

INTERNATIONAL CONFERENCE ON
MOUNTAINS AND CLIMATE CHANGE

PAINTING HIMALAYAN WHITE SPOT ? SUPPORT TO LOCAL RESEARCH CAPABILITY

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High Summit
LECCO 2013

RELATIVE RANKING

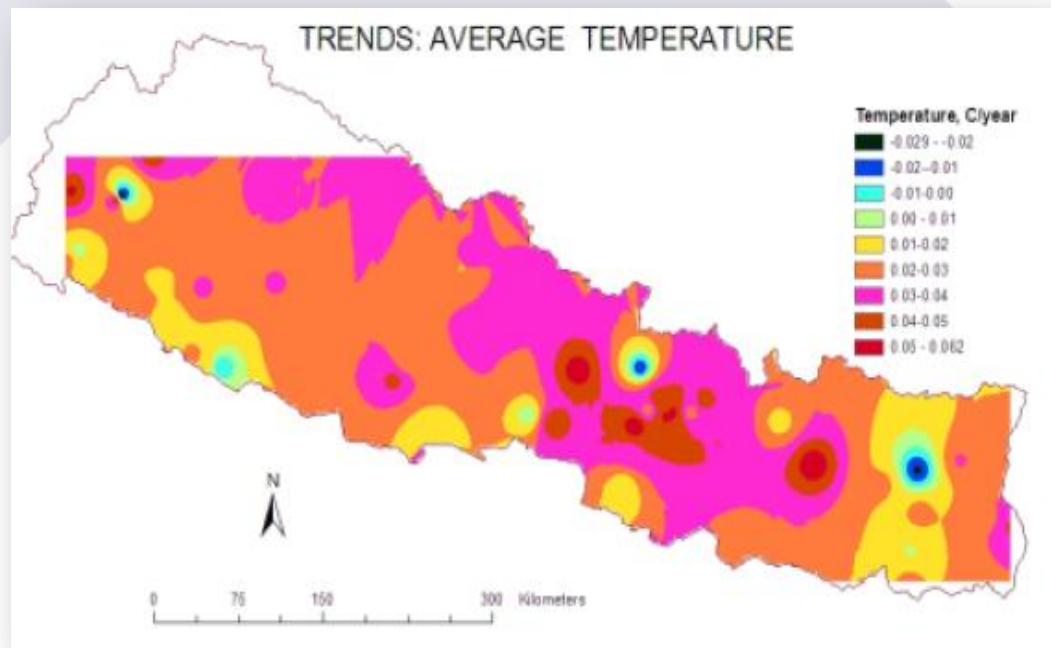
Source: Coutsoukis 2008

Element	Unit	USA	China	India	Nepal
Carbon footprint per capita (2005)	tCO ₂ -equiv	(12/214) 5.49	(92/214) 1.11	(148/214) 0.29	(198/214) 0.03
Carbon dioxide Emission (2004)	tCO ₂	(1/81) 6,040	(2/81) 5,010	(4/81) 1,340	(>81/81) 3.04
Share of Carbon dioxide	%	(1/81) 20.9	(2/81) 17.3	(4/81) 4.6	(>81/81)

AVERAGE TEMPERATURE TRENDS IN NEPAL (1975-2006)

source: KP Sharma/DHM 2009

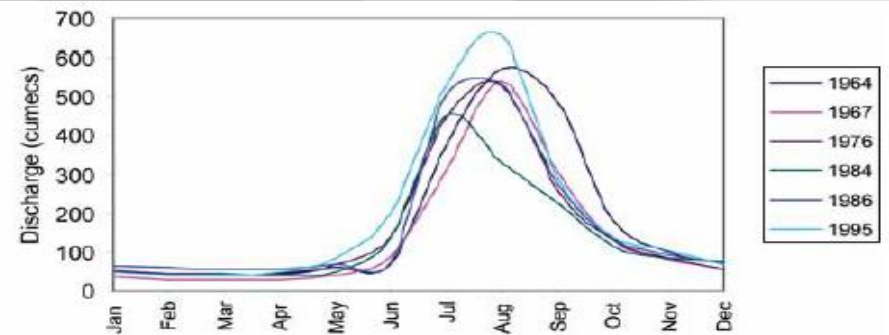
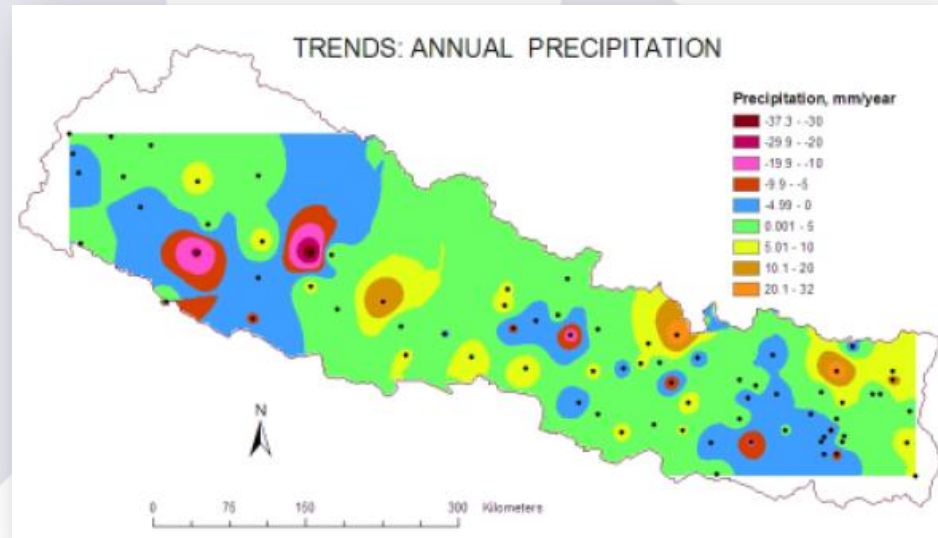
- Nepal average temp. trend (1975 to 2006) 0.027°C per decade; Global 0.017°C (IPCC, 2007)
- Average temperature in Nepal increasing by 50 percent compared to the global average.



AVERAGE PRECIPITATION TRENDS IN NEPAL (1956-2006)

source: KP Sharma/DHM 2009

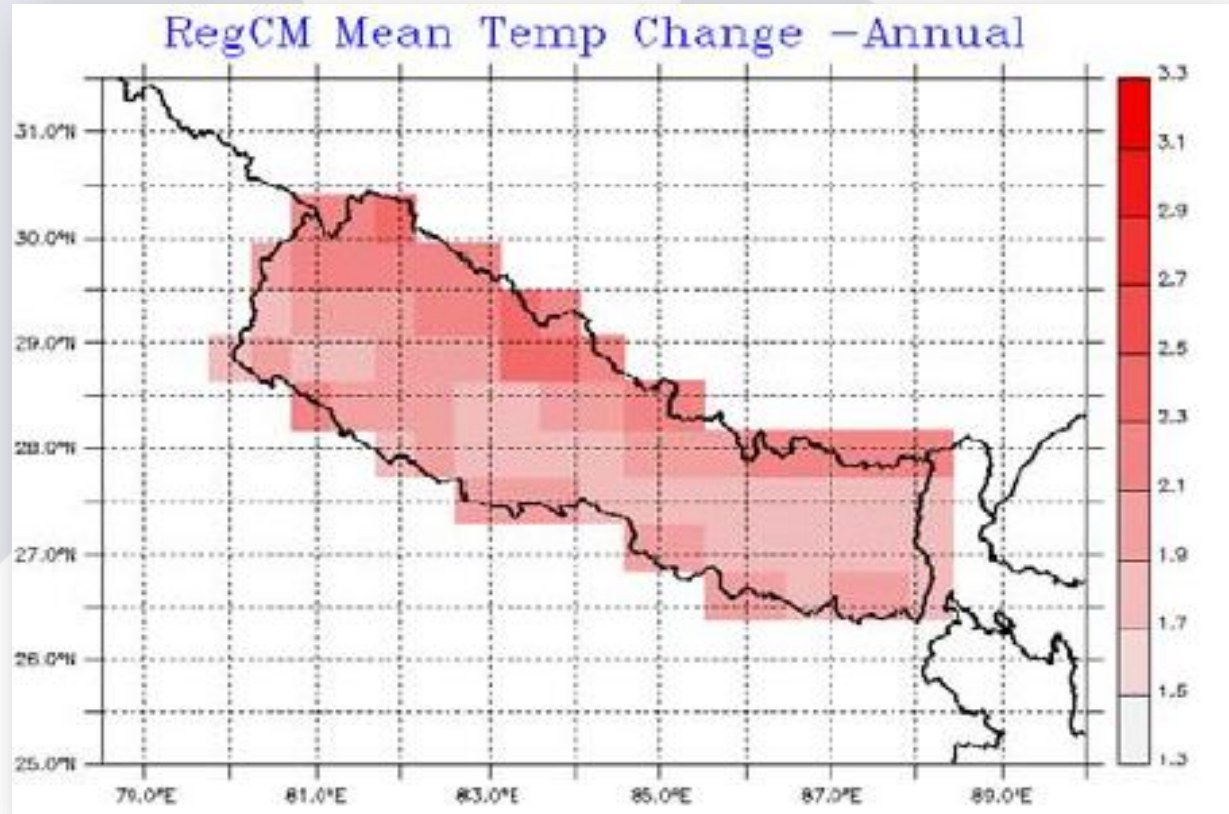
- Overall precipitation trends almost insignificant, but negative trend of winter precipitation during the past 30 years
- Shifting in rainfall and erratic pattern observed



CC PROJECTION FOR NEPAL IN MID 21ST CENTURY (2039-2069) TEMPERATURE

Source: DHM 2007

- Warming over entire country
- Range: 1.7°C in the south; 2.5°C in the north

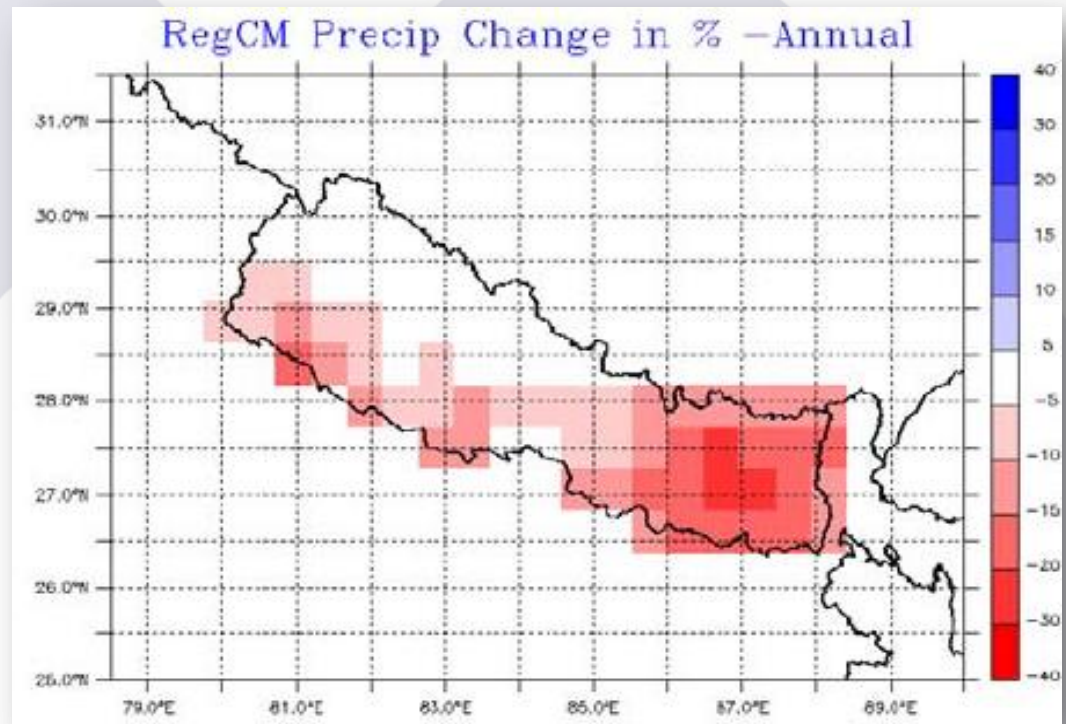


Mean annual temperature change (°C)

CC PROJECTION FOR NEPAL IN MID 21ST CENTURY (2039-2069) PRECIPITATION

Source: DHM 2007

- Decrease in precipitation in large parts of the country, mainly in the eastern and southern part (up to -30%)
- No change in precipitation over north center and north west



Mean annual precipitation change (%)

CLIMATE RISKS IN NEPAL

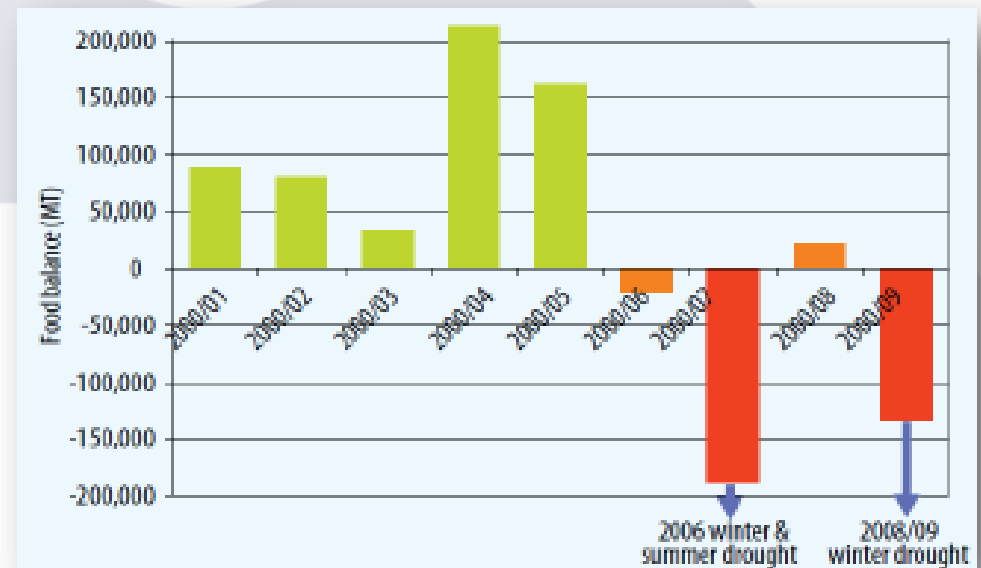
OECD REPORT 2003

Resource ranking	Certainty of impact	Relative timeframe of impact	Severity of impact	Importance of resource
Water res. & hydropower	High	Soon	High	High
Agriculture	Medium Low	Medium Far	Medium	High
Human health	Low	Medium	Uncertain	High
Ecosystems/ biodiversity	Low	Uncertain	Uncertain	Medium High

Source: Agrawala *et al.* 2003

CLIMATE CHANGE IMPACT: AGRICULTURE

- 2006 and 2009 reported to be the driest years in terms of rainfall during winter (DHM, 2009).
- The impact is seen in the decreased agricultural production.



Overall Nepal Annual Cereal Production Surplus/ Deficit. Source UN WFP (2009)

CLIMATE CHANGE IMPACT: SNOWLINE & SNOW COVER

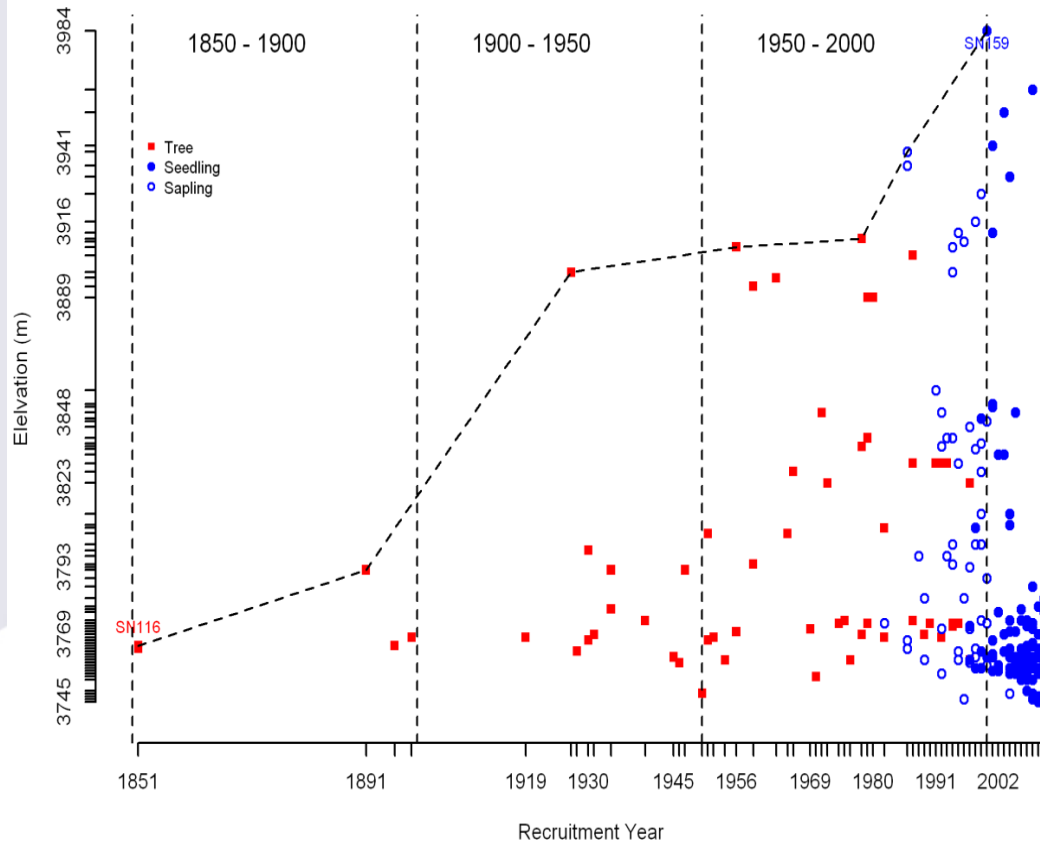
Snow cover area (sq km)

Year	Langtang	Khumbu
1976	320.50	612.90
1992	250.60	606.70
2000	230.90	583.29

Langtang Catchment, 1510.25
Khumbu Catchment, 1475.63

Glacier Change Study
in Nepal Himalaya
Using RS & GIS
Source: Shrestha &
Joshi, 2009

CLIMATE CHANGE IMPACT: TREE LINE SHIFT



- Study in Manaslu Area
- Tree line
- Upward shifting of *A. spectabilis* at the rate of 26.1 m per decade since 1850 AD.

Temporal regeneration and migration of *Abies spectabilis* along an elevation gradient in MCA. Source: NP Gaire, M Koirala & DR Bhujyu 2013

STORY OF MY NEIGHBOUR



- Next to Khumbu & Everest
- Ramechhap & River Tamakoshi
- Water you can see But it's made not to move up



- Empty vessels here, empty vessels there
- Children queue hours for water, shun school
- Nuptial tie difficulty, ask guests to bring drinking water
- Food scarcity looming, look for out migration

Source: Bhujju et al 2013

COLLABORATIVE WORKS

SOME INITIATION

MOU between NAST & EvK2CNR
in 1988; Pyramid Lab. built
in 1990

Study since 1998

Baseline Inventories

1. Agrobiodiversity
2. Herbaceous vegetation
3. Biodiversity knowledge
4. Fuelwood consumption
5. Forest structure & flora

Dendro-climatological Studies

1. Reconstruction of environmental history
2. Relationship between temp. & vegetation shift



BASELINE INVENTORIES AGRO-BIODIVERSITY

■ Major Findings

Upper Limits (m asl)

Staple crops: Barley 4,350;
Buckwheat 3,930

Vegetables: Corriander 4,480,
Radish/Turnip/Onion/Peas 4,359
Cauliflower, Carrot 3,930

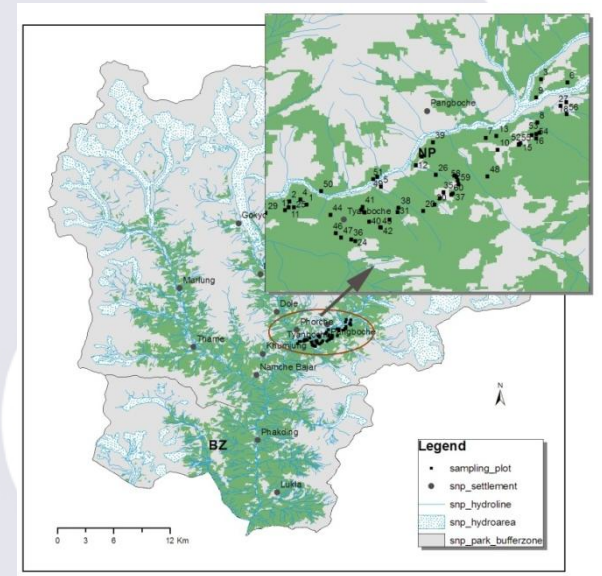
Potatoes 4,700 (Tarnak)

■ Ref. D Bhuju, A Giri, P Rana 2005



BASELINE INVENTORIES BIODIVERSITY KNOWLEDGE

- **Plant uses in Khumbu**
D Bhujyu, A Giri, P Rana 1998
130 plants used locally, 98 for medicinal, 24 livestock feed, 13 firewood, 13 vegetable
- **Mushroom diversity & nutritional value**
P Rana, A Giri, C Pokharel 2008
Mushroom diversity highest at 3500-4000m;
Protein content 12%-28%
- **Molecular characterization**
S Shrestha, N Rana, J Sijapati, D Rawal, A Giri, & P Rana 2007
DNA profiling of 12 high valued med. plants
- **Herbaceous flora in Imja valley**
E Paudel, D Bhujyu, K Shrestha 2007
170 spp recorded, decreased along the altitude



TREE RING LAB: ESTABLISHMENT & TRAINING

- Lab Facility: Lin-Tab digital positioning table for tree-ring analysis, Leica S4E stereo microscope, LintabTm swing arm stand, TSAP-Win Prof. software
- Training Workshop:
Date: 15-22 Jan 2008
Total Participants: 18,
from universities, research organization s
Resource Persons: Univ. of Padova, Italy



TREE RING LAB: ACTIVITIES



- Sites: > 12 incl.
Treelines in Khumbu area, and others
- Core Collection
Abies spectabilis
Juniperus recurva
Betula utilis
- Total About 300
from Manaslu, Everest, Mustang, Manang; collecting more covering Kanchenjunga, Rara, & Api Nampa

TREE RING LAB: RESEARCH OUTPUTS

Publication

3 published; 3 submitted

15 master's thesis defended



SN	Student	Site
MSc completed		
1	NP Gaire	SNP, MCA
2	U Thapa	Khaptad
3	L Khadka	Manaslu
4	R Subedi	Kulekani
5	R Ghimire	Shivapuri
6	YR Dhakal	Langtang
7	HC Lekhak	Langtang
8	E Udas	Mustang
9	MK Suwal	Manaslu
10	A Kc	Manaslu
11	N Shrestha	Mustang
12	A Poudel	Lukla
13	B Adhikari	Lukla
14	K Ojha	Langtang
15	R Bista	Manang

SN	Student	Site
MSc in progress		
1	S Bhandari	Ramechap
2	K Shrestha	Manaslu
3	R Ghale	Lamjung
4	D Acharya	Phulchoki
5	R Shakya	Manaslu
6	S Ghimire	Manang
7	S Pant	Manaslu
8	P Sigdel	Lukla
9	I Thapa	Panchase

SN	Student	Site
PhD in progress		
1	NP Gaire	SNP, MCA
2	P Rana	SNP, MCA
3	D Kharal	Mustang
4	K Mainali	Langtang

WHAT NEXT.....?



- Strengthen existing facilities including Tree Ring Lab
- More Training Workshops
- Involve MSc & PhD Students in research studies