Pan-Asian Regional Policy Forum on Mainstreaming Disaster Risk Reduction and Integration of Climate Change Adaptation into the Environment, Livelihood, and Food Security Sectors

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Background Document

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CONTENTS

PURPOSE OF BACKGROUND DOCUMENT

This background document explores key documents, existing frameworks and research regarding the thematic sectors that will be discussed during the Pan-Asian Regional Forum for Mainstreaming Disaster Risk Reduction (DRR) and Integration of Climate Change Adaptation (CCA) into the Environment, Livelihood and Food Security Sectors (26th-28th November, 2015).

The topics covered in the background document include global frameworks guiding DRR and CCA work, global frameworks on sustainable development, and sector specific information on how the sectors are affected by disasters and climate change, including mainstreaming strategies and challenges and gaps. This document will complement the information garnered from participants during the forum to understand the best practices, key issues and challenges, and actions for implementation under the three thematic sectors.

1. Global Frameworks on Addressing Disaster Risk Reduction and Climate Change Adaptation

1.1 The Sendai Framework for Disaster Risk Reduction; 2015 – 2030

The following information were extracted from the Sendai Framework for Disaster Risk Reduction (SFDRR), and is primarily used as background information which contextualizes the Pan-Asian Regional Policy Forum according to existing global framework on DRR.

Background

Since the adoption of the Hyogo Framework for Action in 2005, significant progress has been achieved in reducing disaster risk at the local, national, regional and global levels by countries and other relevant stakeholders, which led to a decrease in mortality in the case of some hazards. Reducing disaster risk as cost-effective investment in preventing future losses, while effective disaster risk management contributes to sustainable development. Under the HFA, countries have enhanced their capacities in disaster risk management, and the framework has been an important instrument for raising public and institutional awareness, generating political commitment and focusing and catalyzing actions by a wide range of stakeholders at all levels.

Over the 10 year time-frame, disasters have continued to cause significant damages, and have affected the well-being and safety of persons, communities and countries. During this time-period, over 700 thousand people have lost their lives, 1.7 billion people have been affected, and have caused USD 1.4 trillion in total damages worldwide. Between 2008 and 2012, 114 million people have been displaced by disasters, many of which are exacerbated by climate change which causes hydro-meteorological hazards to increase in frequency and intensity.

All countries, especially developing countries who have disproportionately higher mortality and economic losses are faced with increasing levels of possible hidden costs and challenges in order to meet financial and other obligations. It is urgent and critical to anticipate, plan for and reduce disaster risk in order to effectively protect persons, communities, and countries, including their livelihoods, health, cultural heritage, socioeconomic assets, and ecosystems, thus strengthening their resilience.

More dedicated action needs to be focused on confronting underlying disaster risk drivers. Such as the consequences of cumulative poverty and inequality, climate change and its variability, unplanned and rapid urbanization, poor land management and compounding factors such as demographic change, weak institutional arrangements, non-risk-informed policies, lack of regulations and incentives for private DRR investments, complex supply chains, limited availability of technology,

unsustainable uses of natural resources, declining ecosystems, pandemics and epidemics.

It is imperative to continue strengthening good governance in DRR strategies at the national, regional and at the global levels and to continue to improve preparedness and national coordination for disaster responses, rehabilitation and reconstruction, and to use post-disaster recovery and reconstruction to "build back better", supported by strengthened international cooperation.

The SFDRR stresses that there has to a broader and a more people-oriented preventive approach to disaster risk. DRR practices needs to be multi-hazard and multi-sectoral, inclusive, and accessible in order to be efficient and effective. Governments should engage with relevant stakeholders, including women, children and youth, persons with disabilities, people living under poverty, migrants, indigenous peoples, volunteers, the community of practitioners and older persons in the design and implementation of polices, plans and standards.

Expected Outcomes and Goals of the SFDRR

The framework aims to achieve the following outcome over the next 15 years:

> *"The substantial reduction of disaster risk and losses in lives, livelihoods, and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries."*

In order to reach this outcome, there has to be strong commitment and involvement of political leadership in every country at all levels in the implementation and follow up of the present framework and in the creation of the necessary conductive and enabling environment.

To attain the expected outcome, the following goal must be pursued:

> *"Prevent new and reduce existing disaster risk through the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures that prevent and reduce hazard exposure and vulnerability to disaster, increase preparedness for response and recovery, and thus strengthen resilience"*

Pursuing this goal requires enhancing the implementation capacity and capability of developing countries, particularly in least developed countries, Small Island developing states, landlocked developing countries, as well as middle income countries facing specific challenges, including the mobilization of support through international cooperation for the provision of means of implementation in accordance with their national priorities.

SEVEN GLOBAL TARGETS OF THE SFDRR

Seven global targets has been agreed upon in support of the assessment of the global progress in achieving the outcomes and goal of the framework. The targets will be measured at the global level and will be appropriate indicators. National targets and indicators will contribute to achieving the outcome and goal of the present Framework. The seven global targets are the following:

Target (a)	Substantially reduce global disaster mortality by 2030, aiming to lower the average per 100,000 global mortality rate in the decade 2020–2030 compared to the period 2005–2015;
Target (b)	Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 in the decade 2020–2030 compared to the period 2005–2015
Target (c)	Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030
Target (d)	Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030;
Target (e)	Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020;
Target (f)	Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of the present Framework by 2030;
Target (g)	Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030.

THE SFDRR'S PRIORITIES FOR ACTION

Based from the experiences from the implementation of the HFA, and in order to reach the targets and goals, there is a need for focused actions within and across sectors by States, at the local, national, regional, and global levels in the following priority areas:

Priority 1: Understanding disaster risk	**Priority 2:** Strengthening disaster risk governance to manage disaster risk
Priority 3: Investing in disaster risk reduction for resilience	**Priority 4:** Enhancing Disaster Preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction

In the approach of states, regional, and international organizations and other relevant stakeholders into disaster risk reduction, they should take into consideration the key activities listed under each other the four priorities and should implement them, taking into consideration respective capacities and capabilities in-line with national laws and regulations. An enabling international environment and means of implementation are needed to stimulate and contribute to developing the knowledge, capacities and motivation for disaster risk reduction at all levels, particularly for developing countries.

PRIORITY 1: UNDERSTANDING DISASTER RISK

Policies and practices for disaster risk management should be based on an understanding of disaster risk in all its dimensions of vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment. The knowledge can be used for the purpose of pre-disaster risk assessment, for prevention and mitigation and for the development practices and implementation of appropriate preparedness and effective response to disasters.

PRIORITY 2: STRENGTHENING DISASTER RISK GOVERNANCE TO MANAGE DISASTER RISK

Disaster risk governance at the national, regional and global levels is of great importance for an effective and efficient management of disaster risk. Clear vision,

plans, competence, guidance and coordination within and across sectors, as well as participation of relevant stakeholders, are needed. Strengthening disaster risk governance for prevention, mitigation, preparedness, response, recovery and rehabilitation is therefore necessary and fosters collaboration and partnership across mechanisms and institutions for the implementation of instruments relevant to disaster risk reduction and sustainable development.

Priority 3: Investing in Disaster Risk Reduction for Resilience

Public and private investment in disaster risk prevention and reduction through structural and non-structural measures are essential to enhance the economic, social, health and cultural resilience of persons, communities, countries and their assets, as well as the environment. These can be drivers of innovation, growth and job creation. Such measures are cost-effective and instrumental to save lives, prevent and reduce losses and ensure effective recovery and rehabilitation.

Priority 4: Enhancing Disaster Preparedness for Effective Response and to "Build Back Better" in Recovery, Rehabilitation and Reconstruction

The steady growth of disaster risk, including the increase of people and assets exposure, combined with the lessons learned from past disasters, indicates the need to further strengthen disaster preparedness for response, take action in anticipation of events, integrate disaster risk reduction in response preparedness and ensure that capacities are in place for effective response and recovery at all levels. Empowering women and persons with disabilities to publicly lead and promote gender equitable and universally accessible response, recovery, rehabilitation and reconstruction approaches is key. Disasters have demonstrated that the recovery, rehabilitation and reconstruction phase, which needs to be prepared ahead of a disaster, is a critical opportunity to "Build Back Better", including through integrating disaster risk reduction into development measures, making nations and communities resilient to disasters.

Role of Stakeholders under the SFDRR

While States has the overall responsibility of reducing disaster risk, it has to be understood that it is a shared responsibility between Governments and relevant stakeholders play an important role as enablers in providing support to States, in accordance with national policies, laws and regulations, the in implementation of the present Framework at the local, national, regional and global levels. When determining specific roles and responsibilities for stakeholders, and at the same time building on existing relevant international instruments, States should encourage the following actions on the part of all public and private stakeholders:

a) Civil society, volunteers, organized voluntary work organizations and community-based organizations to participate, in collaboration with public institutions, to, inter alia, provide specific knowledge and pragmatic guidance in the context of the development and implementation of normative frameworks, standards and plans for disaster risk reduction; engage in the implementation of local, national, regional and global plans and strategies; contribute to and support public awareness, a culture of prevention and education on disaster risk; and advocate for resilient communities and an inclusive and all-of-society disaster risk management that strengthen synergies across groups, as appropriate.

   i. Women and their participation are critical to effectively managing disaster risk and designing, resourcing and implementing gender-sensitive disaster risk reduction policies, plans and programmes; and adequate capacity building measures need to be taken to empower women for preparedness as well as to build their capacity to secure alternate means of livelihood in post-disaster situations;
   ii. Children and youth are agents of change and should be given the space and modalities to contribute to disaster risk reduction, in accordance with legislation, national practice and educational curricula;
   iii. Persons with disabilities and their organizations are critical in the assessment of disaster risk and in designing and implementing plans tailored to specific requirements, taking into consideration, inter alia, the principles of universal design;
   iv. Older persons have years of knowledge, skills and wisdom, which are invaluable assets to reduce disaster risk, and they should be included in the design of policies, plans and mechanisms, including for early warning;
   v. Indigenous peoples, through their experience and traditional knowledge, provide an important contribution to the development and implementation of plans and mechanisms, including for early warning;
   vi. Migrants contribute to the resilience of communities and societies, and their knowledge, skills and capacities can be useful in the design and implementation of disaster risk reduction;

b) Academia, scientific and research entities and networks to focus on the disaster risk factors and scenarios, including emerging disaster risks, in the medium and long term; increase research for regional, national and local application; support action by local communities and authorities; and support the interface between policy and science for decision-making;

c) Business, professional associations and private sector financial institutions, including financial regulators and accounting bodies, as well as philanthropic foundations, to integrate disaster risk management, including business continuity, into business models and practices through disaster-risk-informed investments, especially in micro, small and medium-sized enterprises; engage in awareness-raising and training for their employees and customers; engage in and support research and innovation, as well as technological development for disaster risk management; share and disseminate knowledge, practices and non-sensitive data; and actively participate, as appropriate and under the guidance of the public sector, in the development of normative frameworks and technical standards that incorporate disaster risk management;

d) Media to take an active and inclusive role at the local, national, regional and global levels in contributing to the raising of public awareness and understanding and disseminate accurate and non-sensitive disaster risk, hazard and disaster information, including on small-scale disasters, in a simple, transparent, easy-to-understand and accessible manner, in close cooperation with national authorities; adopt specific disaster risk reduction communications policies; support, as appropriate, early warning systems and life-saving protective measures; and stimulate a culture of prevention and strong community involvement in sustained public education campaigns and public consultations at all levels of society, in accordance with national practices.

MEANS OF IMPLEMENTATION

In order to achieve this, it is necessary to:

(a) To reaffirm that developing countries need enhanced provision of coordinated, sustained and adequate international support for disaster risk reduction, in particular for the least developed countries, small island developing States, landlocked developing countries and African countries, as well as middle-income countries facing specific challenges, through bilateral and multilateral channels, including through enhanced technical and financial support and technology transfer on concessional and preferential terms, as mutually agreed, for the development and strengthening of their capacities;

(b) To enhance access of States, in particular developing countries, to finance, environmentally sound technology, science and inclusive innovation, as well as knowledge and information sharing through existing mechanisms, namely bilateral, regional and multilateral collaborative arrangements, including the United Nations and other relevant bodies;

(c) To promote the use and expansion of thematic platforms of cooperation, such as global technology pools and global systems to share know-how, innovation and research and ensure access to technology and information on disaster risk reduction;

(d) To incorporate disaster risk reduction measures into multilateral and bilateral development assistance programmes within and across all sectors, as appropriate, related to poverty reduction, sustainable development, natural resource management, the environment, urban development and adaptation to climate change.

The summary of the SFDRR can be seen in the Chart of the Sendai Framework for Disaster Risk Reduction 2015 – 2030.

For more information on the Sendai Framework for Disaster Risk Reduction please refer to the following link:

http://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf

Chart of the Sendai Framework for Disaster Risk Reduction

2015-2030

Scope and purpose

The present framework will apply to the risk of small-scale and large-scale, frequent and infrequent, sudden and slow-onset disasters, caused by natural or manmade hazards as well as related environmental, technological and biological hazards and risks.
It aims to guide the multi-hazard management of disaster risk in development at all levels as well as within and across all sectors

Expected outcome

The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries

Goal

Prevent new and reduce existing disaster risk through the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures that prevent and reduce hazard exposure and vulnerability to disaster, increase preparedness for response and recovery, and thus strengthen resilience

Targets

Substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000 global mortality between 2020-2030 compared to 2005-2015	Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 between 2020-2030 compared to 2005-2015	Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030	Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030	Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020	Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this framework by 2030	Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030

Priorities for Action

There is a need for focused action within and across sectors by States at local, national, regional and global levels in the following four priority areas.

Priority 1	Priority 2	Priority 3	Priority 4
Understanding disaster risk	Strengthening disaster risk governance to manage disaster risk	Investing in disaster risk reduction for resilience	Enhancing disaster preparedness for effective response, and to «Build Back Better» in recovery, rehabilitation and reconstruction
Disaster risk management needs to be based on an understanding of disaster risk in all its dimensions of vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment	Disaster risk governance at the national, regional and global levels is vital to the management of disaster risk reduction in all sectors and ensuring the coherence of national and local frameworks of laws, regulations and public policies that, by defining roles and responsibilities, guide, encourage and incentivize the public and private sectors to take action and address disaster risk	Public and private investment in disaster risk prevention and reduction through structural and non-structural measures are essential to enhance the economic, social, health and cultural resilience of persons, communities, countries and their assets, as well as the environment. These can be drivers of innovation, growth and job creation. Such measures are cost-effective and instrumental to save lives, prevent and reduce losses and ensure effective recovery and rehabilitation	Experience indicates that disaster preparedness needs to be strengthened for more effective response and ensure capacities are in place for effective recovery. Disasters have also demonstrated that the recovery, rehabilitation and reconstruction phase, which needs to be prepared ahead of the disaster, is an opportunity to «Build Back Better» through integrating disaster risk reduction measures. Women and persons with disabilities should publicly lead and promote gender-equitable and universally accessible approaches during the response and reconstruction phases

Guiding Principles

Primary responsibility of States to prevent and reduce disaster risk, including through cooperation	Shared responsibility between central Government and national authorities, sectors and stakeholders as appropriate to national circumstances	Protection of persons and their assets while promoting and protecting all human rights including the right to development	Engagement from all of society	Full engagement of all State institutions of an executive and legislative nature at national and local levels	Empowerment of local authorities and communities through resources, incentives and decision-making responsibilities as appropriate	Decision-making to be inclusive and risk-informed while using a multi-hazard approach

Coherence of disaster risk reduction and sustainable development policies, plans, practices and mechanisms, across different sectors	Accounting of local and specific characteristics of disaster risks when determining measures to reduce risk	Addressing underlying risk factors cost-effectively through investment versus relying primarily on post-disaster response and recovery	«Build Back Better» for preventing the creation of, and reducing existing, disaster risk	The quality of global partnership and international cooperation to be effective, meaningful and strong	Support from developed countries and partners to developing countries to be tailored according to needs and priorities as identified by them

Source: UNISDR, 2015

1.2 Transforming Our World: The 2030 Agenda for Sustainable Development

The Sustainable Development Goals (SDGs), officially known as "Transforming Our World: The 2030 Agenda for Sustainable Development is a broader intergovernmental agreement that acts as the successor to the Post 2015 Development Agenda, or the Millennium Development Goals, has a set of aspirations with 169 targets.

The official Agenda for Sustainable Development was adopted on September 2015, which outlines 17 Sustainable Development Goals, and its 169 targets. The 17 SDGs are the following:

Goal 1	No Poverty
	End poverty in all its forms everywhere In 2000, the MDGs committed to cutting the number of people living in extreme poverty by half in 15 years, which the goal was met. However, there are still more than 800 million people around the world still live on less than USD 1.25 a day, the SGDs looks to build on what we have learned and end poverty altogether
Goal 2	Zero Hunger

End hunger, achieve food security and improved nutrition and promote sustainable agriculture

During the past 20 years, hunger has dropped by almost half. Many countries that previously suffered from famine and hunger can now meet the nutritional needs for their most vulnerable people. The SDGs looks to further end hunger and malnutrition once and for all through the promotion of sustainable agriculture and supporting small farmers. The goal is for everyone to have access to sufficient and nutritious food all year round.

Goal 3 Good Health and Well-Being

Ensure healthy lives and promote well-being for all at all ages

There has been significant progress since 1990s under preventable child deaths and maternal mortality, which are down by more than half. However, some other number remain tragically high. For example, annually, 6 million children die before their fifth birthday, or that AIDs is the leading cause of death for adolescents in sub-Saharan Africa. The goal is for all to have health coverage and access to safe and effective medicines and vaccines.

Goal 4 Quality Education

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Poverty, armed conflict and other emergencies keep many children around the world out of school. In developing regions, children from poor households are four times more likely to be out of school then those of the richest households. Since 2000, there has been large significant progress on the goal to provide primary education to all children world-wide. The primary school enrollment rate in developing regions reached 91%. The goal of quality education is to achieve the goal of universal primary and secondary education, affordable vocational training, access to higher education and more.

Goal 5 Gender Equality

Achieve gender equality and empower all women and girls

Regardless of the incredible progress that humanity has made, the progress for women and girls lag behind. There are still gross inequalities in work and wages, lots of unpaid "women's work" such

as child care and domestic work and discrimination in public decision-making. However, it is important to note that more girls are enrolled in school now compared to 2000. Most regions have reached gender parity in primary education, while the percentage of women getting paid for their work is on the rise. The SDGs aim to build on these achievements to ensure that there is an end to discrimination against women and girls everywhere, as a basic human right.

Goal 6 Clean Water and Sanitation

Ensure availability and sustainable management of water and sanitation for all

While the majority of people around the world take clean drinking water and sanitation for granted, many other don't. Water scarcity affects more than 40% of people around the world, and that number is projected to go even higher as a result of climate change. If we continue to disregard the importance of water resources, by 2050, at least one in four people are likely to be affected by recurring water shortages. The goal of the SDGs is for all to have access to safe and affordable drinking water through strengthened international cooperation, protection of water and natural resources, sharing water treatment technologies, and others.

Goal 7 Affordable and Clean Energy

Ensure access to affordable, reliable, sustainable and modern energy for all

As global population rises, more and more people will need access to cheap energy to light their homes and streets, use phones and computers and to run their businesses. However, our utilization of energy is the primary issue; the use of fossil fuels and greenhouse gas emissions are causing drastic changes in the climate, leading to big problems for every continent. The goal is to ensure that countries become more energy-efficient and invest in clean and renewable energy sources such as solar, wind, tidal and geothermal.

Goal 8 Decent Work and Economic Growth

Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

As of 2015, there are widening inequalities, and job growth is not keeping pace with the growing labour force – over 200 million people don't have secured jobs. A pivotal part of economic growth is that people have jobs that pay enough to support themselves and their families. There is a need to promote policies that encourage entrepreneurship and job creation, eradicating forced labour, slavery and human trafficking, achieving the goal of decent work for all women and men by 2030.

Goal 9 Industry, Innovation and Infrastructure

Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Technological progress helps address global challenges such as job creation, and energy efficiency. There is global progress in becoming more interconnected and prosperous due to the internet, however, 4 billion people have no access to the internet. The more we invest in innovation and infrastructure, the more society benefits from one another. Bridging the digital divide, promoting sustainable industries, and investing in scientific research and innovation are all important ways to facilitate sustainable development.

Goal 10 Reduced Inequalities

Reduce inequality within and among countries

Income inequality is a global problem that requires global solutions, policies must be adopted which creates opportunities for everyone, regardless of who they are and where they come from. Which means improving the regulation of financial markets and institutions, sending development aid where it is most needed and helping people migrate safely so they can pursue opportunities.

Goal 11 Sustainable Cities and Communities

Make cities and human settlements inclusive, safe, resilient and sustainable

As of 2014, there are 28 mega-cities with 453 million inhabitants. More than half of the world's population now live in cities, which is expected to rise to two-thirds of the global population by 2050. Mega-cities are often centers of extreme poverty which contributes to increases in slum settlements. In order to make cities sustainable for all, there is a need to create good, affordable public housing.

There is also a need to invest in public transport, creation of green spaces, and get a broader range of stakeholders involved in urban planning decisions.

Goal 12 Responsible Consumption and Production

Ensure sustainable consumption and production patterns

There is a large disparity between the consumption of the rich and the poor. The poorer populations is consuming too little me meet their daily basic needs. There is a need to consume an a way that preserves the natural resources so that future generations can continue to benefit from them. There is a need to manage natural resources efficiently and dispose of toxic waste better, cut per capita food waste in half at the global level, get businesses and consumers to reduce and recycle waste, and help countries to move towards responsible consumption patterns. The goal is to have a world where everybody gets what they need to survive and strive.

Goal 13 Climate Action

Take urgent action to combat climate change and its impacts

Countries are seeing the drastic effects of climate change, some more than others. On average, the annual losses from earthquakes, tsunamis, tropical cyclones, and flooding count in the hundreds of billions of dollars. The impact of climate change is getting worse, there are more storms, more and extended droughts, and more extreme weather events. We can reduce the loss of lives and property by helping more vulnerable regions, such as the land locked countries and island states too become more resilient. With political will, strong and policies and technological measures are necessary to limit the increase in global mean temperature and limit the increase of global mean temperature within two degrees and prevent the extreme effects of climate change. The SDGs lays out a way for countries to work together to meet this urgent global challenge.

Goal 14 Life Below Water

Conserve and sustainably use the oceans, seas and marine resources for sustainable development

More than 3 billion people depend on marine and coastal diversity for their livelihoods. Today, we are seeing nearly a third of the world's fish stocks overexploited, through unsustainable practices. Humanity

is dependent on the temperature, chemistry, currents and the life forms of the oceans. Oceans absorb about 30% of the carbon dioxide that human produce; however, we are producing more carbon dioxide than ever before, increasing the acidity of oceans. The way we dispose our trash also affects the ocean, there is an estimated of 13,000 pieces of plastic litter on every square kilometer of ocean. The SDGs have indicated targets for managing and protecting ocean life.

Goal 15 Life on Land

Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Humanity and other animals rely on other forms of life on land for food, clean air, clean water, and as a means of combatting climate change. Plant life make up of 80% of human diet, while forests, coring 30% of the earth's surface, helps keep the air and water clean while keeping the earth's climate in balance. Land and life on land are in trouble, arable land is disappearing 30 to 35 time faster than it has historically, deserts are spreading, and animal breeds are becoming extinct. The SDGs aim to conserve and restore the use of terrestrial ecosystems such as forests, wetlands, drylands and mountains by 2020.

Goal 16 Peace, Justice and Strong Institutions

Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

While some regions enjoy relative peace and justice, other regions are plagued by armed conflict, crime, torture, and exploitation, all of which hinder their development. The goal of peace and justice is for all countries to strive towards. The SDGs aim to reduce all forms of violence and propose that governments and communities find lasting solutions to conflict and insecurity. Through the strengthening the rule of law, reducing the flow of illicit arms and bringing developing countries more into the center of institutions of global governance.

Goal 17 Partnerships for the Goals

Strengthen the means of implementation and revitalize the global partnership for sustainable development

Due to the internet, travel and global institutions, the world is more interconnected today than ever before. There's a growing consensus about the need to work together to stop climate change, and increase global resiliency to disaster impacts. This goal lays out a framework for nations to work together to achieve all the other goals.

Source: (UNDP, 2015)

For more information on the 2030 Agenda for Sustainable Development, please refer to the following links:

http://www.un.org/sustainabledevelopment/sustainable-development-goals/

https://sustainabledevelopment.un.org

1.3 THE CONTEXT OF CLIMATE CHANGE ADAPTATION AND ITS FRAMEWORKS

THE 2010 CANCUN ADAPTATION FRAMEWORK

In 2010, parties have adopted the Cancun Adaptation Framework (CAF) as part of the 2010 Climate Change Conference in Cancun, Mexico. The agreements affirmed that adaptation must be addressed with the same level of priority as climate change mitigation. The CAF is the result of three years of negotiation on adaptation under the Ad hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA) that had followed the adoption of the Bali Action Plan (2007 Climate Change Conference in Bali, Indonesia).

The objective of the CAF is to enhance action on adaptation, including through international cooperation and coherent consideration of matters relating to adaptation under the Convention. Enhanced action on adaptation seeks to reduce vulnerability and build resilience in developing country Parties, taking into account the urgent and immediate needs of those developing countries that are particularly vulnerable.

The Cancun Adaptation Framework include the following five clusters

1. Implementation

- All Parties to plan, prioritize and implement adaptation actions and to use existing channels to provide information on support provided and received for adaptation actions and on activities undertaken;
- A process to enable LDC Parties - building upon their experience with the NAPAs - to formulate and implement national adaptation plans and an invitation to other developing country Parties to employ the modalities formulated to support those plans;
- A work programme to consider approaches to address loss and damage associated with climate change impacts in developing countries that are particularly vulnerable to the adverse effects of climate change.

2. Support

- Developed country Parties to provide developing country Parties, taking into account the needs of those that are particularly vulnerable, with long-term, scaled-up, predictable, new and additional finance, technology, and capacity-building (paras 95-137) to implement adaptation actions, plans, programmes and projects at local, national, sub-regional and regional levels, including activities under the Cancun Adaptation Framework.

3. Institutions

- At the global level: establishment of an Adaptation Committee to promote the implementation of enhanced action on adaptation in a coherent manner under the Convention;
- At the regional level: strengthening and, where necessary, establishing regional centers and networks, in particular in developing countries;

- At the national level: strengthening and, where necessary, establishing and/or designation of national-level institutional arrangements.

4. Principles

- Be undertaken in accordance with the Convention;
- Follow a country-driven, gender-sensitive, participatory and fully transparent approach, taking into consideration vulnerable groups, communities and ecosystems;
- Be based on and guided by the best available science and, as appropriate, traditional and indigenous knowledge;
- Be undertaken with a view to integrating adaptation into relevant social, economic and environmental policies and actions.

5. Stakeholder engagement

- Relevant multilateral, international, regional and national organizations, the public and private sectors, civil society and other relevant stakeholders are invited to undertake and support enhanced action on adaptation at all levels.

National Adaptation Plans (NAP)

The national adaptation plans (NAP) process was established under the CAF, enabling 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. It is a continuous, progressive and iterative process which follows a country-driven, gender-sensitive, participatory and fully transparent approach.

Objectives of the NAP Process

The objectives of the NAP process are:

a. to reduce vulnerability to the impacts of climate change, by building adaptive capacity and resilience, and
b. to facilitate the integration of climate change adaptation into relevant new and existing policies, programmes and activities, into particular development planning process and strategies, within all relevant sectors and at different levels, as appropriate.

Guiding Principles

The COP 17 agreed that enhanced action on adaptation should have the following guiding principles:

- be undertaken in accordance with the Convention

- Follow a country-driven, gender sensitive, participatory and fully transparent approach, taking into consideration vulnerable groups, communities and ecosystems;
- Be based on and guided by the best available science and, as appropriate, traditional and indigenous knowledge, and by gender-sensitive approaches, with a view to integrating adaptation into relevant social, economic, and environmental policies and actions, where appropriate; and
- Not be prescriptive, nor result in the duplication of efforts undertaken in-country, but facilitate country-owned, country-driven action.

INITIAL GUIDELINES

The initial guidelines for the formulation of NAPs contains a list of indicative activities that can potentially be undertaken in the development on NAPs under the four elements:

1. Laying the groundwork and addressing gaps
2. Preparatory elements
3. Implementation strategies
4. Reporting, monitoring and review

MODALITIES OF SUPPORT

The NAP process for Least Development Countries Process are supported through various modalities. Developing country parties which are not LDC Parties invited to employ the modalities in the elaboration of their own planning efforts. The COP 17 decided on the following modalities of the national adaptation plans process:

(a) Technical guidelines for the national adaptation plans;
(b) Workshops and expert meetings;
(c) Training activities;
(d) Regional exchanges;
(e) Syntheses of experiences, best practices and lessons learned;
(f) Technical papers;
(g) Technical advice.

FINANCIAL SUPPORT FOR THE FORMULATION OF NAPS

A number of financial support channels will be available for the NAP process, including bilateral and multilateral channels. The COP has provided guidance to the Global Environment Facilities (GEF) to enable activities for the preparation of the NAP process by the LDC parties through the Least Developed Countries Fund (LDCF). It also requested the GEF, through the Special Climate Change Fund (SCCF), to consider how to enable activities for the preparation of the NAP process for interested developing country Parties that are not LDC Parties.

Technical Support

The Least Developed Countries Expect Group (LEG) was established and requested by the CP to provide technical support and advice to the LDCs on the national adaptation programmes of action (NAPAs) and the LDC work programme, and to provide technical guidance and support to the NAP process. The LEG meets twice a year and support LDCs through a variety of modalities that include training workshops, development of guides, tools, technical papers, publications and databases, and by reviewing drafts of the NAPAs upon request or providing direct advice.

As part of the CAF, Parties established the Adaptation Committee (AC) to promote the implementation of enhanced action on adaptation in a coherent manner under the Convention through the following functions:

1. Providing technical support and guidance to the Parties;
2. Sharing of relevant information, knowledge, experience and good practices;
3. Promoting synergy and strengthening engagement with national, regional and international organizations, centers and networks;
4. Providing information and recommendations, drawing on adaptation good practices, for consideration by the COP when providing guidance on means to incentivize the implementation of adaptation actions, including finance, technology and capacity-building;
5. Considering information communicated by Parties on their monitoring and review of adaptation actions, support provided and received.

The Adaptation Process

Adaptation refers to adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impact. It refers to change in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change.

Elements of Adaptation

Adaptation activities have five general components: observation; assessment of climate impacts and vulnerability; planning; implementation; and monitoring and evaluation of adaptation actions.

Observation

At the outset of any adaptation initiative, observation and monitoring of climatic and non-climatic, socio-economic and environmental variables is important to find and

attribute climate change impacts, and to support research towards improved understanding, modelling and prediction of the climate system and climate change impacts. Data can be collected on all aspects of the climate system including on the physical, chemical and biological properties and atmospheric, oceanic, hydrologic, cryospheric and terrestrial processes.

Assessment

Adaptation assessment refers to the practice of identifying options to adapt to climate change, and evaluating them in terms of criteria such as availability, benefits, costs, effectiveness, efficiency and feasibility (IPCC 2007, Fourth Assessment Report). Along with observation, assessment of climate change impacts on natural systems (e.g. agricultural productivity, water supplies) and human systems (e.g. social well-being, economic activities) is required to inform the subsequent elements of adaptation.

Planning

Under the UNFCCC, various processes have been established to support Parties in their planning efforts on adaptation. The NAPAs enable LDCs to identify and prioritize urgent and immediate needs with regard to adaptation to the adverse effects of climate change.

Implementation

Under the UNFCCC, the Cancun Adaptation Framework supports Parties to the UNFCCC to implement adaptation actions, including two focus areas: the formulation and implementation of national adaptation plans; and, a work programme to consider approaches to address loss and damage associated with climate change in particularly vulnerable developing countries.

Figure 1. Elements of Adaptation. Source: UNFCCC.INT

Monitoring and Evaluation

Given the complexity and long-term nature of climate change, it is essential that adaptation be designed as a continuous and flexible process,

including feedback through monitoring and evaluation (M&E). The implementation of adaptation actions needs to be regularly monitored, evaluated and revised, both in terms of the validity of the underlying scientific assumptions and the appropriateness of projects, policies and programmes, including their effectiveness, efficiency and overall utility. M&E of adaptation actions, including projects, policies and programmes, can be undertaken throughout the adaptation process and/or after adaptation actions have been implemented. A monitoring and evaluation framework may be developed to ensure clearly formulated goals, objectives and output measures as well as the availability of good quality data.

STAKEHOLDER ENGAGEMENT AND KNOWLEDGE MANAGEMENT

Effective engagement of stakeholders and management of knowledge for adaptation is vital in supporting all adaptation activities, at each step in the process. Under the Cancun Adaptation Framework, relevant multilateral, international, regional and national organizations, the public and private sectors, civil society and other relevant stakeholders are invited to undertake and support enhanced action on adaptation at all levels

For more information on the Cancun Adaptation Framework, and Adaptation under the UNFCCC, please refer to the following links:

On Cancun Adaptation Framework:

http://unfccc.int/adaptation/items/5852.php

On UNFCCC's Adaptation Strategies

http://unfccc.int/adaptation/items/4159.php

ADAPTATION NEEDS UNDER THE 5TH ASSESSMENT REPORT

Since the Fourth Assessment Report (AR4), the framing of adaptation has moved further from a focus on biophysical vulnerability to the wider social and economic drivers of vulnerability and people's ability to respond (robust evidence, high agreement). These drivers include the gender, age, health, social status, and ethnicity of individuals and groups, and the institutions in place locally, nationally, regionally, and internationally. Adaptation goals are often expressed in a framework of increasing resilience, which encourages consideration of broad development goals, multiple objectives, and scales of operation, and often better captures the complex interactions between human societies and their environment. The convergence between adaptation and disaster risk management has been further strengthened since AR4, building on the IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX).

Adaptation needs arise when the anticipated risks or experienced impacts of climate change require action to ensure the safety of populations and the security of assets, including ecosystems and their services (medium evidence, medium agreement). Adaptation needs are the gap between what might happen as the climate changes and what we would desire to happen. The use of the term needs has also shifted with the framing of adaptation. In the National Adaptation Programmes of Action (NAPAs) "needs" were usually discussed in terms of major vulnerabilities and priority adaptation activities, and, in both developing and developed countries, this hazard-based approach with a focus on drivers of impacts and options to moderate them is still used often for urban or regional programs. But more recently, the focus has been on tackling the underlying causes of vulnerability such as informational, capacity, financial, institutional, and technological needs.

Engineered and technological adaptation options are still the most common adaptive responses, although there is growing experience of the value for ecosystem-based, institutional, and social measures, including the provision of climate-linked safety nets for those who are most vulnerable (robust evidence, high agreement). Adaptation measures are increasing and becoming more integrated within wider policy frameworks. Integration, though it remains a challenge, streamlines the adaptation planning and decision-making process and embeds climate-sensitive thinking in existing and new institutions and organizations. This can help avoid mismatches with the objectives of development planning, facilitate the blending of multiple funding streams, and reduce the possibility of maladaptive actions. The increasing complexity of adaptation practice means that institutional learning is an important component of effective adaptation.

Approaches to selecting adaptation options continue to emphasize incremental change to reduce impacts while achieving co-benefits, but there is increasing evidence that transformative changes may be necessary in order to prepare for climate impacts (medium evidence, medium agreement). While no-regret, low-

regret, and win-win strategies have attracted the most attention in the past and continue to be applied, there is increasing recognition that an adequate adaptive response will mean acting in the face of continuing uncertainty about the extent of climate change and the nature of its impacts, and that in some cases there are limits to the effectiveness of incremental approaches. While attention to flexibility and safety margins is becoming more common in selecting adaptation options, many see the need for more transformative changes in our perception and paradigms about the nature of climate change, adaptation, and their relationship to other natural and human systems.

Among the many actors and roles associated with successful adaptation, the evidence increasingly suggests two to be critical to progress: those associated with local government and those with the private sector (medium evidence, high agreement). These two groups will bear increasing responsibility for translating the top-down flow of risk information and financing and in scaling up the bottom-up efforts of communities and households in planning and implementing their selected adaptation actions. Local institutions, including local governments, non-government organizations (NGOs), and civil society organizations, are among the key actors in adaptation but are often limited by lack of resources and capacity and by continuing difficulties in gaining national government or international support, especially in developing countries. Private entities, from individual farmers and small to medium enterprises (SMEs) to large corporations, will seek to protect and enhance their production systems, supply lines, and markets by pursuing adaptation-related opportunities. These goals will help expand adaptation activities but they may not align with government or community objectives and priorities without coordination and incentives.

Adaptation assessments, which have evolved in substance and style since AR4, have demonstrably led to a general awareness among decision makers and stakeholders of climate risks and adaptation needs and options. However, such awareness has often not translated into adaptation action (medium evidence, high agreement). Most of the assessments of adaptation done so far have been restricted to impacts, vulnerability, and adaptation planning, with very few assessing the processes of implementation and evaluation of actual adaptation actions. Assessments that include both top-down assessments of biophysical climate changes and bottom-up assessments of what makes people and natural systems vulnerable to those changes will help to deliver local solutions to globally derived risks. Also, assessments that are linked more directly to particular decisions and that provide information tailored to facilitate the decision-making process appear to have most consistently led to effective adaptation measures.

The evidence to support the most valuable metrics of adaptation needs and effectiveness is limited, but increasing (medium evidence, high agreement). At present, there are conflicting views concerning the choice of metrics, as

governments, institutions, communities, and individuals value needs and outcomes differently and many of those values cannot be captured in a comparable way by metrics. The demand for metrics to measure adaptation needs and effectiveness is increasing as more resources are directed to adaptation. These indicators that are proving most useful for policy learning are those that track not just process and implementation, but also the extent to which targeted outcomes are occurring.

Maladaptation is a cause of increasing concern to adaptation planners, where intervention in one location or sector could increase the vulnerability of another location or sector, or increase the vulnerability of the target group to future climate change (medium evidence, high agreement). The definition of maladaptation used in AR5 has changed subtly to recognize that maladaptation arises not only from inadvertent badly planned adaptation actions, but also from deliberate decisions where wider considerations place greater emphasis on short-term outcomes ahead of longer-term threats, or that discount, or fail to consider, the full range of interactions arising from the planned actions.

For more information on Adaptation Needs under the AR5 and under the IPCC, please refer to the following links:

IPCC's Fifth Assessment Report. Working Group II "Climate Change 2014: Impacts, Adaptation and Vulnerability

http://www.ipcc.ch/report/ar5/wg2/

IPCC's Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation

http://www.ipcc.ch/pdf/special-reports/srex/SREX_Full_Report.pdf

2. Disaster Risk Reduction and Climate Change Adaptation in the Environment, Livelihood and Food Security

2.1 Importance of DRR and CCA in Environment, Livelihoods and Food Security

The Asia region is experiencing a greater frequency and intensity of disasters as a result of climate change and the increasing amount of people living in risk-exposed environments. Evidently, climate-sensitive sectors are significantly affected by changes in climate norms, impacting reliant sectors. For example, enhanced climate variability has affected the agriculture sector which in turn has implications for livelihoods and food security. Accordingly, environment, livelihood and food security sectors are intrinsically linked and cannot be viewed in silo. Rather, a nexus approach should be employed to ensure decisions affecting one sector do not detrimentally affect another.

By considering all three sectors as climate-sensitive and therefore inter-connected is crucial in policy development and planning and creating risk management strategies. Ensuring the sustainability of natural resources is paramount in providing access to livelihoods and food; consequently, managing natural resources to be sustainable and resilient to shocks and stresses, will ensure long-term social, cultural, infrastructural, and economic needs of countries are achieved.

There are cross-cutting issues and sectors that will be discussed within the three chosen thematic sectors, namely health, and gender. These issues are also affected by enhanced climate variability, primarily through a lack of food, environmental degradation and lack of sustainable livelihoods. Therefore focus has been concentrated on sectors which are directly affected by climate change and disaster impacts.

The consequences of not mainstreaming DRR and CCA into environment, livelihood and food security sectors can be significant. Migration to urban areas to find more sustainable livelihoods will increase the already rapid urbanization in Asia, putting more pressure and demand on basic services that cities are already struggling to cope with. Furthermore, urbanization and development can contribute to human-induced climate change through the increase of greenhouse gases as a result of urban infrastructure and the reduction in green spaces needed to reduce CO_2 concentrations in the atmosphere. Migration to urban settings can also decrease livelihood potential due to increased competition for limited employment. Moreover, human health can be severely affected if environment, livelihood and food security sectors are not prioritized in development plans and policies. Protection of natural resources in order to sustain rural livelihoods and produce food and nutrients is vital in combating malnutrition, especially in children.

Additionally, water resources are crucial in all three sectors and should be considered in all plans related to the sectors. Expansion of areas under severe water stress will be one of the most pressing environmental problems in South and South-East Asia in the foreseeable future as the number of people living under severe water stress is likely to increase substantially in absolute terms. It is estimated that 120 million to 1.2 billion, and 185 to 981 million people will experience increased water stress by the 2020s, and the 2050s, respectively[1]. The decline in annual flow of the Red River by 13 to 19% and that of Mekong River by 16 to 24% by the end of 21st century will contribute in increasing water stress (*ibid*). It is therefore clear that these water stresses will significantly affect natural resource management, livelihood sustainability and food security.

Environmental degradation and exploitation of natural resources in one country can have significant impacts on others. For example, over fishing in the Mekong River in one country, can severely reduce the amount fish available for food further downstream.

For these reasons, Asian countries need to work together and learn from each other in order to protect these three sectors vulnerable to climate change and disasters. Large percentages of the population in Asia rely on natural resources for their livelihood and food security and it is important that governments develop plans that protect the environment, improving the resilience of people to climate change and disasters. The most effective ways of achieving resilience to disasters and climate change is by sector-specific mainstreaming of DRR and CCA. Key steps to achieve mainstreaming are:

Figure 2: The key steps to achieving mainstreaming. Source Benson et al., (2007)[2]

1) Awareness-raising
    a. Disaster loss and damage data
    b. Hazard mapping and exposure
    c. Socioeconomic impact of disaster and climate change
    d. Understanding how to increase resilience
2) Enabling environment
    a. Legislation
    b. Disaster risk management strategy
    c. Institutional arrangements and capacity for disaster risk management
    d. Integration of DRR and CCA into national, sub-national and local development planning
    e. Integration between sectors
    f. Advocacy among sectors and actors
    g. Project appraisal through monitoring and evaluation

These steps are common across all sectors and therefore development planners need to specify their sectoral needs in each step.

2.2 The Environment Sector

As previously discussed, the environment, livelihood and food security sectors are all interconnected. The management of sustainable ecosystems is embedded in disaster risk reduction strategies due to the intrinsic link between environment degradation and disasters. Disasters can destroy natural ecosystems, however degraded environments can also exacerbate negative impacts of disasters[3]. Economic growth is causing exploitation of natural resources pushing them beyond their capacity to respond to shocks and stresses, with climate change adding additional complexities. Examples of this include deforestation leading to soil erosion and potential landslides, flooding due to wetland draining, and the conversion of mangroves to aquaculture increasing the vulnerability to cyclones[4].

Ecosystems within Asia are a key asset at the local level to the international level with many people depending on the environment for a source of income and as a food supply. Water and food supplies for both poor rural people and national and regional economies are directly reliant on ecosystems. With the global population rising, additional pressure is placed on natural resources to meet the increased demand through human activities and land use change, reducing the resilience of ecosystems. In addition to human-made issues, anthropogenic climate change will amplify these issues further increasing the vulnerability of ecosystems and thus the vulnerability of the ecosystem-reliant communities. Consequently, healthy, sustainable ecosystems are key in increasing resilience in local communities to disasters and climate change. Well-managed coral reefs, forests, mangroves and wetlands can reduce climate and disaster related impacts, improve livelihood opportunities and diversification thus building long-term resilience. In Asia, an

estimate of 60 percent of the poor live on marginal, high-risk lands, which paradoxically are often the best places for sustaining livelihoods, for example coastal areas, or floodplains[5]. For this reason, the poor are often the most affected by disasters.

Ecosystems provide vital services such as clean water and air, and buffers from extreme natural events. Climate change is likely to affect around half of Asia's total biodiversity[6]. Biodiversity can help ecosystems to respond to stresses, disturbances and other detrimental environmental changes. Findings from the last 20 years indicate an increase in forest fires as a result of reduced precipitation and rises in temperature[7]. Moreover, natural grassland and grass yields in Asia are likely to decline with increasing temperature and more frequent and prolonged droughts could cause increased desertification in Asia.

Notwithstanding the high-risk environment of the rural poor, the urban poor also face many challenges and vulnerability inducing issues. Increased migration to urban areas has seen cities expand at extortionate rates. This puts pressure on the environment and natural resources to support the increase in population and land use changes from natural to artificial environments.

It is therefore paramount that existing and new national and local policies and plans recognize the importance of protecting natural ecosystems and resources to help communities prepare for and respond to disasters. The Millennium Ecosystem Assessment in 2005 demonstrated the value of ecosystems in mitigating the impact of natural hazards and climate change. In spite of this, many development plans do not adequately consider factors such as habitat protection and natural resource management[8]. This is also apparent in post-disaster situations when ecosystem management and clean-up can often be overlooked.

Where environmental laws, policies and guidelines have recognized the importance of ecosystem management in disaster risk reduction and emergency response, these are often disregarded in emergency situations rather than integrated into humanitarian response. For example, following the Indian Ocean tsunami in 2004, the Sri Lankan government faced challenges in implementing guidelines that required Environmental Impact Assessments (EIAs) to be conducted to identify temporary settlements for 600,000 misplaced people[9]. The disaster was extensive that there was inadequate capacity to follow the existing guidelines. Sudemeier-Rieux et al. (2006) state that "although one could argue that environmental issues are not the main focus during a disaster, environmental concerns – along with poor governance of natural resources – are part of the underlying causes of many, if not most, humanitarian crises."

MAINSTREAMING DRR AND CCA INTO ENVIRONMENT SECTOR

For disaster risk reduction and climate change adaptation strategies to be effective they must be mainstreamed into development planning, be multi-sectoral and invest in ecosystem management. The Ecosystem Approach, endorsed in the fifth Conference of the Parties at the Convention on Biological Diversity (COP5) has been integrated into national Convention on Biological Diversity (CBD) plans. The framework is fundamental to reducing risks through the effective management of ecosystems and recognizes the importance of a multi-sectoral approach, liaising with farming, forestry, urban planning departments, in addition to others. The 5-step approach is as follows:

Step A: Determining the main stakeholders, defining the ecosystem areas, and developing the relationship between them.

Step B: Characterizing the structure and function of the ecosystem, and setting in place mechanisms to manage and monitor it.

Step C: Identifying the important economic issues that will affect the ecosystem and its inhabitants.

Step D: Determining the likely impact of the ecosystem on adjacent ecosystems – or applying adaptive management across spatial units.

Step E: Deciding on long-term goals and flexible ways of reaching them – or applying adaptive management over time.

Figure 3: 5-Step Ecosystem Approach. Source: Shepherd (2010)[10]

The following actions supplement the Ecosystem Approach to integrate environmental and disaster risk reduction policies:

- Assess the environmental causes of vulnerability;
- Assess environmental actions that reduce vulnerability;
- Monitor natural processes (e.g. drought and flood) and establish early warning systems;
- Consider the effects on ecosystem services (e.g. the impacts of draining wetlands on flood regimes) in decision-making processes;
- Establish partnerships for and regional approaches to land use and nature conservation;
- Establish alternatives to conflicts over the alternative uses of resources;
- Provide advice and information to involve people in enhancing ecosystem protection (e.g. community stewardship of mangrove forests);
- Consider the economic benefits of the services that ecosystems provide to disaster risk reduction (e.g. the benefits of investing in wetlands restoration as a buffer for floods);
- Create economic and legal incentives to include ecosystem services in disaster risk reduction (e.g. incentives or disincentives to avoid exploitation of resources from protective sand dunes, mangrove forests and coral reefs);
- Enforce environmental regulations, particularly those that may reduce population vulnerability (e.g. zoning laws, protection of key ecosystems, solid waste management);
- Strengthen ecosystem management to include disaster risk reduction (e.g. watershed management, integrated coastal management, protected area management).

Figure 4: DRR and environment policies. Source: Sudemeier-Rieux et al., (2006)[11]

Dolcemascolo, G. (2004) points to more detailed recommendations in the following diagram:

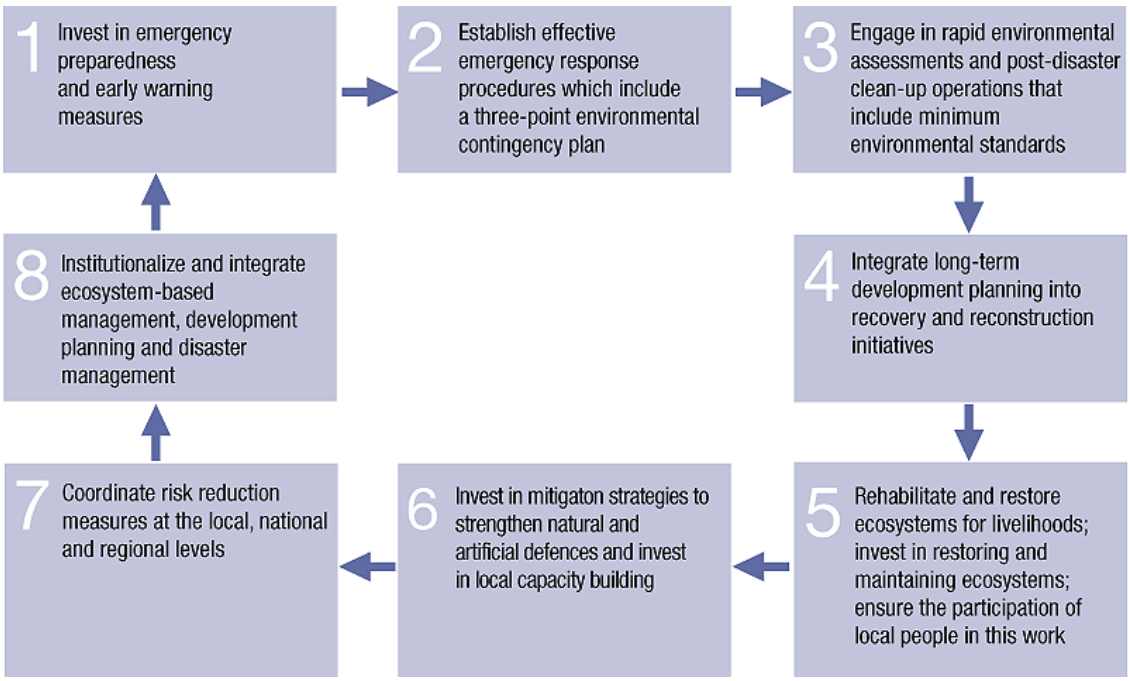


Figure 5: The Integrated Disaster Risk Management Cycle. Source: Dolcemascolo (2004) [12]

These three approaches to integrating DRR and CCA into the environment sector are surprisingly different, highlighting the multitude of methods which can be utilized to protect the environment whilst also providing sustainable livelihoods for the communities that depend on it. Furthermore, projects and programmes should also consider ways to prioritize environment protection. Increasingly, development organizations and national agencies are requiring all projects and programmes to incorporate environmental assessments and reviews as part of the appraisal process, to understand potential environmental consequences and benefits as a result of the proposed project and ensure environmental sustainability is reflected in project design.

An example of this in action is the African Development Bank's environment policy which identifies key environmental issues that have to be considered in all projects and programmes[13]. These include the establishment of early warning systems, maintenance of contingency plans to restore ecological resources, and addressing livelihood resource management and ecological stability.

Working towards building a sustainable environment for livelihoods, food security and protection of ecosystems requires the support and commitment of key government ministries. Capacities need to be improved to strengthen environmental governance and natural resource management. National level policies need to address environmental sustainability and protection through monitoring of environmental change, and cooperation both horizontally (between sectors) and vertically (at different levels of governance). Government ministries need to promote sustainable management, by publicizing the importance of environment protection and through monitoring conservation laws. Some examples of effective natural resource management include:

- Sustainable water management, where river basins, aquifers, flood plains, and their associated vegetation are monitored and managed to provide water storage and flood regulation.
- Restoration and enhancement of coastal habitats, such as mangroves, which can be a particularly effective measure against storm surges, saline intrusion, and coastal erosion.
- Management of grasslands and rangelands using methods that enhance pastoral livelihoods, increase resilience to drought and flooding, restore lost productivity, and promote sustainability.
- Establishment of diverse agricultural systems, where the consideration of local knowledge of specific crop and livestock varieties, maintaining crop and livestock diversity, and conserving diverse agricultural landscapes can help secure food in changing local climatic conditions.
- Strategic management of shrub lands and forests to limit the frequency and size of uncontrolled forest res.
- Establishment and effective management of protected area systems to ensure the continued delivery of ecosystem services that increase resilience to climate change.
- Conservation and restoration of forests to stabilize land slopes and regulate water flows.
- Conservation of agro-biodiversity to provide specific gene pools for crop and livestock adaptation to climate change.
- Farmer-managed Natural Regeneration (the selection and pruning of stems which sprout from indigenous tree and shrub stumps) to increase crop yields, fodder production, and fuel wood availability in degraded dry land areas (particularly successful in West Africa).
- Community-based forest management where forests are managed by communities to facilitate sustainable non-timber forest productivity through officially-endorsed and regulated forest management plans. These provide livelihood resources for communities and protect the integrity of the forest canopy, protect biodiversity, regulate the microclimate, and increase carbon capture.

Figure 6: Natural resource management strategies. Source: Turnbull et al., (2013)[14]

Challenges in Mainstreaming DRR and CCA into the Environment Sector:

Most climate change departments fall within the environment ministry in Asian countries providing an easy pathway for mainstreaming CCA into environment planning. However, disaster management is more commonly managed independently to other departments, causing a lack of coherence and connectivity between key sectors. Consequently, DRR is more difficult to mainstream into the environment sector, as it requires the cooperation and will of two separate departments.

Monitoring and evaluation of policies, laws and plans are crucial in providing sustainable development. Illegal activities, for example logging, can have a massive impact on natural resources and wildlife, calling for sustained monitoring of policy implementation. This requires local government attention and capacity, in terms of funding, time, resources, skills, which is often limited.

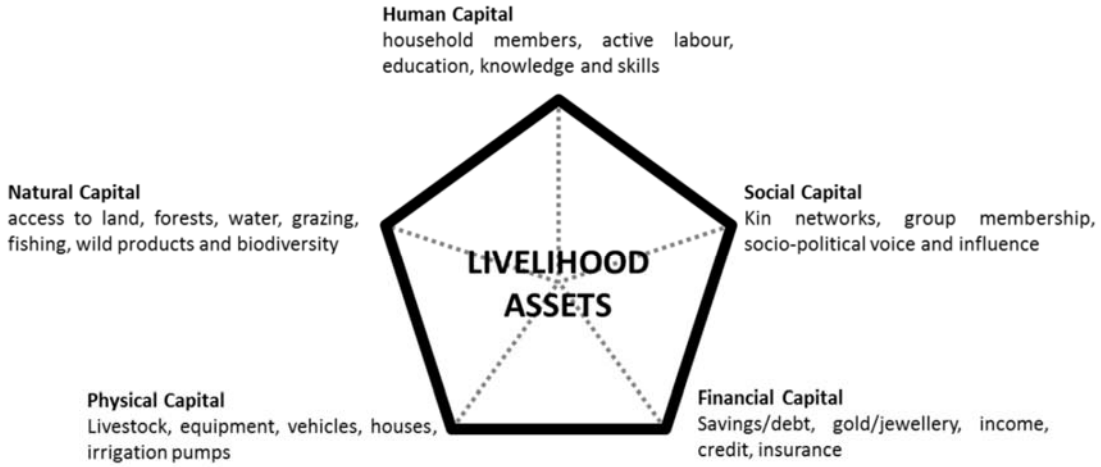
2.3 The Livelihood Sector

A livelihood is a way of making a living and the term encompasses people's capabilities and capacities, assets, income and activities needed to earn an income for basic provisions. Members of households combine their capabilities, skills and knowledge with different resources to achieve the best livelihood possible for themselves and the household[15]. If people are able to cope with and recover from shocks and stresses affecting their livelihood and enhance their well-being without undermining the natural environment, their livelihood can be described as sustainable.

The Sustainable Livelihood Framework

The sustainable livelihood framework was conceived to highlight key factors that affect livelihoods and the interplay of these factors, allowing development planners to create policies and plans that consider all aspects of promoting sustainable livelihoods[16]. The framework provided below[17], prioritizes people, particularly the rural poor, to understand how livelihoods are affected by internal and external influences. Focus is also given to the accessibility of resources and livelihood assets in order to support livelihoods, these include, but are not limited to: natural resources, technologies, their skills, knowledge and capacity, their health, access to education, sources of credit, or their networks of social support. The extent of a person's access to these assets depends largely on their vulnerability context: economic, political, technological trends, shocks and seasonality. Access is also

influenced by the prevailing social, institutional and political environment and the combination of these.



Source (DFID, 1999)

Figure 7: The Livelihood Framework (Assets)

Human Capital

Human capital refers to the level of education and productive skills of the people. It is vital to every society and enhances human capabilities. Human capital is further described by Smith and Skinner (1982) as "the acquired and useful abilities of all the inhabitants" of a place, which includes knowledge, skills, competencies and attributes embodied in people that facilitate creation of personal, social and economic well-being as well as motivation, behaviours, physical and emotional attributes and mental health. Along with range of other things such as the availability and distribution of resources across the population; the structure of critical institutions; decision-makers' ability to manage information; the public's perception of the significance of exposure, implementation of effective adaptation options also depends on the stock of human and social capital. It is central to planning livelihood strategies; therefore it is imperative to examine the level of education and skills of the vulnerable people. More importantly, human capital is required in order to make use of any of the four other types of assets. It is therefore necessary for the positive livelihood outcomes (DFID, Sustainable Livelihoods Guidance Sheets: Framework, 1999).

Social Capital

DFID defines social capital as "the way in which people work together, both within the household and in the wide community, is of key importance for household livelihoods. In many communities, different households will be linked together by ties

of social obligation, reciprocal exchange, trust and mutual support, all of which can play a critical role, particularly in times of crisis. However, according to DFID's Sustainable Livelihoods Guidance Sheets, there is much debate in what is exactly meant by the term "social capital" and the aspects it is comprised of. In the context of Sustainable Livelihoods Approach, it is taken to mean the social resources upon which people draw in seeking for their livelihood outcomes, developed through (DFID, Sustainable Livelihoods Guidance Sheets: Framework, 1999):

- Networks and connectedness, either vertical (patron/client) or horizontal (between individuals with shared interest) that increase people's trust and ability to work together and expand their access to wider institutions, such as political or civic bodies;
- Membership of more formalised groups which often entails adherence to mutually-agreed or commonly accepted rules, norms and sanctions; and
- Relationships of trust, reciprocity and exchanges that facilitate co-operation, reduce transaction costs, and may provide the basis for informal safety nets amongst the poor.

Naturally, access and amount of social capital is determined through birth, age, gender, or caste system and may even differ within a household. Social capital often represents a place of refuge in mitigating the effects of shocks or lacks in other capitals through informal networks.

In pursuing different livelihood strategies, people, groups, communities and families draw from the resources available to them, through their association with others, clubs, networks and affiliations. Adaptation is a social process that requires collective action and social capital which provides opportunities. Adaptation further enables the society to effectively interact with other capital assets and appropriate institutions, like the state, civil societies and financial institutions that can help formulate livelihood strategies that would enhance their ability to cope with extreme weather conditions. Through association and relationships, communities could learn from each other and review past and present strategies and adaptation processes that could lead to better resiliency (Dulal, 2010).

Physical Capital

Physical capital is comprised of the basic infrastructure and producer goods needed to support livelihoods, such as affordable transport, secure shelter and buildings, adequate water supply and sanitation, clean, affordable energy and access to information (M. Kollmair, 2002). Where in order to engage in effective productivity, people need physical capital assets such as land, other forms of infrastructure, livestock, cash/savings and machinery used or production. A society, family, group or person with limited or no physical capital, is at risk of non-productiveness which is likely to affect their livelihood (Dulal, 2010). Since infrastructure can be costly, not only its physical presence is important but as well as the pricing and secure disposition for the poorest groups of society must be considered.

Natural Capital

Natural capital is the term used for the natural resource stocks from which resource flows and services such as land, water, forests, air quality, erosion protection, biodiversity degree and rate of change are useful for livelihoods are derived. It is of special importance for those who derive all or part of their livelihoods from natural resource-based activities, as it is often the case for the poor stakeholders, but also in more general terms, since a good air and water quality represents a basis for good health and other aspects of a livelihood. Within the framework a particularly close relationship exists between natural capital and the vulnerability context and many of the devastating shocks for the livelihoods are natural processes that destroy natural capital, which in this case is climate change, variability and other hydro-meteorological hazards (DFID, Sustainable Livelihoods Guidance Sheets: Framework, 1999).

Financial Capital

Financial capital denotes the financial resources that people use to achieve their livelihood objectives and it comprises the important availability of cash or something of equivalent that enables people to adopt different livelihood strategies (OECD, 2003). The two main sources of financial capital can be identified as:

1. Available stocks: Savings are the preferred type of financial capital because they do not have liabilities attached and usually do not entail reliance on others. They can be held in several forms: cash, bank deposits or liquid assets such as livestock and jewellery. Financial resources can also be obtained through credit-providing institutions.
2. Regular inflows of money: Excluding earned income, the most common types of inflows are pensions, or other transfers from the state, and remittances. In order to make a positive contribution to financial capital these inflows must be reliable (while complete reliability can never be guaranteed there is a difference between a one-off payment and a regular transfer on the basis of which people can plan investments).

Among the five categories of assets, financial capital is perhaps the most versatile as it can be converted in to other types of capital or it can be used for direct achievement of livelihood outcomes such as purchasing of food to reduce food insecurity). It also pulls together other forms of capital assets (human capital, natural capital, social capital) needed for a successful livelihood strategy in climate high risk areas of developing countries. Therefore, access to formal financial services from banks, and microfinance industries improve adaptive capacity and reduce the vulnerability of the poor to climate-induced extreme events (Dulal, 2010). However, it tends to be the asset the least available for the poor, thus making other capitals important as substitutes.

Figure 8 also highlights the importance of policies and processes in improving livelihood outcomes.

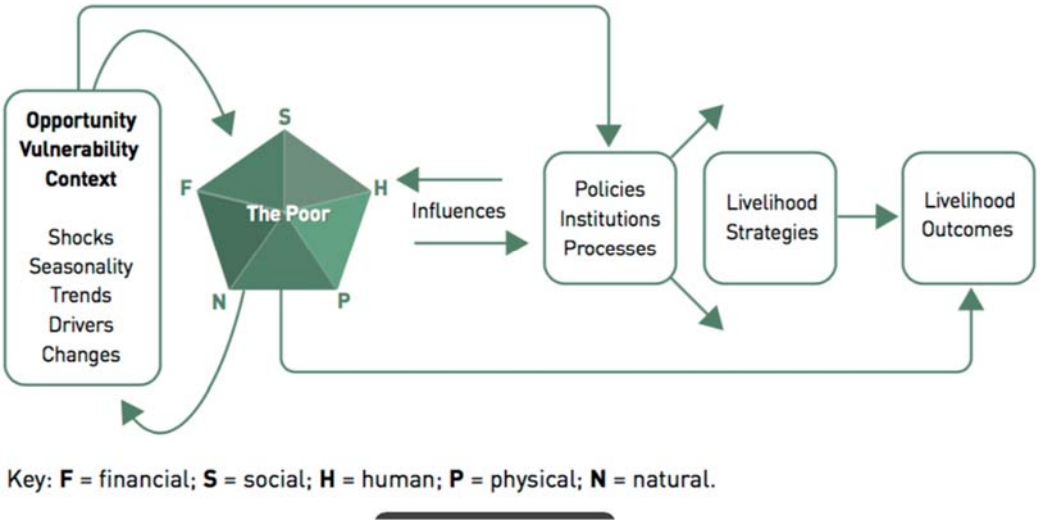


Figure 8: The Sustainable Livelihood Framework. Source: IFAD (2015) [18]

LIVELIHOODS IN ASIA

Livelihoods in Asia are largely dependent on agricultural production, particularly rice farming, fisheries, and livestock. The majority of the estimated 500 million rural poor in the Asia/Pacific region are subsistence farmers occupying mainly rain-fed land[19]. The table below shows the global percentages of people relying on water-fed livelihoods:

Livelihood contexts	Rural population		Potential beneficiaries from water interventions	
	Total (000)	% rural poor	(000) rural poor	% of total rural poor
Groundwater irrigation (dry)	110 062	38.2	1 481 (32 329) [2]	3.5 (76.8) [2]
Rice/wheat groundwater irrigation (humid tropics)[3]	217 530	34.3	27 703 (43 046) [2]	37.2 (57.7) [2]
Rice-based surface irrigation (humid tropics)	332 877	36.2	96 261	80.0
Wheat/rice surface irrigation (dry)[3]	373 362	21.1	12 456 (59 090) [2]	15.8 (75.1) [2]
Forest-based	30 349	19.7	1 280	21.4
Rangeland pastoral areas	89 057	13.4	5 872	49.1
Sparse[3]	86 467	17.9	4 902 (431) [2]	31.6 (2.8) [2]
Cereal-based rainfed (temperate)	167 737	3.6	4 468	75.0
Highland / mountain agriculture	68 991	15.4	6 944	65.4
Lowland rice-based rainfed (humid tropics)	276 594	43.8	87 125	72.0
Rainfed (dry tropics and subtropics)[3]	153 307	49.6	25 525 (16 133) [2]	33.5 (21.2) [2]
Rainfed (humid subtropics)	262 995	21.7	32 842	57.5
Tree crops and mosaic agriculture-forest	131 487	20.8	12 958	47.5
Upland rainfed (humid tropics)	59 502	35.9	7 298	34.2
Total	**2 272 369**	**29.3**	**327 118 (151 042) [2]**	**49.2 (22.6) [2]**

[3] This livelihood system presents areas affected by water scarcity. Specifically, it is water-constrained system in some of all the different sub-regions.

Figure 9: Percentages of people relying on different water-fed livelihoods. Source: Khanal et al. (2014)[20]

The table below provides further detail of the contribution of agriculture to GDP in seven Asian countries.

Note: PPP = purchasing power parity.

	Contribution of Agriculture to GDP (%)		Poverty based on $1.25 PPP (%)		Agricultural Employment (% of total)	
	1990	2010	1990	2010	1990	2010
Bangladesh	30	19	66.7 (1989)	43.3	65	48 (2005)
Cambodia		36	44.5 (1994)	18.6 (2009)	78 (1998)	54
China	27	10	60.2	11.8 (2009)	60	37
India	29	18	53.6 (1988)		61(1994)	51
Philippines	22	12	30.5 (1988)	18.4 (2009)	45	33
Viet Nam	39	21	63.7 (1993)	18.9 (2008)	70(1996)	48
Sri Lanka	26	13	15 (1991)	4.1	48	33

Figure 10: Contribution of agriculture to GDP in seven Asian countries Khanal et al. (2014) [21]

It has long been understood that livelihoods are severely affected by disasters and climate change and promoting sustainable livelihoods will reduce the vulnerability of poor communities to these shocks and stresses.

As previously mentioned, Asian livelihoods depend primarily on agricultural production, non-agricultural home production, waged employment and harvesting forest products, all of which can be severely affected by disasters and climate change impacts. This is accentuated when the capacity of at-risk populations to respond to potential shocks is low. Even small shocks can have a huge impact on the livelihoods of populations, particularly rural populations who do not have the social, infrastructural, and economic structures in place to effectively respond. Furthermore, when combined with stresses as a result of climate change, communities can struggle to recover from shocks, eroding their resilience over time.[22]

Rural livelihoods are particularly vulnerable to climate variations, particularly agricultural production and harvesting forest products due to their reliance on rainfall. Moreover, previous community-level understanding and coping strategies that have been effective may no longer be enough to recover from rainfall variations, since impacts of climate change are largely uncertain at the local level. Traditional knowledge must be supplemented by specific weather forecasting and other scientific information.

Prolonged El Nino events, as a result of climate change are already having affects in the Asia region. Thailand and other Southeast Asian countries have experienced reduced rainfall this year, as a result of a strong El Nino, substantially affecting farming practices and putting farmer communities at risk of reduced agricultural

production. Reduced productivity in rural areas can also significantly impact other areas due to migration and increased urbanization, as communities struggle to find sustainable livelihoods. Furthermore, entire countries or regions can face food security concerns as a result of reduced agricultural productivity. Disasters and climate change impacts, namely floods and droughts, can reduce the amount of crops being harvested or destroy them completely, directly impacting livestock and fishery farming. The need for increased productivity can also cause environmental degradation due to improper practices such as slash and burn which is not only harming the environment in a non-sustainable way but also contributing to climate change.

Agriculture will be the main sector discussed in this chapter due to its vulnerability to climate change and disasters. Other non-farming livelihoods, while also impacted by climate change, may not suffer the same extreme impacts felt by the agriculture sector.

All secondary (including manufacturing, processing, construction, tourism) and tertiary (including transport, trade, finance, rent, services) sectors are non-farm livelihoods even in rural settings, as are some primary sub-sectors, such as mining.

Climate change will have various impacts on urban cities and its residents, especially the vulnerable poor and those who rely on climate-sensitive livelihoods. Climate-related hazards such as floods, typhoons and drought are likely to be more frequent and more severe, while there are expected increases in climate extremes and variability, including the impacts of sea level rise, and storm surges for coastal cities. The World Bank's report on Cities and Climate: An Urgent Agenda recognizes that climate change poses as a serious threat to urban infrastructure, quality of life, entire urban systems and critical supplies such as food security, energy provisions, water supplies, waste removal, information of technologies, including the susceptibility to pandemics. Not only poor countries, but also rich ones will increasingly be affected by uncharacteristic climate events and trends (World Bank, 2010).

Cities are traditionally located near rivers and oceans for transportation and connectivity purposes, developing a natural geographic advantage. The vulnerabilities of the cities are cumulating due to the increase in population, urban poor and pollution. Where such hydro-meteorological would further increase its susceptibility as sea-level rise, tropical storms, and typhoon intensities will increase in its severity and frequency. Furthermore, climate change and urbanization will result in a growing number and variety of impacts on cities, their critical ecosystems and people's livelihoods (Dickson E. T., 2010).

While recognizing that the specific assessment of urban risk will differ across cities based on poverty levels, the pace of urbanization and awareness surrounding disaster risk or climate change, a general typology including coastal cities, dry-land cities, inland cities and high altitude cities including cities placed on flood plains should consider a wider range of issues. Coastal cities in the least developed

countries are found in tropical areas with hot and humid climates and low-lying land, both of which increases their vulnerability to extreme event (Dickson E. B., 2012).

In terms of building urban livelihood resilience it is important to improve people's assets, as described in the sustainable livelihood framework, to create redundancy networks, should a disaster occur. This includes access to basic services, infrastructure improvements, community networks, and access to employment. The tourism sector can be largely affected by disasters, not least because of the negative media attention disasters receive.

- Promote green livelihoods and 'green jobs': From ecosystem management to waste recycling, there is considerable opportunity, which supports both livelihoods and more resilient cities. There are considerable future benefits in supporting businesses and SMEs with a positive environmental impact through training, incentives and credit assistance.
- Understand the potential impacts of climate change on employment and livelihoods and promote diversification to offset impacts: While climate change will impact negatively on some livelihoods, other opportunities will need to be sought to provide alternative income sources. Greater attention should be given to the nexus between climate change, resilience and changing livelihoods.
- Expand credit opportunities and support for informal sector businesses: Even though small businesses or livelihoods often require limited upfront costs, many poor households lack the funds to make this initial investment. Improving their access to these opportunities through small loans transfers, microfinance schemes and community savings groups can support the development of local entrepreneurialism, including through opportunities to diversify livelihoods.
- Extend social protection and insurance systems to the poor: Not only are poorer populations more vulnerable to the impacts of climate change and disasters, but they also have the least capacity to 'bounce back'. Individual and community resilience could be greatly strengthened through the extension of social protection and insurance systems to the most vulnerable urban populations, providing a basis for recovery, which does not necessitate selling of assets or borrowing of money. Livelihoods for the poor and those in the informal sector are often limited and vulnerable.

Figure 11: Building urban resilience through livelihood strategies. Source: UN (2014)[23]

MAINSTREAMING DRR AND CCA INTO LIVELIHOODS

It is well-regarded that the negative and cumulative impact of disasters erode livelihoods and coping capacities over time[24]. All livelihood assets are negatively affected by disasters and households often have to borrow or use savings to meet basic needs, reducing their limited resource base. Agriculture needs to transition towards farming systems that are more productive, preserve natural resources and

ecosystems, and are more resilient to shocks and stresses. This requires sector specific DRR and CCA technologies, practices, plans and policies to ensure sustainable land management. For many countries this will require significant changes national and local governance, legislation, policies and financial mechanisms.

The table below demonstrates some of the key strategies to mainstream DRR and CCA into the livelihood sector and the key actors needed to achieve this, as reported at the Livelihoods Forum in Bangkok, 2015.

Key Strategies	Approach to refine, develop and adopt the strategies viable for local context	Players, Instances and Stakeholders
1. Risk and livelihoods analysis and effective assessment of the impact of disasters on livelihoods and food security 2. Mainstreaming resilience 3. Creating an enabling environment through risk governance and policy development 4. Expansion of social protection polices and services for managing uncertainty (climatological, social an economical) 5. Livelihoods promotion and transformation (enhanced livelihoods)- 6. Sustainable management of natural resources / physical infrastructure / spatial planning. 7. Resilience oriented preparedness and post-disaster recovery when disasters appear 8. Creating capabilities, abilities and a culture for resilience	A. Participation and organization B. Capacity Building C. Service delivery D. Knowledge management and communications E. Research and technology sourcing F. Advocacy G. Regulation, planning and resourcing H. Partnership and coordination	• Civil society and CS Organizations and networks • Government organizations • Non-Government Organizations • Cooperation institutions and agencies (national, regional, international) • Academy and research institute

Table 1: Strategies for mainstreaming DRR and CCA into livelihoods. Source: Livelihood Forum (2015).

As gleaned from the Livelihood Forum in Bangkok in 2015, government development plans aiming to build resilient livelihoods should develop capacities such as:

- Capacity to anticipate, cope and recover from hazards and the impact of disaster and shocks (Absorptive capacity)

- Capacity to deal and adapt to a changing context, including the climate changes (Adaptive capacity)
- Capacity to secure their food and income based on their livelihoods base (livelihoods transformation and profitability)

Some common indicators proposed as a measure of livelihoods resilience includes:

- Increasing level of income, cash savings, asset base and income diversification
- Power in markets
- Less dependence on wage labour (rural and peri-urban areas)
- Access to basic sanitary services
- Access to social protection services
- Women empowerment (effective participation and ability for influencing household decisions on investments, having independent income and savings, having voice in community process and networks)
- Food security (quantity and diversity)

Figure 12 from FAO's 2014 report[25] highlights some key DRR measure adopted in agricultural development plans of 30 countries in Asia and Africa and how they relate to the Sendai Framework for DRR 2015-2030.

HFA Priority for Action 1	
• Introduce Disaster Risk Management in the agriculture and rural development planning activities of the Ministry of Agriculture • Develop agricultural community based action plans/programs for risk reduction • Prepare disaster management plan in districts • Strengthen technical capacity of the Ministry of Agriculture and relevant departments (to pro-actively address climate risks in agriculture)	
HFA Priority for Action 2	**HFA Priority for Action 3**
• Strengthen tracking and monitoring of food and nutrition surveillance system • Establish a system for the use of market price information to manage national response and price stabilization • Enhance food security monitoring • Establish a special early warning system for livestock including pastoral areas • Assess the geographical and agro ecological coverage of the current meteorological stations • Improve monitoring of plant pests and diseases	• Train staff on agricultural disaster risk reduction and preparedness, early warning and forecasting system and post-disaster activities. • Develop awareness programs • Develop institutional capacity for disaster risk management and preparedness • Develop training manuals on early warning and crisis prevention
HFA Priority for Action 4	**HFA Priority for Action 5**
• Improve resource conservation technologies in more agro-climatically fragile areas • Promote the use of more sustainable cropping patterns and systems better adapted to local conditions • Promote technologies for integrated pest management • Promote water conservation and management practices • Research programmes on drought resistant pasture and forage for animals in pastoral areas • Improved management of water and land resources for productivity improvement and protection from natural disasters	• Establish mechanisms and guidelines for responding to food emergencies where the market is not able to respond • Upgrade the current national food reserve infrastructure and establish new facilities in sites and stock for six months • Design national food reserve utilization and management protocols • Identify key staple crops in vulnerable areas and establish emergency seed system • Design working modalities for the use of risk financing and contingency fund • Improve access to crop and livestock insurance

Figure 12: DRR development plans as per the HFA. Source: FAO (2014)

Challenges of Mainstreaming DRR and CCA into Livelihood Sector

There are many challenges in mainstreaming DRR and CCA into the livelihood sector and many of these are related to a lack of data. Natural hazards and disasters affected more than 1.9 billion people in developing countries between 2003 and 2013, with USD 494 billion in damage, however the amount of damage on the agriculture sector was unreported[26]. Loss and damage data of disasters is often aggregated for all sectors, not capturing the specific impact on individual sectors. Consequently, there is limited information and understanding of the extent to which disasters and climate change impact different livelihoods. As previously

demonstrated, high percentages of people in Asia rely on agriculture for their livelihood and agriculture significantly contributes to national GDP. Accordingly, disasters affecting agriculture and the environment can slow economic growth, but with a sound data-set supporting this, advocating for the need of mainstreaming DRR and CCA into the agriculture sector remains a challenge. Furthermore, disasters affecting the agriculture sector consequently have a direct effect on the food security of those dependent on it.

Common gaps in mainstreaming DRR and CCA into livelihood sectors include:

- The most vulnerable livelihoods sectors are not well integrated to disaster risk management and climate change adaptation mechanisms and networks
- Role of local communities and community level is not well recognized and integrated
- Civil society participation is not well promoted
- Root causes of disaster risks are not addressed, especially those related to inequality
- Limited understanding of how urbanization and modernization drive changes in livelihood patterns
- Deficiency in energy, inadequate/non-accessible public utilities, lack of sector–based facilities and infrastructures in poor conditions limit capacity options of vulnerable communities to cope with the adverse impacts
- Limited capacity (skills, resources, time, funding, knowledge) to conduct necessary risk assessments on livelihood sectors

2.4 THE FOOD SECURITY SECTOR

Understandably, the previously discussed environment and livelihood sectors have a considerable effect on food security in the region. Governments are legally bound to ensure everyone has the right to food yet an estimated 1 billion people of the 7 billion world population do not have adequate access to food and nutrition, despite sufficient levels of food, nutrition and calories in the global food system[27]. With increased global population growth, and Asia population growing disproportionately quickly, there is extra pressure on the food system, accentuated by climate change and disasters. Food insecurity intensifies poverty and can affect livelihoods and the environment as a result of limited assets and resources, pressure on natural resources and migration. There are serious health concerns as a result of food insecurity with half the world's population located in Asia, resulting in malnutrition, particularly in children, breast-feeding women and marginal groups.

Large uncertainties in our understanding as to how the regional climate change will impact the food supply and demand in Asia continue to prevail in spite of recent scientific advances. Increasing urbanization and population in Asia will likely result in increased food demand and reduced supply due to limited availability of cropland area and yield declines projected in most cases.

The FAO (2015)[28] report, found that the agriculture sector accounts for, on average, 22% of global economic losses:

Figure 13: Damage and loss data to agriculture sector. Source: FAO (2015)

The agriculture sector is mostly severely affected by droughts, accounting for 84% of economic losses[29].

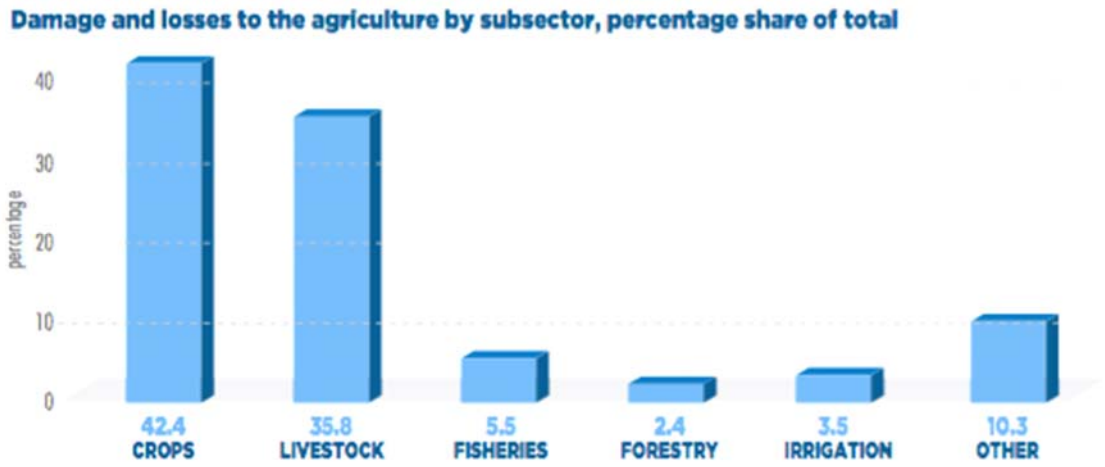


Figure 14: Damage and loss data per subsector. Source: FAO (2015)

Disasters affect all aspects of food security, reversing poverty gain, agricultural development and hunger reduction as a result of large shocks, or recurrent smaller stresses. Poor households are often trapped in a cycle of food insecurity as a result of being directly reliant on natural resources for food and livelihoods, often resulting in long-term food crises.

Studies suggest that there could be substantial decreases in cereal production in Asia by the end of this century. Regional differences may be observed, for example crop yields could increase by up to 20% in East and South-east Asia, while decreases of 30% might be noticed in Central and South Asia. Rice production, as a result of thermal stress and water scarcity could decline by 3.8% by the end of the 21st century[30]

Consumption of animal products such as meat and poultry has increased steadily in comparison to milk and milk products-linked protein diets in the past few decades. However, in most regions of Asia (India, China, and Mongolia) pasture availability limits the expansion of livestock numbers.

The Asia-Pacific region is the world's largest producer of fish, from both aquaculture and capture fishery sectors. Recent studies suggest a reduction of primary production in the tropical oceans because of changes in oceanic circulation in a warmer atmosphere[31]. The tuna catch of East Asia and South-East Asia is nearly one-fourth of the world's total. The migration route and migration pattern and, hence, regional catch of principal marine fishery species, such as ribbon fish, small and large yellow croakers, could be greatly affected by global climate change.

Food supply or ability to purchase food directly depends on income and price of the products. The global cereal prices have been projected to increase more than three-

fold by the 2080s as a consequence of decline in net productivity due to projected climate change. Localized increases in food prices could be frequently observed.

Food insecurity and loss of livelihood are likely to be further exacerbated by the loss of cultivated land and nursery areas for fisheries by inundation and coastal erosion in low-lying areas of the tropical Asia. Management options, such as better stock management and more integrated agro-ecosystems could likely improve land conditions and reduce pressures arising from climate change.

Four key dimensions of food security: availability, access, stability and utilization, assist in developing strategies to increase the resilience of the food security sector. All of these can be affected by disasters and climate change[32]:

Availability: Reduced harvests or death of livestock from severe drought; shortage of seeds leading to reduced yields.

Access: Damaged infrastructure cutting off access to food or markets; low livestock prices causing a reduction in cash availability to buy food.

Stabilization: Unpredictable weather patterns affecting yields of certain crops or the regular planting of staple foods.

Utilization: Unsafe drinking water that causes chronic diarrhea resulting in decreased absorption of nutrients.

Figure 15: Four key dimensions of food security. Source: Turnbull et al. (2013)

The Food and Agriculture Organization (FAO) produced guidelines of how to ensure Food Security plans were in line with the Hyogo Framework for Action 2005-2015 and MDG 1[33]:

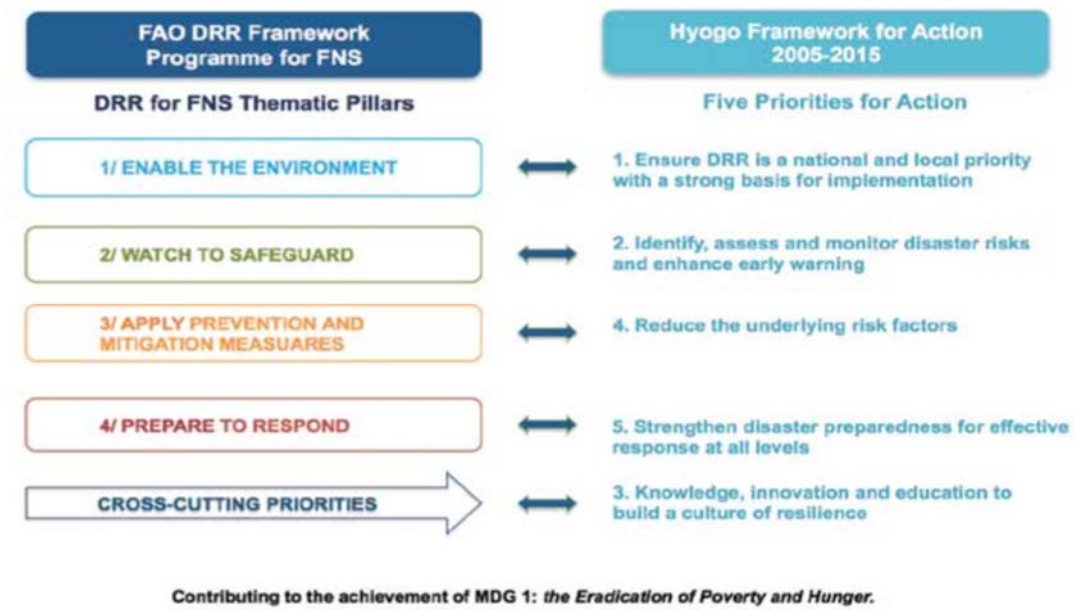


Figure 16: FAO DRR Framework for Food Security. Source: FAO (2013)

Furthermore, Mahendra (2011) provides these adaptation options and supporting policies[34]:

Adaptation Options	Supporting Policies
Short term	
Crop insurance for risk coverage	Improve access, risk management, revise pricing incentives, etc.
Crop/livestock diversification to increase productivity and protect against diseases	Availability of extension services, financial support, etc.
Adjust timing of farm operations to reduce risks of crop damage	Extension services, pricing policies, etc.
Change cropping intensity	Improve extension services, pricing policy adjustments
Livestock management to adjust to new climate conditions	Provide extension services
Changes in tillage practices	Extension services to support activities, pricing incentives
Temporary mitigation for risk diversification to withstand climate shocks	Employment/training opportunities
Food reserves and storage as temporary relief	------
Changing crop mix	Improve access and affordability, revise pricing, etc.
Modernize farm operations	Promote adoption of technologies
Permanent migration to diversify income opportunities	Education and training
Define land-use and tenure rights for investments *(Both short and long term)*	Legal reform and enforcement
Develop crop and livestock technology adapted to climate change stress: drought and heat tolerance, etc.	Agricultural research (crop and livestock trait development), agricultural extension services
Develop market efficiency	Invest in rural infrastructure, remove market barriers, property rights, etc.
Expand irrigation and water storage	Investment from public and private sectors
Efficient water use	Water pricing reforms, clearly defined property rights, etc
Promote international trade	Pricing and exchange rate policies
Improve forecasting mechanisms	Distribute information across all sectors, etc.
Strengthen institutional and decision-making structures	Reform existing institutions on agriculture, etc.

Figure 17: Adaption and policy options. Source: Mahendra (2011)

At the more local level IPCC (2007; p490)[35] suggests the following adaptation strategies:

1°C temperature increase in June to August

- Use of more heat/drought-tolerant crop varieties in areas under water stress
- Use of more disease and pest tolerant crop varieties
- Use of salt-tolerant crop varieties
- Introduce higher yielding, earlier maturing crop varieties in cold regions

Farm Management

- Altered application of nutrients/fertiliser
- Altered application of insecticide/pesticide
- Change planting date to effectively use the prolonged growing season and irrigation
- Develop adaptive management strategy at farm level

Livestock production

- Breeding livestock for greater tolerance and productivity
- Increase stocks of forages for unfavourable time periods
- Improve pasture and grazing management including improved grasslands and pastures
- Improve management of stocking rates and rotation of pastures
- Increase the quantity of forages used to graze animals
- Plant native grassland species
- Increase plant coverage per hectare
- Provide local specific support in supplementary feed and veterinary service

Fishery

- Breeding fish tolerant to high water temperature
- Fisheries management capabilities to cope with impacts of climate change must be developed

Development of agricultural bio-technologies

- Development and distribution of more drought, disease, pest and salt-tolerant crop varieties
- Develop improved processing and conservation technologies in livestock production
- Improve crossbreeds of high productivity animals

Improvement of agricultural infrastructure

- Improve pasture water supply
- Improve irrigation systems and their efficiency
- Improve use/store of rain and snow water
- Improve information exchange system on new technologies at national as well as regional and international level
- Improve sea defence and flood management
- Improve access of herders, fishers and farmers to timely weather forecasts

Figure 18: Adaptation strategies per subsector. Source: IPCC (2007)

CHALLENGES IN MAINSTREAMING DRR AND CCA INTO FOOD SECURITY SECTOR

A significant challenge of mainstreaming CCA into food security sector is the limited data on agriculture and local climate change impacts.

Agriculture in developing countries must undergo a significant transformation in order to meet the related challenges of food security and climate change. FAO (2010)[36] provide a list of challenges of how to address them:

- Effective climate-smart practices already exist and could be implemented in developing country agricultural systems.
- Adopting an ecosystem approach, working at landscape scale and ensuring inter-sectoral coordination and cooperation is crucial for effective climate change responses.
- Considerable investment is required in filling data and knowledge gaps and in research and development of technologies, methodologies, as well as the conservation and production of suitable varieties and breeds.
- Institutional and financial support will be required to enable smallholders to make the transition to climate-smart agriculture.
- Strengthened institutional capacity will be needed to improve dissemination of climate-smart information and coordinate over large areas and numbers of farmers.
- Greater consistency between agriculture, food security and climate change policy-making must be achieved at national, regional and international levels.
- Available financing, current and projected, are substantially insufficient to meet climate change and food security challenges faced by the agriculture sector.
- Synergistically combining financing from public and private sources, as well as those earmarked for climate change and food security are innovative options to meet the investment requirements of the agricultural sector.
- To be effective in channeling fast-track financing to agriculture, financing mechanisms will need to take sector-specific considerations into account.

Figure 19: Addressing challenges in food security and climate change. Source: FAO (2010)

2.5 COMMON STRATEGIES ACROSS SECTORS

The key strategies that encompass these steps towards livelihoods resilience (relevant to all livelihoods subsectors) are:

1. Creating an enabling environment through risk governance and policy development
2. Mainstreaming resilience in planning and budgets
3. Risk and livelihoods analysis
4. Expansion of social protection polices and services for managing uncertainty (climatological, social an economical)
5. Livelihoods promotion and transformation (enhanced livelihoods)
6. Sustainable management of natural resources / physical infrastructure / spatial planning
7. Resilience oriented preparedness and post-disaster recovery when disasters appear
8. Creating capabilities, abilities and a culture for resilience

2.6 CROSS-CUTTING ISSUES

Cross-cutting issues include migration, health, gender, age and health. Climate change and disasters can increase migration as vulnerable people search for more sustainable livelihoods and better access to food. Urbanization is particularly prevalent in Asia and can increase food insecurity as increasing numbers of people depend on limited supplies in urban areas. Furthermore, urbanization is reducing the availability of potential agricultural land, limiting livelihoods and causing food insecurity.

Health is likely to be affected by climate change as a result of limited food supplies and increased amount of diseases. India and China are likely to see an increase in people at risk of dengue fever, urban areas are likely to observe reduced air quality as a result of newly industrialized areas and poor environment management. Global burden (mortality and morbidity) of climate-change attributable diarrhea and malnutrition are already the largest in South-East Asian countries including Bangladesh, Bhutan, India, Maldives, Myanmar and Nepal in 2000, and the relative risks for these conditions for 2030 is expected to be also the largest.

Men and women are affected differently by climate change and disasters and they also have different capacities and opportunities. Many of the world's poorest people are women living in rural areas in developing countries who are currently dependent on subsistence agriculture to feed their families and who are disproportionately affected by the lack of modern fuels and power sources for farming, household

maintenance and productive enterprises (FAO, 2010). Women also have few resources for adaptation. Migration can also affect women's vulnerability, since they are more reliant on agriculture than men. Consequently, livelihood opportunities are limited and children's food security affected.

Overcoming gender inequality can help to build household communities. When considering mainstreaming strategies, it is vital to include gender equality such as:

- Strengthening public institutions (functional and structurally) towards gender equality (structures, systems, guidelines, resources)
- Investing in gender equality
- Understanding the reasons for gender inequality
- Ensuring both men and women are involved in planning, implementation, monitoring and evaluation processes.
- Increasing the equal entitlement of women and men to be full equal participants in the governance of communities and societies.

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