Climate Change: A Threat to Nepal’s Environment and the Himalayas

Trento Mountain Film Festival
Observed Climatic Trends in Nepal

- Nepal’s climate varies with its topography and altitude
  - Lowland Terai – hot and humid, above 45 °C during summer
  - Midland – pleasant days with colder winter nights
  - Northern mountain region - alpine climate with lower temperature during winter

- Temperature increasing at a higher rate
  - 0.06 °C between 1977 and 2000
  - More pronounced in higher altitudes

- Nepal’s projected climate change by IPCC (2001) and OECD (2003)

<table>
<thead>
<tr>
<th>Year</th>
<th>2030</th>
<th>2050</th>
<th>2100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rise in Temperature (°C)</td>
<td>1.2</td>
<td>1.7</td>
<td>3.0</td>
</tr>
</tbody>
</table>
Climate Change

Climate change is already happening and represents one of the greatest environmental, social and economic threats facing the planet.

According to available data, average annual mean temperatures have been increasing in Nepal by 0.06°C between 1977 and 2000 and these increases are more pronounced at higher altitudes and in winter.

There has been a general increase in temperature extremes with warmer days and nights becoming more frequent and cooler days and nights less frequent. Again, these changes are greater at higher altitudes.
Consequences of Climate Change

- **Freshwater**
  - Water availability decreases

- **Agriculture**
  - Food production decreases due to the loss of top fertile soil
  - Rice, wheat and maize yields are sensitive to slight increases in temperature

- **Biodiversity and wildlife**
  - Climate change might destroy tropical wet forests and warm temperate rain forests
  - Extinction of both plants and animal species

- **Health**
  - Increased vulnerability to malaria, kala azar and Japanese encephalitis in sub tropical and warm temperate regions

- **Economy**
  - Increased risk of GLOFs, causing damage to villages, lives, and property downstream
  - Decline in tourism
Himalayas

The Himalayas cover three fourths of the land in Nepal

- Home for many species of flora and fauna

- Growth of different vegetation at different altitudes of Himalayas

- 118 species of birds and 26 species of butterflies are found just in the Sagarmatha National Park

- These include endangered animals like musk deer, wild yak, red panda, snow leopard and Himalayan black bear
What do the Himalayas offer to Nepal?

- Conservation of ecosystem and biodiversity
- Freshwater from glacial melt of the Himalayas
  - Drinking
  - Agriculture and food production
  - Forestry
- Economy
  - Hydropower generation
  - Tourism
Impact of Climate Change on the Himalayas

- Nepal’s glaciers are melting and retreating at an unprecedented rate, leaving in their place the highest and most unstable lakes in the world.

- Reduction in the size of glaciers and reduced snow in the Himalayas will result in less water flowing into rivers and the formation of glacial lakes.

- Changes to mountain wildlife habitat and ecology.

- Threat of catastrophic Glacial Lake Outburst Floods (GLOFs).

- Severe wind, hail, snow and ice storms, more droughts in some areas, more floods in others, as well as lower lake and river levels.
## Glaciers of Nepal

<table>
<thead>
<tr>
<th>River Basin</th>
<th>Number of Glaciers</th>
<th>Number of Lakes</th>
<th>Area (km²)</th>
<th>Volume of Ice Reserve (km³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Koshi River Basin</td>
<td>779</td>
<td>1062</td>
<td>1409.84</td>
<td>152.06</td>
</tr>
<tr>
<td>Gandaki River Basin</td>
<td>1025</td>
<td>338</td>
<td>2030.15</td>
<td>191.39</td>
</tr>
<tr>
<td>Karnali River Basin</td>
<td>1361</td>
<td>907</td>
<td>1740.22</td>
<td>127.72</td>
</tr>
<tr>
<td>Mahakali River Basin</td>
<td>87</td>
<td>16</td>
<td>143.23</td>
<td>10.06</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3252</strong></td>
<td><strong>2323</strong></td>
<td><strong>5323.44</strong></td>
<td><strong>481.23</strong></td>
</tr>
</tbody>
</table>

1 = These river basins are 3,500 m above sea level

- **The Sagarmatha National park itself includes 213 glaciers with an estimated ice reserve of 46.44 km³**

Source: ICIMOD
Glacier Lake Outburst Floods (GLOF)

- Deglaciation and growth of glacier lakes
  - Formation and growth of glacier lakes
  - The structurally weak and unstable walls of lakes can break causing catastrophic GLOFs

- GLOF
  - Release of huge amount of water that rushes downstream in the form of a dangerous flood

- 2315 glacier lakes of various size covering a total area of 75 km²
Some of the world’s most fragile eco systems lie downhill from huge glacial lakes.

When these glacial lakes burst their banks, the mountain farmer’s topsoil will be washed away, leaving behind only rocky infertile land.

Wild and domestic animals will be washed away.

Valley Forests will be washed away.

It will take many years for the environment to recover.

Less immediately noticeable at lower altitudes, the urgency is in the high Himalaya, now emerging as one of the world's most vulnerable and quickly disintegrating areas due to man-made climate change.

Unlike the Tsunami in 2005, the loss of lives and infrastructure in the mountain environment of Nepal will be very difficult to revive and rebuild.
## GLOF Events Recorded in Nepal

<table>
<thead>
<tr>
<th>Date</th>
<th>River Basin</th>
<th>Name of Lake</th>
</tr>
</thead>
<tbody>
<tr>
<td>450 Years ago</td>
<td>Seti Khola</td>
<td>Machhapuchhre</td>
</tr>
<tr>
<td>August, 1935</td>
<td>Sun Koshi</td>
<td>Taraco, Tibet</td>
</tr>
<tr>
<td>21 September, 1964</td>
<td>Arun</td>
<td>Gelaipco, Tibet</td>
</tr>
<tr>
<td>1964</td>
<td>Sun Koshi</td>
<td>Zhangzangbo, Tibet</td>
</tr>
<tr>
<td>1964</td>
<td>Trishuli</td>
<td>Longda, Tibet</td>
</tr>
<tr>
<td>1968</td>
<td>Arun</td>
<td>Ayaco, Tibet</td>
</tr>
<tr>
<td>1969</td>
<td>Arun</td>
<td>Ayaco, Tibet</td>
</tr>
<tr>
<td>1970</td>
<td>Arun</td>
<td>Ayaco, Tibet</td>
</tr>
<tr>
<td>3rd September, 1977</td>
<td>Dudh Koshi</td>
<td>Nare, Tibet</td>
</tr>
<tr>
<td>23rd June, 1980</td>
<td>Tamur</td>
<td>Nagmapokhri, Nepal</td>
</tr>
<tr>
<td>11th July, 1981</td>
<td>Sun Koshi</td>
<td>Zhangzagbo, Tibet</td>
</tr>
<tr>
<td>27th August, 1982</td>
<td>Arun</td>
<td>Jinco, Tibet</td>
</tr>
<tr>
<td>4th August, 1985</td>
<td>Dudh Koshi</td>
<td>Dig Tsho, Nepal</td>
</tr>
<tr>
<td>12th July, 1991</td>
<td>Tamo Koshi</td>
<td>Chubung, Nepal</td>
</tr>
<tr>
<td>3rd September, 1998</td>
<td>Dudh Koshi</td>
<td>Sabai Tsho, Nepal</td>
</tr>
</tbody>
</table>

Source: Yamada, 1998; DHM, ICIMOD
Potentially Dangerous Lakes

- Tsho Rolpa (Rolwaling)
- Imja (Khumbu)
- Thulagi (Manang)
- Barun (Makalu)

ICIMOD/UNEP (2001): 20 lakes dangerous
Dig Tsho

- 0.605 km long and 0.230 km wide in 1974
- GLOF event took place on 4 August 1985 in the Langmoche valley, Khumbu
- GLOF emptied the lake within 4 to 6 hrs
- Flood released 6 to 10 million cubic meters of water
- Damage caused
  - Namche Hydropower Project
  - Washed away land, bridges, houses, livestock and people
Tsho Rolpa

- Largest glacier lake in Nepal

- Located in Gaurisanker village, Dolakha district.

- Situated at an altitude of 4580 m above sea level with an area of 1.76 km²

- High risk of GLOF event based on rapid growth of the lake and degradation of dam holding the lake water
Tsho Rolpa

SOURCE: DHM
Kongma La 1955
Ngozumpa Glacier

I used to take yaks up to pasture and would cross this glacier so the yaks could graze on either side of the glacier. Today the glacier has melted so much that it is not possible to cross with Yaks.
Imja Tsho

- Another dangerous lake in the Khumbu region
- Lies on the lap of Mt. Everest, nearly 4 times as big as Ding Tsho and is nearing a critical GLOF stage, near to bursting.
- Located above 5000m
- Did not exist before the 1950s
- Rapid expansion
  - The lake occupied 0.60 km² in 1992 and 0.86 km² in 2002
  - An increase by 28% in 10 years
In 1962, Imja appeared as a pond

In 2008, Prof. Dr. Fukui and a group of scientists from Kio University conducted research which showed Imja Lake to be

- 2.3 km long
- 900 m wide
- 92 m deep
Imja Tsho in 1955
Imja Tsho in 2006
How can we solve this problem?

- Creating channel diversions
- Relocating people
- Relocation of houses, buildings and population above the flood zone
- Installing early warning systems to give people vital time to evacuate the area of destruction
- Creating emergency response capability
- Education and awareness campaigns
- Strengthening health services
Formation of Climate Change Council

- Formed under the Chairmanship of Prime Minister Madhav Kumar Nepal
- Aimed at tackling the environment and climate change related issues in Nepal
- Held a cabinet meeting on the lap of Mt. Everest to highlight the importance of climate change to the Nepali people
- Prelude to Summiteers’ Summit to Save the Himalayas held in Copenhagen on December 11, 2009
Kalapatthar Cabinet Meeting

- Cabinet Meeting at Kala Patthar Plateau (5,542 m), near Mount Everest base camp held on December 4, 2009
- Nepalese Prime Minister Madhav Kumar Nepal and 23 other ministers attended the meeting
- Significant in drawing attention towards the dangers of climate change and global warming on the Himalayas.
- Commitment of Nepalese Government towards the burning issues of climate change and the mountain environment
Summiteers’ Summit to Save the Himalaya

- Organized in Copenhagen to mark International Mountain Day on December 11, 2009
- It was an accompanying event in the 15th session of UNFCCC conference.
- With the objective to draw attention of international community towards the impacts of Climate Change on the Himalayas.
- Dawa Steven Sherpa in the Khumbu Icefall on Mt. Everest with the “Summiteers’ Summit to Save the Himalayas” banner

“Summiteers’ Summit to Save the Himalayas” rally at Copenhagen
Eco Everest Expeditions

- Organized successfully for 3 consecutive years (2008, 2009, 2010) to create international awareness about the impact of Climate Change in the Himalaya and on the lives of the mountain communities.

- Activities
  - Take the climate change message to the top of Mt. Everest.
  - Encourage climbers to climb in eco-sensitive manner.
  - Collect and bring down garbage and debris from trails.
  - Encourage climbers to use alternative energy solutions like the parabolic solar cookers and the SteriPENs for water purification during climb.
Eco Everest Expedition 2008

• 965 Kgs of garbage brought down from Mt. Everest and its Base Camp.
• Approx 75 Kgs of human waste properly disposed of.
• Supported by ICIMOD, UNEP
Eco Everest Expedition 2009
CASH FOR TRASH

• Rs 100 per kilo of garbage offered to the Sherpa

• 6000 Kgs of garbage brought down including part of Italian Army helicopter crashed in 1973

• Approx. 80 Kgs of human waste properly disposed of

• Organised in Partnership with the World Wildlife Fund (WWF)
Eco Everest Expedition 2010

CASH FOR TRASH

• Target to bring down 6000 Kgs from Camp 2 and below

• Offers NPR 100 per kilo of garbage brought down

HIGH ALTITUDE CLEAN UP

• Target to collect 1000 Kgs from 6500 m and above
Financial Sponsors for the Clean Up Efforts

- Reinhold Messner
- The North Face
- The Alpine Convention
- Asian Trekking
Beat the GLOF Action Run
18 June 2009

Runners at the starting point, Imja Lake - Source: The Nepal News (P) Ltd
The Objectives of Beat the GLOF Action Run

- Focus on creating greater international as well as local concern on the risks posed by GLOFs in the Khumbu region
- To demonstrate that even the fastest runner will not be able to outrun the fury of GLOF
- An opportunity where local residents are the focal point and they will spearhead the campaign
- Maximum local participation is encouraged
Khumbu Festival 2009

Yak Dance at the Festival
The Objectives of Khumbu Festival

- To focus on the irreplaceable value of the culture and traditions of the mountain communities
- An opportunity to share knowledge of traditions and cultures with younger generation to sustain its survival in the future.
- Various organizations are invited to set up stalls at the Festival to share information regarding GLOF, and other issues of Climate Change with the local people.
- Aama Samuha (Mother's Group) is organising stalls, selling local delicacies and handmade cottage products indigenous to the region.
Community Action against Climate Change
Beat the GLOF Action Run 2010 &
Save the Himalaya – Khumbu Festival

- To aware the mountain community about GLOF, its consequences and the future actions.
- Held in Khumjung village on 4 June 2010.
- Organised by iDEAS and Sherwi Yondhen Tshokpa.
- Supported by The North Face, Sagarmatha National Park Buffer Zone Management Committee, Department of National Parks and Wildlife Conservation, Nepal Tourism Board, WWF Nepal, NMA, Asian Trekking, The Himalayan Trust, Agni Airlines
Saving the Himalayas means saving Ourselves

So Let’s THINK Sustainably, WORK together and ACT now!
THANK YOU

Ang Tshering Sherpa

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