

# International Nepal Fellowship

**INF Nepal CHD Technical Sector  
CEDRA assessment  
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## **Programme Information**

### **Goal**

Target communities able to act, to be friendly with the impacts of climate change and environmental degradation in order to maintain their health and quality of life consistently, especially poor and marginalised people, in INF/Nepal coverage districts.

### **Target group**

Poor and Marginal group of people of targeted communities in six districts

### **Geographical Focus**

Six District of Mid-western and Western Development Region of Nepal, namely Banke, Surkhet, Dang, Jumla, Mugu and Kapilvastu districts..

### **Implementing Agency**

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## **Executive Summary**

The CEDRA assessment is a new experience for INF Nepal, although INF Nepal has long experience in Community Health and Development (CHD) projects. However, some of the CEDRA work has been implemented through the CHD plan due to similarity between the CHD and CEDRA assessments.

INF Nepal management has enthusiastically implemented the CEDRA assessment through integrating it into its existing CHD project activities. Recently INF Nepal has been working in different districts through their six District Programmes which cover all three ecological zones: mountains, hills and terai (flatlands). The six District Programmes are: INF Jumla & INF Mugu situated in the mountain zone, INF Banke, INF Kaski's Kapilvastu & INF Dang situated in the Terai zone and INF Surkhet situated in the hilly zone. Each of these district programmes have Community Health & Development projects targeted to poor and marginalised groups aiming to empower them improve their quality of life.

This report has been compiled with reference to assessments undertaken across each of the above Districts where INF Nepal has been implementing their CHD work. CHD work has been implemented through community Self Help Groups. We thank these SHGs for their involvement in collecting the information for the CEDRA assessment.

The CHD log frame was intentionally designed to commence with a small number of pilot projects. The timing of these pilot projects has coincided well with the CEDRA assessment, enabling the two processes to be integrated. Activities (adaptations and other actions) coming out of the CEDRA assessment will also be implemented through the CHD project structure. Therefore the CHD Section Head will be responsible for day to day monitoring, planning, budgeting and reporting to the Programme Manager. The district Programme Manager will be responsible for the overall management of the Programme including CEDRA activities. The CHD Technical Advisor will be responsible to provide cross programme technical inputs in coordination with District Programmes to ensure technical standards and timely donor reporting.

The following sections of this report commence by describing how the CEDRA assessment was undertaken, identifies the three separate ecological zones and gives an overview of the outcomes of district orientation workshops. The report then goes on to give an overview of the scientific findings including climate change projections, projected climate and environmental impacts, government responses and potential adaptation options. The community based risk assessment is then given, leading to the proposed logical framework at the end of the report.

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## **1 Introduction**

Global warming through Climate Change and Environmental degradation is becoming a global interest to talk on the issues and act towards it for adaptation and reducing the impacts of climate change. During the year 2010 a Copenhagen Summit was organised on Climate Change which was able to draw the global attention to think for the impacts of Climate Change and their commitment to reduce environmental degradation.

Nepal is a mountainous country and range of Himalayas peaks including Everest lies in the country, majority of population rely on agriculture productions. In compare of developed countries, Nepal has not big factories or nuclear plant which has been contributing in environmental emission. Even though, Nepal has also affected by the impacts of Climate Change. Everywhere the country people are easily recognising the changes in their lifestyle and agriculture pattern due to changes in the climate. Nepal is a member of SAARC, a recent SAARC Summit (April 29-30 2010) have one of main agenda is how to overcome the impact of Climate Change in South Asian Countries.

INF/Nepal is working for the people of Nepal to meet the contemporary need of the country. From beginning INF/Nepal's has been focusing of their work to address the need of the country. Thus the issues of Climate Change and Environmental Degradation is increasing and the whole nation thinking towards it, therefore INF/Nepal wish to contribute for the country in the common goal of Climate Change issues.

## **2 Method collecting data**

The data has been collecting from three different scenarios as below;

- A) Organised 1.5 days workshop at each District Programme for Programmes staff. The workshop was intended to sensitise them on the impacts of Climate Change and Environmental Degradation and its causes. Prepared action plans at the end of the workshop to be environment friendly our Programmes work as well as our day to day practices.
- B) Meeting with community people in Self help Groups at community side. The intention was to know the community feeling/ knowledge on climate change and environmental degradation by using the Risk Assessment Form of CEDRA tools.
- C) Visit to relevant government offices and other organisation at District level to collect scientific data from their records. It is very hard to get the information from government offices at District level because they have not proper recording system.

### **3 Background Information**

Nepal is a landlocked country. Geographically it lies between  $80^{\circ} 4'$  &  $88^{\circ} 12'$  East longitude and  $26^{\circ} 22'$  &  $30^{\circ} 27'$  North longitude. The areas of 147,181 sq Km, extending roughly 885 Km from east to west and varies from 145 – 241 Km from North to South. The country is bordered by India from three sides and China is in North side.

**Topographically, the country can be divided into four main regions;**

1. Himalayan Region and Inner Himalayas, altitude ranging 16000 to 29028 ft. (4878 to 8848 meters). The region is perpetually covered with snow.
2. The sub –Himalayas or the mountainous region, altitude ranging 6000 to 16000 ft (1828 to 4876 meters)
3. The valley basin, Dun or Inner Terai altitude ranging 900 to 2000 ft. (274 to 609 meters)
4. The low plain region Terai, altitude ranging 300 to 900 ft. (91 to 274 meters)

**For the practical purposes, the country is mainly divided in three broad ecological zones:**

- ❖ The Himalayan region, comprising 15% of the country's land surface. The highest peaks of the Himalayas like Sagarmatha (Everest), Kanchanjunga 8586 m, Lhotse 8516m, Makalu 8463m, Annapurna 8091m, Dhaulagiri 8167m, Manaslu 8163m lie along the Northern border.
- ❖ The Hills and mid mountain region, comprises 68% of Nepal's land area. Two ranges enclose between them valleys of various widths and altitudes, known as Duns or the Inner Terai. Kathmandu, Pokhara and Surkhet lies in the region.
- ❖ The Terai region, comprises 17% of the total land area. It has a width ranging from 25.6 to 32 Km.

#### **Climate**

There are variations in the climate due to the difference in altitude and in topography of the county. Climatically Nepal is divided into three types:

1. Subtropical: The Terai, the Inner Terai and lower foothills gave a subtropical climate. The temperature range from  $5^{\circ}$  to  $47^{\circ}$ c.
2. Temperate: The area between the Mahabharat range and Himalayas has a temperate climate. The temperature range is varies between  $0^{\circ}$  c to  $30^{\circ}$  c.
3. Alpine: The Himalayan and Inner Himalayas have an Alpine, Dry and Arid type of climate. The temperature is several degrees below Zero during winter and never above  $16^{\circ}$ c during summer.

Nepal is a highly mountainous country and has rich water resources. There are about 6,000 rivers and rivulets that add up to a length of 45,000 Km.

**Population**

According to recent census held in 2001, a population of 23,151,423 with a male: female ratio of 99.8:100.

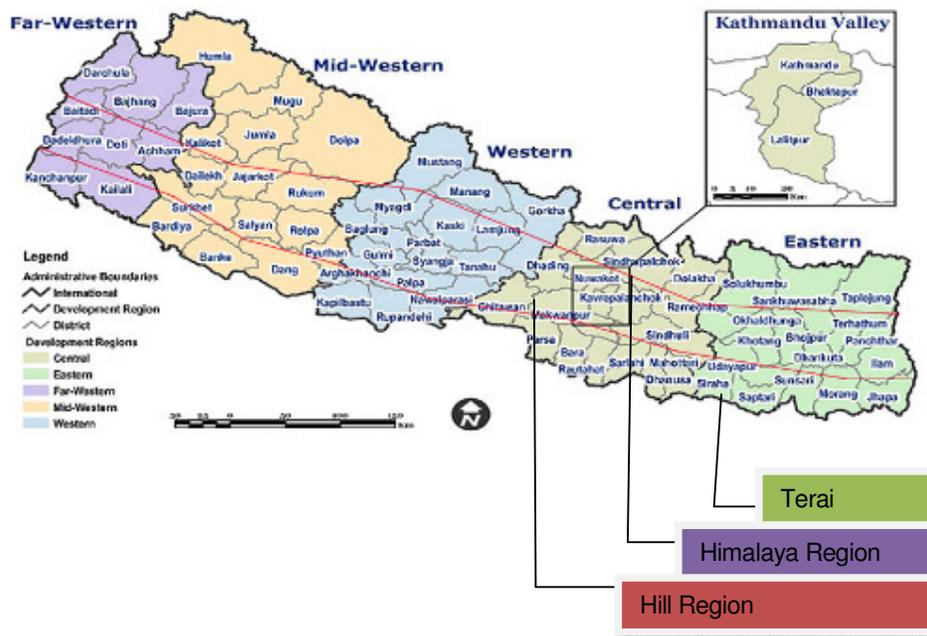
The population growth rate between 1981 and 1991 was 2.08 percent, however growth rate has increased up to 2.25 percent between 1991 and 2001. The recently held census shows that 41.3% population is children below 14 years of age and 6.5% of it is elderly 60 plus years.

**Forest**

Forest in Nepal have high ecological and economic value in terms of stabilizing soil, protecting water sheds and water sources, maintaining natural habitat and biodiversity, supporting subsistence farming system, providing fuel, wood for majority of households and building national economy.

During the past five decades, the imprudent use of forests has greatly reduced both the forest area and the forest vegetation. Forest has reduced from 6.079 million hectares in 1964 to 4.269 million in 1998, area shrinking on average 54,852 hectares per year.

**4 Demarcation of ecological zones**



## 5 Outcomes of the Orientation workshop

A workshop was organised for 1.5 days at each INF/Nepal District Programmes side for Programmes staff. The main intention were (a) to sensitize the staff on the impacts of Climate Change and Environmental degradation and human phenomenon which are contributing in climate change (B) to develop knowledge and skills to assess their project environmentally (C) to develop skills and knowledge to collect community information regarding climate Change and environmental degradation. At last the participants were prepared an action plan to show their commitment to save environment.

The details of the action plans are given below in table;

### a) INF Mugu Programme

Total 14 staffs were participated among 3 female

	Current practices	Action to be done	From
1	Every where more use of polythene bag and throw away	Making 2 cloth bags for office use. Keep iron rod in office premises for the use of proper plastic collection to be disposed weekly. Staff are not using polythene bags	February 2010
2	No proper disposal system for waste office products i.e. papers, filth etc	Identify proper disposal pit/place to be disposed the waste office product. As possible computer print do both side of the paper to minimize use of papers.	February 2010
3	Using general more heat producing electric bulbs in office	All general heat producing bulbs replaced by CFL	February 2010

### b) INF Banke Programme

Total 23 staffs were participated among 9 female.

	Current practices	Action to be done	From
1	Every where more use of polythene bag and throw away	Making jut or paper bag for office use. Use old newspaper for making medicine distribution pocket to replace the current practice of plastic pocket. Avoid use of plastic glasses/ plates for tea & snacks in office.	February 2010
2	Currently maximum use of motorbike/vehicle for office purpose even for walking destination.	Encourage to use bicycle/rickshaw as possible within town areas. As possible using public vehicle instead of office vehicle. Avoid motorbike on Monday to reach office except emergency.	February 2010
3	Poor use of incinerator of NTRC	Develop coordination with Nepalgunj municipality and NTRC senior staff will take responsibility for regular checking and feedback for proper use of existing incinerator.	March 2010

<b>4</b>	Un necessary consumption of electricity power	Replace general electric bulb by CFL. Switch off the light/ fans if not necessary and people are not in office room.	February 2010
<b>5</b>	No proper plantation/ gardening in office premises	Make a plan to improve garden of office premises for enough greenery	March 2010
<b>6</b>	Computer printing	Reduce the printing as possible, use stock printed formats like Travel Order, leave request form etc instead of develop computer print. Print back to back as possible.	February 2010
<b>7</b>	Always using new envelops	Circulate to all for reusing the used envelops for internal purpose.	February 2010

## c) INF Dang Programme

Total 12 staffs were participated among 1 female.

	Current practices	Action to be done	From
<b>1</b>	Unnecessary consumption of electricity power	Turning off light, fans, computer when the staffs are not in the office room.SH will monitor to section staff and PM to SHs to be practiced.	February 2010
<b>2</b>	Using plastic and plastic made materials for personal and office work	Buy jut bags for office use and totally avoid the use of plastic bag in the office premises.	Mach 2010
<b>3</b>	Using high heat producing bulbs	General heat producing bulbs will replace by CFL.	March 2010.
<b>4</b>	Using heat producing equipments e.g. generator, printers, photocopiers etc	Increase backup systems while no electricity.	March 2010
<b>5</b>	Using motorbike/ vehicle even in walking distance destination	Encourage to all staff to minimize this by using bicycle or walking.	March 2010
<b>6</b>	No proper disposal system for clinic waste material (medically used)	Make proper waste disposal pit for proper disposal.	February 2010.
<b>7</b>	Using individual computer printers	Develop network for server printing system.	February 2010.

## d) INF Kaski Programme, Kapilvastu

Total 12 staffs were participated among 7 female.

	Current practices	Action to be done	From
<b>1</b>	No proper greenery in office premises	Maintain for good greenery by kitchen gardening behind the office and flower gardening in front of office open ground.	February 2010
<b>2</b>	Using motorbike for day to day office work within walking distance	Avoid motorbike uses in administration department for day to day work with telecommunication office, water supply office, purchasing stationery etc.	February 2010
<b>3</b>	No proper disposal of polythene waste bags	Collect separately the polythene waste bags and properly dispose in proper disposal pit.	February 2010

4	Un necessary consumption of electricity in office	Circulate to all staff that computers, lights, fans must turn off when the staff are not in office room.	February 2010
5	Using general electric bulbs in training hall	Replace the electric bulbs by CFL.	February 2010
6	Not proper disposal system in working (S)HPs	Encourage the HP committee to make proper disposal pit for proper disposal of waste materials.	February 2010

e) INF Surkhet Programme

Total 17 staffs were participated among 4 female.

	Current practices	Action to be done	From
1	Using plastic bags & no proper disposal system of waste plastic bags	Making cloth bags and uses it instead of plastic bags in office. Arrange iron rod and put at appropriate places in office premises to collect waste plastic for proper disposal.	February 20 10
2	Using general electricity bulbs/ tubes in office	Replace the more heat producing bulbs/ tubes by CFL.	February 2010
3	Using pesticide even in office premises for agriculture use	Totally avoid the use of inorganic pesticide and adapt organic pesticide.	February 2010
4	Using traditional oven for cooking in staff house	Encourage to the staff replace their traditional oven by improved one even for household use.	February 2010
5	Unnecessary consumption of electricity in office	Circulate to the staffs, turn off the computer, fans, light when the staff are not in office room.	February 2010
6	Using motorbike/ vehicle even in walking destination	As possible minimize the use of vehicle/motorbike by using public vehicle and promote bicycle.	February 2010

f) INF Jumla Programme

Total 17 staffs were participated among 6 female.

	Current practices	Action to be done	From
1	More use of polythene bags around us	As possible minimize the use of plastic bags and promote cloth bags for personal and office use. Properly collect the waste plastic and dispose properly.	February 2010
2	Not using incinerator in office even for medically used waste materials	Allocate budget for coming fiscal year to construct incinerator and properly use it.	February 2010
3	Less greenery in office as well as staff house premises	All staff must planting (Baise tree) around their own house to increase greenery as well as in office compound.	February 2010
4	Using more paper for training and other purpose	As possible use both side of paper for writing and printing, minimize the use of paper in training session and other office work.	February 2010

## 6 Scientific Information on Climate change

### 6.1 General Climate

Nepal's climate is strongly influenced by its topography, which varies greatly. The northwestern border has very high altitudes in the Himalayan mountain range while the southeastern edge sits on the northern rim of the Gangetic plain – only around 300m above sea level.

The climate of Nepal is broadly separated into three bands that run horizontally through the country. The lowlands (the Terai Plateau) have a warm and humid sub-tropical climate, with temperatures around 22-27°C in summer months, dropping to 10-15°C in winter. The Middle Mountains, or mid-hills, are subtropical towards the bottom of valleys, but experience a cooler, more temperate climate as altitude increases up the valley sides and on higher ridges (Kansakar *et al.*, 2004). The high altitude mountainous regions (the Himal) are considerably colder, at 5-15°C in summer and remaining below zero in winter.

Nepal has four climatic seasons, which can be characterised as follows:

- Pre-monsoon (March to May): a hot, dry season with little rain but occasionally strong winds; conditions become more humid towards the end of the season, particularly in the Terai basin (*ibid*).
- Summer monsoon (June to September): provides 70-85 percent of annual rainfall, varying with the topography of Nepal (WWF, 2005). Monsoon rainfall arrives in June and continues until August or September, beginning in the southeast before moving northwest with diminishing intensity (*ibid*). The summer monsoon brings 250-450mm of rainfall per month in most of the country, though only 100-150mm in the northwestern mountain regions.
- Post-monsoon season (October to November): a very dry season follows the monsoon, with November typically the driest month of the year (Kansakar *et al.*, 2004).
- Winter (December to February): the winter is largely dry; however, although comparatively small, winter rainfall is significant for northwest Nepal. The majority of winter precipitation falls as snow, contributing to snowpack and glaciers, which in turn feeds rivers as melt water in the spring (WWF, 2005).

**Key climate vulnerabilities:** Flooding; landslides; infectious disease epidemics; drought.

### 6.2 Observed Climate Changes

Because of Nepal's highly variable topography, gridded climate data with a coarse resolution (i.e. a large-scale grid over which a single average value is given for each square), will not accurately represent large local climatic changes.

#### **Temperature**

Analysis of local station data shows that mean annual temperatures for Nepal have been increasing steadily since the mid-1970s (See Figure 1). Increases are largest in the more elevated regions in the north – highlighting the sensitivity of mountainous regions to climate changes (Shrestha *et al.*, 1999) –, while changes in the Terai are small (WWF, 2005). Warming has been concentrated in the period immediately following the monsoon, through into winter (*ibid*).

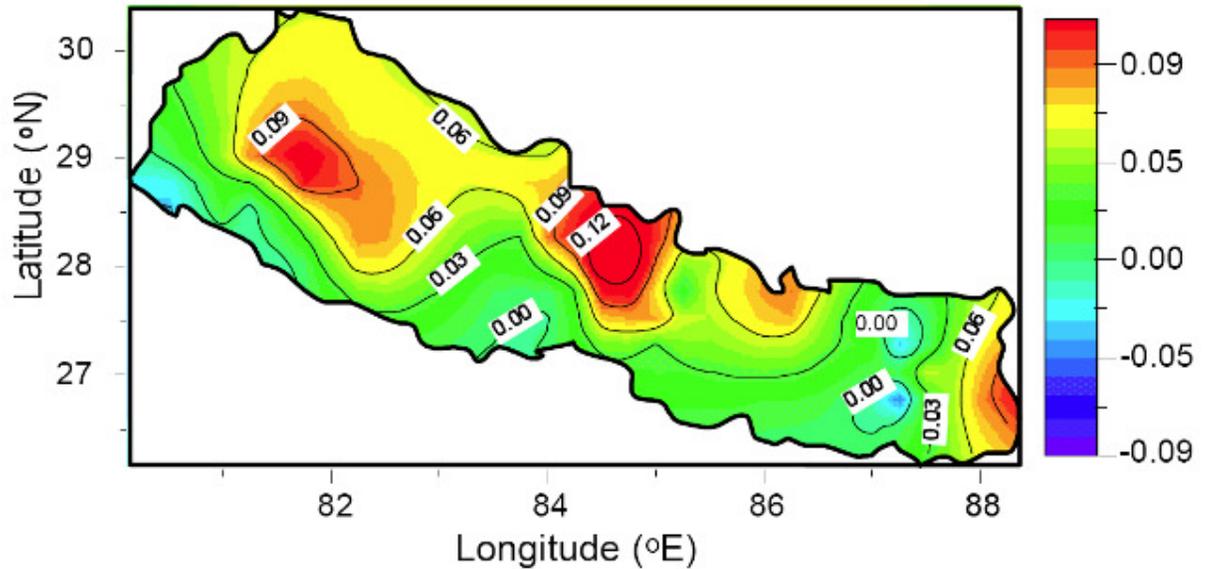


Figure 1 – Decadal changes in mean annual temperature for Nepal: 1977-94 (WWF, 2005).

### Precipitation

Observed changes in precipitation in Nepal (both nationally and regionally) over the second half of the 20<sup>th</sup> century (1959-1994) show a large amount of inter annual and decadal variability, but no overall trend (Shrestha *et al.*, 2000). While an overall increasing trend would be expected for the most recent decades (in response to higher global temperatures), it is likely that this driver is countered by higher concentrations of atmospheric sulphate aerosols from fossil fuel emissions in Asia (*ibid*). Increases in atmospheric sulphate aerosols cause a reduction in the amount of solar radiation reaching the Indian Ocean and therefore a reduction in evaporation from the ocean surface (Ramanathan *et al.*, 2005). The result is less moisture in the atmosphere to drive the summer monsoon rains (*ibid*).

The variability that has been noted correlates well with the El Niño-Southern Oscillation (ENSO); warm ENSO events (El Niño) tend to be associated with a reduction in summer monsoon strength, while cold ENSO events (La Niña) are associated with increases in the monsoon (*ibid*). However, the driest year of the latter half of the last century (1992) is linked to the aftermath of the eruption of Mount Pinatubo (in 1991) rather than a warm ENSO event in 1992 (*ibid*; Meehl, 1994).

In recent years there has been a noted delay in the onset of the monsoon (DIFD, undated). While rainfall totals have remained consistent, the time period over which the monsoon falls is reduced, thus in these instances the intensity of the monsoon is higher.

### 6.3 Current Climate Variability

Table 1 shows the environmental hazards that have affected Nepal most in the past 20 years. Nepal is affected by many different environmental hazards, yet flood events, landslides and disease outbreaks have been a particular threat for Nepal over this period, causing the most severe loss of life. Such hazards are a threat across the country; for example, the Terai is particularly at risk of flooding during the monsoon, while the Himal is under threat from flooding from glacier lake outbursts.

<b>Hazard</b>	<b>Number of Events</b>	<b>Deaths</b>	<b>Total of Population Affected</b>
Drought	1	-	200,000
<i>Average per event</i>		-	-
Earthquake	1	-	285
<i>Average per event</i>		-	-
Epidemic (unspecified)	3	685	50,242
<i>Average per event</i>		228	228
Epidemic (bacterial)	2	1,648	104,215
<i>Average per event</i>		824	824
Epidemic (viral)	9	995	4,669
<i>Average per event</i>		111	111
Extreme Cold	3	126	200
<i>Average per event</i>			42
Flood (unspecified)	3	455	120,552
<i>Average per event</i>		152	152
Flood (flash)	2	1,816	704,650
<i>Average per event</i>		908	908
Flood (general)	14	1,292	1,988,673
<i>Average per event</i>		90	92
Avalanche	1	95	-
<i>Average per event</i>		95	95
Landslide	8	916	367,618
<i>Average per event</i>		129	115
Storm (unspecified)	2	26	184
<i>Average per event</i>		13	13
Forest Fire	2	88	54,000
<i>Average per event</i>		44	44

Table 1 – Natural Hazards in Nepal (1991-2010) (CRED, 2010)

Nepal is already experiencing the impacts of a changing climate. For a country with over 85 percent of the population relying on agriculture, even small changes have substantial impacts on farming practices. Perhaps the most notable change is the late arrival of the monsoon rains. The monsoon traditionally begins around the middle of June, but in recent years the monsoon season has been seen to start later— even into mid-August. The result is that the growing season is shorter and local varieties of rice lack sufficient time to mature. Many farmers have therefore been forced to switch to hybrid varieties, for which they have to buy the seeds each year. Crop types have also changed, with some farmers changing to grow vegetables rather than wheat or maize; however, this option is only available where a farming community is sufficiently close to market to sell the produce.

In addition to the late arrival of the monsoon rains in the summer, some farmers in Nepal have also experienced the failure of winter rains in the past 5 years. Though the winter rainfall is substantially less than the monsoon, it is nevertheless important for both agriculture and as a resource of drinking water.

## 6.4 Climate Change Projections<sup>1</sup>

The climate change projections presented here use a grid for which only a few cells encompass Nepal; as noted earlier, using a grid of rather coarse resolution can mask some more extreme local changes. Therefore, this should be taken into account when interpreting results. Projections are presented with reference to four seasons of 3-month duration each: March-April-May (MAM), June-July-August (JJA), September-October-November (SON) and December-January-February (DJF).

### Temperature

- Central estimates of mean annual temperature show increases of between 2.0 and 2.9°C by the 2060s, and of 2.6 to 4.8°C by the 2090s (see Figure 2). Maximum increases in mean temperature are projected to be 3.8°C and 5.8°C for the 2060s and 2090s respectively.
- The projected rate of warming is most rapid in DJF and MAM.
- All projections indicate increases in the frequency of days and nights that are considered 'hot' in current climate.
- Annually, projections indicate that both 'hot' days and 'hot' nights will occur on up to 28 percent of days by the 2060s, and up to 39 percent of days by the 2090s. The most rapid increases are projected for DJF and JJA (see Figure 3 for DJF example).
- All projections indicate decreases in the frequency of 'cold' days and nights. In some projections, 'cold' days and nights do not occur at all by the 2090s for much of the country.

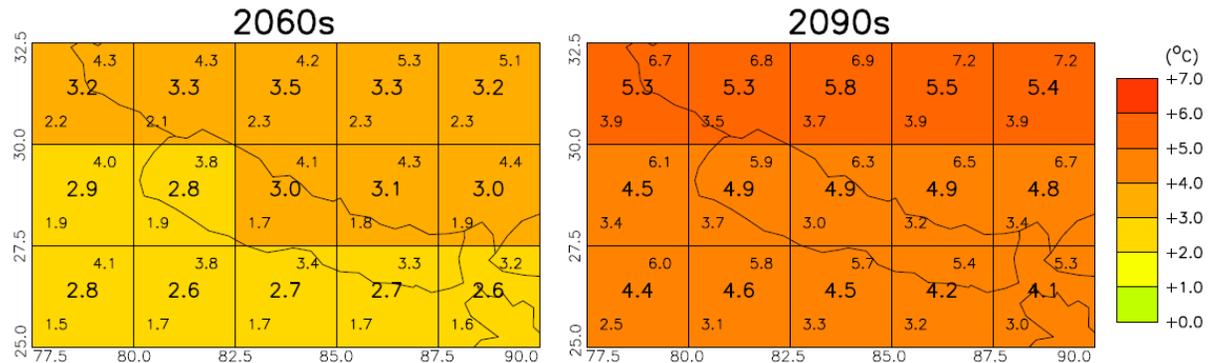


Figure 2 – Projections of mean annual temperature for Nepal for the 2060s and 2090s (the central value in each grid box gives the central estimate of the model projections, and the values in the upper and lower corners give the maximum and minimum) (McSweeney *et al.*, 2008).

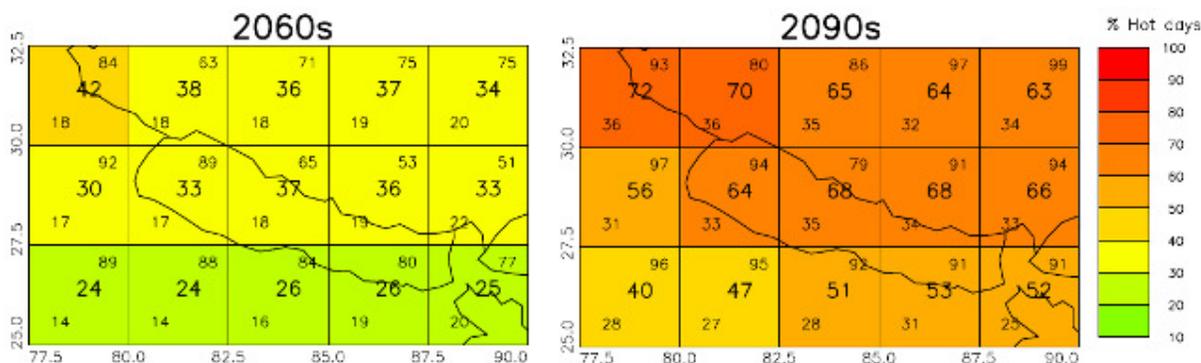


Figure 3 – Projections of percentage changes in frequency of 'hot' days in the DJF season for Nepal for the 2060s and 2090s (see Figure 2 for details) (McSweeney *et al.*, 2008).

### Precipitation

- Projections for mean annual rainfall for the whole country broadly indicate increases in rainfall for Nepal. Central estimates show increases of between 1 and 17 percent by the 2090s for Nepal as a whole, but the upper end of the projections show this increase could be as much as 58 percent, equivalent to an increase of 59mm per month annually.
- Seasonal changes in rainfall are more substantial, with projections indicating increases during the monsoon (JJA and SON) and decreases in winter rainfall (DJF).
- Rainfall for JJA and SON is projected to increase by 5 to 11 percent and 2 to 6 percent respectively for the 2060s, and by 10 to 21 percent and 5 to 16 percent for the 2090s. The increases in JJA rainfall are largest in the southeast (see Figure 4).
- The upper end of the projections (i.e. maximum) show much larger changes, with increases of 61 and 104 percent for the 2060s and 2090s respectively for summer rainfall (JJA), equivalent to 132mm and 224mm per month respectively.
- Reductions are projected for winter (DJF) rainfall; with decreases of up to 34 percent by the 2060s, and 63 percent by the 2090s. These decreases are particularly serious for the northwest, which rely heavily on winter rainfall (see Figure 5).
- The proportion of total rainfall that falls in heavy<sup>1</sup> events is projected to increase, particularly in JJA and SON (see Figure 6), with decreases in DJF.
- Projections indicate that maximum 1- and 5-day rainfall totals are expected to increase, and that these increases may be dramatic – up to twice what they are currently for 5-day maxima, for example. These increases are most prominent in JJA and SON.
- Recent research also suggests that warmer temperatures may cause an eastward shift in the monsoon circulation, causing both a delay of its arrival, and even a decrease in rainfall totals (Ashfaq *et al.*, 2009). For Nepal, projected changes in local rainfall are indeed uncertain.

<sup>1</sup> A 'Heavy' event is defined as a daily rainfall total which exceeds the threshold of the top 5% of rainy days in current the climate of that region and season.

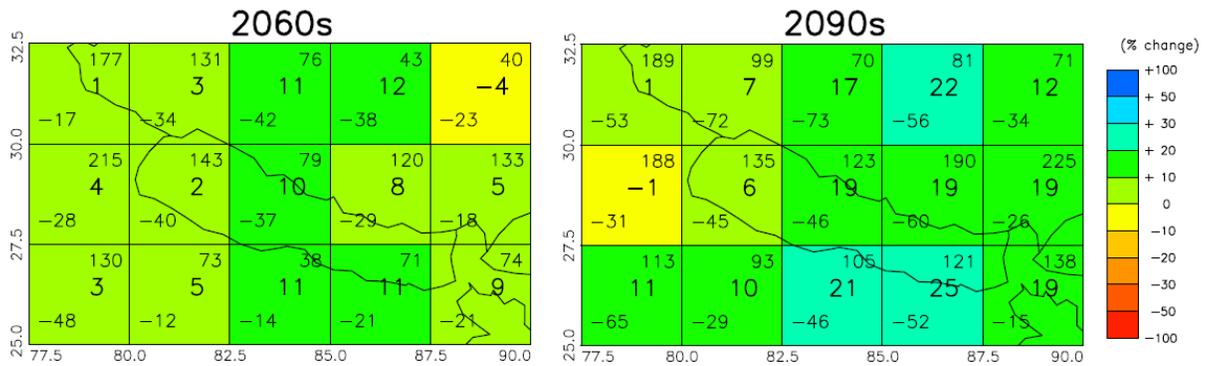


Figure 4 – Projections of percentage changes in rainfall for the JJA season for Nepal for the 2060s and 2090s (see Figure 2 for details) (McSweeney *et al.*, 2008).

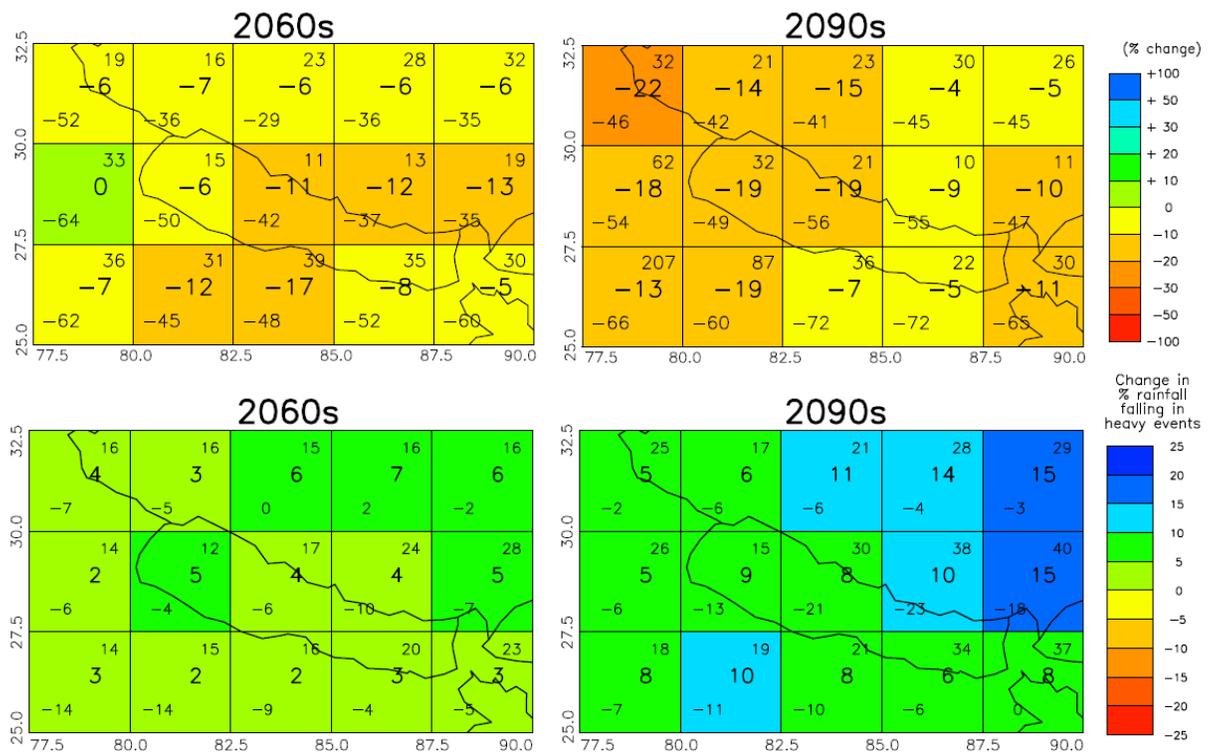


Figure 5 – Projections of percentage changes in rainfall for the DJF season for Nepal for the 2060s and 2090s (see Figure 2 for details) (McSweeney *et al.*, 2008).

Figure 6 – Projections of percentage changes in the amount of rainfall falling in 'heavy' events during the JJA season for Nepal for the 2060s and 2090s (see Figure 2 for details) (McSweeney *et al.*, 2008).

## 6.5 Climate Change Impacts

### Flooding

Flooding and associated landslides are a major threat for Nepal, and with increasing rainfall totals and intensity projected for the whole country, the risk of flood events is likely to increase.

Nepal is also at risk from melting glacier and snow pack from the Himalayas. Increasing temperatures will accelerate this melting, adding to the water accumulating in the 3,252 glaciers and 2,323 lakes at or above 3,500 metres above sea level in Nepal (Mool *et al.*, 2001). Of these lakes, 20 have been found to be at high risk of glacier lake outburst (ibid). Higher run-off will also increase river flows in the short-term, adding to the risk of flooding events.

### **Water Resources**

Nepal has relatively large resource of water, with over 6,000 rivers – of which the large ones are fed by snowmelt from the Himalayas and are perennial (UNEP, 2001). Though Nepal theoretically has sufficient surface water resources for the whole country, this is dependent of sufficient water storage from wet season to dry. In the short-to-medium term, run-off from snowmelt will increase with rising temperatures, resulting in an initial increase in river flow and water resource. However, towards the end of the century the reduction in glaciers and snowpack will have a knock-on effect on run-off and water availability.

Projections for Nepal's rainfall show an increasing trend, yet rainfall is likely to fall in increasing heavy events, which is only beneficial for water resource if storage is available. Increasing temperature will cause an increase in evapotranspiration, which will offset increases in rainfall. Reduced winter snowfall and retreating glaciers will also reduce the water available to feed river systems originating in the Himal.

### **Agriculture & Food Security**

The Nepalese rely heavily on rain-fed agriculture for subsistence (around 80 percent of the population) and climate change is likely to cause further food insecurity than currently experienced (GoN, 2004). Drought in Nepal has implications for agriculture, food prices and food security. The drought in 2009, for example, caused food insecurity for around 2.5 million people, with the World Food Agency (WFA) stating that a further 3.9 million would be at risk if the situation worsened (IRIN, 2009). In that same drought, thousands of people from the western regions of Jajarkot, Humla, Rukum, Bajura, Gorkha, Mugu and Darchula were forced onto the road to walk in search of food (Parajuli, 2009).

Soil productivity will also be at increasing risk from the loss of fertile topsoil from soil erosion caused by extreme rainfall, flooding and landslides (WWF, 2005).

### **Public Health**

Nepal is endemic for malaria, Japanese encephalitis (JE) and a form of Leishmaniasis (known as kala-azar), all of which are affected by climate. As temperatures increase, the range for breeding mosquitoes (the vector for malaria and JE) will extend to higher latitudes, putting a greater number of the population at risk. Furthermore, these risk areas will suffer a higher level of morbidity and mortality from the disease as the newly exposed population has a lower natural immunity. With a greater number of heavy rainfall events and associated formation of standing water, the endemic areas for malaria and JE are likely to experience an increase in mosquito abundance. The result of this is likely to be a greater number of outbreaks across the country.

Additionally, increasing mean temperatures invoke changes in the life-cycle of vectors such as mosquitoes and sand flies (which spread Leishmaniasis) and the bacteria that they carry. This could potentially increase the transmission of infectious disease (McMichael *et al.*, 2003).

Drought and flooding can both be a factor in disease outbreaks, and an increase in the number and severity of flood events will likely also increase the incidence of water-borne disease such as cholera, dysentery and typhoid. Drought is common in Western regions, such as in August 2009, which led to

an outbreak of dysentery that killed 321 people (Parajuli, 2009). More erratic rainfall may leave many more susceptible to periods of drought.

Finally, the arrival of the monsoon is important for bringing cooler temperatures and some rest bite from the hot, humid conditions in the Terai basin. Therefore, with a later start to the monsoon, there is an increased risk of death from heat waves in the lowlands areas.

### **Housing & Communities**

As the risk of flooding in Nepal increases, so does the threat to houses and community buildings. Flooding and associated landslides in October 2009, for example, saw over 20,000 houses lost or damaged (Relief Web, 2009).

### **Biodiversity & Conservation**

Despite its small size, Nepal is home to a disproportionate amount of important and diverse flora and fauna, spread between the dense tropical monsoon forests of the Terai, the deciduous and coniferous forests of the country's subtropical and temperate regions, and in the sub-alpine and alpine pastures and snow-covered Himalayan peaks (Bhujju *et al.*, 2007). 29 percent of Nepal is forested, though this is declining through land use change. This will be further affected by climate change as tropical and temperate rainforests disappear and are replaced by cool temperate vegetation, thus losing substantial diversity in habitat (GoN, 2004).

### **Livelihoods**

Nepal has relatively few natural resources, and the economy relies strongly on agriculture, forests and tourism. Agriculture accounts for around 40 percent of GDP, and associated industries process raw materials such as sugarcane, tobacco, jute and grain (GoN, 2004). Climate change is likely to increase the risk to these key areas.

### **Energy**

Nepal's energy sources are predominantly from hydropower (around 90 percent (DFID, undated)). Supply of electricity is fragmented and Kathmandu often experiences blackouts and load shedding. Nepal is exploiting less than one percent of its 83,000 megawatts of hydropower capacity (UNEP, 2001) and there is sufficient potential even without additional snowmelt and rainfall brought about by climate change. There may also be an increase in the risk of damage from flooding and landslides to hydropower installations, as well as causing irregularities to the stream flow.

### **Transport**

Nepal's internal transport links are poor, and this can affect the speed and efficacy of aid. The road network in western regions is particularly bad and often not navigable. With increasing heavy rainfall events, glacier melt and associated flood risk, roads and other transport networks in Nepal will be at increasing risk from flood damage. This will inhibit economic growth, transportation of food, and the ability of aid to get to the more remote areas.

## 6.6 Government Response

Nepal has prepared an Initial National Communication to the Conference of the Parties of the United Nations Framework Convention on Climate Change (UNFCCC), but is still to publish a National Adaptation Plan of Action (NAPA).

During the UNFCCC Copenhagen negotiations in December 2009, the government held a special Cabinet meeting at Everest Base Camp to highlight the dangers of climate change to the Himalayas. At the meeting the ministers endorsed the 'Sagarmatha Declaration' ('Everest Declaration'), which outlined the risks posed to the Himalayas and pledged the government's commitment to tackle the problem.

### 6.7 Likely Adaptation Options

The following are a selection of adaption options identified in Nepal's National Communication as suggested areas for further research and development (GoN, 2004):

- Develop drought tolerant crop varieties and study the use of traditional varieties.
- Study the role of agro-silvicultural systems in Nepal- which are regarded as carbon dioxide sinks and sources of GHG emissions.
- Study the effect of different traditional cultural practices such as green manuring, continuous cropping with fertilizer, multiple cropping, modified alley-farming, etc.
- Identify agro-ecological zones particularly sensitive to Climate Change impacts and potential vulnerable areas.
- Study the effect of Climate Change impact on weed, pest and disease occurrence of cultivated crops and develop forecasting systems.
- Conduct research and development of appropriate protocols for community forest management for agroforestry type projects.
- Develop a database of biomass for different types of vegetation in Nepal. Data can be derived from direct measurements of biomass representing the main vegetation types in the country.
- Develop appropriate guidelines for sustainable management of water sheds and aquatic ecosystem.
- Conduct studies on epidemiological forecasting and early-warning systems using remote sensing and/or geographical information systems technology applicable in high-risk areas for Malaria, Japanese Encephalitis, diarrhoeal disease and nutritional disorders.

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## 7 Community Information – Project risk assessment

A Sector	B Project	C CC and/or ED impacts	D Sig	E Lik	F Rsk	G Adaptation option
Dang District	Community Health & development	Unpredictable rainfall even in monsoon	3	2	6	Tree plantation, preservation of forest, use bio gas, smokeless oven etc.
		Climate getting hot	3	2	6	-
		Agriculture production becoming low	3	2	6	Select suitable seeds and training on it.

		Flood & storm very common	2	2	4	-
		Poor health & outbreak of communicable diseases i.e. diarrhea, common cold, typhoid etc.	3	3	9	Improve hygiene & sanitation condition
		Heavily use of pesticide	2	3	6	Encourage for organic pesticide
		Water table is getting low	3	2	6	Plantation
		New diseases in crops	3	3	9	Training on how to control it
		New diseases in human being	2	2	4	Awareness raising
		Mosquito found nearly whole year even in winter	2	3	6	Awareness raising

A Sector	B Project	C CC and/or ED impacts	D Sig	E Lik	F Rsk	G Adaptation option
Banke District	Community health & Development	unpredictable monsoon rain	3	2	6	A forestation & preservation of Forest
		Monsoon starts late and finish soon	2	2	4	Prefer less water friendly crops
		Some time heavy & some time low rainfall	3	3	9	Select suitable crops variety, whether there is less or plenty of rainfall. Early preparedness of the flood, preserve forest by stopping getting stones from Jungles.
		No rainfall during winter	2	2	4	Select suitable variety of crops which are easily grown in less water.
		Being increased diseases in crops.	3	3	9	Prefer suitable crops and encourage towards organic pesticides through training & awareness raising.
		Flood during harvesting of crops which has created food scarcity.	3	3	9	Preservation of forest and disaster preparedness activities such protection dam etc.
		Sedimentation on fertile land and in long term creating poverty.	3	3	9	Preservation of forest and provide income generation opportunities.
		Relatively less production of food grains. Where previously 5 quintals now 2 only.	2	2	4	Planting more producing crops in the changing situation.
		Sometimes extremely cold and run cold wave.	2	2	4	
		Relatively during summer very hot climate which created very hard to work agriculture.	2	2	4	

		Production of the some grains like mustard, pulse seed etc now it became very low. Due to soil degradation.	3	2	6	-
		Some of earlier crops are becoming unseen due to change in climate.	3	3	9	Prefer that crops which grow.
		Mosquitoes grow faster	2	2	4	Using net, Spray anti mosquito liquid.
		Seen new diseases	3	2	6	Need training on new diseases
		Decreasing level of soil fertility.	2	1	2	Forestation, preserving the Jungle.
		Less production if no use of chemical fertilizer and insecticide.	3	3	9	Keeping more cattle , forestation, Preservation of forest , increase the quantity of organic fertilizer.
		Level of water table is getting dawn e.g. earlier we got water level on 25 – 30 feet now more than 50 feet.	3	3	9	Forestation, preservation of jungle and build ponds in different places. Water storage system to be developed.
		Drying lakes and ponds early.	3	2	6	Forestation, preservation of jungle and build ponds in different places.
		Now we are compel to use pesticide other wise no growth of crops.	3	3	9	Use more Composting fertilizer and organic pesticides.
		Foods/fruits are not delicious and testy as before.	3	2	6	-

A Sector	B Projects	C CC and/or ED impacts	D Sig	E Lik	F Rsk	G Adaptation option
Jumla District	community Health & development	Land slide	3	3	9	Tree plantation, build dam
		Less rain in monsoon season and more rain in off season.	3	3	9	Tree plantation, Awareness to forest user committee to protect and expand jungle area.
		Less snow then past	3	2	6	Stop use of plastic, Save jungle.
		Less food production	3	3	9	Use Hybrid cultivation, focus on more IG
		Insects infestation of crops	2	2	4	Use traditional natural and homemade medicine in croups, Rotation of crops,
		Increase new disease	3	2	6	Encourage to use modern stove, training on new diseases.
		Increase temperature	2	2	4	Tree plantation, Awareness family planning, Avoid tin, cement, plastic
		Less apple product	3	3	9	Use compost fertilizer avoid bactericidal medicine
		Rain with Hail in season off season.	1	3	3	Tree plantation, irrigation project. Awareness to forest user group to protect and expand jungle area.
		Deforestation	2	2	4	Tree plantation ,Awareness
Increase new disease	3	2	6	Encourage to use modern stove, awareness for personal hygiene, priority to use iodine. Avoid traditional practices.		

<b>A Sector (s)</b>	<b>B Projects</b>	<b>C CC and/or ED impacts</b>	<b>D Sig</b>	<b>E Lik</b>	<b>F Rs k</b>	<b>G Adaptation option</b>
Mugu District	Community Health & development	Deforestation due to maximum use of firewood & no plantation	2	3	6	Awareness rising for plantation, Promotion of alternative bio gas energy and use of smokeless stove
		Water sources getting dry, more scarcity of water even for drinking purpose	3	3	9	Plantation & water storage schem need to produce
		Very less rainfall even during monsoon, lack of vegetation	4	3	12	More plantation and preservation to them
		Drought nearly every year and crops production is very low.	3	4	12	Seeking suitable crops to grow in less water
		Now seeing new diseases in human	1	2	2	Awareness rising
		Hailfall	3	2	6	Select suitable crops
		Health problem/epedemic of communication diseases	4	3	12	Improve hygiene & sanitation condition
		Temprature increased	2	2	4	-
		Food deficiency and famine	4	4	8	Improve appropriate technology to get more crops production
		Relatively low snowfall	3	1	3	-
		Relatively wild animals not seen	2	2	4	Forestation

A Sector(s)	B Projects	C CC and/or ED impacts	D Sig	E Lik	F Rsk	G Adaptation option
Kapilvastu District	Community Health & development	Maximum use of Pesticide	3	3	9	Awareness rising about organic pesticide,
		Deforestation	4	4	16	Awareness rising for plantation, Promotion of alternative bio gas energy and use of smokeless stove
		Maximum use of chemical fertliger	4	3	12	Raise awarness to use organic mannure and provide training to produce organic mannure at household level.
		Maximum use of polythin bags and through it openly	2	4	8	Awareness rising to avoid polythin bags and promote for cloth / jute bags.
		Increase of population	2	3	6	Awareness rising of the contraceptive devices, discourage early marriage
		Drought	4	4	16	Irrigation support, Promote suitable variety of seed.
		Cold wave destroying crops	4	4	16	Suitable variety of crops for cold wave resistant
		Changes in rain pattern, now difficult to pridict monsson for harvest	4	3	12	Seek environment friedly seed for varvesting
		Delay monsoon start	4	3	12	Plantation
		Vanishing local crops seeds	3	2	6	Training to select favorable seed for good production
		During winter more cold like wise during summer extrem hot	2	3		
		Without using of pesticide no crops or very low	3	2		Promot organic pesticide
		Mosquito seen whole year – before just June to October	3	3		Awareness to prevent Malaria
		Changes in harvesting time table such as mustard, mango ect	2	3		-
		Water table go down now need to go 150 ft. Previously was 30 ft. only	3	3		Choose suitable seed to grow in minimum irrigation
		New disease in cattles	3	2		Training on new disease

A Sector	B Project	C CC&/or ED impacts	D Sig	E Lik	F Rsk	G Adaptation option
Surkhet	Community Health & development	Less crops production.	3	4	12	Seek favorable variety
		Unpredictable monsoon rain	3	3	9	Plantation & preserve forest
		Mosquitoes are seen nearly whole year due to warm climate.	3	4	12	Awareness to use mosquito net
		Very hot climate now, even in winter do not need warm cloth	3	3	9	-
		Forest not seen around the people settlement, now people used to go very far for fire wood.	2	2	4	Forestation
		No rainfall during winter.	2	2	4	Select new crops
		Inadequate rain even in monsoon	3	4	12	Tree plantation
		Flood & storm increasing	3	3	9	Protection dam and awareness on risk reduction



River cutting forest every year

## 8. Logical framework

Logical framework for the year 2010/011							
Goal, outputs & activities	OVI	Quarterly Target				MOV	Risk & assumption
		July -Sep 010	Oct-Dec. 010	Jan-Mar 011	Apr.- June 011		
<b>Goal:</b> Target communities able to act to be friendly with the impacts of climate change and environmental degradation in order to maintain their health and quality of life consistently, especially poor and marginalized people, in INF/Nepal coverage districts.	Increased resilience with the impact of climate change in all target communities					FGD, District level report	Political situation will be favourable, security situation will be improved
<b>Output one:</b> Target communities aware about the causes and impacts of the climate change and environmental degradation and developed capacity seeking appropriate adaptation options to adjust with the changes in the environment.	1.1. 80% of SHG members shared about the causes of climate change. 1.2. 60% of SHG members involved with at least one adaptation option of CC					Programme annual report. District annual report	Appreciation & support will be provided by government line agencies
<b>Activities</b>							
1.1 Raise awareness in SHG three monthly	No. of SHG aware	172	172	172	172		
1.2 Orientation workshop on climate change to SHG members for 2 day	No. of workshop organized	5	3	1	4		
1.3 VDC level orientation/workshop on climate change & ED for 1 day	No. of workshop organized	2	2				
1.4 Tree plantation on bare land	No. of tree planted	3000	3000				
1.6 Workshop for Partner organization people for 3 days	No. of participants	16					
1.7 Distribute bamboo basket to collect filth at road side	No. of basket distributed	80		80			
1.8 Embankment at two places	No. of scheme completed		1	1			
1.9 Training on adaptation of suitable crops for 3 days	No. of people participated	10	10	10	10		
1.10 Training to school children about Climate change and ED for 1 day	No. of school		2				
1.11 Education on organic pest management	No. of SHG received	21					
1.12 Facilitate to Govt. Forest User Committee for forest protection	No. of committee		2	2	2		

	facilitated						
1.13 Street drama on Climate change issue	No. of dram shown		1	1			
<b>Output Two:</b> INF/Nepal's employees have access to develop understanding on the impacts of climate change and environmental degradation and acts to minimize impacts of the INF/Nepal's projects activities on the environment.	2.1 All District Programmes able to assessed their plan to make environment friendly. 2.2 All District Programmes able to implement environment friendly behaviour such as proper waste disposal, using CFL bulbs, minimize paper for printing etc					Observation & interaction with staff	Enough fund available
<b>Activities</b>							
2.1 Improve greenery in office premises as possible	No. of Dist. Program. office	2	3				
2.2 Heat producing bulb replace by CFL	No. of Dist. Program office	6					
2.3 Orientation to staff to adapt environment friendly behaviour	No. of training	6					
2.4 Improve disposal system	No. of Dist. Program office			6			
2.5 Minimize use of plastic bags for office purposes	Using cotton bags	Y	Y	Y	Y		
2.6 Keep iron rod at appropriate places to collect waste plastics for proper disposal	No. of rod installed		50				
2.7 Training on climate change to cross programme staff	No. of participants		20				
2.8 Annual plans assessed to environment	No. of Dist Programme's plans assessed				6		

## 9 Budget Summary

Heading	Cost	Remarks
Staff cost	None	It is a very new project for INF/Nepal and now implementing as trial basis. So at the moment this will be covered from the existing staff.
Admin & management cost	None	Same as above
Activity cost	773,000.00	Now there are minimum activities at minimum cost due to trial project.
Grand total	<b>NRs.773,000.00</b>	

(See appendix 1, for detail calculation of the activity cost.)

## 10 Appendix

### 10.1 Appendix 1, Activities wise budget calculation

Activities	Indicator	Target				Cost calculation	Cost
1.1 Raise awareness in SHG three monthly	No. of SHG aware	172	172	172	172	No need	
1.2 Orientation workshop on climate change to SHG members for 2 day	No. of workshop organized	5	3	1	4	13 workshop@10000	130,000.
1.3 VDC level orientation/workshop on climate change & ED for 1 day	No. of workshop organized	2	2			4 w/s@5000	20,000
1.4 Tree plantation on bare land	No. of tree planted	300	300			6000 @ 50	300,000.
1.6 Workshop for Partner organization people for 3 days	No. of participants	16				one w/s @ 25000	25,000.
1.7 Distribute bamboo basket to collect filth at road side	No. of basket distributed	80		80		160 @ 300	48,000.
1.8 Embankment at two places	No. of scheme completed		1	1		20000 per scheme	40,000.
1.9 Training on adaptation of suitable crops for 3 days	No. of people participated	10	10	10	10	one w/s @ 32000	32,000.
1.10 Training to school children about Climate change and ED for 1 day	No. of school		2			2 session @ 13500	27,000.
1.11 Education on organic pest management	No. of SHG received	21				2 session @ 5000	10,000.
1.12 Facilitate to Govt. Forest User Committee for forest protection	No. of committee facilitated		2	2	2	6 FUG @ 1000	6000.
1.13 Street drama on Climate change issue	No. of drama shown		1	1		2 @ 5000	10,000.
2.1 Improve greenery in office premises as possible	No. of office	2	3			Internally	
2.2 Heat producing bulb replace by CFL	No. of Programmes office	6				Internally	
2.3 Orientation to staff to adapt environment friendly behavior	No. of training	6				Snacks	10,000.
2.4 Improve disposal system	No. of office			6		Internally	



## 10.2 Appendix 2, Abbreviation

SHG	Self-help Group
CC	Climate Change
ED	Environmental Degradation
FGD	Focal group Discussion
UNFCC	United Nations Framework Convention on Climate change
NAPA	National Adaptation Plan of Action
DFID	Department For International Development
GoN	Government Of Nepal
WFA	World Food Agency
Himal	Snow line altitude where always be snow
MAM	March April May
JJA	June July August
SON	September October November
DJF	December January February
PM	Programme Manager (INF/Nepal District Programme's manager)
SH	Section Head (In-charge of the department)
NTRC	Nepalgunj TB Referral Centre( It is a INF/Nepal's TB care/treatment centre)
(S)HP	Health Post/ Sub Health Post (It is a government health institution at rural area)
Banke	Name of the district
Surkhet	Name of the district
Dang	Name of the district
Mugu	Name of the district
Jumla	Name of the district
Kapilvastu	Name of the district