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Final thesis

Mika Korkeakoski

**The Sherpa people's Observations on Climate Change in the Solu-Khumbu region in the Highlands of Nepal**

Supervisor: Marjukka Dyer, Principle lecturer  
Commisioned by: Snowchange project 2004

Mika Korkeakoski

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Supervisor

Marjukka Dyer

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## ABSTRACT

The survey concentrates on the Environmental, Socio-economic and Cultural changes deriving from the climate change, and more precisely, on the views observations of the Sherpa people about these possible changes. The results (observations) are evaluated in comparison to previous scientific researches. Traditional Ecological Knowledge (TEK) was also collected to find out how the communities can benefit from the traditional ways of living to improve their living conditions. The method for collecting the information was chosen to be of a qualitative interview study and the fieldwork took place in 2002 in Solu-Khumbu region in the Nepalese Himalayans. The observations from the area indicate that the climate is warming and it has its effects on their (Sherpas) everyday life. These observations vary from the changes in glaciers to flora and fauna, and from traveling routes to traditional life and culture.

Mika Korkeakoski

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Havaintoja ilmastonmuutoksesta Sherpa väestön keskuudessa Solu-Khumbu alueella Nepalin ylängöillä  
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Sherpat, Perinnetieto, jäätiköt, Himalaja, Solu-Khumbu, ilmastonmuutos, eroosio, ilmaston lämpeneminen, jäätikköjärvien aikaansaamat äkilliset tulvat, vuoristot

## TIIVISTELMÄ

Tutkimuksen tavoitteena on selvittää Ilmastonmuutoksen aikaansaamat sosioekonomiset, kulttuurilliset ja ympäristön muutokset Sherpa väestön keskuudessa Solu-Khumbu alueella Nepalin ylängöillä. Tutkimus suoritettiin laadullisena haastattelututkimuksella. Saavutettuja tuloksia on verrattu aiempiin tieteellisiin tutkimuksiin samasta aihepiiristä. Perinnetietoa pyrittiin tallentamaan ja selvittämään kuinka yhteisöt voivat parantaa elinolosuhteitaan perinnetietoa hyödyntäen. Kenttätyö suoritettiin Nepalissa Solu-Khumbu alueella kesä- ja heinäkuun välisenä aikana. Havainnot alueelta osoittavat ilmaston lämpenemisen ja sen aiheuttamat vaikutukset Sherpa väestön jokapäiväiseen elämään. Havaintoja on tehty muun muassa eläimistössä ja kasvistossa, jäätiköissä, lumessa ja kulkureiteissä, sekä perinteisessä elämäntyyliä ja kulttuurissa.

## FOREWORD

A long process is now coming to its end point, since we started to plan this survey with a colleague of mine in the latter part of the year 2002. Now we are living in the year 2005, and a long, but a delightful journey is leaving behind. This survey has made me realise many things and left a mark that will never fade away. Nothing of this would have been possible without the sincerity and good will of all the people we met. I would like to give my warmest thanks to all of the people who have been of tremendous help for the success of this particular work, as well as for Nepal chapter for the book "Snowscapes, Dreamscapes".

Firstly I would like to thank the interviewed people who were kind enough to tell about their experiences and observations of the surrounding environment and of life: Mr. Lama Ngawang Jimba, Mr. Pasang Norbu Sherpa, Mr. Lama Dorjee, Ms. Phuti Sherpa, Mr. Ang Kami Sherpa, Ms. Ang Lhakpa Sherpa, Ms. Ang Doma Sherpa, Mr. Ang Norbu Sherpa. Mr. Tandy Sherpa and Mr. Phurba Sherpa of Iceland Trekking and Expedition.

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ICIMOD (International Centre for Integrated Mountain Research); Mr. J. Gabriel Campbell (Director General), Mr. Binayak P. Bhadra (Director of Programmes), Mr. Mingma Norbu Sherpa of Nepal Tourism Board (NTB), People at Kathmandu Environmental Education Project (KEEP), Ecohimal, Mountain Spirit, Action Aid Nepal and United Nations Development Programme (UNDP)

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And last but not the least Mr. Samuli Teittinen, a friend, colleague and the other surveyer in the Mountain Knowledge Project, without whose contribution the survey would not have been possible.

Mika Korkeakoski in January 2005

## TABLE OF CONTENTS

ABSTRACT .....	2
TIIVISTELMÄ.....	3
FOREWORD .....	4
LIST OF ABBREVIATIONS AND TERMS .....	6
LIST OF TABLES, MAPS, PICTURES AND APPENDICES.....	7
1. INTRODUCTION .....	8
2. DESCRIPTION OF THE SURVEY .....	9
2.1. Survey methods and practices .....	9
2.1.1. Fieldwork stage.....	10
2.1.2. Other fieldwork.....	10
2.1.4. Language.....	11
2.1.5. Timetable of the survey .....	11
2.1.6. Survey equipment.....	12
2.2. The interviewed people .....	12
3. SCIENTIFIC BACKGROUND FOR THE SURVEY .....	15
3.1. Climate change .....	15
3.1.2. Impacts of climate change to Himalayan glaciers .....	16
3.1.3. Impacts of climate change to glaciers on other mountainous areas .....	17
3.2. Science, local knowledge and Traditional Ecological Knowledge(TEK) .....	18
3.3. Biodiversity .....	19
3.3.1. Nepal .....	19
3.3.2. Solu-Khumbu region in the Himalayas.....	20
3.4. Survey question.....	20
4. SHERPAS AND THE “LAND OF SHERPA” SOLU-KHUMBU .....	21
4.1. Definition of the Sherpa people and their culture .....	21
4.2. Sherpa areas of Solu and Khumbu .....	23
5. OBSERVATIONS .....	28
5.1. Environmental change.....	28
5.1.1. Weather: Winds, rains, temperature .....	28
5.1.2. Snow and avalanches, ice and glacial melting.....	30
5.1.3. Mist.....	35
5.1.4. Flora and fauna.....	35
5.1.5. Overall results of the changes in the environment. ....	41
5.2. Changes happening in the Sherpa culture .....	42
5.2.1. Changes in the traditions and language .....	42
5.2.2.....	46
A personal view: Ang Norbu Sherpa evaluates the situation nowadays in Namche Bazaar .....	46
5.2.3. The impacts of tourism .....	47
5.2.4. Traditional skills; predicting and reading weather .....	49
5.2.5. Changes in the traditional travelling routes.....	51
5.2.6. Changes in the relations to mountains.....	52
5.2.7. Introduction to electricity .....	53
5.3. Interrelations between the observed changes? .....	55
5.4. The overall changes in the Sherpa culture .....	57
6. DISCUSSION .....	57
7. CONCLUSION.....	59
8. REFERENCES .....	61
9. APPENDICES:.....	63

## LIST OF ABBREVIATIONS AND TERMS

TEK=	Traditional Ecological Knowledge
ICIMOD =	The International Centre for Integrated Mountain Development ICIMOD has a long and extensive experience on the mountain research
CIA=	Cumulative Impact Assessment
GHGs=	greenhouse gases
KEEP=	Kathmandu Environmental Education Project
NTB=	Nepal Tourism Board
IPCC=	Intergovernmental Panel on Climate Change
GLOFs=	glacial lake outburst floods

## LIST OF TABLES, MAPS, PICTURES AND APPENDICES

Table 1.	Differences in the approach of science and Traditional Ecological Knowledge(TEK).
Table 2.	The changes, in the environment observed by the people of Solu and Khumbu districts.
Table 3.	Observations of the changes in the Sherpa Culture in the Solu and Khumbu regions
Map 1.	The route from Jiri to Sete
Map 2.	Route from Sete to Ghat
Map 3.	The route from Ghat to Dingboche
Map 4.	The route from Dingboche to Kala Patthar
[1-8+]	The interviewed people
Picture 1.	Glacial lakes documented from Kala Patthar
Picture 2.	The first floor serves for storage and for livestock.
Picture 3.	Inside a Sherpa house drinking tea made with yak butter and salt. Close to the ceiling wheat is dried. It is daytime in the village of Mulkharka.
Picture 4.	After a glacial lake outburst the banks of the Bhote Koshi- river
Picture 5.	Samuli Teittinen climbs up to Kala Patthar (5,500 meters above sea level). Down the hill a glacier with rocks on top of the ice spreads from Mt.Everest base camp.
Picture 6.	Grazing Yaks.
Appendix 1	Mountain knowledge project: Questions for the interviewed

## 1. INTRODUCTION

This survey is conducted by interviewing local people on their observations on climatic, cultural, socio-economic and ecological changes. The focus was laid on the elderly people of the communities in the Solu-Khumbu region, to be able to have observations that can correlate the past to the present. Traditional Ecological Knowledge (TEK) of the interviewed people about the surroundings was of great importance in the study and was given a high value, since it is believed it TEK can be/become of great help in the scientific climate change studies and in some cases provide knowledge/information that can not be measured with general (quantitative) scientific means.

To have an effect on the local, regional and international forums the data and observations collect are evaluated to other researches from the mountainous and arctic regions. Similarities in other related environmental research is looked into, in order to show that the climate is really changing as the people has noticed it in their everyday life. By doing so it is believed that it creates a more effective means and credibility to influence locally as well as in the international scale.

This survey is integrated as a part of *Snowchange* project, which is a “*multi-year education oriented project to document Indigenous observations of climate change in the northern regions*”. The survey aims to launch *Snowchange* sub-project, which focuses on climate change in the mountainous arctic regions, tries to establish a network, where to handle the effects that the global warming poses to the local population and create a multi-year research cooperation with the local people. The *Snowchange* [[www.snowchange.org](http://www.snowchange.org)] project will lay out the completed survey on its web pages, and it functions as a portal for future studies. /14/

In the future the snowchange sub-project also wishes to develop mutual research together with The International Centre for Integrated Mountain Development (ICIMOD) in order to cope with the problems that arise due to climate change.



The survey provides a chance for the local population to get their voices heard and a possibility to influence on the matters that are taking place in the area, by this it is meant e.g. other research projects, community aid and development programs or a local level action programs. The most frequent matters and causes of concern are given a great value in order to assure that the survey has a meaningful output for the local people as well. In the end the survey tries to provide some kind of action plans and solutions to the most concerning matters.

## 2. DESCRIPTION OF THE SURVEY

### 2.1. Survey methods and practices

The survey concentrates on the possible changes deriving from the climate change, and more precisely, on the views and opinions of the local people about these possible changes. These results will then be evaluated in comparison to previous scientific researches. Interest was also on collecting TEK and finding how the communities can benefit from the traditional ways of living to improve their living conditions.

The method for collecting the information was chosen to be of an semi-structured interview study /2/, and for that connections to the people inhabiting the area was a necessity. In order establish connections with local people, which would result in interviews that would be informative and possibly bring out new points of view, quite a lot of background work was conducted in Kathmandu, Nepal: meetings with the staff of International Centre for Integrated Mountain development (ICIMOD), Kathmandu Environmental Education Project (KEEP), Ecohimal, Nepal Tourism Board (NTB), Mountain Spirit, Action Aid Nepal and United Nations Development Programme (UNDP).

As a result information was given of the elderly people living in the Solu-Khumbu region. As the limitations in time and resources was evident it was decided that a focus will be on somewhat ten qualitative deep going interviews instead of interviewing tens of people by only scratching the surface. By doing so it was believed to result in better quality results, and offer clear ideas to further projects.

#### 2.1.1. Fieldwork stage

The fieldwork took place in the Solu-Khumbu region in Himalayas of Nepal. It was conducted by using semi-directed open-ended interview method (qualitative) /2/, with beforehand determined topics, such as changes in the flora and fauna, culture, economy and TEK. The interviews were conducted in the villages of Junbesi, Mulkharka, Namche Bazaar, Khumjung, Thame, Jorsale, Ghat and Bengkar with people aged around 40-75 years consisting both the sexes. The occupations of the people varied from farmers, lodge owners, mountain guides, yak herders to Buddhist Lamas. Altogether eight interviews were conducted and transcribed, by collecting the most important views considering the survey.

The concentration was in interviewing the older people of the community, elders or people with similar respected position. In that way it was thought to have greater possibilities to reach to the knowledge, which has accumulated during the decades and which has been passed to the next generation, and at the same time creates a better understanding of the environment and observation of the changes in it. It does not though mean that the views of the younger generations would not be important. The knowledge of the local people of the cause and effect relationship in their surroundings brings forward certain ideas and effects, which can not be predicted nor measured by using quantitative methods.

#### 2.1.2. Other fieldwork

Field observations were made in the area by the survey team. These observations were gathered by travelling in the chosen area, observing local people and the surroundings. Documenting the erosion potential areas, deforested regions and the glaciers was a part of the survey. The observations made (pictures mainly) are

combined with the material that has been studied and surveyed before, during and after the field component.

#### 2.1.4. Language

To be able to conduct the interviews language is a crucial factor. The amount of English spoken in the Solu-Khumbu region is little, especially among the older people. The most common languages spoken are Nepali and Sherpa. This of course required a Nepali-English-Sherpa mastering translator present, who could translate the question in such a way that the content of the question do not suffer. With the aid of the translator Mr. Phurba Sherpa, the eight interviews were conducted, in the interview with Lama Ngawang Jimba the translator was the English teacher of Himalayan Sherpa Buddhist School, Mr. Nangyel Furba Sherpa.

#### 2.1.5. Timetable of the survey

During January to May 2003

- Coordination
- Preparation
- Networking

In June 2003

- Networking in Nepal
- The beginning of the documentation
- Creating partnerships

In July 2003

- Documentation
- Interviewing
- Community fieldwork

During September 2003 to March 2004

- Transcribing in Finland
- Analysis of the material
- Preparation for a chapter in the book "Snowscapes, Dreamscapes: Snowchange Book on Community Voices of Change"

May 2004

- Launch of the book "Snowscapes, Dreamscapes: Snowchange Book on Community Voices of Change"

April 2005

- Final thesis "The Socio-economic and Cultural change addressed by the Climate Change: Views and opinions of The Sherpa people of the Solu-Khumbu region in the Highlands of Nepal"

#### 2.1.6. Survey equipment

All the interviews were recorded on minidisk, with the permission of the informant. The interviews are transcribed on paper. The recorded material will be returned on request to the community or informant, in a form they prefer and wish. This is done in copies of tapes of interviews or transcripts. Other materials used and gathered during the survey are photographs. Copies of pictures and other material gathered will be provided back to the community on request.

#### 2.2. The interviewed people

[1]



Lama Ngawang Jimba, Founder and Principle of the Himalayan Sherpa Buddhist School. Phungmochhe Monastery in the village of Junbesi, Solu-Khumbu.

[2]



Pasang Norbu Sherpa, 60 years old, a farmer and a cattle owner in the village of Mulkharka 60 years old. Owns a small tea stall with his wife for porters and other travellers.

[3]



Lama Dorjee, 75 years old, Lama of the local monastery and owner of Lama Lodge, in the village of Ghat. Renovates and creates *Mani* stones and *Mani* wheels and teaches the younger generation in *Mani* carving and painting.

[4]



Phuti Sherpa, 50 years old, owner of the Buddha Lodge and restaurant at the village of Jorselin. Has lived in the area for more than 20 years.

[5]



Ang Kami Sherpa, 64 years old, farmer and the owner of the Bengkar Guesthouse at the village of Bengkar

[6]



Ang Lhakpa Sherpa, 60 years old, wife of a yak herder, lives in the village of Khumjung. Makes also carpets from yak wool.

[7]



Ang Doma Sherpa, 39 years old, looks after the tree nursery, has a farm and keeps a lodge in the village of Thame

[8]



Ang Norbu Sherpa, 61 years old, ex-mountain guide and owner of Sagarmatha Lodge and restaurant, in the village of Namche Bazaar

[+]



Phurba Sherpa, our experienced guide a translator and a friend, originally from the village of Mulkharka, now living in Kathmandu with his family.

### 3. SCIENTIFIC BACKGROUND FOR THE SURVEY

#### 3.1. Climate change

In the recent decades there have been numerous studies of the human-induced global warming and climatic and environmental change. The scientific community is divided into two opinions; the ones that argue that the earth's average temperature has fluctuated considerably all over the geologic time and the warming taking place now is natural variation, and the ones who greatly believe that the increased amounts of greenhouse gases caused by human activities can result to global warming. The substantial rise in the amount of the greenhouse gases (GHGs) since 1950s is though seen as a result of human activities by both parties. This enhances the earth's natural green house effect resulting to increased temperatures and leading to global warming. /6/

##### 3.1.1. The effects of climate change

According to latest studies, Intergovernmental Panel on Climate Change (IPCC) evaluates that the average temperature will rise 1-3, 5° C between 1990 and 2100. This does not seem much, but even with an increase of 1°C the earth will be warmer than it has been for 10,000 years. The warming is faster on the northern hemisphere, because of the greater land area(water absorbs more heat and cools slower than land), and according to measurements in the surface temperatures in the Arctic circle the increase from the year 1968 is about 5,5°C. The average summer temperatures in Antarctica have increased by nearly 2°C from the year 1947. According to climate models (IPCC) the warming will increase the amount of evaporation and the average global precipitation will rise. The warming will mean that much of the precipitation will come as heavy showers and thunderstorms instead of long-lasting gentle rains. These changes are already observed on many parts of the northern hemisphere./6/

Other possible changes according to Miller include increased retreat of some glaciers on top of mountains (e.g. Alps, Andes and Himalayas), changes in the habitats of some plant and animal species and rises in the global sea levels. It is estimated that

global sea levels will by 15-95 cm by the year 2100. The IPCC states also that warming or cooling by 1°C in a few decades, (rather than centuries, like the pattern has been for the last 10,000 years) will cause drastic disturbances in the current structures in terms of ecosystems and human economic and social systems./6/. As the global warming intensifies it will have much more severe impacts on the developing countries of Asia, where the “adaptive capacity of human systems is low and vulnerability is high”. /4/

### 3.1.2. Impacts of climate change to Himalayan glaciers

Evidence of the climate change is present through out the Himalayan mountain region. In the monitoring stations set out in the Nepal Himalayan a clear increase in the temperature can be seen. Since the mid 1970s the temperature has on average increased by 1 ° Celsius by today and increases at a rate of 0,06 ° Celsius per year. The increase has the greatest values especially at higher altitudes. Some experts have estimated that due to climate change and the human-induced global warming the glaciers in the Himalayan region will vanish within the next 40 years. /11/.

As the temperature goes up, the glaciers retreat and the melting waters form lakes behind the newly exposed moraine dams. The water rapidly accumulates into this lakes and presses up against the moraine walls resulting a breakdown in the dam. As a resultant huge amount of water and debris is discharged. Formation of these lakes and their sudden outbursts, glacial lake outburst floods (GLOFs), have caused severe impacts on the local population and environment./13/ These catastrophic effects include loss of lives, buildings and property, destruction of roads, fields and pasture lands. It is studied that in Nepal there are 20 glacial lakes which can be identified as potentially dangerous. /11/





Picture 1. Glacial lakes documented from Kala Patthar

### 3.1.3. Impacts of climate change to glaciers on other mountainous areas

Evidence from all over the world suggests that the glaciers are melting regardless of the cause. The rapid melting of the glaciers result in increase of supply in the water in short term, but in the longer run the water resources depletion. A rapid retreat of the glaciers have been witnessed worldwide and e.g. the ice on top of Mount Kilimanjaro in Tanzania has shrunken by 80% in the last 80 years, and by that rate it is evaluated that the ice cover will be gone between the years 2010 and 2020. Another example from Peru's Quelccaya shows that the icecap in the southern Andes has retreated 20% from the year 1963, and one of its main glaciers, Qori Kalis, is melting more than 150 meters annually. /12/. In Central Asia the Tien Shan mountain glaciers have lost more than 20 % of their volume and the Duosuogang Peak glaciers in Ulan Ula mountains have shrunk by 60 % from the early 1970s. In the Indian Himalayas the Pindari glacier is retreating by an average of 135 meters annually. /4/. This

applies also to other cold-region climates from Arctic north to with no exception Himalayan highlands of Nepal./6/

### 3.2. Science, local knowledge and Traditional Ecological Knowledge(TEK)

By documenting traditional ecological knowledge (TEK) a broad view of the changes that are or have already taken place can be obtained. Since the area (Solu-Khumbu) was approached as members of a different culture it was considered that witnessing changes that happen on a longer time period is most unlikely and furthermore to know what the most relevant matters for the area are, the cooperation between the local people was necessary in order to reach results. By carrying out the interviews with the elder people it was aimed to collect traditional knowledge of the climate and the environment, which, in some cases have approved to be of great help in providing solutions to tackle changes.

According to Slikkeveer “the very roots of western science and philosophy are based on the observations and political interpretations of local observations of nature”. Though when determining western science it is often seen as global disciplinarity. Almost parallel to this can be seen the local, traditional or indigenous knowledge which is greatly rooted in the area and can be seen inter-disciplinarity wisdom, that has been gathered from practices and experiences of the local communities inhabiting the area. The distinctions are not easily made and are not black and white between western scientific and local knowledge./10/. Some examples of distinctions are listed in Table 1.

Table 1. Differences in the approach of science and Traditional Ecological Knowledge (TEK)./10/

Local Knowledge/Traditional Ecological Knowledge (TEK)	Science
Qualitative	Quantitative
Intuitive	Rational
Holistic	Reductionist
Spiritual	Mechanistic

The approaches of general (quantitative) science and Local/ Traditional Ecological Knowledge can be seen as different pathways of explaining the surrounding universe, and in fact, are both the same intellectual process of defining order and disorder. /10/

Local/ Traditional Ecological Knowledge is often accumulated from many generations and passed on to the next generation often orally (storytelling). The passed on knowledge often consists observations and experiences from the environment including the visible and non-visible world. /5/

*“This oral tradition goes beyond simply documenting events: it represents an understanding of complex relationships in the natural environment that influence the behaviour of animals and indigenous peoples.” /5/*

Until recently the TEK has been ignored by the government agencies, industry, scientists and sometimes has been neglected by officials as culturally determined. In the recent years though the knowledge of the locals has been given consideration among the academics. The trend shows that information/ knowledge possessed by the local people has approved to be of great assistance in the studies. TEK has been used e.g. in Cumulative Impact Assessment (CIA). /5/

### 3.3. Biodiversity

#### 3.3.1. Nepal

Nepal has a bit of everything ranging from the sub- tropical to arctic and alpine plant and animal life. This is mostly due to the greatest altitude range in the whole world. There are over 6,500 plant species from trees in the jungles to the grasses of mountains. There are approximately 800 species of birds and over 800 species of butterflies, not to forget the rhinoceroses, leopards, tigers or crocodiles. All in its variability Nepal is like an overview of the animals and plant species in the whole world, even though it is approximately the size of England in area wise. /3/

### 3.3.2. Solu-Khumbu region in the Himalayas

Mountains contain the most diverse and complete ecosystems in the world. If we consider the Himalayan mountains from the top to bottom, as in their entirety, there can be found jungles, forests, shrub lands, meadows, deserts, rivers, lakes, tundra and glaciers; everything from the sub-tropics to Arctic. Tree species for example vary from the low altitude jungle trees to the dwarfs of the highlands, consisting all of the different species of each of the vegetation zones. The animals range from tigers to mountain goats, and snow leopards. It is impossible to introduce the range of animals that inhabit the different altitude zones and therefore it is only stated that both the plant and animal species are rich in variability. It must be noted that the different altitude zones often consist animals that are not necessarily found in the other zones. E.g. Yaks can not enter the low altitude (under 3,000 meters) regions because of the thickness of their blood. /3/, /8/, /7/

### 3.4. Survey question

The survey was originally aimed to answer the question: Have the local people noticed the glacial melting, unaware of the scientific studies that e.g. ICIMOD has produced about the glacier melting in the high-altitude areas in the Solu-Khumbu. As the survey went on the question had to be adjusted, since some of the interviewed people, especially in the Solu areas do not have much to do with the glaciers, glacial lakes nor even an ice cover. The surveyors had to find other parameters alongside the changes observed in the glaciers, and therefore in the lower areas the focus was more on the animal and plant changes rather than the intended glacier melting. The survey question now is to find out if there are observations amongst the local people that can indicate possible warming in the temperatures of the area. It focuses also on the effects that the warming and climate change poses on the people, in terms of environmental, socio-economic and cultural effects. This survey also tries to emphasise that the warming that has been noticed in the Arctic of the northern hemisphere, also has an effect on the people inhabiting the arctic and alpine regions in the south as well. As in its entirety the question is as is stated *are there Environmental, Socio-economic and Cultural change addressed by the Climate change amongst the Sherpa people of the Solu-Khumbu region in the Highlands of Nepal?*

#### 4. SHERPAS AND THE "LAND OF SHERPA" SOLU-KHUMBU

##### 4.1. Definition of the Sherpa people and their culture

*Sherpa "a person from the East" (of Tibet)*

Sherpas inhabit the high mountains of eastern and central Nepal, more precisely in the Solu (lowland Sherpas) and Khumbu (highland Sherpas) areas. The Solu Sherpas are less distinct, both culturally and ethnically, because they inhabit the lower altitude region and come in contact with a lot of influences from the neighbouring people. The Khumbu Sherpas on the other hand are more distinct, with their own customs and dresses, because they inhabit the high altitude areas north from Namche Bazaar and do not come in to contact with other people so often. This though is changing especially in the Sagarmatha National park region mainly because of interaction with tourists and trekkers. /9/

Sherpas are one of the best known Nepali ethnic groups mostly because of their high-altitude skills. A distinction must though be made between the members of the ethnic group Sherpas and the porter/climber sherpas, who necessarily do not have anything to do with the ethnic group. In the early 16<sup>th</sup> century the ancestors of the Sherpas of today began to migrate over the high passes into Nepal most likely from the eastern Tibetan province Kham and settled to the Everest region, and in the 1800s to Rowaling area of northern Dolakha to the west. Sherpa language is similar to Tibetan and they practice nyingma-pa (Old order, "Red Hat") sect of Buddhism. They believe that all plants and wildlife have consciousness and spirits and therefore can not be harmed. /9/



Picture 2. The first floor serves for storage and for livestock.

Sherpa houses are traditionally built of stones on two storeys topped with a roof. The first floor is used for livestock and storage, while the other serves the living purposes. Usually there is only one big room, where everybody lives. When getting married the Sherpas must marry outside of their own clan, but inside their own group. /3/

Sherpa (traditional) dresses are similar to Tibetan dress, where men wear a long sleeved heavy coat, *Chuba* or *Bakkhu*, usually with the right shoulder bare (over the cotton shirt), tied with a belt at the waist and the women a long shirt, *Ghorma*, topped with a woollen *Shyama* (a skirt) and a tripartite striped apron. On a special occasion also a silk blouse may be worn under a heavy, long woollen one-piece dress. /3/. Originally Sherpas were nomadic herders, but with the introduction of potato in the mid 19<sup>th</sup> century they started to settle in permanent villages. Today most Sherpas work in tourism, trade or agriculture. According to 2001 statistics there are nearly 155,000 Sherpas excluding app. 4,000 Yolmo Sherpas. /9/



Picture 3. Inside a Sherpa house drinking tea made with yak butter and salt. Close to the ceiling wheat is dried. It is daytime in the village of Mulkharka.

#### 4.2. Sherpa areas of Solu and Khumbu

The maps presented in the following pages show the villages in the area of Solu-Khumbu, where interviews were carried out. The maps however do not show the whole areas of Solu and Khumbu districts and are therefore not adequate to prescribe the “land of the Sherpa”.

The sites of the maps:

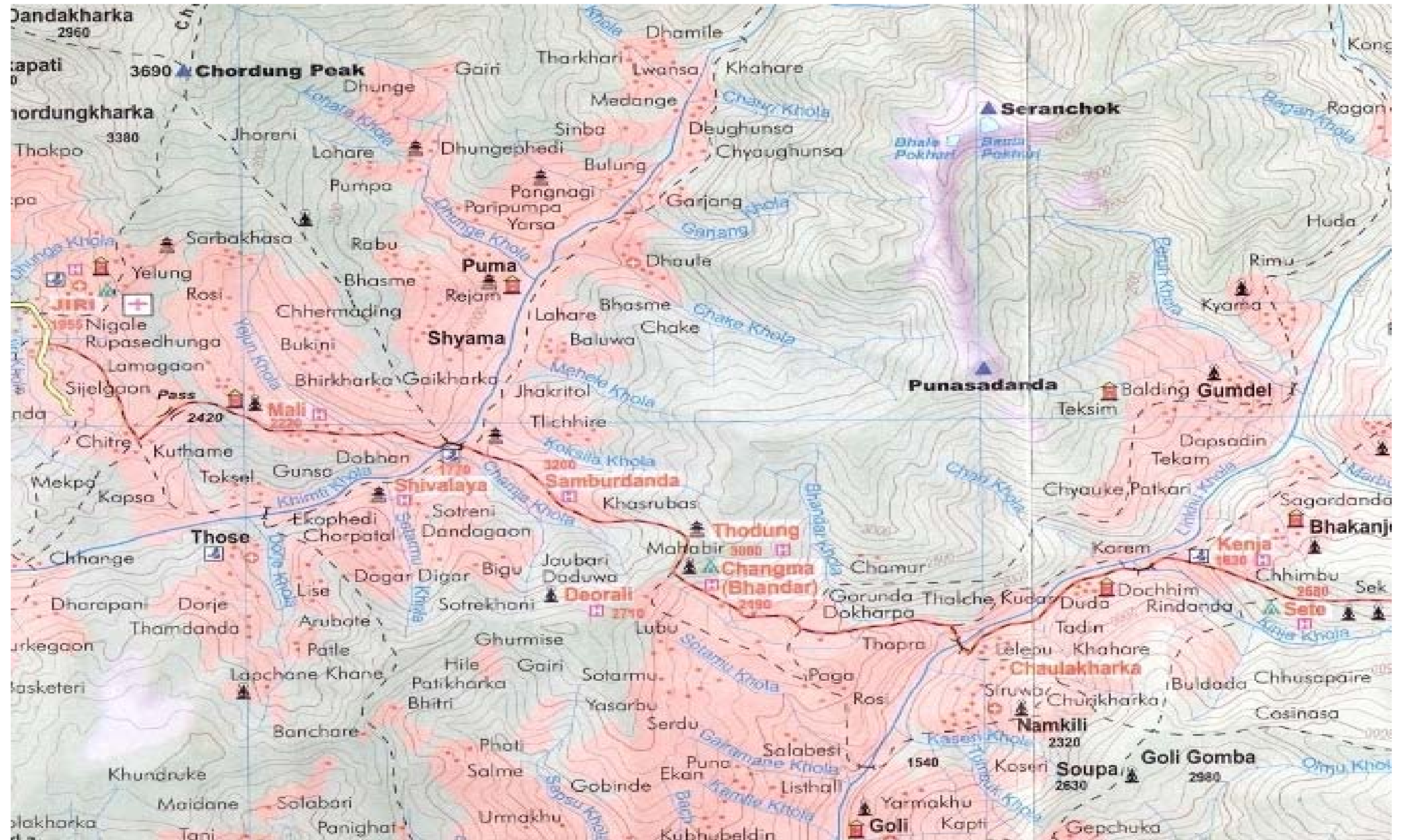
Map 1. The route from Jiri to Sete

Map 2. Route from Sete to Ghat

Map 3. The route from Ghat to Dingboche

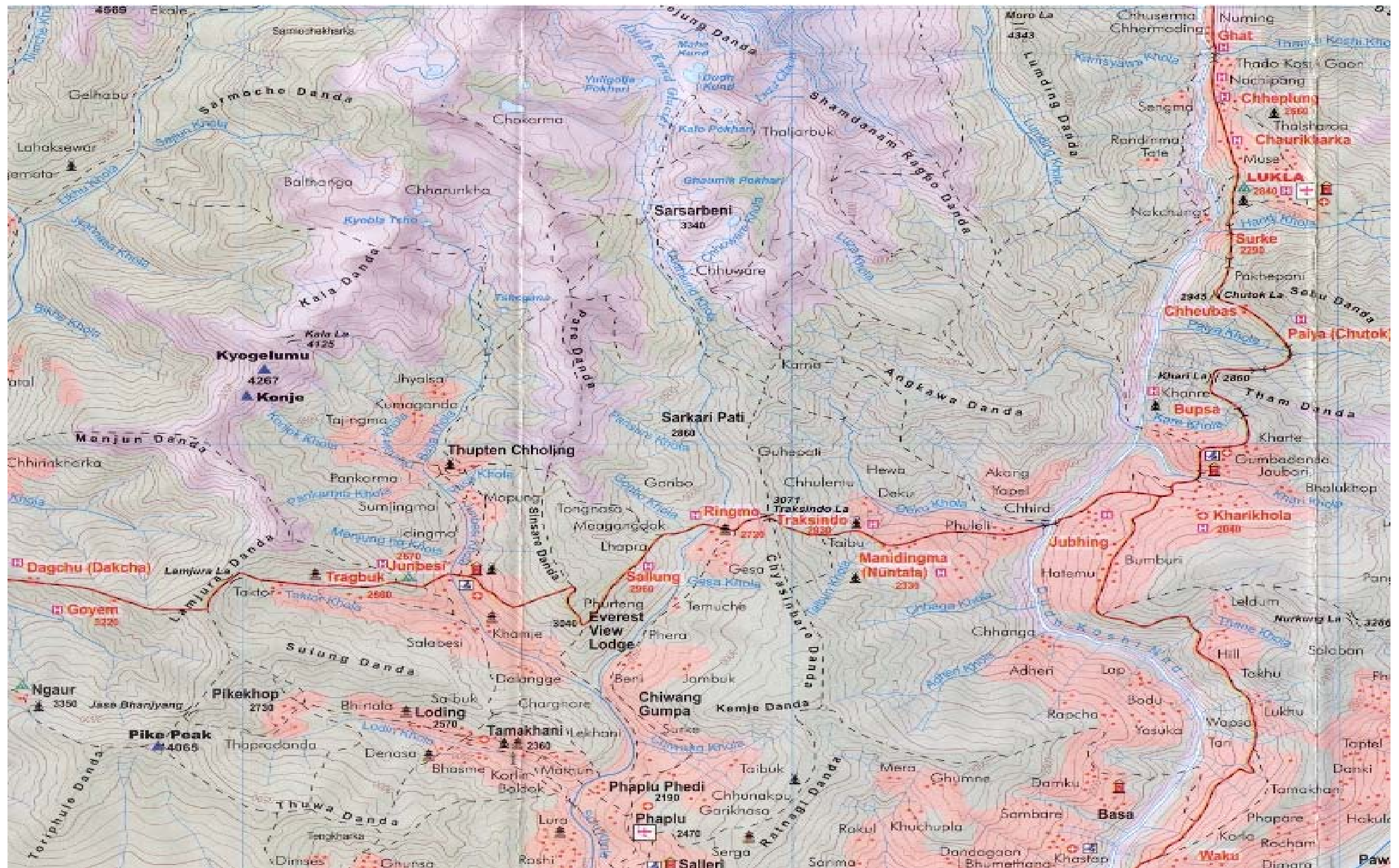
Map 4. The route from Dingboche to Kala Patthar

Map 1. The route from Jiri to Sete

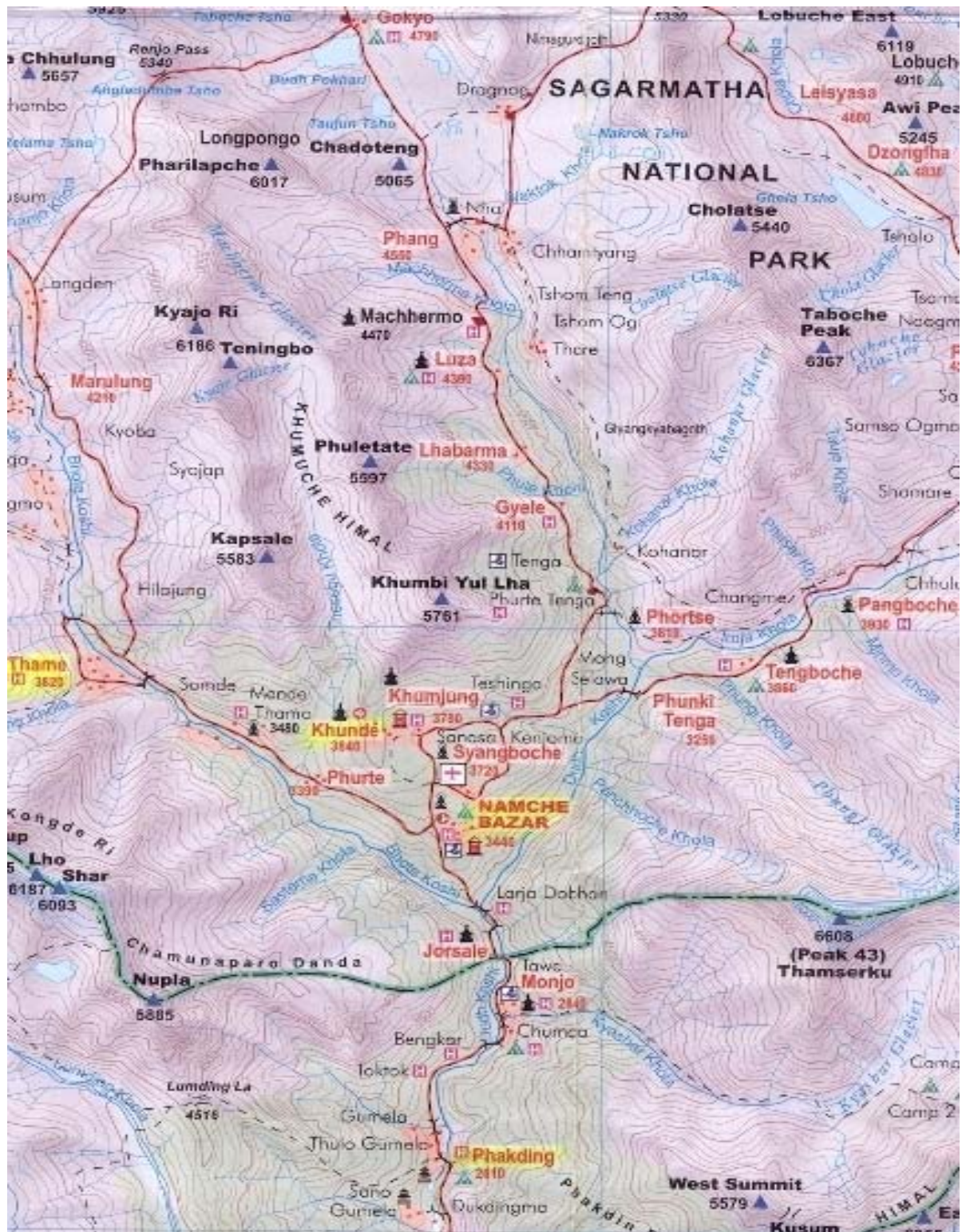




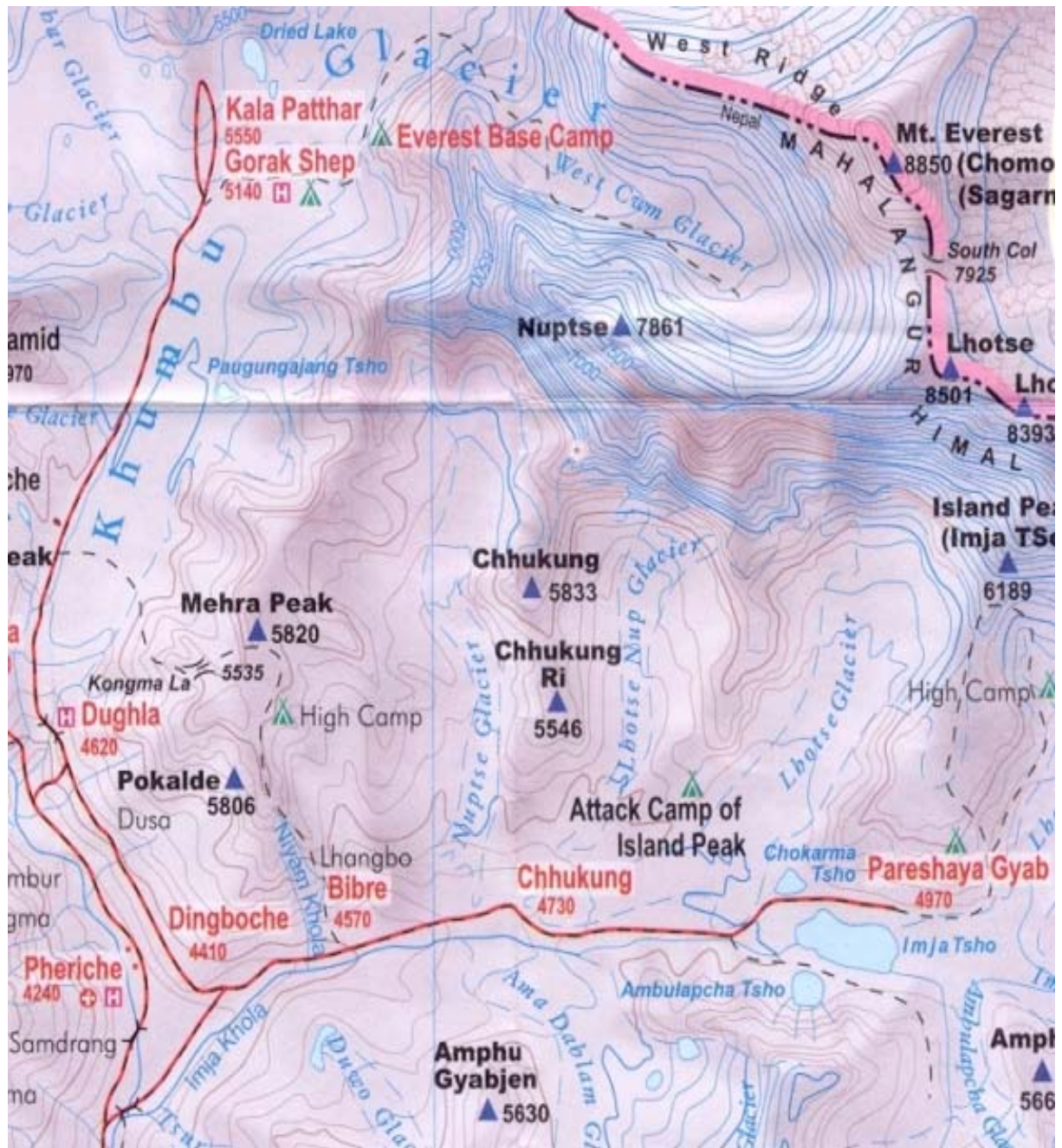
Map 2. Route from Sete to Ghat



Map 3. The route from Ghat to Dingboche



Map 4. The route from Dingboche to Kala Patthar



## 5. OBSERVATIONS

### 5.1. Environmental change

#### 5.1.1. Weather: Winds, rains, temperature

Lama Ngawang Jimba has witnessed more heavy rains in the latest years and some differences also in the wind conditions.

*“More heavy rains in the recent years, two or three times very unexpected. No difference, the same (clouds). The wind is stronger now.”*

Pasang Norbu Sherpa is concerned of a bad cloud that has influenced the weather for at least twenty years.

*“Five years earlier in this area a lot of winds and rains, but this year no winds and rains, and this spring very less wind here, and because always there is a very bad cloud here. More than twenty years the winds and the rains have been like this. Before in the spring there were big winds that take the roof, for 2-3 days, but not anymore. No, only this year the monsoon has been late. Only this year cloudy. Now the winds are not coming to this area. 1970 very big raining (snowstorm), 6-7 meters of snow, and many people died, and also animals. But not in the recent years, but just sometimes little bit more cold. This year heavy snow, otherwise light snow”*

Lama Dorjee sees that in the recent years there has been a difference in the amounts of rains in the area.

*“Three years before lot of more dry, not very good weather for fields and no good raining. Sometimes no rain for long times, all things die. This year more rain, good raining. This year, only this year good weather. The fields are very nice for potatoes, vegetables, nice. This year too hot, this year more hot. Before similar, also hot and cold.”*

Lama Dorjee continues with the observations of the rains and winds:

*“Only this year no change (in raining). In last year, always changing. Sometimes nine months no raining, six months no raining. And sometimes always three to four months*

*raining. And like that. Last year, this year not like that. It has been more dry in the past. This year the clouds, this year is less cloudy. Before is more, very thick clouds and sometimes there was big wind. But this year clouds also very nice. They say higher the clouds, more nice for all things. Winds also similar, also this year less wind. Sometimes big raining. Sometimes big wind, but this year no wind like that. But the wind, before there many changes. This years been very nice, wind also been very less and nice.”*

Phuti Sherpa shares her knowledge of the weather and wind conditions:

*“A little bit more raining. In 20 years more and more (temperature). 30 years ago a big landslide, a lot of damage, nowadays the water is higher. Winters coming very soft snow, and springs very heavy. 12 years ago heavy snow, a lot of animals and people died. Clouds are quite similar, in the springs more deeper mist. The winds come later and bigger in the spring.”*

Ang Kami Sherpa tells about the winds

*“This year, spring time little bit more wind and less clouds. Before also sometimes like this. I remember 50 years back, similar like that.”*

Ang Lhakpa Sherpa sees the change in faster variations between the hot and cold season

*“Before same temperature, but now very hot and very quickly cold, when the sun comes it is getting hot, I think of it often. Raining is about the same. This year a little bit more quick raining (in the beginning of monsoon).”*

Ang Doma Sherpa has witnessed that when the sun comes, it is now hotter than before.

*“Clouds are same as always. Temperature nowadays little bit more hot. Sometimes when sun is coming, sun is little bit hotter. Don’t remember (for how long). Maybe this year little bit hot.”*

Ang Norbu Sherpa shares the same opinion of the hotness of the sun.

*“The temperature little bit higher, sun is very hot. This year. Many people thinking like that.*

Phurba Sherpa adds: "Because I think there are more people and something."

Ang Norbu Sherpa continues of his observations of the rains, temperature and the winds.

*"Here the temperature is not a problem, no effect on life. Sometimes it is little hot and dry. About winter temperatures, not scared for temperatures. Sometimes in winter is raining, snow. Sometimes in morning and night very cold. Sometimes it has been more heavy and sudden rains, but for very short time. But this year, no hard rain, no big rain. This year little bit too windy, too much wind. This year more wind. Wind is every year, but this time is very strong."*

#### 5.1.2. Snow and avalanches, ice and glacial melting

Lama Ngawang Jimba comments about the amounts of snow.

*"For two years not that much snow, but earlier too much."*

Lama Dorjee tells that if the glacier lakes outbursts occur it will mean big problems.

*"Twelve years between, two times this area big avalanche, because up in the mountain some lake broken. Big water and many things damaged. Now for three-four years no problems. Monsoon waters are higher but not problem. Some lakes, glaciers are very dangerous. Some day they might break, if they are broken then big problems."*



Picture 4. After a glacial lake outburst the banks of the Bhote Koshi- river

Ang Lhakpa Sherpa tells that her husband has witnessed less snow and ice while going out with the Yaks.

*“My husband says that less ice and snow because of temperature is hot. This year there is more hot temperature, because less wind. Long time before there was a landslide.”*

Ang Kami Sherpa has seen changes in the amounts as well as in the texture of snow.

*“Sometimes snow is little bit changing. When temperature little bit hot, snow is coming very, little bit soft. When very cold in winter, snow is coming very small size, similar to rice, like powder. Before, 30 years behind, lot of snowing, lot of big rain. This year little bit more snow, but otherwise getting less.”*

Ang Kami Sherpa is concerned about the glacial lakes, even though he thinks it is getting now more safe.

*“This area has more problems on riverbanks, erosion. Before it was more, but now little bit safes. Fewer landslides. Before sometimes broken a lake or pond, and then like that, from the glacier lakes. But now there is more trees and more something. It was in August and September. Not every year. Sometimes, very few times”*

Ang Doma Sherpa thinks of the glacial lakes and the melting and states that there is more melting of the snow and ice.

*“Yes, I remember little bit about glacial lake outburst. That time near the lake 6-7 houses damaged, but nobody dead. Dig Tsho lake. Before little bit less melting, now more melting and waters. Now not any effect on life, no problems. Before sometimes up there snow and ice but not anymore. Now it is easier to move. (I have) No idea for how long glaciers have been melting. Before sometimes when travelling from here to Tibet, that time always, this time also snow and ice in low parts. Now snow and ice only in high places. Before three years, there was every time landslides, but for 2-3 years gone, no big land slides and no broken...Because they are covering the grounds, putting plants in the ground, maybe*



*because that. Still the lake is not full. Not full, so not dangerous. No landslide like that. There is no controlling of the lake.”*

Ang Norbu Sherpa comments about the snowfalls and the amounts of snow.

*“Sometimes eight meters of snow. This year also raining, very big and heavy. Only for one day raining, one meter or something of snow. If two days is snowing, very dangerous.*

*I think before also raining like that, only one big rainfall. But before was little bit less raining. This year only one day raining like that. Maybe if raining for 3-4 days, houses are damaged. The roofs break.”*

*“Before my father came, only one avalanche down of Jonbuse side. One house down, some people dead. Told by my father. It was maybe 50-60 years ago, but now there are no avalanches. Because there is lot of jungle. Now they are starting more tree planting.”*

*“This area, because sun gives good light here, only two-three days after snowing, all snow is away. Other side is little bit in shadow, maybe two-three weeks of snow. The snow cover has been like that also before.”*



Picture 5. Samuli Teittinen climbs up to Kala Patthar (5,500 meters above sea level). Down the hill a glacier with rocks on top of the ice spreads from Mt. Everest base camp.

Ang Norbu Sherpa concludes by telling about the situation in the glaciers in the Mount Everest base camp region.

*“Before there was lot of ice and it was too difficult to take yaks and other animals to the Everest base camp. Now there is more sand and more stone. Now the route is very easy. Ice is going away. Now the base camp going upside, all is plain. Before the base camp was very down, upside all ice. This time I went there with American group, now there is no ice, only glacier. Many camps this year, too many expedition also.”*

### 5.1.3. Mist

As the journey from the Solu region continued, the surveyers witnessed a mist, which did not seem to be of a similar kind of the ones connected to raining. This phenomenon was also noticed by Ang Kami Sherpa and Lama Ngawang Jimba.

*“Before little bit less mist, but that time, this year more mist. Not for many years, only one two years more mist.” -Ang Kami Sherpa*

*“Here we also have this problem of this mist, before I haven’t seen much of this mist in the area, but there is, it is like Kathmandu sometimes. This has been for 6-7 years.” - Lama Ngawang Jimba*

### 5.1.4. Flora and fauna

Lama Ngawang Jimba sees that there are changes in the animals that reason from many causes.

*“35 years ago, there were many jungle pigs. After that there was very big snow fall, and most of the animals died, and after that I have not seen them anymore. So that is a change in animals. Before there was no deer in the village but now there are more deer in the village. Also before there were many danphe, national birds in the area but now there is not many, because of the people killing them. Somewhere there are mosquitoes, before there were no mosquitoes. People bring them from Kathmandu in aeroplanes, or maybe the temperature is hot, and maybe because of the electricity.”*

Lama Ngawang Jimba sees a change also in the plants.

*“There were many big trees, but now only small greens. Because people destroy the forest for building houses. There are little changes in flower blooming, because it is getting hotter. Flowers are blooming sooner. Now there are fewer animals than before in the jungle, because of the big snowfall of that time and the deforestation. I am not sure are there new plants in the area, but if people would want to grow corn, they could because of the temperature. People are not used to growing corn, so they do not grow it here, but they can if they want to. In Junbesi they grow corn.”*

Pasang Norbu Sherpa sees no changes in the plants or animals.

*“Now more deer and more tiger. Only one month ago tiger took a dog and one goat. Then next day they kill also one deer. Nowadays here is more tiger and deer. Deer do damage in the fields. 20 years ago here was a little bit tigers, now more and more deer. Also more birds now, earlier less, but now they come and do damage in the fields with barley and wheat. This area there are not many flies here, only the mountain mosquitoes. This area is good for fever medicine plants, this year there are no people who pick them up and sell in Kathmandu. No new animals, plants or birds in this area, and also none disappeared.”*

Lama Dorjee sees that the creation of Sagarmatha National Park is the reason there are more animals in the area nowadays.

*“ In animals, there are many changes. Before, 10-12 years ago not many animals here, everybody, many people killing. Now with the National park, all people, army also, go looking for animals, now there are many animals this area. Now in the National park, there is so that, if somebody kills any small animals or birds. They put into jail maybe for ten years, or five years. If someone kills some big animals, they put in to jail for the whole life. Now there are more animals. Because, also there is coming more jungle, that's why also more animals. Now the animals are coming also very near the houses, destroying crops and causing damage. Now it is with the birds also the same, many birds in this area. Because of WWF project, with the help of Mingma Norbu (Sherpa) for this area. Now this area has many, many birds growing more and more. And all is very nice.*

*...There is no change in the insects. This year few, little more flies. In this area there are no mosquitoes. Very small mosquitoes, high mosquitoes, we cannot see them, this kind of mosquito. No new animals. Mountain goat, in this area they are coming every year, one hundred and more in groups. But this year no coming, there is many tigers. Maybe tigers are killing them. Now there are more tigers. And wild dogs, also there is more wild dogs. Wild dog hunt deer, mountain goat and farm animals.”*

Lama Dorjee sees that the increase in the amounts of tigers is because there are no people killing them.

*"I think here are more tigers now because there is not allowed to kill them, only Buddhist people. Government also gives only permit to kill them. Because there is no killing, they are growing more. Tigers are not so much a problem for man, only for other animals, killing and slaughtering. Bad. The deer and this kind of animals cause trouble in the fields, for the crops. There is more jungle, maybe more food inside. But this year, not many of them seen in this area. But tigers make more problem, killing cows and deer, baby yak maybe sometimes."*

Lama Dorjee sees there are more plants in the area.

*"Three years more better. Now there are many changes in all area. People are also changing. Everyday environment, everything going more nice. Now more good idea for everything – now more plants, things. More nice.  
...No new plants. Plants are the same,... same kind of flowers, no disappearing. No new medicine plants or other plants. Now they are growing maize and some more new vegetable. This is because they get good compost, which grows many things. Not like that before."*

Phuti Sherpa has the opinion that there are more wild animals in the region nowadays.

*"Now here are less domestic animals (cow, sheep), because of trekking and lodge business. Coming more birds, mountain goat, deer. Some other come and eat all. Because more scared for the people, no killing, National park. Insects and animals are the similar as before, no new ones. Plants and trees are more nice."*

Also Ang Kami Sherpa finds more animals in the region he lives and travels.

*"More animals now, before very little animals. More mountain goats, and tigers also many. Before there was no national park, now with the park, about 20 years, more animals are coming. Before many people were killing all the deer, now with the National Park, killing is not allowed and more deer comes. No new or disappearing animals. Now also many birds, but no new or disappearing birds. It is same with insects. Amounts also similar. Winters cold, very few fly. In summer more insects, but no fly in winter."*

Ang Kami Sherpa sees an increase in the amounts of plants, because the temperature may be getting hotter.

*“Now all plants are coming very nice. More plants, also medicine plants. Now not allowed to take the forest / from forest. Sometimes flowers are coming in spring all the time, but sometimes coming also in winter. This has been only these five years. Actually no idea why it is so, but maybe temperature little bit hot.  
...Now we get from nursery, some new plants. But none are disappearing. Many people like now putting new ones into ground. Very happy about that, always needing forest. This tree program started ten years ago.”*

Ang Lhakpa Sherpa has observed that the mountain goats are going to higher altitudes in the recent years.

*“Now the mountain goat is many, this year there is no deer. Now the mountain goat also goes higher, like Gokio.”*

Ang Lhakpa Sherpa tells about other observations.

*“Amounts of insects are every year the same, but this year more mosquitoes...”*

*If there is good compost, the crops grow good. Plants are the same, but now they are better. This is because there is nobody killing the animals, because of the National park.”*

Ang Doma Sherpa answers when asked about the animal and plant life in the area. (Mosquito was seen before the interview.)

*“No changes in animals, no new ones or disappeared ones. Also insects are same. No mosquitoes here. Are you sure you saw one (mosquito)?  
Animals are now going in higher places. September august animals are coming down, when it gets colder. Yak go same time higher, now is the monsoon and they are going to yarsa, higher place. In winter this area has many yaks, but not now. Now there are growing potato and other things, and little bit more hot. Gunja (lower camp) is the*

*same height. Sometimes go more down, but otherwise always here. Trees are growing good. Juniper is very small, good. Animals don't eat it. Pine trees young leaves always problem for animals.*

*Trees are this time growing good, more than before. Maybe little bit more in a year than before. Before there were no trees, all was very empty. Now every people know they need trees, environment is in they trees. Medicine plants are same as before. Other plants same as before. Norsidi (?) is a new plant people are growing more."*

Ang Norbu Sherpa tells that the Yaks can not go below a certain altitude and nowadays they are going to higher places.

*"No new animals in this area. Yaks go only upside of Namche, never downside. They are dead if they go downside. They drink the water and then die. Only to high Tibetan side and mountains. Before it was the same. Only dzopkyo is going down to Lukla and Solu-area. And going to base camp side. Dzopkyo is very busy; it's going to high place and low place. Father is yak and mother is cow. Now the yaks are going upside of Thame, just higher. Going higher than before."*

Ang Norbu Sherpa continues of the plants and trees.

*"Not many fly and no mosquitoes here. No leeches and no other insects either. Because this is little bit colder, in night it is raining very cold. Some new plant growing good here. Medicine plants are same as before. Tree plants are now growing more and more. Thick forest. Pine trees and others grow only this high, from Tengpoche to 3500 meters. Juniper is growing up to 5500 meters or 5000 meters. No change in the tree line. The rhododendron also, red rhododendron is only growing down from Namche. White rhododendron is growing higher. Tree is the same, different flower. No change. Flowers are coming in May - June. When the flowers come, then potato ready to come, but now not looking anymore (refers to flower blooms)."*

Table 2. The changes, in the environment observed by the people of Solu and Khumbu districts. (Yes= change, No= no change, NA=not asked; += more in the quantity,-=less in the quantity, +/-=occasionally more/less; Descriptive information is also mentioned in some cases ;(/)=how many out of the questioned shared the same observation

CHANGES IN THE ENVIRONMENT													
The interviewed	Temperature	Rains	Snowfall	Winds	Ice cover	Glaciers/ Glacial lakes	Erosion	Animals	Birds	Insects	Plants	New animals	New plants
Lama Ngavang Jimba	Yes +	Yes +	Yes -	Yes +	NA	NA	No 0	Yes +/-	Yes -	Yes +	Yes -	Yes +	Not sure
Pasang Norbu Sherpa	Yes - sometimes	Yes -	Yes +/- heavier	Yes -	NA	NA	No 0	Yes +	Yes +	No 0	No 0	No 0	No 0
Lama Dorjee	Yes +	Yes +	Yes +/- heavier	Yes +/-	NA	Yes + 12 years	Yes +	Yes +	Yes +	Yes +	Yes +	No 0	No 0
Phuti Sherpa	Yes +	Yes +	Yes +	Yes +	NA	Yes + 30 years landslide	No 0	Yes +/- less domestic	Yes +	No 0	Yes + nicer	No 0	No 0
Ang Kami Sherpa	Yes +	No +/-	Yes -	Yes +	No 0	Yes -	No 0	Yes +	Yes +	No 0	Yes +	No 0	Yes + tree nursery
Ang Lhakpa Sherpa	Yes +/- quick variations	Yes +/- quick rains	Yes -	Yes -	Yes -	No 0	Yes +/- landslide 30 years	Yes +	NA	Yes +	Yes + grow better	NA	No 0
Ang Doma Sherpa	Yes +	Yes -	Yes - heavy	No + sometimes wind in the spring	Yes - less ice	Yes + more melting	Yes + landslides	No 0	NA	No 0	Yes + grow better	No 0	Yes +
Ang Norbu Sherpa	Yes +	Yes +	Yes +	Yes +	Yes +	Yes +	Yes 0 landslide	Yes - less domestic	NA	No 0	Yes + grow better	No 0	No +
Overall	Yes (8/8)+	Yes (7/8)+/ -	Yes (8/8) +/-	Yes (7/8) +/-	Yes (3/4) +/-	Yes (6/8) +/-	Yes/No (4/4)+/-	Yes (7/8) +/-	Yes (5/5)+	No (5/8)+	Yes (7/8)+	No (6/8)+	No (5/8)+



### 5.1.5. Overall results of the changes in the environment.

As it can be seen from the Table 2 all of the people have witnessed changes in the temperature and more precisely in the warmer temperature, also quick variations between the cold and warm temperatures have occurred. Seven out of eight of the interviewed have observed changes in the rains and the majority of them see that the amounts of rains have increased. All eight of the interviewed have noticed changes in the snow, and it is mentioned that the snow is often heavier. In the Glaciers and glacial lakes the changes are observed especially in the form of glacial lake outbursts, but in the recent years the problems caused are seen minor than before, mainly because of tree and other vegetation plantation. Erosion can be seen in some places. There has also been a change in the winds, where the variation ranges from less wind to more wind, depending highly of the place of living. Also change in the amounts of birds, animals and plants is witnessed in many areas. The amounts of wild animals have increased while the amounts of the domesticated ones have decreased, same applies to bird species. Also in some areas there have been seen an increase in the mosquitoes and flies. Trees and other plants have been observed to grow better and nicer. No significance observations of new plants or animals are seen, but in some cases the plant that has not been cultivated in the area, is now introduced. Also it was noticed that some animals go now higher (mountain goat, Yaks) in the altitude than before.

#### Changes in the environment

Temperature	Yes (8/8) +
Rains	Yes (7/8) +/-
Snowfall	Yes (8/8) +/-
Winds	Yes (7/8) +/-
Ice cover	Yes (3/4) +/-
Glaciers/ Glacial lakes	Yes (6/8) +/-
Erosion	Yes/No (4/4)
Animals	Yes (7/8) +/-
Birds	Yes (5/5) +
Insects	No (5/8) +
Plants	Yes (7/8) +
New animals	No (6/8) +
New plants	No (5/8) +

## 5.2. Changes happening in the Sherpa culture

### 5.2.1. Changes in the traditions and language

Lama Ngawang Jimba knows that people are speaking less Sherpa language and more Nepali.

*“People are going more into vegetables than before, like cauliflower, cabbage, garlic and corn. People use Sherpa language here in the house and in the community and everywhere, but now many people who pass (Hindu people) they speak Nepali. They go to school and learn Nepali and speak Nepali. Sherpa language is spoken little less than before. The village people speak Sherpa, but the town people are forgetting.”*

Pasang Norbu Sherpa is happy about the future of his village, Mulkharka.

*“In this area no changes in traditional lifestyle. In this area not many change with the children, they like to stay here and continue farming. Also the language stays because every body speaks Sherpa. No words disappeared, because older people teach the children.”*

Lama Dorjee mentions it is easier now, but the interest of younger generation is in the business, not in Sherpa culture.

*“There is not any change in the lifestyle. Before a little bit hard life, now easier. Because little bit developed. Before it was for many people very difficult for food. Many had no money, no things. Because now many tourists are coming this area, every people is getting money. Tourists coming is very good. Every people have good life, very nice. Now the young boys going little bit for the Sherpa tradition and culture, little bit going to forget. Now there is many people, young boys, they are looking European way, looking only for the business. Like learning to count the money and have stores. No interest in Sherpa culture.”*

Lama Dorjee feels also that not only the Sherpa language is disappearing, but also interest in becoming Lama is vanishing.

*“Sherpa language is disappearing also. Now many young children are talking only Nepali language. If talking Sherpa language, then they don’t listen. It’s bad. This is because more European people, more English and others. There are going more things in this area. There is also that, they are not joining lama-schools. Also disappearing.”*

Phuti Sherpa is sometimes worried about their traditions and survival of the Sherpa language.

*“Only old people have the same tradition as before, but there are coming young people with different taste and talking, trekking business. The young people go to Nepal and English languages, more interesting than Sherpa language. It worries sometimes. We teach sometimes our children about Sherpa.”*

According to Ang Kami Sherpa the Sherpa language might be disappearing amongst the younger generation.

*“Weather is same every year. But more changes in people. No more interest in farming, they are little bit going for the foreign system, good food, good clothing and things like that. Men is little bit changing, weather is similar. There are many changes in the Sherpa tradition. Now many young, only more interest in Nepali, English, Europeans like. Only the old people are still doing same things. Also is same change with the language. Sherpa language is maybe disappearing. This area also changing, many people making new...”*

I am worried about that, yes. But.”

Ang Kami Sherpa evaluates the changes in the language.

*“Now some old people are teaching Sherpa culture to young people. Sherpa language, things, culture...”*

*Sometimes talking with other farmers, people. Then Sherpa language also little bit of changing. Before, only five houses in this area, now over thirty houses and many kind of people.”*



Picture 6. Grazing Yaks.

Ang Lhakpa Sherpa has noticed that the attitude of the younger generation towards Yak herding has changed to dislike.

*“It is very hard life with yaks, but without yaks it is harder. Because if no yaks, it is hard to make fire because there is no yak shit. In the winter there is no shit, so there is no fire and warming. From yaks we get only milk, and they carry the baggage. A lot of raining, then we get a lot of milk. I make carpets from yak wool, but it takes a long time. Now here are only five families with yaks, before there was many people with yaks. But nowadays the young, the other child and young, say it is a bad thing to go with the yak. The young people don’t like the yaks, it is bad because then there is no butter or milk or yak shit.”*

Ang Lhakpa Sherpa does not have to go to Tibet anymore for salt and carry other necessary things from Jiri or Salleri. Now she can buy them from a nearby village.

*“Now after the winter when the grass is dead, then the yaks come down. Female yaks come down to *gunja* (lower camp) here and stay here for eight months and other 4 months in the *yarsa* (high camp). Male yak is little bit higher, likes higher, because the insects go into the fir. The male yaks stay 6 months in *yarsa*. The yak knows when to go to *yarsa*. Here are maybe flies and mosquitoes and then they go. They know the road, always go the same time. Depends on the grass, when it is good they stay, when it is bad they go. We have lots of yaks because we used to go to Tibet for business, but now it is cold. Before we had to get salt from Tibet and carry potatoes and other things from *Jiri* and *Salleri*. Now we get them to *Khumjung*.”*

Ang Doma Sherpa tells about the changes in the traditional life.

*“Lifestyle and culture is little bit different now, many people have good life now, clean clothes and good food. Lives and jobs are little bit easier, easy things. Farming is still same here. Now coming many things from Kathmandu and other places. Before it was hard life, in this area people eat only *tsampa* (parched barley flour) and some dry meat with salt. Sometimes eat potato. But rice only once a week or two weeks. Always mashed and potato and *tsampa*.”*

Ang Doma Sherpa is also a little bit concerned about the survival of Sherpa traditions and language.

*“There is little bit less Sherpa language, more learning in Nepalese and English, little bit going bad times for Sherpa language. Maybe children know the Sherpa tradition little less or something. I am a little bit worried about that. Only father and mother are teaching traditional things to children, some other old people.”*

Ang Norbu Sherpa thinks the introduction of electricity was a good thing for the people in the area.

*“In 1963 not so many houses here, old houses but no lodges. About 25-30 houses, now there is hundred and more. And the electricity came in 1994. Before that was one electricity down river of *Thamo*. After big flood, glacial lake outburst, came, big damage. Now is the new hydropower plant. Electricity is now very good. Everyone in *Khumjung*, *Khumde*, *Namche*, this area, have electricity.”*

5.2.2.

A personal view: Ang Norbu Sherpa evaluates the situation nowadays in Namche Bazaar

*“Everybody still have animals here. Small cow also, not so many, 2-5. And yaknak is important for the area. They have many yaks and naks. Before many people had lots of animals. Now Namche people have no animals, only lodges. Some animals are carrying luggage. Now they are moving business. It is shame to see that people are only for the tourism business. Before here were many farmers. Now all the farmers are making houses, lodges. No interest in farming. Many changes now, in tradition and everything. In peoples life. Now they don't use natural compost anymore, chemicals and such. No taste in food. People are also very weak; they get different kind of food. Now people get short life. Before people lived 80-90-100 years. Now they only more than fifty years, seventy years. Always have some stomach problems or something. For vegetables use only natural compost. For grass they use chemicals, grass coming longer. After winter they need grass for animals, every year, month, buying grass for animals. Now the yaks going up high, after they are fat and strong they come back. Yaks are used in trekking and wool is used for blankets. Every year less Sherpa language, other things more. Before many dance and chyang. Before only chyang, now whisky, red label, many kind, beer. All European countries are getting to here. Singing and dancing are disappearing. Now in schools all language is Nepali, all small children talking Nepali and English.*

*Effect of TVs and videos is for children, they doesn't do homework, no interest for school work. Only interest about the programs. One effect is for the old people, they like looking for the TV. No mantra, and no mani payment. Little bit less, forgetting they Buddhism. It worries me. Now almost all have TV. Also worrying. Now in every house there is TV. If no TV, then wife asks why we have no TV. Before only one house had TV, we give ticket and everybody go there. Now everybody have TV.*

*Because many Sherpa ladies are only working home, always wear same, traditional dress. But many boys go with trekking groups, they get some presents, jacket or something. This is more easy. Only when Sherpa festival or monastery festival, that time men use also Sherpa dress. Trekking clothes are more light and easy. Sherpa dress is big and heavy, and too difficult walk. Jacket is more easy and comfortable. Now many people are using trekking shoes, before there was one kind of buffalo leather shoe. Very tight and difficult to walk. Now easy trekking shoes are used.*

*Many words are disappearing. Like traditional clothing words, eating. Food has changed, children don't like tsampa. Only European food they like. Eat with fork and knife. Before here people doesn't eat egg, no chicken. No idea for omelette. But now everybody eat omelettes and fry eggs, like that. Children like always sweets and chocolate.*

*It is little bit crowded with the amount of trekkers, but it is difficult to do something about it, control it. Everybody gets money, now more competition. This year Edmund Hillary visited here, said control Everest, one year or two years. But this is not possible, Nepal government need the money. If controlling here, then everybody go from Tibetan side. Now still they are opening more peaks. Permit price also going little bit down, if permit price high, then expeditions go from Tibet side. And government lose money, no business here, everybody loses. Many people say, make permit less, everybody gets money. Khumbu-area and Namche area waiting for tourist, because also better business. Send your friends here. Namche people buy all food, no growing here. We think that more tourists is more important than the remaining of Sherpa culture. Send more trekkers, otherwise no good for village people. Always waiting for trekkers. If tourists don't come, all are dead meat. Now we Sherpa get good clothes, good shoes, good food. All is because of tourism. No trekkers, no expeditions come, no business and no nothing. There is worry about being so relied on tourism. If tourists don't come, there is less food, clothes, everything.” Ang Norbu Sherpa*

### 5.2.3. The impacts of tourism

Phuti Sherpa sees the tourism as an advantage for the local people.

*“Tourism is very good for Sherpa people, every one is waiting for tourists, they get money and jobs. Also the farmers get money for the vegetable, otherwise only enough to eat. Many people choose tourist side because it is easier, lodges and trekking”*

Ang Kami Sherpa evaluates the impacts of tourism

*Food coming from this area is not enough, bringing more from outside. This area people have very small farms, not enough food. Food brought from Jiri and Kathmandu. Life is quite expensive, much more expensive. Because food is carried by people. This area is*

*very expensive. It's good idea, all food imported and people living from tourism. There are lot of young people with no interest in farming.*

*Tourism is very nice, very good thing for Sherpa. Little bit a problem of losing culture but better to have tourists."*

Ang Lhakpa Sherpa highlights the importance of the tourism.

*"Now when the tourists come, it is good life. But if no tourists, there will be more problems."*

To growing tourism Ang Doma Sherpa has a clear answer.

*"More tourism business is nice, because tourists are teaching some things cleaning, cooking. Tourists are good, good business. I think everyone of the younger generation is going for the tourist business, no more yak herding and farming. Little bit difficult to say is it harmful for the Sherpa culture. Now, sometimes not sure, if tourists are coming or not. Sometimes there are no tourists coming, then always need farming, cow farming."*

Ang Norbu Sherpa remembers still how the things were in the early days with no electricity or tourists.

*"It was very difficult times here in Namche in 1963, difficult for a job. Somebody going to a Tibet for some business. After people come to expeditions, then more people are coming to trekking. Then more easy. If tourist people do not come, then for Sherpa-country, Nepal-country, it is very difficult. No any job, nothing. Now everyplace is like this, many European-people come, good business and good money. Now everybody makes big lodges. If no tourists come, then no good. All money is gone, very difficult.*

*They started building these big lodges about 15 years ago. Before, my first house was downhill. Not much room. That time mister president Jim Carter come to my home, his party in my house, Khumbu Lodge. That time, no room, all were sleeping in floor. After that many tourists came."*



#### 5.2.4. Traditional skills; predicting and reading weather

Lama Ngawang Jimba tells of his experiences and skills on weather interpreting.

*“No lamas with weather reading skills here anymore. No particular people in the village predict themselves about the weather. When there is a red cloud in the evening in the sky, then tomorrow the weather will be better, weather will be clear. And when there is wind blowing from the north side, now there is no more rain. They predict like this. And one thing, whenever the birds sing it will be good weather.*

*Some people do this in this area whenever there is a dry season. They put this, bad things or taste, something in the river. Animal skin, worms, flesh, like chyang. Sometimes when there is very dry season, people carry lama books and it starts raining, it is a peoples' belief.*

*No particular system for the place of a house, but people choose a good place. They build a field and house close to each other. The lamas choose the places according to books. When people go far away places, they look from the books which route to take. It is for important trips, to look from the text books.”*

Pasang Norbu Sherpa tells about the beliefs in the area of Mulkharka.

*“Sometimes the bear don't find any animal meat, they eat white sand. Sometimes very good quality sand people also eat. They go to toilet the same ways (as normally), they also eat some grass sometimes. When they have problems they eat also young bamboo.*

*It has been little bit hard to predict the weather for the past four five years. This year is only difficult to predict the weather. This year it has been hard to predict the weather, before that like the clouds in the afternoon evening then clear tomorrow. Children don't know these signs. When it rains, bring an umbrella; children go to their mother and father. Not anymore people who know these things in this area. Looking for the lamas for place of house and field, and some Brahmins take sand to lama and they say if you have good life. My father has taught me about medicine plants, and government*

*organise these medicine plant groups. We teach the children about the plants, but they don't learn it."*

Lama Dorjee shares his knowledge and mentions also that Sherpas use certain type of Sherpa calendar for choosing the right places for houses and the appropriate days when to travel.

*"There is not any weather reading skills. When there is today less and cloudy, then there is good weather. There is the red clouds and night, like that in afternoon, then tomorrows a good weather. If it is in the mornings like that, then afternoon and night raining. Before some lama and some people putting an animal skin in the river. But now this is not possible, now there is no, not any lama doing that. Because this is very bad for god and other. When they are doing like that, very big storm coming and big hails, washing everything. People are killed, animals are killed. Now no people doing that.*

*Everybody is doing like that. Sherpas have calendar, Sherpa-calendar. Looking for good place. Only for the lama possible to read. They look in one month how many days are bad, how many days good. Then see good or no good. After that they debate, good or no good. Good life for doing like that. Young people who don't want Sherpa culture are still doing like that. Lamas are also giving advice on travelling. It is always for long travels, but not for short. Like to Kathmandu, India or America."*

Phurba Sherpa mentions: "Only the lamas can read the book. When I make own house, lama come there with prayer flags. Lama is making more good luck."

Phuti Sherpa is familiar that if it is cloudy in the early morning there will be rains in the afternoon.

*"Travelling routes are little bit changed, because of coming trees (planted and naturally). Weather reading like early morning cloudy, raining in the afternoon. Long time lamas who could make the storm go away, but no skills anymore. Place of houses according to Sherpa-calendar and asked from the lama, maybe the young people also so."*

Ang Lhakpa Sherpa announces that if a red cloud can be seen in the afternoon, the next day's weather is going to be good.

*“Every year more and more trees and the forest is nicer, and National Park is good. When in the afternoon red cloud, tomorrow there is a good weather, if there is dark sky it will be bad.”*

Ang Doma Sherpa possesses the same knowledge.

*“To predict weather like if it is very hot in the morning, afternoon or night and tomorrow is raining. Sometimes if clouds are red in afternoon, then tomorrow is good weather. Only this kind of things.”*

#### 5.2.5. Changes in the traditional travelling routes

Ang Kami Sherpa mentions that the old travelling routes have changed because of the new forest growth.

*“In travelling routes now also many changes, because new forest coming. Always changing. After few years maybe life bit harder. Because of National Forest, always forest. Little bit difficult for animals to find grass. In monsoon they are going very high. Not higher than before.*

*Thinking about if bus coming and road coming here, no job for poor people. Because bus then carrying all things.”*

Ang Doma Sherpa says there is a change in the travelling routes because of erosion. She also wishes that the glacial lake would not burst again.

*“Travelling routes have changed because of landslides. Before route went down on this side, now on the other side. People in this area have owned three houses, in winter when snowing here, people go down and living there. During monsoon, people with yaks and sheep, they are going higher. There are also other houses. People who lived down there, in the now deserted village, had also houses here in Thame.*

*No idea about the future, will these changes (e.g. weather getting warmer) have any effect. Maybe if every year going like that, then some effects. It worries that glacier lake not full, maybe bursting again. But there is nothing to do about it.”*

#### 5.2.6. Changes in the relations to mountains

Would Sherpas climb mountains if it were not for these mountain expeditions? How are the relationships between the Sherpas and mountains in these days?

*“We have special hills, one village have one mountain god. We say ylha, Numbur is our ylha, so we pray for the mountain. Sherpa people climb mountains because they want to earn money, but some do this for own interest.” -Lama Ngawang Jimba*

*“In bad times we pray for the mountain gods. Children don’t know these things. Our holy places are Numbur and Pike Peak.” -Pasang Norbu Sherpa*

*“Still there are good relations for the mountains and Sherpa people. When there’s, sometimes changing many things, long travel also. Some put praying, thinking about hills. Putting also prayer flags. No tourists and no other people, then no Sherpa climbing the mountains.” -Lama Dorjee*

*“Good relations with the holy mountain. Climbing mountain is living for many Sherpa, climbing with the tourists. Very rich Sherpas do it also for fun.” -Phuti Sherpa*

*“Still serving the good relation, mountain and people of this area. Some hills are hills, and they go every year there and put new prayer flags. And now they teach young and they do the same. Before there is lot of, only greetings in Sherpa language this area. Only going for monasteries and learning for Sherpa culture. Now always going in English and Nepalese language. Sherpas climb mountains only with tourists.” -Ang Kami Sherpa*

*“Still every people have good relations to the mountains, holy hills. Not sure about the children.” -Ang Doma Sherpa*

*“Relationship with the mountains is still the same. Now there is more, every village putting up prayer flags. Before little bit less, but now more. Good relations.*

*Now mountain climbing is very easy, before no idea, no experience. Now we have good experience, good techniques and good equipment. Before many people lose fingers, many accidents. Now there are fewer accidents. Before stronger was better.*

*No possible for only Sherpas to climb mountains. Sometimes some rich sponsor, then just Sherpas. But otherwise only climbing with tourists. Now this year two different new records, 12 and half ours base camp – top – base camp, and then 10 hours same.*

*Too many people (in high season), many people, some get robbed. Also equipment makes climbing more easy, many people successful. Good road going to summit.” -Ang Norbu Sherpa*

#### 5.2.7. Introduction to electricity

In the Solu-Khumbu region, the introduction to electricity to some due to solar panels and a hydropower plant in Thame has meant a change in their traditional lifestyle./1/

*“The electricity here is still not enough, so we use wood to cook our meals. But when there is good electricity we use it, and save the wood, maybe afterward there will be electricity for the school...they are conscious people here. They are making a new power plant to the river down there, down hill from this school.”- Lama Ngawang Jimba*

*“We have a power plant just behind these buildings. It gives electricity 24 hours. They use more times electricity for cooking, sometimes when big groups and more people they use wood. Electricity is easy and very nice. Saves the trees. Power is still small, when we get bigger power, then we don't have to use wood anymore. There are plans for bigger electricity.” -Lama Dorjee*

*“Some solar power is used by the rich people. It would be good to get electricity for cooking and other things. For children to do their homework. It is possible to get hydropower from the nearby river, but there is no idea, and there is not money.” -Phuti Sherpa*

*“This area has no electricity (line), only solar power, only for 2-3 years. I would be very happy about good electricity. Now give for some person other for government, but still no hope. Sometimes people just coming and checking and just going away. Electricity is very important for this area. Rich people have solar power, but poor people can't. Government not looking. Electricity only for people living more down, some donations. Not much interest in government about building electricity. Government might give some money, but people put it in their own pocket. That's bad. Always development and poor people lose.” -Ang Kami Sherpa*

*“Not many bad things for people from the hydropower plant, sometimes animals happen to drop in to the canal like the cow you took out yesterday, also baby animals.*

*Electricity brings very nice feeling, good life. And they see television and videos. They use heater for cooking. Electricity also used for cooking. Very happy with the electricity. Everything is different, electric heater is very easy and more clean. All health better, otherwise smoke affect eyes. And others. Sometimes little problems with the landslides.*

*Money we pay for the electricity is going for new plant and such, some money deposited in bank. Now needing more power, after more money, they build new generator. Now guaranteed only for 20 years. All houses in this are have electricity. Something like 35 houses.” -Ang Doma Sherpa*

### 5.3. Interrelations between the observed changes?

The surveyors posed a question if there can be seen any links between all of these happening changes?

*“This is, there is no link between changes. Because there are more people and other things. There is not any problem with the changes, only something running in jungle. When they are coming in night.(tigers in the jungle)”-Lama Dorjee*

*“Mosquitoes appearing here is because of the temperature, they are active in the summer but not active in the winter, but not so many mosquitoes here. People say that we have mosquitoes here. The deer are safer near the house and people, if much snow they come to village, but it is not because of the temperature. It is good to have deer around, because of balance, but for the farmers it is little disturbing. Because they come near the house and eat potatoes and plants. But for the environment is good.” -Lama Ngawang Jimba*

Table 3. Observations of the changes in the Sherpa Culture in the Solu and Khumbu regions. (Yes= change, No= no change,NA=not asked;+= more in the quantity,-=less in the quantity, +/- =occasionally more/less; Descriptive information is also mentioned in some cases;(/) =how many out of the questioned shared the same observation)

CHANGES IN THE SHERPA CULTURE										
The interviewed	Language	Customs	Traditions	Dress	Source of livelihood	Knowledge of holy places	Food	Introduction of western commodities	Knowledge of spiritual skills	Concern of passing the knowledge/skills to children
Lama Ngavang Jimba	Yes -more Nepali	NA	Yes -move to towns	NA	NA	No 0	Yes -cauliflower, potato	Yes -electricity	Yes	NA
Pasang Norbu Sherpa	No 0 -elders teach	No 0 -elders teach	No 0 -elders teach	NA	No 0	Yes	NA	Yes -tape recorder	No 0	Yes
Lama Dorjee	Yes -disappearing	Yes	Yes -somewhat	Yes -looking European	Yes -tourism	NA	Yes -new crops	Yes	Yes	Yes
Phuti Sherpa	Yes -more into English	Yes	Yes -only old people maintain	Yes -different taste	Yes -tourism	No 0	NA	Yes	NA	Yes
Ang Kami Sherpa	Yes -into English	Yes	Yes	NA	Yes -foreign things	NA	NA	Yes	NA	Yes
Ang Lhakpa Sherpa	NA	Yes	Yes	NA	Yes	NA	Yes	Yes	NA	Yes
Ang Doma Sherpa	Yes	Yes	Yes	NA	Yes	No 0	Yes	Yes -TV, video	No -children do not know	Yes
Ang Norbu Sherpa	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Overall	Yes (6/7)	Yes(6/7)	Yes(7/8)	Yes (3/3)	Yes (6/7)	No(3/5)	Yes (5/5)	Yes (8/8)	Yes (3/5)	Yes (7/7)



#### 5.4. The overall changes in the Sherpa culture

Table 3 shows that a lot of changes are taking place in the Sherpa culture, where many have observed changes in the language, as the younger generation is introduced other languages(English, Nepali, and other foreign languages). Changes in the traditions and customs are also changing , more and more people get all ,or part, of their livelihood from tourism. A change in the traditional food and clothing style is seen. The relation to mountains has not seemed to have changed, while the changes in spiritual skills is somewhat changing. All of the interviewed people have had contact with western commodities. A concern of the passing of the knowledge and skills of Sherpa culture to the children is clear.

#### 6. DISCUSSION

The scientific studies (e.g. temperature monitoring) imply that the worldwide average temperatures are constantly increasing in the long run. The same applies for the Himalayas and the Solu-Khumbu region where all the interviews took place./11/.The interviews and more precisely the observations of the people inhabiting the Solu and Khumbu districts reveal that all of the interviewed people had witnessed changes in the temperature, and according to their observations it may be now a little bit warmer than before. According to Miller warmer temperatures increase the amounts of evaporation and therefore increase also the precipitation./6/ The interviewed people in the Solu and Khumbu districts also confirmed that there have been changes in the rains, majority saying that there are more rains than before. Also changes in the texture and amounts of snow came up.

It is estimated that the Himalayan glacier could vanish in the next 40 years. A lot of studies have been made by The International Centre for Integrated Mountain Development (ICIMOD) about the glacial lake formations and glacier melting in the Himalayan region./13/ The scientific consensus is that the melting is evident. In the interviews it came up that the ice cover is less and the glaciers in high altitudes are melting. The observations of the glacial lake formations (mostly due to glacial lake outburst floods (GLOFs)) were also noticed.

In the mountainous areas the *flora and fauna* often varies with altitude and even small changes in the altitude can mean variations in the plant and animal life. This is mainly due to vegetation, climate and soil. However when the climate changes, in terms of warming, it can mean that the certain altitude *flora and fauna*, could be introduced with plants and animals that usually inhabit the lower altitudes./5/ The interviewed people had not witnessed significant amounts of new animal or plant species, but they had noticed that some plants are growing better and nicer with greater quantities, and on the other hand more animals have been observed. It is also very noticeably that certain animal species, e.g. Yak, mountain goat, are now going to more and more high in the altitude. Also in some areas it was found that there are more mosquitoes and flies.

The observations or TEK the local people had and the scientific research of the climate change in the Himalayas seems to support each other more or less. We have to though remember that some of the witnessed changes can reason from other sources. E.g. the amounts of the plants and animals in some areas most certainly reason also from the creation of Sagarmatha National Park, which bans the hunting and unauthorised tree cuttings etc.

The Sherpa culture is witnessing many changes at the moment, besides the possible climate change and the changes can both be of good and bad. Increasing amounts of tourists/trekkers are rushing to admire the pristine nature of the Himalayas and at the same time influence the local people by bringing a lot of things and ideas with them. As the survey focused also on documenting the TEK, questions of Sherpa culture and tradition emerged. As a result lot of the interviewed told they were worried of the continuation of their traditions and customs. Concern was also detected in the survival of the Sherpa language and more or less the Sherpa way of living. The connection to the culture loss due to climate change is though harder to detect.

## 7. CONCLUSION

To answer the question on whether there has been changes in the environmental, socio-economic and cultural matters in the lives of the Sherpa population in the Solu- Khumbu area: Yes there has and there is.

All of the changes are not though addressed by the climate change, but of tourism, westernisation and education.

There are direct environmental changes that derive from the global warming like the glacial lake outburst floods (GLOFs), and the fact that it is easier to move in the higher regions now when there is not that much snow and ice. The trees and plants are growing faster and nicer.

The biggest contributor of change in the economic sector is, in my mind, tourism. The warming as such does not pose any big threats to the economy of the originally nomadic Sherpas. The thing is that life has come easier for most people in the area because of “westernisation”. Another thing is the still partly nomadic yak herders. The animals are going higher and higher now. Is this warming going to be the end of yak, this strong carrier that cannot go below certain altitude or it dies. Does the warming have an effect on the thickness of air, this we don’t know, but for sure we can state that the people dependent on the Yak will face drastic effect when the climate warms. And if the Yak herding comes to its end because of the warming, it is a change in the traditional, cultural and socio-economic sector.

The culture and the language of the Sherpas are according to the interviewees facing hard times. The younger generation is not interested of the matters. I guess the same phenomena can be found all over the world. Young people are not the same as the old. “The life is easier now”, like one of the interviewed mentioned. Some words are disappearing and the traditional dress is worn by fewer among the young. The concern of the continuation of the Sherpa is strongly present.

To cope with the problems that the climate change poses there are not many solutions. Fortunately the plantation of trees has started in the hilly and mountainous regions of the Solu-Khumbu, to prevent erosion and to slow down the floods from the glacial lakes. Also introduction of hydro energy power plant in Thame has helped to prevent tree cuttings.

For the global warming itself the Sherpas can not do much, since much of the greenhouse gas emitters are in the developed western societies that by their ignorance affect the whole world. The most effective means to stop these climatic changes would be to set clear restrictions of emitting greenhouse gases to the atmosphere. This at the moment does not though seem to be realistic. Fortunately there are studies of the glacial lakes which make it easier to predict when potential danger is present; that in a case of outburst even some people's lives could be saved.

However the Sherpas have lived from the surroundings of Solu-Khumbu region since their migration started from Tibet hundreds of years ago. A Fact is that even though they (Sherpa people) are in the midst of a great deal environmental, socio-economic and cultural changes, in the end they are the ones who have lived off the nature and survived, and therefore in my opinion the ones that need to be taken into account as experts of their environment. In consideration that often the scientists who come to the area, and are not from the area, it is needless to say that the information that comes out of the study is more of quantitative character. A great way to deepen this (study) is to hear also from the inside. In such a way it is also understood what are the greatest causes of concern in the area and what can be done to them. By doing so it is action not only on the global level, but on the local level as well.

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## 9. APPENDICES:

### Appendix 1- Mountain knowledge project

#### Questions for the interviewed

1. Have you seen any changes in the weather conditions in this area?
2. If yes, what kind of changes and when?
3. Have you seen any changes in the ice; lakes, glaciers etc.?
4. Are there any changes in the permafrost?
5. Have you seen erosion on the river banks?
6. Are there any changes in the amounts/ texture of the snow, ice, rain?
7. Has there been any unexpected natural incidents, like snow/thunder storms, heavy rains?
8. Have you seen any changes in the winds or clouds?
9. Have you seen any changes in the animals (Yak, sheep, deer, other)?
10. Have you seen any changes in the birds?
11. Have you seen any changes in the insects?
12. Have you seen any changes in the plants (trees and tree line, grasses, flowers, medicinal plants)?
13. Have you seen any new animals or plants in the area?
14. Have some animals or plants disappeared?
15. Are there changes in the availability of drinking water?
16. If yes; why do you think there is a change?
17. In your opinion, what causes these changes?
18. Do you think these changes are linked to each other?
19. What kind of effects these changes have to your traditional lifestyle?
20. What kind of effects these changes have to your local culture?
  
21. What kind of effects these changes have to your language?
22. Are these changes taking place on certain locations (travelling routes, grazing areas, rivers or lakes)?
23. How do these changes affect your daily life?
24. How are you handling these changes in your life?
25. Is there something that should be done to stop the changes?
26. Do you have weather reading skills, to see what the weather will be tomorrow or day after tomorrow?
27. Do other people have weather reading skills? Or weather control skills?
28. How have you chosen places for houses, fields, grazing areas?
29. How have you chosen travelling routes?
30. Has there been any change in the relation to mountains?
- + (31) Would the Sherpa people climb the mountains, if there weren't these climbing expeditions?