonized and, if needed, developed.

The overall technical support and scientific standardisation of the future institutional arrangements under the Convention should involve the following sub-functions:

Scientific standardization:

- Collecting information and projections on loss and damage to inform planning at all levels
- Collating baseline data on relevant parameters, and tracking changes in these parameters, such as sea level rise, sea surface temperature, air temperature, precipitation, wind speed, soil salinity and/or ocean acidity from objective sources, and providing the COP with access to data on impacts
- Assembling and tracking information and projections on loss and damage, including economic and non-economic loss, property loss and damage, loss of life, environmental damage (e.g., coral reef damage, salt-water intrusion, loss of fisheries, ecosystem damage)

Need-based technical support:

- Identifying appropriate insurance and risk transfer tools to address particular country and regional circumstances
- Investigating types of insurance systems that can be utilized at the international or regional level to address market failures or reduce costs,
- Providing technical assistance related to adaptation, disaster risk reduction and specific approaches to address loss and damage associated with climate change impacts;

Catalyzing sustainable and long-term funding

A central challenge underlined throughout this report is the lack of sustainable sources of funding for institutional arrangements to address loss and damage in developing countries. Therefore, a key function of the Convention, and any future institutional arrangements established under the Convention to address loss and damage, should be to identify and secure adequate, sustainable and long-term funding support for the tools needed to assess and address loss and damage. Certain worthwhile initiatives can require a significant amount of funding, for example, a regional catastrophe risk pool may require several billions of dollars for the initial capitalisation of the pool and the premium support per year (Young, 2009), which represents a small share of the total Sub-Saharan countries' GDP compared to the potential damages projected (see chapter 2). A core challenge that the international mechanism established under the UNFCCC will have to address is its own long-term sustainability, together with that of the institutional arrangements it supports at various levels. The financial function should also ensure the long-term sustainability of the mechanism.

The financial function of the international mechanism established under the Convention could therefore involve the following sub-functions:

- Funding start up and support of insurance schemes
- Ensuring long term and sustainable functioning of the established arrangements at the country or regional level by investigating sustainable funding solutions that could involve subsidized premiums
- Supporting regional country-level risk officers
- Providing start-up funds for regional and national risk reduction
- Providing redress for residual or unavoidable loss and damage from the adverse effects of climate change and from slow-onset processes, rehabilitation and compensation support to address loss and damage, and ways to address and provide compensation for lost development opportunities

4.4.2. Structure of a new international mechanism

To deliver the necessary functions, any new international mechanism to address loss and damage under the Convention will have to develop a carefully-designed structure of bodies and facilities, in light of the significance of the issues and the high likelihood that elements that are crucial to vulnerable developing country Parties will not be addressed by other existing, or future arrangements.

To realize the functions identified above effectively, and meet the needs of Parties, three elements for the structure of an international mechanism are required:

- An Executive Board that reports directly to the COP to provide strategic direction, identify systematic gaps that require attention and make recommendations to the COP for their closure
- A Technical Body to provide or facilitate technical advice, provide guidance on standardized approaches and parameters, and commission research and other work to fill gaps
- A Financial Facility, tasked to support recommendations of the Technical Body or Expert Body, either directly or via decisions of the COP

An **Executive Board** to coordinate the international mechanism and ensure consistency with the Convention and its series of COP decisions.

A **Technical Body** to provide support at the request of Parties consistent with the functions identified above, and where appropriate, make recommendations to the financial facility on needs, including new needs arising in the context of the UNFCCC, for example through projections on loss and damage, including economic and non-economic loss, property loss and damage, loss of life, and environmental damage (e.g., coral reef damage, salt-water intrusion, loss of fisheries, ecosystem damage).

A **Financial Facility**, established under the Convention, to provide financial support at the request of Parties or on recommendations of the Executive Board and within this framework serve as a facility whose resources can be applied in a structural, predictable and balanced way in full agreement with the Convention. It could also serve as a coordinating and catalyzing entity with respect to insurance, premium payments, start up funding, compensatory funding, solidarity funding, public source funding, funding from industry, and from multilateral banks and/or GCF.

With respect to participation, the **Executive Board** could be comprised of a number of experts nominated by Parties from each of the five UN regional groupings, LDCs and SIDS and could be based on other models for expert bodies under or outside the UNFCCC. It could reflect the need for technical advice and inputs from external organisations through the formal inclusion of seats for various intergovernmental bodies, to enable direct substantive input on issues of shared concerns (e.g., health, security, mobility, insurance-related actions), that will benefit from coordination under the UNFCCC of work related to climate change impacts, including those listed in Table 4.2.2

Each of these perspectives is relevant to the development of quantitative and qualitative tools to anticipate and assess loss and damage, project thresholds for impacts on socio-economic systems, ecosystems, minimize and avoid loss and damage, and fashion financial tools to assist in minimizing loss and damage and offering rehabilitation and redress where permanent loss and damage from anthropogenic climate impacts cannot be avoided.

4.4.3 Models for the structure of the international mechanism

In the process of further negotiating and defining modalities for the international mechanism, negotiators can draw from a variety of other existing bodies and structures. Two examples include the Kyoto Protocol's Clean Development Mechanism and the Convention's Technology Mechanism, both of which have policy arms, provide technical support and have links to finance. Of course there are other examples, both within the UNFCCC and associated with other international frameworks.

The **Clean Development Mechanism** functions relatively autonomously with an Executive Board that functions as a policy-making body under the guidance and authority of the CMP, clear modalities and procedures37 and rules of procedure38 that provide for the establishment of committees, panels and working groups to assist the Board in the performance of its functions. Over time, the CDM has developed specialized panels and working groups. Members of these groups are contracted beyond the CDM EB's own membership to provide services to the CDM EB. The CDM EB reports directly to the CMP.

The **Technology Mechanism**39 also has both a policy body - the Technology Executive Committee (TEC) - and a technical implementing arm, the Climate Technology Centre and Network (CTCN), which has access to a range of expertise40, including outside expertise for advice in performing its functions, and to seek input from intergovernmental and international organizations, the private sector and civil society. The TEC reports to the COP through the subsidiary bodies. The CTCN acts under the guidance of the COP through its Advisory Board and facilitates a network of national, regional, sectoral and international technology networks, organizations and initiatives.

37 Paragraph 18 of the annex to decision 3/CMP.1

38 Rule 32 of the annex I to decision 4/CMP.1. See also CDM-EB61-A01-PROC, Procedure: Terms of reference of the support structure of the CDM Executive Board, Version 04.0

39 Priority areas for attention and the functions of both the TEC and the CTCN are set out in 1/CP.16 and its Annex. The TEC's modalities and procedures were adopted by decision 4/CP.17.

40 FCCC/ADP/2013/INF.2, An overview of the mandates, as well as the progress of work under institutions, mechanisms and arrangements under the Convention, Note by the Secretariat.

5. Next Steps after Warsaw

The nineteenth session of the UNFCCC Conference of Parties in Warsaw (COP 19) was mandated "… to 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."[41]

COP 19 succeeded in establishing a "Warsaw International Mechanism for Loss and Damage associated with climate change impacts" through Decision 2/CP.19. To some extent, the decision reached in Warsaw details the functions of this mechanism. However, the mechanism's modalities and workplan were not finalized, with this work deferred to the twentieth session of the COP, to be held in Lima, Peru, in December 2014 (COP 20).

The main features of Decision 2/CP.19 are:

a. The establishment of the Warsaw International Mechanism for loss and damage associated with climate change impacts.

b. Formal acknowledgement that loss and damage associated with the adverse effects of climate change includes, and in some cases involves more than, that which can be reduced by adaptation.

c. The placement of the mechanism under the Cancun Adaptation Framework (CAF), subject to a review in 2016.

d. The establishment of an Executive Committee of the mechanism directly accountable to the COP to guide the implementation of its functions, whose composition and procedures are to be developed by the SBSTA and SBI and recommended for adoption by COP 20.

e. The establishment of an interim Executive Committee comprised of representatives from five existing bodies within the Convention.

f. A mandate to this interim Executive Committee to meet by March 2014 and to develop a 2 year workplan by December 2014.

g. The mandate of the Warsaw International Mechanism, viz: "promoting the implementation of approaches to address loss and damage", with specific reference to paragraphs 6 and 7 of Decision 3/CP.18.

The decision represents a step forward in the consideration of loss and damage under the UNFCCC from the perspective of the African countries. The establishment of an independent mechanism accountable to the COP and the recognition that loss and damage involves more than adaptation (notwithstanding the placement under the Cancun Adaptation Framework) were both significant achievements for the African countries. However, the task of "establishing institutional arrangements" was not completed and there is a significant amount of unfinished work to be done before the mechanism becomes fully operational.

The decision also describes the mandate of the mechanism, but the outcomes from the implementation of this mandate will depend on how the (interim and permanent) Executive Committee interprets the provisions of Decision 3/CP.18 and the relative balance to be established in the development of the initial and subsequent workplans, between the three functions of the mechanism, viz:

a. Enhancing knowledge and understanding of comprehensive risk management approaches to address loss and damage associated with the adverse effects of climate change, including slow onset impacts;

41 UNFCCC, Decision 3/CP.18

b. Strengthening dialogue, coordination, coherence and synergies among relevant stakeholders;

c. Enhancing action and support, including finance, technology and capacity-building, to address loss and damage associated with the adverse effects of climate change.

There is therefore significant unfinished work to be done during 2014. In this context, African countries should seek to ensure the ***development of a 2-year workplan and a structure for the Warsaw International Mechanism that address the main priorities of African Countries, especially with respect to the following functions, as described in detail in Section 4.4.1. above,*** ensuring that that these institutional arrangements:

- Take a systematic approach to assessing and addressing loss and damage from human-induced climate change,
- Address the full spectrum from risk reduction, risk management, risk transfer, to rehabilitation and compensation for permanent loss and damage,
- Complement the work of other UNFCCC bodies, and not replicate the functions already undertaken by other bodies and committees,
- Facilitate the development of risk reduction, risk transfer and rehabilitation arrangements in developing countries, by guaranteeing both technical advice and access to sustainable financial support,
- Identify gaps and commission studies, research and development on potential arrangements to address loss and damage at the request of developing countries
- Advise countries and groups of countries, at their request, on the potential technical arrangements and funding to address loss and damage.

The decision does not specifically refer to funding for the operations of the Executive Committee, or for programming to address Loss and Damage that is initiated through the Executive Committee. The question of funding is addressed through the functions detailed in para 5(c), on "Enhancing action and support, including finance, technology and capacity building …", and sub-section (iii) thereof, which provides a role for the mechanisms in "… facilitating the mobilization and securing of expertise, and enhancement of support, including finance..."

There is a need therefore for significant emphasis to be placed on the provision of adequate and sufficient funding and solutions to ensure the sustainable and long-term funding of the established institutional arrangements that can address the following:

- Supporting and enhancing the assessment of risk associated with climate change related loss and damage
- Funding start up and support of insurance schemes
- Ensuring long term and sustainable functioning of the established arrangements at the country or regional level by investigating sustainable funding solutions that could involve subsidized premiums
- Supporting regional country-level risk officers
- Identifying options, design and implementation of country-driven risk management strategies and approaches
- Providing start-up funds for regional and national risk reduction approaches.
- Providing redress for residual or unavoidable loss and damage from the adverse effects of climate change and from slow-onset processes, rehabilitation and compensation support to address loss and damage, and ways to address and provide compensation for lost development opportunities

The workplan to be developed by the interim Executive Committee should include activities that will lead to concrete actions bringing concrete benefits to communities and countries in a community and country driven way. There is also a need to ensure that the final composition of and procedures for Executive Committee are appropriate for the role that the African countries require from the Mechanism. In order to ensure the Mechanism's effectiveness, sufficient and sustainable resources will need to be provided to support the Mechanism's operation and programming.

Finally, to ensure that the needs and priorities of African countries are fully reflected in Executive Committee's 2-year workplan and in the evolving governance and structures of the Mechanism, there will be a need for active participation by African countries in the UNFCCC processes at the level of the Interim Executive Committee, SBI and SBSTA during the course of 2014 and beyond.

Glossary of terms in recent literature

Adaptation (IPCC, 2012)

In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate.

Climate extreme (extreme weather or climate event) (IPCC, 2012)

The occurrence of a value of a weather or climate variable above (or below) a threshold value near the upper (or lower) ends of the range of observed values of the variable. For simplicity, both extreme weather events and extreme climate events are referred to collectively as 'climate extremes.'

Disaster (IPCC, 2012)

Severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic, or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery.

Disaster risk management (DRM) (IPCC, 2012)

Processes for designing, implementing, and evaluating strategies, policies, and measures to improve the understanding of disaster risk, foster disaster risk reduction and transfer, and promote continuous improvement in disaster preparedness, response, and recovery practices, with the explicit purpose of increasing human security, well-being, quality of life, and sustainable development.

Disaster risk reduction (DRR) (IPCC, 2012)

Denotes both a policy goal or objective, and the strategic and instrumental measures employed for anticipating future disaster risk; reducing existing exposure, hazard, or vulnerability; and improving resilience.

Exposure (IPCC, 2012)

The presence of people; livelihoods; environmental services and resources; infrastructure; or economic, social, or cultural assets in places that could be adversely affected.

Hazard (IPCC, 2012)

The potential occurrence of a natural or human-induced physical event that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, and environmental resources.

Insurance/reinsurance (IPCC, 2012)

A family of financial instruments for sharing and transferring risk among a pool of at-risk households, businesses, and/or governments. See Risk transfer.

Local disaster risk management (LDRM) (IPCC, 2012)

The process in which local actors (citizens, communities, government, non-profit organizations, institutions, and businesses) engage in and have ownership of the identification, analysis, evaluation, monitoring, and treatment of disaster risk and disasters, through measures that reduce or anticipate hazard, exposure, or vulnerability; transfer risk; improve disaster response and recovery; and promote an overall increase in capacities. LDRM normally requires coordination with and support from external actors at the regional, national, or international levels. Community-based disaster risk management is a subset of LDRM where community members and organizations are in the center of decision making.

Residual risk (UNFCCC, 2012, p.20) could be referred to as the loss and damage that remains once all feasible measures (especially adaptation and mitigation) have been implemented.

Risk financing (Cummins & Mahul, 2009) refers to the process of managing risk and the consequences of residual risk through products such as insurance contracts, catastrophe bonds, reinsurance or options.

Risk layering (Cummins & Mahul, 2009) is the process of separating risk into tiers that allow for a more efficient financing and management of risks.

Risk pooling (Cummins & Mahul, 2009) is the aggregation of individual risks to manage the consequences of independent risks.

Risk retention (Cummins & Mahul, 2009) refers to the process whereby a party retains the financial responsibility or loss in the event of a shock.

Risk transfer (IPCC, 2012)

The process of formally or informally shifting the financial consequences of particular risks from one party to another whereby a household, community, enterprise, or state authority will obtain resources from the other party after a disaster occurs, in exchange for ongoing or compensatory social or financial benefits provided to that other party.

Risk transfer (Cummins & Mahul, 2009) is the process of shifting the burden of financial loss or responsibility for risk financing to another party, through insurance, reinsurance, legislation or other means.

Slow onset events (UNFCCC, 2012, p.4) are identified to include "sea level rise, increasing temperatures, ocean acidification, glacial retreat and related impacts, salinization, land and forest degradation, loss of biodiversity and desertification".

Vulnerability (IPCC, 2012)

The propensity or predisposition to be adversely affected.

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(Footnotes)

1 Decision 1/CP.16, para. 20.

2 The Adaptation Committee's three year work programme notes only one meeting to consider limits to adaptation, conditioned on the provision of funding to hold the meeting, and consideration of work resulting from the outcomes of work programme at a meeting of the group. See http://unfccc.int/files/adaptation/cancun_adaptation_framework/adaptation_committee/application/pdf/work_plan_final.pdf

3 See https://www.adaptation-fund.org/about

4 See http://unfccc.int/cooperation_support/least_developed_countries_portal/ldc_expert_group/items/6097.php

5 See http://gcfund.net/about-the-fund/mandate-and-governance.html

6 Decision 12/CP.18, FCCC/CP/2012/8/Add.2,
Report of the Conference of the Parties on its eighteenth session, held in Doha from 26 November to 8 December 2012, pages 3-5.

7 World Bank, see http://www.imf.org/external/np/exr/facts/imfwb.htm; http://www.worldbank.org/

8 Office of the UN High Commissioner for Refugees, http://www.unhcr.org/cgi-bin/texis/vtx/home

9 International Organisation for Migration, http://www.iom.int/cms/home

10 United Nations University, http://unu.edu/about/unu

11 See http://www.gpplatform.ch/pbguide/organisation/norwegian-refugee-council-nrc

12 The joint submission of UNHCR, IOM and NRC to the UNFCCC process is available at http://unfccc.int/resource/docs/2012/smsn/igo/106.pdf. See also Lefeber, An Inconvenient Responsibility at 19 (existing international instruments that attribute rights to refugees and stateless persons do not offer adequate judicial protection for climate change-displaced persons, citing the 1951 Convention Relating to the Status of Refugees, the 1954 Convention Relating to the Status of Stateless Persons, and the 1948 Universal Declaration of Human Rights, Article 14.1).

13 http://www.who.int/about/en/

14 http://unfccc.int/resource/docs/2011/smsn/igo/312.pdf

15 Information drawn from CBD website.

16 Information gleaned from UNCCD website.

17 Submission by Swaziland on behalf of the African Group (24 November 2012) available at http://unfccc.int/files/documentation/submissions_from_parties/application/pdf/africa_group__submission_on_loss_and_damage[1].pdf

18 Submission by the Gambia on behalf of the Least Developed Countries Group on Loss and Damage, available at http://unfccc.int/files/adaptation/application/pdf/submission_by_the_gambia_on_behalf_of_the_least_developed_countries_on_loss_and_damage.pdf

19 Submission of Nauru on behalf of The Alliance of Small Island States Views and information on elements to be included in the recommendations on loss and damage in accordance with decision 1/CP.16 (2 October 2012), available at http://unfccc.int/files/documentation/submissions_from_parties/application/pdf/aosis_submission_on_loss_and_damage_submission_2_october_2012.pdf.

20 "Funding Scheme for Bali Action Plan: A Swiss Proposal for global solidarity in financing adaptation", available at http://unfccc.int/files/cooperation_support/financial_mechanism/long-term_finance/application/pdf/questionn_switzerland.pdf

21 Munich Climate Insurance Initiative (MCII): Insurance Instruments for Adapting to Climate Risks – A Proposal for the Bali Action Plan. Version 2.0. Submission to the UNFCCC at its fourth session of the Ad Hoc Working Group on Long-Term Cooperative Action under the Convention (AWG-LCA 3), by the Munich Climate Insurance Initiative (MCII)

22 FCCC/TP/2008/9.