Climate Change and Disaster Risks in Cambodia

Climate Change and Disaster Risk Guide

Which climate and disaster risks affect Cambodia?

How do they affect Cambodia?

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Picture Front Side

Flood in Cambodia

Available at: http://www.templenews.org/2013/10/15/cambodian-floods-life-ad-hope-association-news-2/ [Accessed: 03.9.2015]

Text

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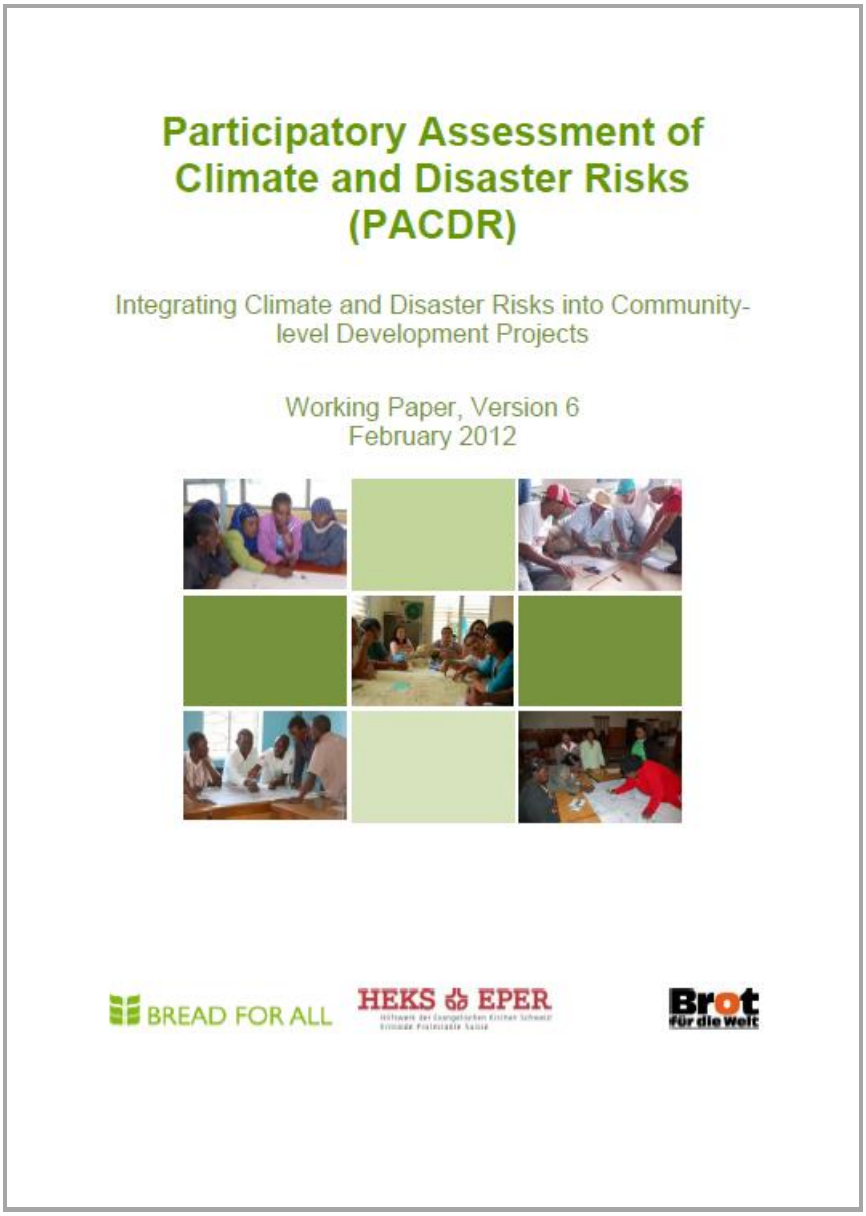
Contents

Introduction

Climate change is one of the largest problems humanity faces today. Communities in Cambodia suffer now and in the future from the impacts of this global phenomenon. However, people in Cambodia have contributed little to causing climate change, in comparison to the highly industrialised countries in the global North.


Participatory Assessment of Climate and Disaster Risks (PACDR)

Integrating Climate and Disaster Risks into Community-level Development Projects

Working Paper, Version 6
February 2012

BREAD FOR ALL HEKS EPER Brot für die Welt

The first step in order to be able to cope with the adverse effects of climate change is to know about climate change forecasts and impacts. This guide aims to provide basic information on climate change, its causes, and how it affects us. Furthermore, this guide can also be used to analyse the climate context, using the *Participatory Assessment of Climate and Disaster Risks (PACDR)* developed by *HEKS*, *Bread for all and Bread for the World*.

An introduction to the terminology on climate change and disaster risk reduction can be found in the PACDR on page 7 which can be downloaded here:

www.breadforall.ch/climatetraining.

1 Climate Change and Disaster Risks in Cambodia

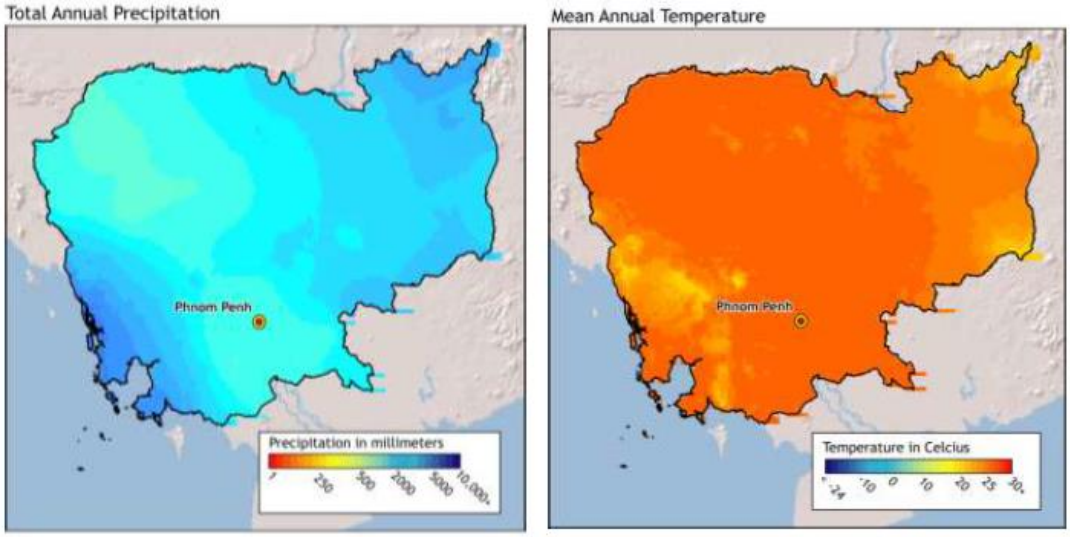
1.1 1.1 The Climate in Cambodia

As climate change is a long-term phenomenon, it is not easy to identify. In order to be able to distinguish between "natural" climate variations and man-made, long-term trends of climate change, it is necessary to know what Cambodia "general" or "normal" climatic conditions are like. On this basis, trends can be identified. When working on climate change in a specific region, it is advisable to find out about local climate conditions there first.

General climate is described by temperature and rainfall patterns:

- Temperatures are more or less consistent across the country, at an average of 25 to 27° Celsius during most of the year. In the hottest months, just before the rainy season, this rises to 26 to 42°C.

- The tropical monsoon climate in Cambodia is characterized by two major seasons. The monsoon occurs from May to October, with heavy rains, high humidity and strong winds. From November to April is the dry season, with little rain, low humidity and not much wind. Total rainfall is higher in the coastal zone, with certain areas receiving up to 5000 mm annually, compared to approximately 1400 mm per year in the central plains (MoE, 2002).



***Map 1**: Annual Climate Baseline for Cambodia: Rainfall (Left) and Temperature (Right), (Worldclim, 1960-1990 Averages)*

Furthermore, Cambodia's climate is influenced by the El Niño Southern Oscillation. El Niño episodes influence the behaviour of the monsoons in this region, and generally bring warmer and drier than average conditions across south-east Asia during the monsoon, while La Niña episodes bring cooler than average dry season (UNDP, 2012).

It's important to underline that Cambodia naturally experiences an annual "dry season" between November and April, which does not constitute drought; and an annual "wet season" that typically causes the inundation of large tracts of land in the floodplain areas. This process assists in maintaining biodiversity, fish stocks and soil fertility. This ecological phenomenon is an important source of water and nutrients for soil fertility for agriculture and for fisheries biodiversity especially for the natural cycle of the flooding of the Mekong River.

2 Past Trends of Climate Change and Disaster Risks

Climate change is already happening now in Cambodia, as well as around the world. Please have a look into the PACDR Tool (www.breadforall.ch/climatetraining) for details on global trends, which are a clear prove of the reality of man-made climate change.

Past and present changes help to indicate possible future changes so it makes sense to have a look at climate changes during the last decades. It can be seen that temperatures have already risen, and that extreme events happen more frequently.

The key message of trends during the last decades in Cambodia: Large-scale climate changes exist, especially an increase of drought and floods and an increase in temperature

Temperature change

Mean annual temperature has increased by 0.8°C since 1960, a rate of around 0.18°C per decade. The rate of increase is most rapid in the drier seasons at a rate of 0.20-0.23°C per decade and slower in the wet seasons at a rate 0.13-0.16°C per decade (UNDP, 2012)

The frequency of hot days and hot nights has increased significantly since 1960 in almost every season. The average number of 'hot' days per year in Cambodia has increased by 46 (an additional 12.6% of days) between 1960 and 2003. The average number of 'hot' nights per year increased by 63 (an additional 17.2% of nights) between 1960 and 2003 (UNDP, 2012)

2.1.2 *Rainfall change*

Mean rainfall over Cambodia does not show any consistent increase or decrease since 1960. The proportion of rainfall that occurs in heavy events has not been altered significantly since 1960. Throughout, some changes in the magnitude of rainfall have been shown causing more frequently droughts and floods as usual (UNDP, 2012).

2.1.3 *Oceanic and sea level trends*

In coastal areas of Asia, the current rate of sea-level rise is marginally bigger than the global average. A rate of sea-level rise of 3.1 mm/yr has been reported over the past decade compared to 1.7 to 2.4 mm/yr over the 20th century as a whole, which suggests that the rate of sea level rise has accelerated relative to the long-term average (IPCC, 2007).

2.1.4 *Disaster risks*

The most common extreme weather events in Cambodia are droughts and floods.

Floods

***Photo 1**: Flooding on 13 October 2011 immediately north of Phnom Penh (source: T.Murphy et al)*

There are two major flood types in Cambodia:

1. *Mekong flood* (seasonal flood): Cumulative rainfall in the upper catchments throughout the rainy season causes a slow but steady rise in water levels lasting several days (FAO, 2013)
2. *Flash floods*: Repeated heavy rainfall in mountainous areas, which flows into the streams and tributaries of the Mekong River branch of river often cause flash floods which are swift and last only a few days, but often cause severe damage to crops and infrastructure especially in tributaries around the Tonle Sap basin (FAO, 2013)

This last climatic phenomenon put seriously in danger the life and wellbeing of the Cambodian population. In 2003, the National Committee for Disaster Management (NCDM) and the UN World Food Program (WFP) mapped the most disaster-prone areas of the country; approximately 500 communes were identified as being prone to natural disasters: 260 prone to floods and 293 prone to drought (see map 2 and 3).This is about one third of the total number of communes in the country (SNAP 2008-2013).

In the past, severe flooding were relatively common in many parts of Cambodia, but extreme floods with significant negative impacts occurred only every five years, or less frequently (in 1961, 1966, 1978, 1984, 1991 and 1996). However, since 1999 severe flooding has been occurring more frequently (CDRI, 2011). There were major floods in 2000, 2001, 2009, 2011, and 2013. The mainstream flood of 2000 and 2011 were especially severe. During the flood of 2000 in Cambodia and Vietnam, 800 people were killed, over 13 Million were affected, and the total cost was over USD 400 M (MRC, 2012).

Cambodia

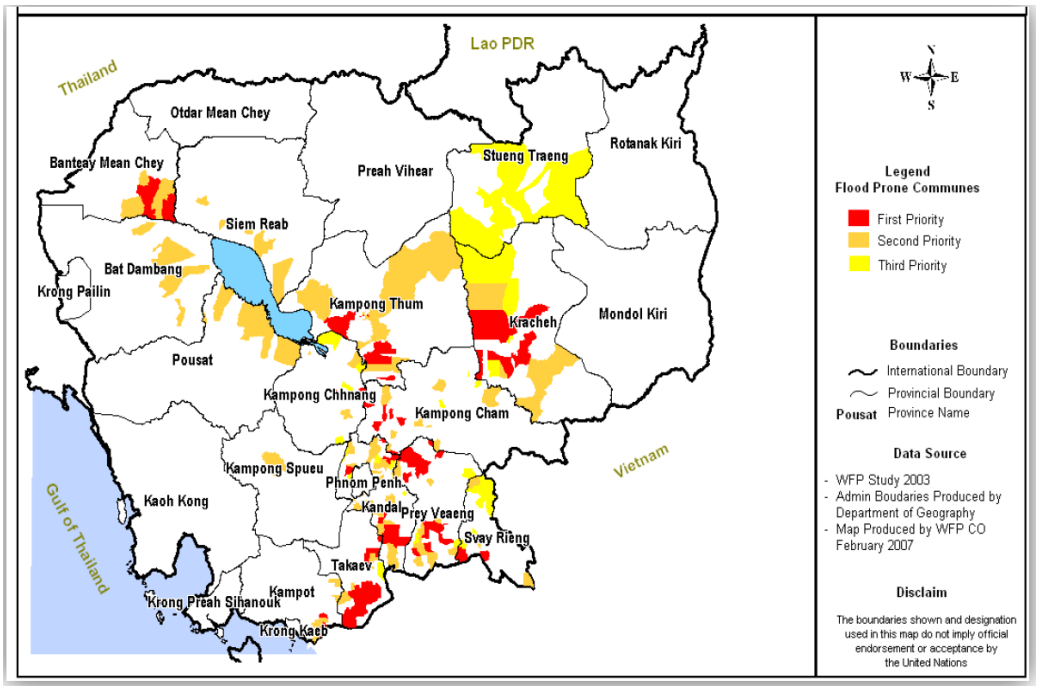
Year	Cost (M USD)	People Killed	People Affected	Damaged Crops (ha)
1996	86.5	169	-	250,200
2000	161.0	347	3.4 M	421,600
2001	36.0	62	0.6 M	164,200
2002	12.5	-	1.5 M	45,000
2003	-	-	-	-
2004	55.0	-	-	247,400
2005	3.8	4	-	55,000
2006	11.8	11	-	14,500
2007[a]	9.0	10	147,200	9,500
2008[a]	5.8	-		18,900

[a] Damage in 2007 and 2008 in Cambodia was almost solely related to flash flooding.

Table 1: *Annual Flood Impacts, 2000-2008 (MRC, 2011)*

In 2011, more than 1.7 million people were affected. 50,000 people lost their homes, and almost 250 died. Once again, in 2013, Cambodia suffers from severe monsoon season in a country that was still recovering from the damage of previous years floods (MRC, 2012) In 2013, twenty provinces and 377,354 households, according to the National Committee for Disaster Management (NCDM), were affected by 2013 floods.[1] These facts explain that in 2015 German Watch ranked the country second most affected by climate risk.

In the map 3, you can see the communes that are more vulnerable to flooding according to the Strategic National Action Plan of Cambodia (SNAP).



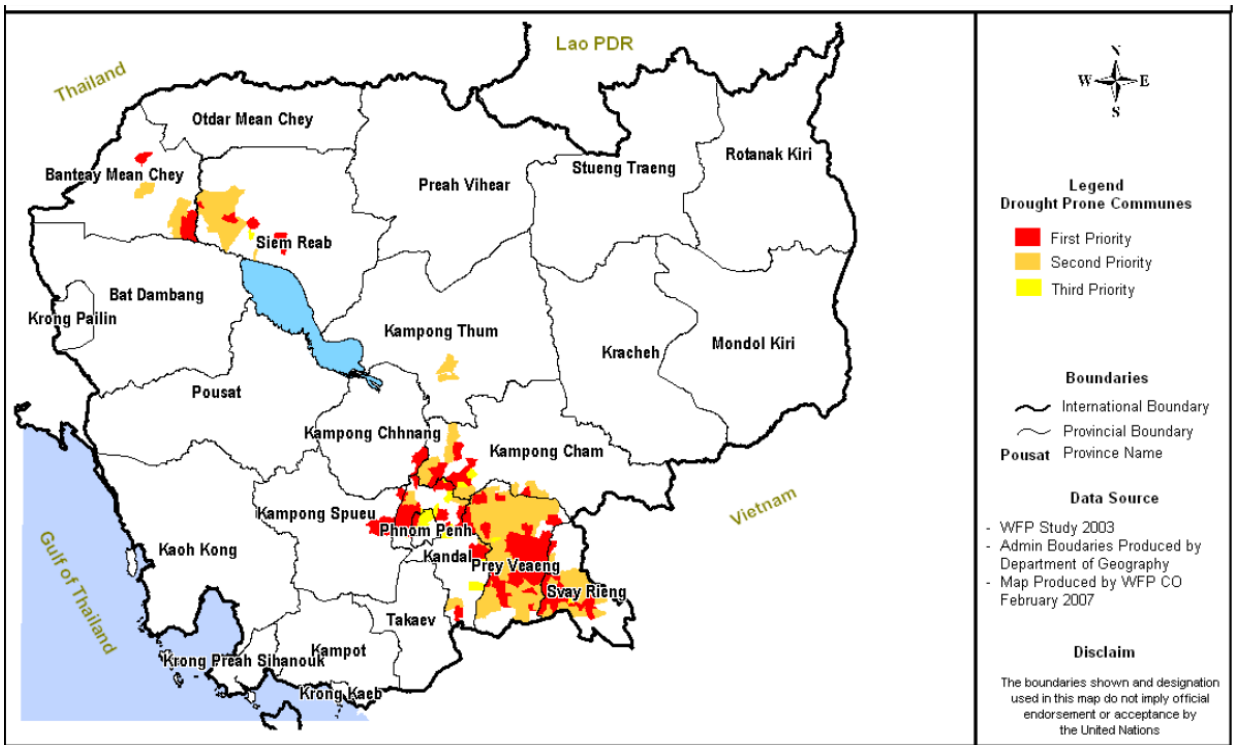
Map 2 *: Map of Flood-prone Communes (SNAP, 2008-2013)*

[1] http://reliefweb.int/report/cambodia/floods-humanitarian-response-forum-hrf-final-report-no-07-07-december-2013

Droughts

Localized drought is also becoming increasingly apparent and significant. [2] This phenomenon is present in many areas of the country, including areas that are also flood-affected. In 2001, 2002 and 2003, drought affected a number of areas. For example in 2002, a drought affected some 420 communes in 76 districts located in the 10 provinces of Prey Veng, Kandal, Kampong Speu, Takeo, Svay Rieng, Kampong Thom, Kampong Cham, Kratie, Otdar Meancheay, and Banteay Meanchey. The drought was during the rainy season and prevailed until the onset of rains in mid-August. Statistics from the NCDM indicate that the drought had affected 2,047,340 people or 442,419 families and was the worst drought to affect the country. The cost of the drought was estimated to be more than US$21.50 million (SNAP, 2008-2013).

In the map 4, you can see the communes that are more vulnerable to drought according to the Strategic National Action Plan of Cambodia (SNAP).



***Map 3**: Drought-prone Communes (SNAP, 2008-2013)*

Extreme events

Extreme weather events, such as storms or typhoons are generally not considered a major problem in Cambodia, as the country is protected by surrounding mountain ranges. Nevertheless, storms do occasionally affect the country with most of the storm-related damage caused by localized floods associated with heavy rain. For example, in 2009, Cambodia suffers from one devastating typhoon (Ketsana) which cause the death of 43 people and forced more than 66,000 families from their homes by floodwaters (The Phnom Penh Post, 2009-

[2] http://reliefweb.int/report/cambodia/cambodia-humanitarian-response-forum-hrf-report-no-1-2015-31-july-2015

10-26) .In the first 6 months of 2015, inclement weather, especially storms, claimed the lives of at least 56 Cambodians, injured another 166 and damaged and destroyed more than 7,000 homes according to a report released by the National Committee for Disaster Management (NCDM).[3]

3 Projected Trends of Climate Change and Disaster Risks

The International Panel on Climate Change (IPCC) consists of a large number of climate scientists from around the world and its task is to model future climate change and its impacts. With the help of very complex computer models which have been "filled" with huge amounts of data from the present and the past, those scientists try to forecast climate change for the next decades. Of course, the future is always uncertain. However, by using different scenarios and by cross-checking the models with the past, fairly good projections for the future can be made.

Projected sea-level rise is very likely to result in significant losses of coastal ecosystems and a million or so people along the coasts of South and South-East Asia will likely be at risk from flooding

3.1.1 *Temperature forecast for Cambodia*

Based on these estimates of the UNDP, it is projected that the mean annual temperature will increase by 0.7 to 2.7°C by the 2060s, and 1.4 to 4.3 degrees by the 2090s. The range of projections by the 2090s under any one emissions scenario is around 1.0-1.5°C.

- The projected rate of warming is similar in all seasons and regions of Cambodia
- All projections indicate substantial increases in the frequency of days and nights that are considered 'hot' in current climate (see Figure 3).

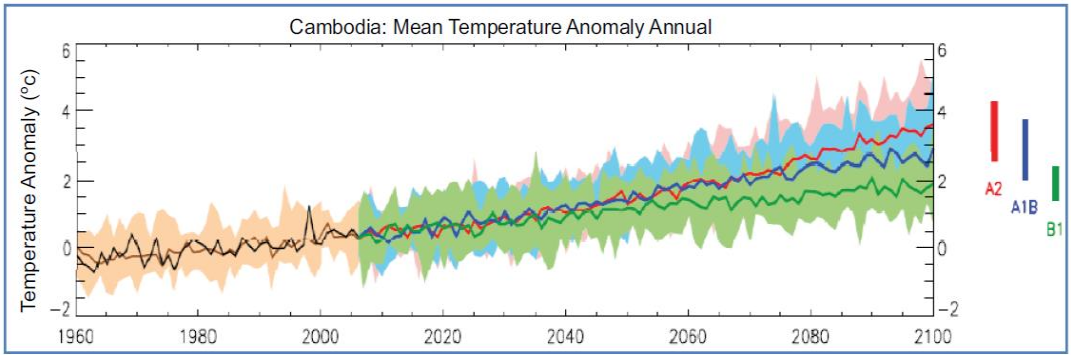


Figure 2: *Mean Annual Temperature in Cambodia under A2, A1B, and B1 scenarios, (UNDP, 2011) All values shown are anomalies,relative to the 1970-1999 mean climate. Black curves show the mean of observed data from 1960 to 2011, Brown curves show the median (solid line) and range (shading) of model simulations of recent climate across an ensemble of 15 models. Coloured lines from 2006 onwards show the median (solid line) and range (shading) of the ensemble projections of climate under three emissions scenarios. Coloured bars on the right-hand side of the projections summarise the range of mean 2090-2100 climates simulated by the 15 models for each emissions scenarios*

[3] http://www.phnompenhpost.com/national/deaths-damage-storms-are-year

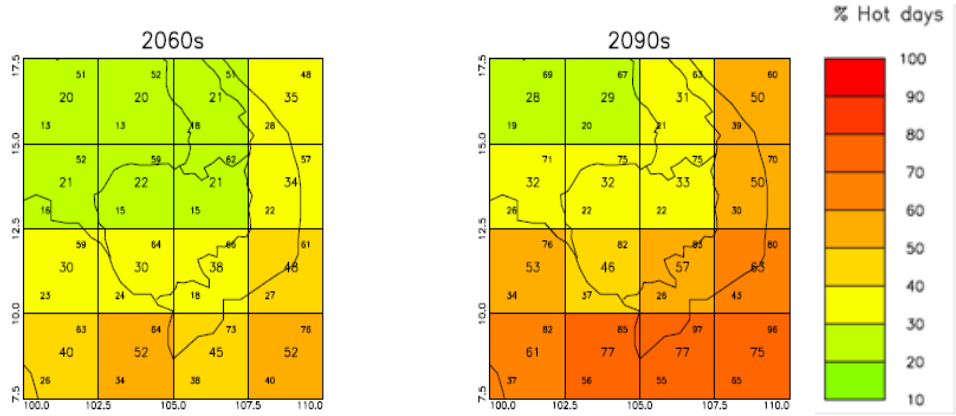


Figure 3: *Spatial patterns of projected change in Hot-day frequency for 10-year periods in the future under the SRES A2 scenario All values are anomalies relative to the mean climate of 1970-1999. In each grid box, the central value gives the ensemble median and the values in the upper and lower corners give the ensemble maximum and minimum (UNDP, 2012).*

Precipitation forecast for Cambodia

While the available precipitation datas do not show significant changes in average rainfall since 1960, climate models predict an increase in annual rainfall in the coming decades. Under the Intergovernmental Panel on Climate Change (IPCC) emission scenarios, it is expected that Cambodia's annual average rainfall will have increased by 31 percent by the 2090s (MRC 2010).

It may also mean anomalies in seasonal patterns, such as the incidence of short droughts during the rainy season, which has been observed in recent years. For example, during December-February which corresponds to dry season, rainfall is projected to decrease by up to 54% (UNDP, 2011). This will cause severe droughts. Together, these impacts mean increased uncertainty in the availability of water for domestic and productive purposes (IFAD, 2013). In practical terms that means later, shorter and wetter rainy seasons and longer, drier dry seasons.

Sea level rise forecast for Cambodia

Based on IPCC projections for the rate of sea level rise, it is estimated that up to 25 000 hectares (ha) of Cambodia's coastal zone may be permanently inundated with sea water by 2100, with an even larger area affected by salinization.

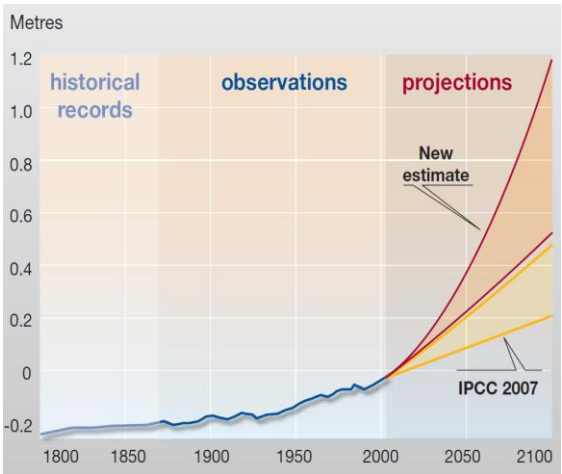
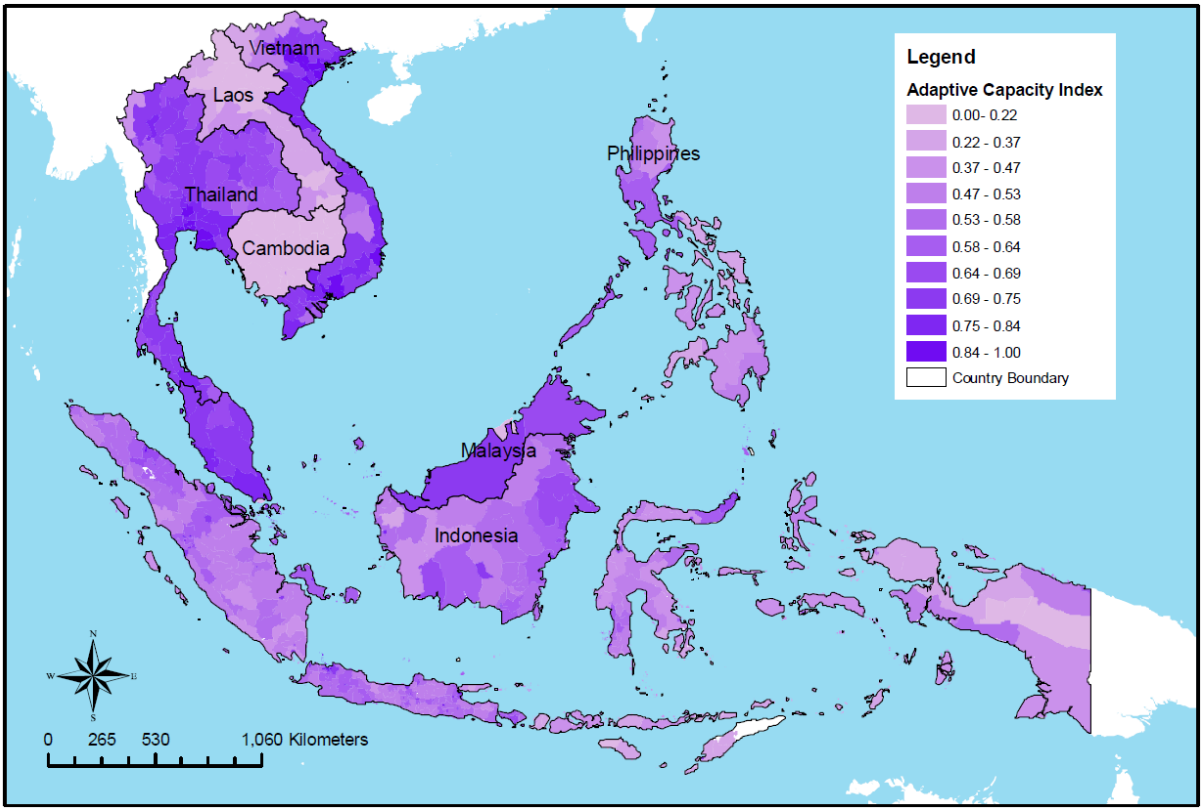


Figure 4: *Global sea level rise. According to the 2007 IPCC report, global average sea level rise will vary from 18 cm to 59 cm by 2100. The IPCC models did not account for the accelerated melting of ice sheets in Greenland and Antarctica. Some of the latest research, however, estimates a global sea level rise of between 0.6 and 1.2 metres by 2100 (Riccardo Pravettoni, UNEP/GRID-Arendal, 2009).*

4 Impacts

Cambodia's vulnerability to climate change is linked to its characteristics as a post-civil war, its limited capacity to invest resources in adaptation and its economy that is largely based on agriculture with nearly 80% of the population living in rural areas and about 73 % depends on agriculture for their livelihoods (FAO, 2011). The projected and ongoing changes of Cambodia's climate have started to have severe adverse impacts on different environmental and social resources and sectors. These impacts affect greater the more vulnerable part of population such as women, migrants, indigenous community, and people that have less resources. The impacts of climate change are also really dependent to the adaptive capacity of one country. If one country has a really good adaptive capacity he will be less vulnerable to climate change. This adaptive capacity is determined by the socioeconomic factors such as education and income but also by the electricity coverage, the extent of irrigation, the road density or the communication. As you can see in the map 4 above, the adaptive capacity of Cambodia are low which involved that the impacts of climate change will be stronger than a country that is more prepared to respond to such impacts.



Map 4: Adaptive capacity map of Southeast Asia 2005 (Yusuf & Francisco, 2009)

The scientific literature lists various impacts. We will here focus only on the impacts of climate change on agriculture, water resource management, forestry, fisheries and health.

4.1.1 *Agriculture*

The majority of the rural poor are dependent on agriculture for their livelihoods. Agriculture accounts for around 29% of Cambodia's GDP (CDRI, 2009). The majority of these farmers are smallholders, with 21% of households being landless and an additional 45% owning less

than one hectare. Agricultural productivity is low, both in terms of production by laborer and in terms of production per hectare (IFAD, 2013/ MoE, 2011).

With only approximately 20% of farmland under irrigation, Cambodian agriculture is highly vulnerable to climate variability (MoE, 2011). Drought and flood events in recent years demonstrate the damaging effects these extreme events can have on agricultural production (see table 2 and 3).

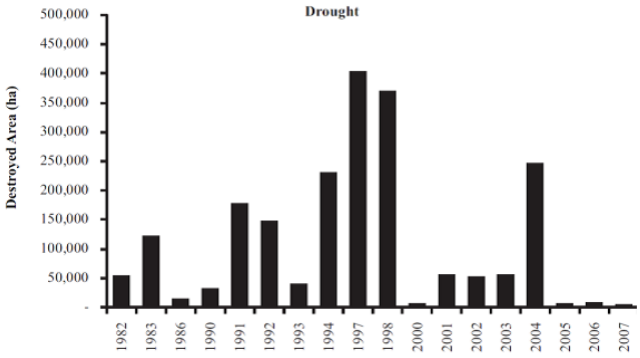


Table 2: *impact of droughts on agriculture (MAFF, 2010)*

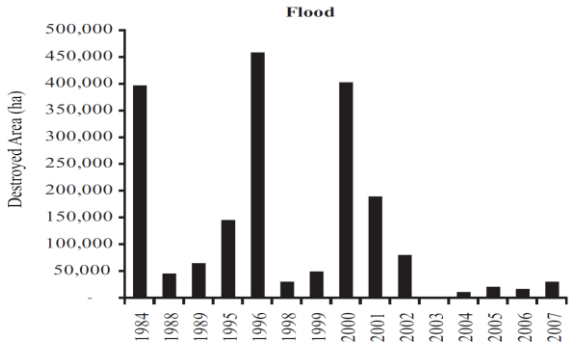


Table 3: *impact of floods on agriculture (MAFF, 2010)*

Major crops grown in Cambodia are rice, maize, cassava, sweet potato, mung beans, green beans, peanuts, soybeans, sesame, sugarcane, rubber and tree fruits. However, rice is the main crop grown in Cambodia (accounting for around 90% of cultivated land) and is the main basic food of Cambodians' diet. Rice production which is traditionally dependent on rainfall is particularly vulnerable to climate change and disaster risk. Studies have shown that rice yields can be expected to decrease by 10% for every 1°C increase in minimum temperature during the growing season. This increase of temperature will also increase the incidence of pests and disease in agriculture (IFAD 2013/MoE, 2011).

The impacts of climate change on agriculture will place people, especially vulnerable groups, at greater risk of hunger and malnutrition.

Water resource management

Almost 86 percent of Cambodia's territory lies within the Mekong River basin, water resources are extremely dependent on this complex river system, which interact with six countries. The Mekong basin has been highlighted in global assessments as one of the river basins that will be most severely affected by climate change (UNEP 2009). Climate change will disturb the water cycle, bringing changes in the timing, duration and intensity of rainfall patterns and seasons, altering the hydrology of major rivers and tributaries as well as groundwater recharge. These changes will lead to uncertainty in availability of water for domestic and productive uses, potentially causing water scarcity and decreasing water quality. Furthermore, floods may cause damage to rural water infrastructure including water supply and irri-

gation systems. Risks of privatization of water resources will be in these conditions also stronger (MoE 2011/IFAD, 2013).

These impacts will affect predominantly poorest people, including small-scale farmers and fishers. Therefore, they will be an increased need for water infrastructure planned to manage fluctuations in water availability (water storage and distribution, etc.). Coastal zone management strategies will also need to be adapted to the changing conditions caused by sea level rise and strong variations in the hydrological system (IFAD, 2013/ MoE 2011).

Finally, sea level rise would have really big impact on national and transnational migration in South East Asia.

Forestry

Forest resources represent an important source of energy for a large part of Cambodia's population, with more than 80% dependent on fuel wood for cooking (National Institute of Statistics (NIS), 2009). In addition, non-timber forest products provide income for many households, particularly in times of crisis. Large scale agro-industrial development and a lack of effective implementation of existing laws and policies for forest land and forest resource management result in the growing deforestation of the country. The human impacts on forest resources are really high as you can see in figure 3. The impact of climate change will worsen the deterioration of biodiversity like loss of forest resources in Cambodia.

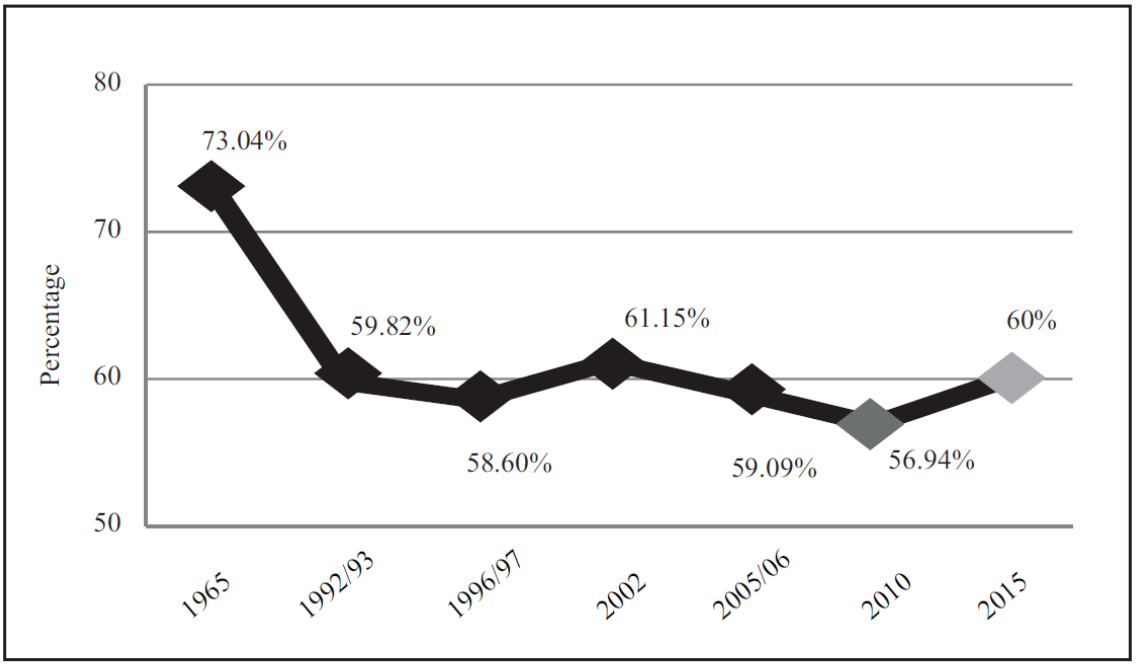
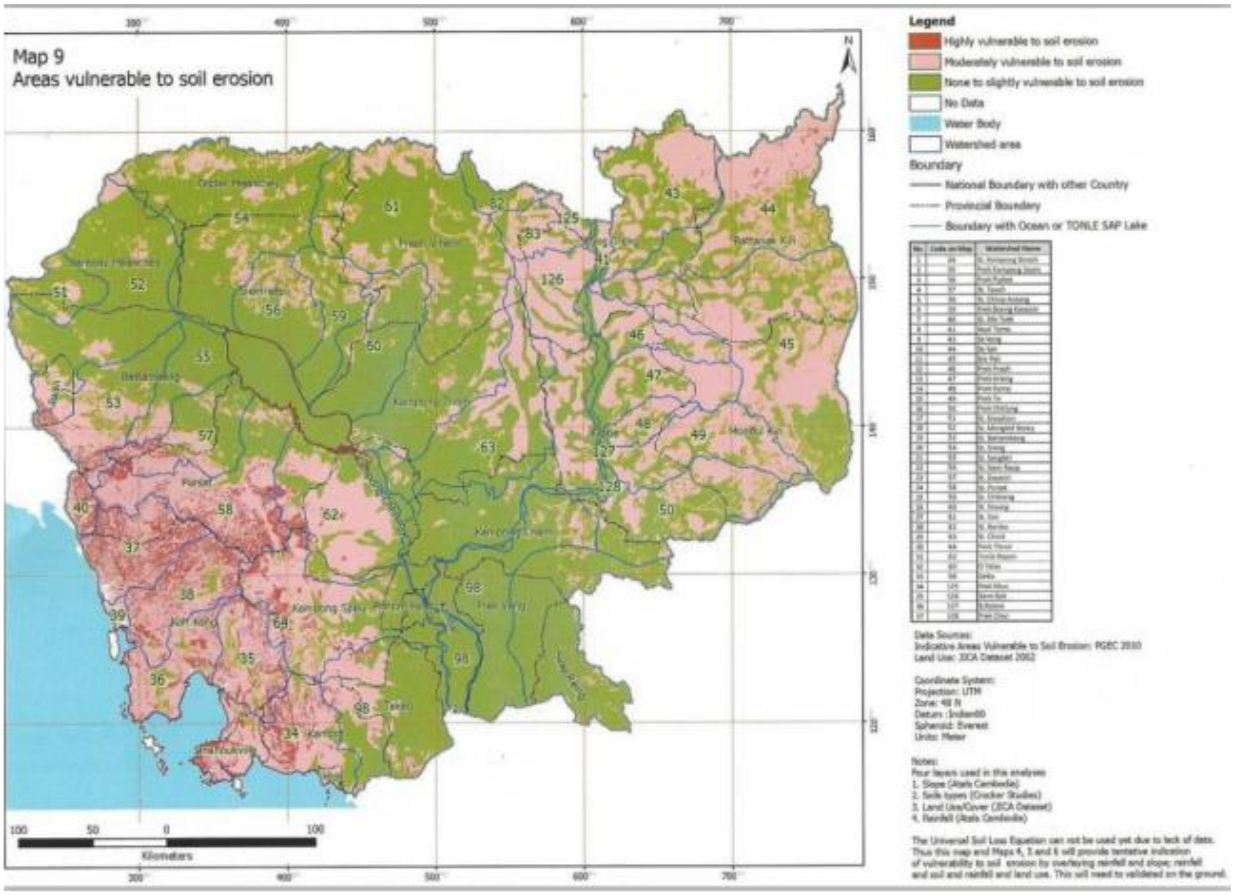


Figure 2: *Changes in Forest Cover, 1965-2010 (FAO, 2010)*



Map 5: *Maps of Area vulnerable to soil erosion (MAFF, 2012)*

Cambodia's forests will be strongly affected by climate change impacts. The predicted increase in temperature has the potential to change the extent and composition of forests, including a decrease in wet forests and an increase in moist forests, each of which currently account for approximately 20% of the country's forests (CNMC, 2010). This may lead to changing availability of forest resources for rural livelihoods. Changes in seasons and rainfall patterns may lead to reduced forest productivity and increased risk of forest fires (IFAD, 2013). Erosion is one of the impacts of climate change that will lead to loss of biodiversity (see map 5).

In coastal zones, mangrove forests may be submerged by rising sea levels. Together, these effects will lead to the degradation and loss of forests, leading to decreased income security for forest-dependent communities (MoE 2011/IFAD 2013).

Fisheries

Shifting seasons and rainfall patterns will affect Cambodia's freshwater fisheries in several ways. Change in the Mekong flooding, seasonal flooding, are expected to affect fish migrations. With shorter rainy seasons, the duration of the period for breeding and spawning will be reduced, leaving less opportunity for fish populations to propagate and for young fish to reach maturity before migration. Increase of drought means that fish habitat will be reduced. This will not just affect fisheries community but also traditional rice agricultural systems that incorporate fish, which eat the insect pests of the rice and fertilise the paddies (MRC, 2004).

With sea level rise, the environment for coastal fisheries will change, with consequent changes to fish species composition. As well, salinity will spread into inland, potentially affecting freshwater fisheries. Collectively, these impacts will lead to declines in natural fisheries productivity and augmented competition over fish resources (IFAD 2013). These changes will have severe consequences for food security and nutrition in a country where fishes contribute to 82.1% of the total animal protein intake for the population. Climate change will affect strongly Cambodian fisheries sector which contribute to 12% of the Cambodia's GDP (So & Buoy, 2005).

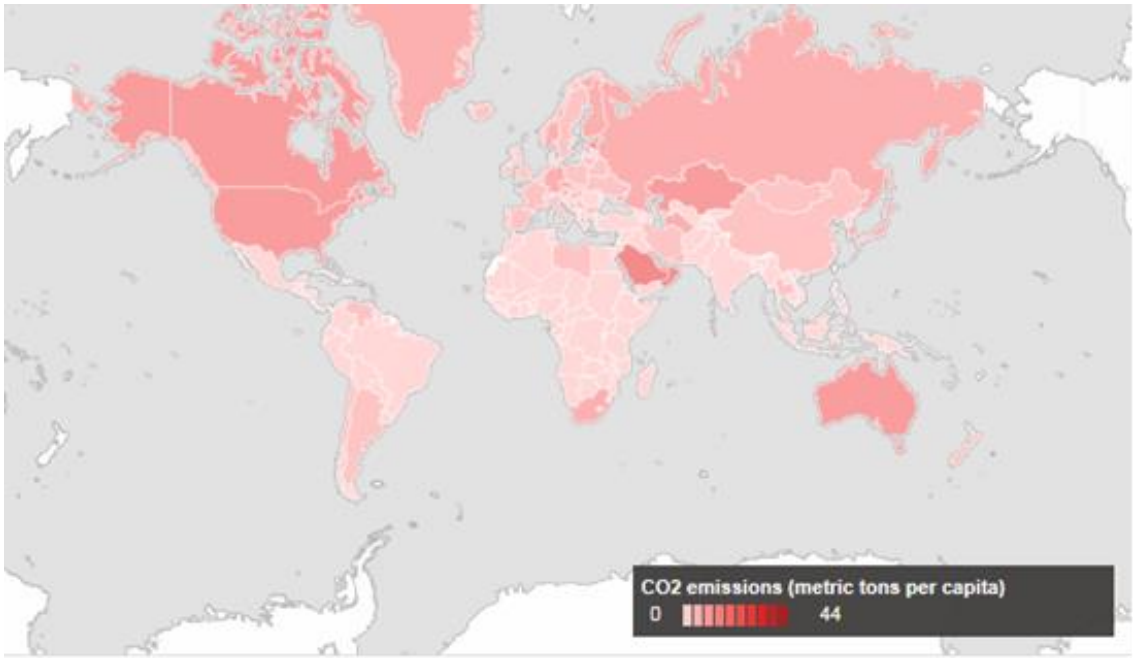
4.1.5 *Human health*

Climate change will affect the fundamental determinants of health. As temperatures rise, the local micro-climate can change, leading to increased risk of vector-borne diseases such as malaria and dengue. Changing rainfall patterns and sea level rise also affect water quality and quantity. With reduced access to safe sources of water for domestic use, people are more at risk of water and food-borne diseases, including diarrhea and cholera.

This is particularly true for extreme events such as droughts and floods that can also cause injuries and deaths. These effects represent an supplementary problem for health services, which is worrying given the already poor state of health care in Cambodia (MoE, 2011/Christian Aid, 2009/ IFAD, 2013)

5 Cambodia's Contribution to Climate Change

The National Climate Change Committee of Cambodia report from 2013 underline that emissions in Cambodia are currently extremely low compared to regional and global averages (see map 5)



Map 6: *CO2 emissions (metric tons per capita) 2010-2014 (World Bank, 2014)*

In 2012, Cambodia emitted 49.12 million tons of greenhouse gases (GHGs) (CAIT, 2015). The forestry sector absorbed 48 million tons of CO2 equivalents in 2002 which implies that Cambodia has just recently become a net emitter of GHGs (MoE, 2013).

As you can see in the figure 4 below, Cambodia didn't increase a lot his CO2 emission in comparison with general overage of East Asia & Pacific.

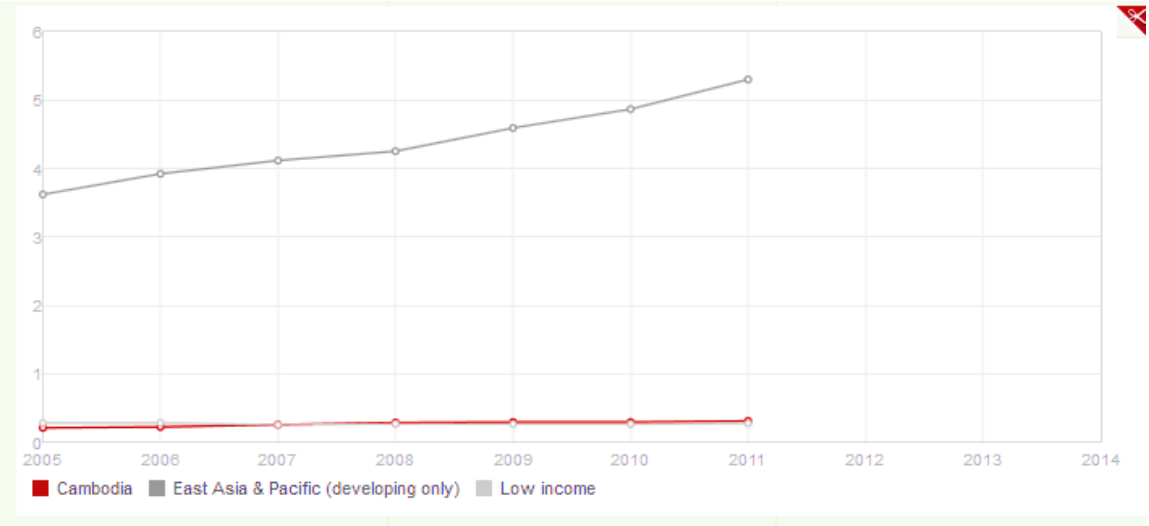
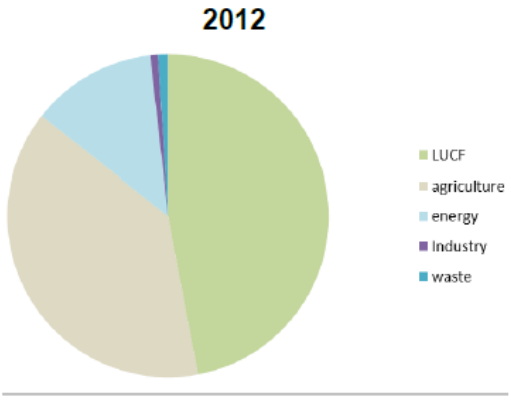


Figure 3: *CO2 emissions (metric tons per capita) (World Bank, 2015)*

Throughout up-to-date information regarding the details of Cambodia's current greenhouse gas (GHG) emissions profile is limited. According to the latest national communication by Cambodia under the UNFCCC, the last greenhouse gas (GHG) inventory for Cambodia was conducted in 2002 for the year 1994 and shows that Land Use Change and Forestry (LUCF) was the largest emitter of GHGs in Cambodia. In Cambodia, GHG emissions from LUCF result mainly from commercial harvesting of wood for timber, for other applications (such as cooking) and from converting forested land for alternative uses, such as agriculture (IFAD, 2013)



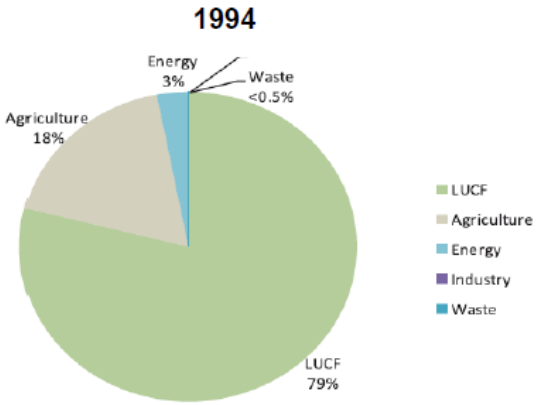


Figure 6*: Total ghg emissions by sector in Cambodia in 2012 including Land Use Change and Forestry (LUCF). (CAIT, 2015)*

Figure 5*: Total ghg emissions by sector in Cambodia in 1994 including Land Use Change and Forestry (LUCF). (UNFCCC, 2002)*

The CAIT Climate Data Explorer[4] collects GHG data for Cambodia from 1990 to 2012.With these new data, we can see that the emissions from Land Use and Forestry declined by 16,81 % between 1990 et 2012 when agriculture sector increase by 45.9 % and waste sector by 63 %. The largest increase is in industry and energy sectors with more that 100 % growth.

[4] http://cait.wri.org/profile/Cambodia#Equity%20Indicators

6 Climate Change and Disaster Risk Management Policy

6.1 6.1 Climate Change Policy

6.1.1 *International Climate Change Policy – UNFCCC conferences and outcomes*

UNFCCC in 1992: The international political response to climate change began with the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992. The UNFCCC sets out a framework for action aimed at stabilizing atmospheric concentrations of greenhouse gases to avoid "dangerous anthropogenic interference" with the climate system. The Convention, which entered into force on 21 March 1994, now has 195 parties (IISD 2012).

Kyoto Protocol in 1997: In December 1997 in Kyoto in Japan, delegates to the third session of the Conference of the Parties (COP) agreed to a Protocol to the UNFCCC that commits industrialized countries and countries in transition to a market economy to achieve emission reduction targets. These countries, known as Annex I parties under the UNFCCC, agreed to reduce their overall emissions of six greenhouse gases by an average of 5.2% below 1990 levels between 2008-2012 (the first commitment period), with specific targets varying from country to country. The Kyoto Protocol entered into force on 16 February 2005 and now has 193 parties (IISD 2012).

Bali Roadmap in 2007: Negotiations resulted in the adoption of the Bali Action Plan. Parties established a working group with the mandate to focus on key elements of long-term cooperation identified during the Convention Dialogue: mitigation, adaptation, finance, technology and a shared vision for long-term cooperative action. The Bali conference also resulted in agreement on the Bali Roadmap. Based on two negotiating tracks under the Convention and the Protocol, the Roadmap set a deadline for concluding the negotiations in Copenhagen in December 2009 (IISD 2012).

Copenhagen, 2009: Disputes over transparency and processes dominated the Climate Change Conference in Copenhagen, Denmark and hindered the successful completion of the Bali Road Map. Informal negotiations of a group consisting of major economies and representatives of regional and other negotiating groups proposed "The Copenhagen Accord" which was after heavy debating "taken note of" by the plenary. In 2010 over 140 countries indicated support for the Accord in which amongst other topics the temperature limitation to 2°C, fast start finance, long term finance and scaled up, new and additional, predictable and adequate sources of funding are mentioned.

Cancun, 2010: By the end of the conference, parties had finalized the Cancun Agreements. The parties recognized the need for deep cuts in global emissions in order to limit global average temperature rise to 2°C. On finance, parties created the Green Climate Fund (GCF) and recognized the commitment by developed countries to provide US$30 billion of fast-start finance in 2010-2012, and to jointly mobilize US$100 billion per year by 2020 (IISD 2012).

Durban, 2011: The Climate Change Conference in Durban, South Africa was ending with outcomes, related to the Durban outcomes, covering a wide range of topics. The most notable results were the establishment of a second commitment period under the Kyoto Protocol, a decision on long-term cooperative action under the Convention and agreement on the operationalization of the GCF. Parties also agreed to launch the new ADP with a mandate "to develop a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties." The ADP is scheduled to complete negotiations by 2015. The outcome should enter into effect from 2020 onwards. (IISD 2012)

Doha, 2012: The Conference produced a package of documents collectively titled The Doha Climate Gateway over objections from Russia and other countries at the session, The documents contained: (1) An eight year extension of the Kyoto Protocol until 2020 limited in scope to only 15% of the global carbon dioxide emissions due to the lack of participation of Canada, Japan, Russia, Belarus, Ukraine, New Zealand and the United States and due to the fact that

developing countries like China (the world's largest emitter), India and South Africa are not subject to any emissions reductions under the Kyoto Protocol. (2) Language on loss and damage, formalized for the first time in the conference documents. (3) The conference made little progress towards the funding of the Green Climate Fund [5]

Warsaw 2013: Officially, the Warsaw Climate Conference concluded successfully (UNFCCC, 2013). However, this is seen much more critically by NGOs and independent observers. The meeting adopted a decision that invites parties to initiate or intensify domestic preparations for their country mitigation contributions, and resolves to accelerate the full implementation of the Bali Action Plan and pre-2020 ambition. Parties also adopted a decision establishing the Warsaw international mechanism on loss and damage, and the "Warsaw REDD+ framework" (IISD, 2014). With regard to finance for helping poorer countries cope with climate change, Warsaw was a disappointment: Even though the Green Climate Fund was established as an independent institution and arrangements between the COP and the Green Climate Fund were settled, the developed nations did not keep their promise to set any concrete financial targets. Instead, it was only agreed that developed nations should set "increasing levels" of aid.

Lima 2014: In order for the agreement that will be negotiated in Paris to come into effect in 2020, at the end of the second commitment period of the Kyoto Protocol, Lima COP meeting worked on finalizing its details. In Lima, nations concluded by elaborating the elements of the new agreement and agreeing the ground rules on how all countries can submit contributions. These **Intended Nationally Determined Contributions (INDCs**) will form the foundation for climate action post 2020 when the new agreement is set to come into effect. Countries should submit an offer that addresses their domestic GHG emissions as a contribution to a post 2020 global deal on climate change. Some INDCs may also address adaptation to climate change.

On the road to Paris, 2015: The United Nations Climate Change Conference, COP21 that will be held in Paris, France in December 2015 has for objective to achieve a binding and universal agreement on climate, from all the nations of the world, including the biggest emitters of greenhouse gases. The objective is still to reduce global greenhouse gas emissions so as to hold the increase in global average temperature below 2°C.

The most polluter countries have already present them INDCs. At a first glance, these commitments look pretty good. For example, in June, China has committed to lowering carbon dioxide emissions per unit of GDP by 60 to 65 percent from 2005 levels. The United States has communicated has committed to a 26-28% reductions in total greenhouse gases from 2005 levels by 2025 (theroadthroughparis, 2015). The year 2005 as a reference year for the calculation is not sufficient.

Indeed, a study[6] published in august 2015 analyzed the 46 INDCs that were submitted by 20 July 2015. These 46 Parties were together responsible for 58 per cent of global annual emissions of greenhouse gases in 2011. The results of them analysis show at this point that these 46 INDCs would result in a reduction in global emissions in 2030 relative to UNEP's 'business as usual' pathway and our Reference Scenario. That means that these commitments are not sufficient at all to have a significant impact on climate change. The Nations should undertake additional actions to get closer as possible to the aim of 2°C limits. (see figure 6 below)

[5] http://en.wikipedia.org/wiki/2012_United_Nations_Climate_Change_Conference
[6] http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/08/Boyd-et-al-policy-paper-August-2015.pdf

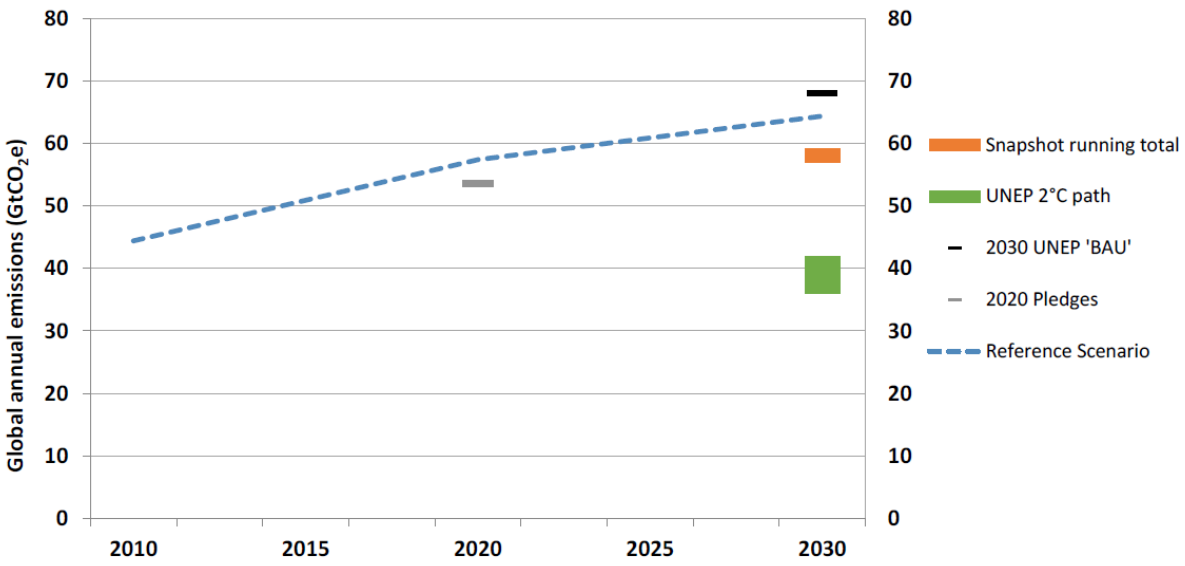


Figure 8: *Global annual emissions between 2010 and 2030. BAU menas Buisness as Usual (Boyd, Turner & Ward, 2015)*

6.1.2 *Cambodia's Climate Change Policy*

As a developing country, Cambodia is classified as a non-Annex I country under the UNFCCC and is therefore not subject to emissions reduction targets under the Kyoto Protocol. However, Cambodia is eligible to host emissions reduction projects under the Clean Development Mechanism (CDM). In addition, as a signatory to the UNFCCC, Cambodia is required to periodically report its national GHG emissions and as a Least Developed Country (LDC), Cambodia was also obliged to develop a National Adaptation Programme of Action on Climate Change (NAPA), submitted in 2006.

Cambodia's status as a Least Developed Country also entails eligibility for funding under the UNFCCC's "financial mechanism", the Global Environment Facility (GEF). Cambodia benefited from these funds in the development of its national communications and its National Adaptation Programme of Action on Climate Change (NAPA).

Recognizing that climate change is a global issue and requires individual and collective effort to adapt or mitigate its impacts, Cambodia's government has developed regulations and policies aimed at addressing climate change issues. You can find some more information about the climate change polices of Cambodia on the website of the Climate Change Department of the Ministry of Environment: http://camclimate.org.kh.

The National Climate Change Committee (NCCC) was created in 2006 to implement the National Adaptation Programme of Action on Climate Change (NAPA). The NCCC is an inter-ministerial mechanism with the mandate to prepare, coordinate and monitor the implementation of policies, strategies, legal instruments, plans and programs of the Royal Government to address climate change issues within the country, thus contributing to the protection of the environment and natural resources and foreseeing and preventing man-made changes in climate that might have adverse impacts on the peoples well-being

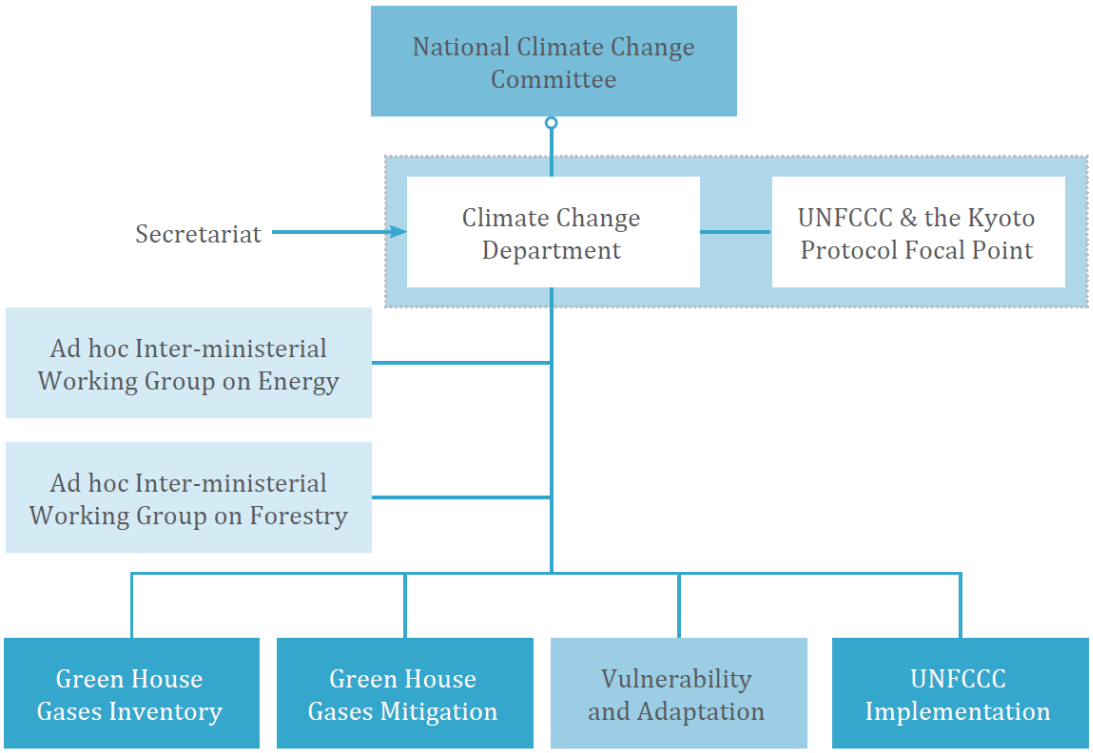


Figure 9: *National Climate Change Committee's organizational relationships (Adaptation Knoledge Plateform, 2010)*

In 2013, the National Climate Change Committee developed the Cambodia Climate Change Strategic Plan 2014 – 2023 (CCCSP)[7] that is designed to develops Cambodia towards a green, low-carbon, climate-resilient, equitable sustainable and knowledge-based society.

To achieve this vision, the Royal Government of Cambodia (RGC) has identified eight strategic objectives:

1. Promote climate resilience through improving food, water and energy security;

2. Reduce sectorial, regional, gender vulnerability and health risks to climate change impacts;

3. Ensure climate resilience of critical ecosystems (Tonle Sap Lake, Mekong River, coastal ecosystems, highlands, etc.), biodiversity, protected areas and cultural heritage sites;

4. Promote low-carbon planning and technologies to support sustainable development;

5. Improve capacities, knowledge and awareness for climate change responses;

6. Promote adaptive social protection and participatory approaches in reducing loss and damage due to climate change;

7. Strengthen institutions and coordination frameworks for national climate change responses; and

8. Strengthen collaboration and active participation in regional and global climate change processes.

- ***Cambodia Climate Change Alliance***

Another important institution which is active in climate change program is the *Cambodia Climate Change Alliance* (CCCA)[8] which is developing projects related to capacity building and institutional strengthening. They also provide grants for climate change initiatives. The projects are implemented by the Ministry of Environment and funded by the European Union (EU), UNDP, Swedish International Development Agency (SIDA) and the Danish International Development Agency (DANIDA).

- **Reducing Emissions by Deforestation and Degradation (REDD)**

For forestry there is a new finance mechanism available through the Reducing Emissions from Deforestation and Forest Degradation (REDD+). This mechanism has been under negotiation by the United Nations Framework Convention on Climate Change (UNFCCC) since 2005, with the objective of mitigating climate change through reducing net emissions of greenhouse gases through enhanced forest management in developing countries. The Royal Government of Cambodia has an opportunity to benefit from carbon market mechanisms such as REDD+ with 57.07% of land area (2010) under forest cover (MoE, 2013).

In May 2008, Reducing Emissions by Deforestation and Degradation (REDD) was officially endorsed by the government. The guiding principles ensure that carbon revenues are used to 1) improve forest quality, 2) provide maximum benefits to local communities with participate in project activities and, 3) study the potential for new REDD projects in Cambodia. In

[7] https://www.humanitarianresponse.info/system/files/documents/files/KHM_0701_CCSP2014-2023_0.pdf

[8] http://www.kh.undp.org/content/cambodia/en/home/operations/projects/environment_and_energy/cambodia-climate-change-alliance.html

some contexts, this effort may be seen as a mitigation strategy, however, safe guarding the forest results in soil stabilization that safeguards communities from landslides, excess effects of flooding, and protects community livelihoods that equate to income to be used in times of calamity, thus the project is also considered as an adaptation to new conditions (Adaptation Knowledge Platform, 2010). You can have more information about this program on this website: http://www.cambodia-redd.org/

6.2 Disaster Risk Management Policy

6.2.1 *International Disaster Risk Management Policy*

The Hyogo Framework for Action (HFA) is the key instrument for implementing disaster risk reduction, adopted by the Member States of the United Nations. Its overarching goal is to build resilience of nations and communities to disasters, by achieving substantive reduction of disaster losses by 2015 – in lives, and in the social, economic, and environmental assets of communities and countries.

The HFA offers five areas of priorities for action, guiding principles and practical means for achieving disaster resilience for vulnerable communities in the context of sustainable development. Since the adoption of the HFA, many global, regional, national and local efforts have addressed disaster risk reduction more systematically, much however, remains to be done. The United Nations General Assembly has called for the implementation of HFA, reconfirmed the multi-stakeholder ISDR System and the Global Platform for Disaster Risk Reduction to support and promote it. It is named after the Japanese prefecture of Hyogo, whose main city is Kobé and where the conference was held in 2005.

The General Assembly has encouraged Member States to establish multi-sectoral national platforms to coordinate disaster risk reduction in countries. Many regional bodies have formulated strategies at regional scale for disaster risk reduction. More than 100 Governments have designated official focal points for the follow-up and the implementation of the HFA (March 2007). Some have taken actions to mobilize political commitment and establish centers to promote regional cooperation in disaster risk reduction.

In 2015, The HFA was replaced by the the Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR). It was adopted by UN Member States on 18 March 2015 at the WCDRR. The Sendai Framework is the first major agreement of the Post-2015 development agenda. It outlines seven clear targets and four priorities for action to prevent new and reduce existing disaster risks: (i) Understanding disaster risk; (ii) Strengthening disaster risk governance to manage disaster risk; (iii) Investing in disaster reduction for resilience and; (iv) Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction. It aims to achieve 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 over the next 15 years.

6.2.2 *Regional Disaster Risk Management Policy*

The ASEAN Agreement on Disaster Management and Emergency Response (AADMER) is a regional legally-binding agreement that binds South East Asian Nations (ASEAN) Member States together to promote regional cooperation and collaboration in reducing disaster losses and intensifying joint emergency response to disasters in the ASEAN region. AADMER is also ASEAN's affirmation of its commitment to the Hyogo Framework for Action (HFA). AADMER contains provisions on disaster risk identification, monitoring and early warning, prevention and mitigation, preparedness and response, rehabilitation, technical cooperation and research, mechanisms for coordination, and simplified customs and immigration proce-

dures. The agreement has objectives to provide effective mechanisms to achieve substantial reduction of disaster losses in lives and in the social, economic and environmental assets of the Parties, and to jointly respond to disaster emergencies through concerted national efforts and intensified regional and international co-operation

6.2.3 *Cambodian's Disaster Risk Management Policy*

The Royal Government of Cambodia has developed a Strategic National Action Plan for Disaster Risk Reduction (DRR) for 2008-2013. The action plan identifies floods as the most critical hazard facing Cambodia, followed by drought as well as occasional epidemics and storms. The action plan identifies priority communities based on their vulnerability to flood and drought (see chapter 3), and notes the important linkages between poverty and disasters. In addition to establishing national coordination and implementation mechanisms for DRR actions, including early warning systems, the strategy emphasizes the role of sub-national entities and of community-based disaster risk management in building resilience to disasters in Cambodia. It also notes the importance of integrating DRR into policies and programs in relevant sectors, including health, agriculture, food security and climate change adaptation (National Committee for Disaster Management and MoP, 2008/ IFAD, 2013). You can find some further information in the website of the National Committee for Disaster Risk Management (NCDM): http://www.ncdm.gov.kh/

You can also find the Plan of Action for Disaster Risk Reduction in Agriculture 2014-2018 on this link: http://www.wcdrr.org/wcdrr-data/uploads/878/FAO-Cambodia-ECHO%20-%20Plan%20of%20Action%20for%20DRR%20in%20Agriculture%202014-2018.pdf

7 Summary

Cambodia is being hit by climate change, and impacts are likely to increase in the future. In particular, floods, droughts and sea level rise are forecasted to have severe impacts on the poor.

While Cambodia is undertaking many efforts to mitigate climate change and also offer disaster risk reduction strategies, it is necessary to understand the urgency of action with regard to adaptation to changing climates. Even if international mitigation efforts are successful, climate change will not be stopped completely. Adaptation means that agricultural (and other) systems should be as resilient and shock-proof as possible, and any projects should foresee the changing climatic conditions. As there is no one-fits-all solution, it is necessary to go through a thinking process for each local project. The PACDR tool can help to identify risks and challenges, as well as to adopt sustainable, long-term strategies to cope with climate change.

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