

Draft Inception Report

SDPI

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SDPI
Sustainable Development Policy Institute



*UNEP-CKNP Ecosystem Assessment Project in
joint collaboration between UNEP and SDPI*

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Executive Summary

The inception report provides a contextual overview of the key climate change issues threatening the environment and ecosystem of the CKNP region. The report is based on the review of literature covering prior studies carried out by different organisation in and outside the CKNP region; preliminary field visit conducted by a team of environmentalists of SDPI; and an inception workshop attended by experts from various organizations having common interest on the issue of climate change. The inception report is designed to outline research methodologies and analytical tools and presents a review of the preliminary study undertaken by a team from SDPI to comprehend the extent of climate change effects on the socio-economic sector in the CKNP region.

This report primarily comprises the contracted deliverables stated in the Terms of Reference for the project. A comprehensive project programme and confirmation of methodological approaches are provided in the report to be pursued by the UNEP-CKNP-SDPI team. The report also outlines details of the Inception Mission to be executed as part of the project. The inception report encompasses the following activities related to the proposed project:

- i. A work-plan/statement of work.
- ii. A detailed schedule of work and project execution methodology.
- iii. Project budget details.
- iv. The professional expertise of the staff detailed for the project execution along with their roles and responsibilities.
- v. A brief on all appropriate tools and techniques to be used for conducting the study in the local context given the important physical characteristics of the CKNP region such as topography and large size of the area.
- vi. The report inter alia indicates the expected variance in the work plan that may pop up owing to differences between actual conditions and what has been anticipated.
- vii. Recommended modifications are also suggested in line with the Terms of Reference to improve the utility of the work output.

This inception report is supplemented with the description of the strategically important aspects of the study. The report is based on the Work Package methodological approach which encompasses a comprehensive plan outlining each and every minutia of the work plan. The report also identifies the potential risks, challenges and opportunities that may arise during the execution of the project.

1. Introduction

1.1. Context of the Project

The central Karakoram region lies in the Northern Area of Pakistan. It has an area of 10,000 square kilometers and it is the biggest national park of Pakistan. It falls into the administrative boundaries of districts of Hunza, Gilgit, Skardu, and Ghanche. The Central Karakoram National Park (CKNP) further comprises of Baltoro, Panmah, Biafo and Hispar glaciers and their tributary glaciers.

It is a mountainous area which is endowed with captivating natural beauty, rich biodiversity and wealth of natural resources including the forest resources. It was officially declared as a National Park in 1993. A populace of approximately 211,475 with an average household size of 7.9 persons is located in areas adjacent to CKNP.

CKNP is one of the national parks that fall under the responsibility of the Forest Department, an attached department under the Directorate of Parks and Wildlife. The Northern Areas Wildlife Preservation Act 1975 is presently applicable to govern the CKNP ecosystem. Moreover, The District Forest Officer of the Northern Areas is the Ex-Officio Director of the CKNP. The institutions responsible for its protection, management and conservation include the Aga Khan Rural Support Program (AKRSP), IUCN, and the World Wildlife Fund. However, there are a number of smaller NGOs working within or in adjacent areas of CKNP on a range of conservation initiatives.

Presently, the CKNP ecosystem is going through a chaotic situation where there is neither physical indication on the ground nor public awareness on the ground to suggest the real/true existence of CKNP. Climate change has been affecting the socio-economic and environmental conditions of the CKNP region; and has impacted the way of life of the region's inhabitants. Some of the changes are causing irreversible damage to existing system in place, which presents a tremendous risk to the survival of the region's flora and fauna; and in some places even human beings.

1.2. Project Background

The EV-K2-CNR of Italy and United Nations Environment Programme (UNEP) have collaborated to develop the Karakoram Trust Project. The project has been approved by the Government of Italy for implementation. It will help advance the goal of sustainable development in the Karakoram region and developing a comprehensive knowledge management and integrated management plan including the environmental monitoring system pertaining to the region. The aim of the project is to consolidate the coordination of efforts and initiatives, enhance the decision making system, strengthen the institutional mechanism for better management of CKNP and improve the capacity of local communities and institutions to deal with climate change.

The UNEP-CKNP project aims at encouraging the development of a holistic ecosystem approach by providing valuable data to the decision makers. The assessments thus obtained would help identify vulnerable communities and regions that need policy focus for conservation of biodiversity and local ecosystems. A lot more remains to be accomplished in order to promote policy formulation to take into account the state of the region's ecosystems. This research will help generate a better understanding of the social phenomenon behind the effects of climate change.

1.3. Importance of CKNP Region

The CKNP is an important region for its unique ecosystem including some of the highest glacier peaks of the world having spectacular trekking touts as well as access to major

peaks. The unique biodiversity, distinctive local culture and wilderness make CKNP an attractive destination for around 4,000 visitors per year. CKNP is known to be the largest and most extensive glacial systems outside the polar region.

K2 (8611m) stands as the second highest peak in the world and is the center piece of CKNP. The national park also encompasses the greatest concentration of high mountains on planet earth. Some of the world's most famous mountains including Gasherbrum, Broad Peak and Masherbrum are located within the park's boundaries. Besides, there are sixty peaks over 7,000 m that are part of the national park's geography. Around 60 to 70 mountaineering expeditions to the Central Karakoram each year are attracted by the cluster of peaks, many of which river vertically from the valley floor for over 5,000 m.

Due to its physical importance, the park is a significant refuge for a number of endangered species such as snow leopard and markhor. Various mammal species also inhabit the region including ibex, blue sheep, brown bear, musk deer, long tailed marmot, markhor, Tibetan wild ass, snow leopard and wolf. Systematic surveys are still required to figure out the status of these species in the park.

1.4. Access to Baseline Information

A number of organizations have been actively working in the CKNP region over the past few years. By virtue of their work, a number of reports covering the socio-economic and environmental state of the region have been produced. These reports need to be compiled and mapped out according to the indicators that have been prepared. The basis of the ecosystem assessment must take into account existing data, which has been collected and compiled over time. There are number of organizations working in the different sectors in the CKNP region. Preparation of a bibliography on this would help spearhead the preparation of the final report on the project. In order to collect indicators in the economic category, organizations such as the Federal Bureau of Statistics, HIES and DHS could be engaged in the project. The size of the population would also be determined from the population census carried out in the region. The Economic Affairs Division possesses data indicating a district wise productivity of the sector. It is necessitated that the project should focus on acquiring anecdotal evidence from the informal sector and should be split into different sectors: vegetable, fruit and transport etc.

The inception workshop held under the project already highlighted the need to effectively collect and compile data pertaining to the different indicators that are required for the ecosystem vulnerability assessment.

2. Project Terms of Reference

2.1. Overview

The UNEP-CKNP Ecosystem project was signed on the 22nd of March, 2011 by Mr. Young-Woo Park (Regional Director, UNEP-ROAP, Thailand) and Dr. Abid Suleri (Executive Director, SDPI, Pakistan). Both the agencies nominated Mr. Shakeel Ahmad Ramay (SDPI) and Dr Haruko Okusu (UNEP) as focal points to the project. Funds received from UNEP will help smoothly carrying out the project activities and contribute to achieving the project objectives. UNEP and SDPI will mutually cooperate to monitor progress of the project. The signing of this agreement delineates fostering of cooperation between UNEP-ROAP and SDPI, whereby policy making is encouraged through exchange of information on the environment of CKNP region. The purpose of the study will in essence help support implementation of the Karakorum Trust Project.

UNEP's role involves encouraging and coordinating sustainable development activities within the paradigm of the world's environment. Having a global reach, UNEP works with a number of organizations particularly the sister UN bodies, civil society, private sector, non-governmental organizations and the government. UNEP's work includes the following (UNEP, 2011):

1. Undertake an evaluation of the state of the regional, national and global environment.
2. Consolidate collaboration with different entities working on the sphere of environment.
3. Enable an exchange/transfer of information and knowledge pertaining to the environment.
4. Foster partnerships with civil society and the private sector.

The development of an agreement on a global policy depends primarily on information pertaining to the global environment and the issues of concern that arise from time to time. UNEP brings into focus the pressing issues pertaining to socio-economic sector at the national and international platforms. This organization engages in activities that include executing an analysis of the state of the global environment and exploring the regional trends about environment. This project will help boost greater collaboration between all the entities working in this sphere. UNEP supports organizations that are working in development and are actively engaged in promoting environmental objectives.

It is in this light that UNEP is pursuing SDPI's involvement in the ecosystem assessment in the CKNP region owing to its prior experience with projects on climate change.

2.2. Project objectives

The objectives of the project include:

1. Examination of the knowledge base that includes historical climate information, coping strategies and local capacity to deal with the potential impacts of climate change. It has been observed that there is a strong relationship between the ecosystem components and the state of human development in a region (Diversity, 1993). The interaction between individuals and their natural systems needs to be studied in detail, as it is the connection that determines survival of the future generations. It is envisaged that a network of experts hailing from different backgrounds and who had worked in the CKNP region for a long time can be created in order to benefit collectively from the vast wealth of information held with them.
2. Understand climate change scenarios on the hydrology and the mountain ecosystem.
3. Identify vulnerable ecosystem components, including infrastructure and local communities, to understand impacts of climate change and its variability.
4. Examine and quantify the magnitude of social, environmental and economic changes likely to happen in CKNP.
5. Identify and assess a suitable mitigation and adaptation scenario, whereby suitable mitigation and adaptation are prioritized according to their effectiveness. Inclusions of programs that may help reduce climate change threats; associated cost and potential within an institutional framework of the CKNP.
6. Analysis of the capacity of the Pakistani authorities pertinent to CKNP to manage climate change effects in line with best international practices.

7. Propose pilot projects with significant effective adaptation strategies.

2.3. Project purpose

1. To capture baseline data for monitoring CKNP environmental quality.
2. To promote better use of CKNP natural resources.
3. To improve consideration of the need to manage and conserve CKNP resources in physical development plans.

2.4. Project expected results/outputs

1. Draft inception report reflecting the scope of work, work plan and feedbacks from the inception workshop.
2. Draft comprehensive assessment of ecosystem vulnerability to climate change in the CKNP.
3. Proposal for the series of actionable pilot climate change adaptation projects.
4. Organizing at least four meetings and workshops: inception workshop, final workshop and two consultation workshops.
5. Publication and launching of the media kit: 100 copies of flyer in English, 400 copies of flyer in local language, 100 copies of short awareness raising documentary (dubbed in English and local language).

3. Project Team and Staff Details

Name of expert	Position	Specialist areas of knowledge
Amb. Shafqat Kakakhel	Advisor	Environment
Shakeel Ramay	Team leader	Climate change environment and Economics
Sajida Naeem	Research Associate	Environment, Ecology
Dr. Vaqar Ahmad	Advisor	Economic Modeling
Zuhair Munawar	Research Assistant	Climate Change
Anusha Sherazy	Research Assistant	Environment

4. Research Methodology

The research methodology adopted in this project is consists of different phases each culminating in a certain deliverables followed by a final project report. The research and analytical methodology of the study is envisaged to be conducted using three fundamentals – quantitative and qualitative assessment tools, and consultations with stakeholders. However, the

research methodology is predominantly based on the quantitative and qualitative data collection and analysis techniques as significant amount of data would be based upon the personal/subjective opinions and views of the local inhabitants obtained during field visits. The interviews with locals will be treated as primary source of information and the previous data held with the collaborators (government, UN, and Non-government agencies) on this subject will be considered as secondary source. The secondary data is presently available in the form database, surveys reports, research findings, documents and publications held with different organization. All efforts will be made to get access to data archive of different organization working on the same subject/issue. The access to secondary data may take considerably less time as compare to collecting the primary data. During the data analysis phase of the project, a critical comparison of the primary and secondary data will be carried out for validation purposes as well as to find the key relationships among both the data sources. Furthermore, this research is not only focused on qualitative research techniques but also takes into account the quantitative analysis methods for evaluating any form of numerical data pertaining to the issue of climate change obtained from the field surveys. In this regard, the field visits would help to collect and subsequently integrate all information that could used to gauge the effects of climate change in the region. During field surveys, three hundred households will be selected as representatives of the whole village present in a certain region. It will also entail venturing out to specific communities and their selection would be based on a on certain reasonable criteria, which is discussed later in this report.

Research based on the collection of anecdotal evidence will be conducted to examine the climate change impacts on the region. The study of perceptions and opinions from the local community would be useful in understanding the effects of climate change on the local economies of the region in general and the livelihoods, agricultural practices, forests, animal and plant species and hydrological cycle in particular. It will provide an overview of the perceptions of individuals about the changes that have been inflicting their lives. The project will also involve conducting of focus group discussions and interviews with local inhabitants, key informative and government officials. The methodology for the project would also employ examination of existing data and knowledge on key indicators pertaining to the ecosystem vulnerability assessment. The research cycle adopted for the project is illustrated in Fig. 1.



4.1. Study Indicators

Specific indicators have been identified that need to be thoroughly studied and evaluated during the course of the literature review and consultations with the collaborators. The main indicators include: climate; land use change; cryosphere; water resources; ecosystem function and services; biodiversity and ecosystems; risk and hazards; health determinants and outcomes; mountain economies; and society and environmental change. In addition to the specific indicators proposed, more general and macro indicators may be used for contextual purpose. As such, while most of the indicators will be uniformly assessed, certain indicators will only be used when appropriate for ascertaining impact assessment of the other indicators. A detailed description of these indicators is provided in Appendix III.

4.2. Inception Phase

The inception phase of the project involved apprising all appropriate stakeholders, having specific interests in the CKNP region, about the projects objectives and work plan. All aspects of the project have been prepared and clarified in more detail in the inception phase. Information has been gathered to help produce a more detailed review of available literature and databases on CKNP. The collected information relating to CKNP has been found quite helpful to support the methodology and designing the training and knowledge exchange programme for this study.

4.3. Inception Mission

The primary objective of the Inception Mission is to validate the scope of the project and to develop a detailed work plan and statement of work for the project. Secondary objectives are to meet the stakeholders, gather information regarding the scope of work and make logistical enquiries for the field visits.

Specific outputs required of this task are a draft inception report and a preliminary work plan for executing the project.

Specifically, this sub-task focused attention on producing the following:

1. Revised Work Plan
2. Revised Work Schedule
3. Validation of professional staff assigned to the project and description of their duties
4. Advice on the most appropriate tools and techniques to be used to conduct the exercise in the local context; and
5. Preparation of a report based on outcomes of meetings and discussions outlining the above tasks.

4.4. Inception Workshop

An Inception Workshop was held on the 14th of June, 2011 at SDPI premises. The participants in the workshop having varying backgrounds represented a range of different institutes including Pakistan Foreign Service, Embassy of China, WWF, CKNP Directorate, Karakoram International University, Allama Iqbal Open University (AIU),

EV-K2-CNR, Global Change Impact Study Center (GCISC), P, Planning Commission of Pakistan, Project SEED and Mountain and Glacier Protection Organization. Summary of Proceedings of the Inception Workshop is provided in (Appendix 1)

4.5. Literature and Database Review

A range of published reports and digital data has been collated for the project. A list of documents that need to be consulted to assess their potential relevance to the project has also been prepared. The UNEP-CKNP-SDPI team has reviewed the literature and database information in detail that unanimously agreed upon considering CKNP within the geographical area under study. The purpose of literature review was to ascertain the extent of CKNP environmental damage from the available information in order to support the field visits. The similar approach was used to review the documentation provided to the UNEP-CKNP-SDPI team and is suggested to be employed for evaluating the initiatives that are presently being supported by UNEP to address the issue of Land-Based Sources and Activities of environmental pollution. The project is targeted towards improving management of ecosystem in and along the CKNP.

A number of contacts at national level were identified to help obtain the base data (secondary data). The list of agencies contacted is as under:

1. Pakistan Foreign Service
2. Pakistan Meteorological Department
3. International Union for Conservation of Nature (IUCN)
4. International Centre for Integrated Mountain Development (ICIMOD)
5. Embassy of China
6. World Wide (WWF)
7. CKNP Directorate
8. Karakoram International University (KIU)
9. Allama Iqbal Open University (AIU)
10. Global Change Impact Study Center (GCISC)
11. Everest-K2 CNR Committee ((EV-K2-CNR)
12. Pakistan Agricultural Research Council
13. Planning Commission of Pakistan
14. Project SEED

15. Mountain and Glacier Protection Organization (MGPO).

Once the data sources were identified, the UNEP-CKNP-SDPI team met the technical resource persons of the aforementioned agencies. This sub-task resulted in the production of a standalone document clearly outlining the appropriateness and usefulness of available information, data and reports from the identified manuscripts.

4.6. Partner/Collaborator meetings

At the start of the study, a preliminary field visit was made to the CKNP region. A number of local individuals were interviewed to acquire their perceptions about changes that have happened in the region over the past few years. Furthermore, a number of places of interest were also visited in the Skardu district. The researcher met the prominent individuals and office bearers of the organizations that have been working in the region and have built a substantial knowledgebase on the region. An effort was made to consolidate connections with the individuals and organizations so as to pave way for collaboration in the future.

During the FGDs conducted at the inception phase of the project, it became apparent that it was important to understand how a community used to link effects of climate change on its life in a certain region. By further consultations, it would become apparent what sectors the community regards as being mostly affected by climate change. It would also be pertinent to analyze whether similar perceptions prevail in other communities or have they been impacted differently in different regions.

In order to gauge the traditional customs inherent to adaptation to change, locals will be interviewed to recall their experiences and previous knowledge on our subject of interest. The individuals from various communities will be asked about the livelihood, resource management and crop diversifications strategies available to them (ICIMOD, 2008). Their views will be sought about how changes in crop yield have affected their culture and whether they are increasingly referring to cultural practices of the past to deal with these effects.

The research method of Focus Group Discussions (FGD) can be adopted for getting an array of views on a particular topic. However, only the FGD views do not suffice and in no way the interviews taken of certain individuals can be outdone as they have their own worth (Morgan). One advantage of pursuing an FGD approach is that within a limited span of time, a large amount of data and inferences can be collected on a particular subject area; and it is easier to observe interaction on a specific topic. The methodology here do not stress greatly on participant's behavior, as the data to be obtained is rather personal expressions or point of views on the effects on individual's life presumably due to climate change. Group discussions generally proceed in a smoother fashion as compared to individual interviews. The advantage of group discussions is that it is a better option as compared to individual interviews in terms of time saved in conducting them. An interview with only one individual has risk of being marred with his/her biases on the topic. It is contended that individual interviews and group interviews produce differing results, which poses the issue of credibility of either approach; the age group and gender of respondents has an undue effect on this aspect too. Therefore, interviewers need to be more careful in order to achieve better efficiency using this approach to acquire data.

4.7. Data Collection/Field Visits

The field visits to the CKNP region are planned to obtain first hand information of the issue of climate change and its effects on the community lives as well as the ecosystem. The team of experts will collect information pertaining to ecosystem health and quality; and prevalence of disease in the area. For smooth execution of the field visits, enumerators belonging to the CKNP region have been hired for better communication with the local inhabitants. The services of the enumerators have been arranged by the WWF and will be fully trained on filling up the questionnaire before the start of data collection process through the field visits.

The field visit is planned in order to collect relevant data in the CKNP region whereby the community engagement process would facilitate the data and information gathering stage of the project (Khan & Ali).

A questionnaire has been formulated that encompasses a number of different socio-economic and environmental aspects that need to be analysed. The questionnaire is designed on the basis of primary indicators identified in the inception phase and aims at collecting specific information on the apparent climate change effects taking place in the region. In order to create a conducive atmosphere for information collection, the help of local enumerators is needed to be summoned in order to facilitate the interviewing process. Nonetheless, it is very important to devise the context in which to put forward the specific questions to different communities. Different constituent councils of the CKNP region would need to be visited and the representatives of the areas would need to be consulted with regard to share their observations and experiences of the effects of climate change in the region.

The questionnaire is targeted towards seeking qualitative responses; many of the questions could lead the interviewers to put forth an additional set of questions to the respondent, therefore, through this practice, a comprehensive examination of the indicators in question would be obtained. Furthermore, the responses to the queries laid out in the questionnaire would help generate a better understanding of the phenomenon of climate change, especially on the lives of the inhabitants of the region. It will provide an overview of the perceptions of individuals on the change that has been inflicting their lives. It is expected that the field visit would help integrate all the requisite information that could be helpful to gauge the effects of climate change in the region. In this regard, it is necessary to ensure that the locals selected for the interviews are a representative sample of the populace. This essentially means that the interviewees must reflect the inclinations and views of the parent population. It also calls for determining a suitable size of sample that would be interviewed. In order to choose a representative sample from the CKNP populace, the following factors has been taken account of:

1. The sample source should reflect the total population.
2. The selection of a sample must be done such that it reflects the target population.
3. Research survey design has been repeatedly refined, so as to eliminate any bias inherent to it.
4. The survey necessitates inclusion of large number of individuals to be interviewed in order to reduce the chances of exclusion of non-response questions and biased opinions of some individuals on certain issues.

The specific questions are included in the questionnaire that encapsulates social, environmental, governance, economic, demographic and climate change categories. Within each of these categories, there are a set of indicators that need to be studied. The means to obtain this valuable information could be to put forth questions corresponding to each indicator to those being interviewed. A rigorous attempt has been made in minimizing any type of bias that may arise in the formulated questions. The preliminary questions about an indicator seek generic response about the state of a particular indicator; however the response can lead to the putting forth another allied question, which may better reflects the probing stance inherently desired for field work in the CKNP region. Additionally, the questions can antecede certain questions that necessitate further explanations from the respondents. By virtue of the responses gathered from the respondents, the observations about the indicator can be gauged in a more effective manner. If there is a specific hypothetical question that needs further clarification then it must be precise and should to be asked in stages. A considerate endeavor has been made to integrate the aforementioned approach in the formulation of the project's questionnaire. The primary aim is to make the hypothesis quantifiable and focused to acquire a better understanding of the context for which the specific questions are formulated.

The questionnaire will not be directly handed over to individuals rather they will be interviewed instead by the experts who will fill in the questionnaire themselves. This is mainly because the questionnaire is in English and will need to be translated into Urdu/local language by the interviewer.

The perceptions of individuals on the socio-economic and environmental frameworks of their livelihoods can play an important role in the formulation of appropriate adaptation strategies. The information gained can be useful in channeling together efforts of the local government authorities and communities to be better adjusted to changes in the region.

4.8. Campaign and Campaign Material

Once the primary and secondary data related to the climate change effects has been obtained, it will be analysed quantitatively and qualitatively; thus depicting a clear picture of environmental impacts on the communities of CKNP region. After obtaining relevant climate change information pertaining to this project, like to what extent climate change has affected the region, which indicators are more vulnerable to climate change etc.; a policy framework will be formulated to suggest suitable measures to overcome these impacts. At that stage, it is envisaged that a campaign would be launched to create awareness among the communities of the CKNP region as well as apprising the key stakeholders and the collaborators of the findings of research study. To contribute actively to mitigate the climate change effects, it is imperative to raise awareness among the masses about the role and responsibility of citizens to protect the environment. At that stage necessary campaign material will be needed that may include posters/banners, flyers, brochures, t-shirt, documents and publications and CDs/DVDs. The campaign material will contain attention-grabbing messages prepared on the basis of the key findings of the research and highlight the counter-measures to sustain the ecosystem. The campaign will also be duly supported with a series of workshops and seminars organized by SDPI. The possibility of raising the issue at national level through a media campaign will also be explored for which an appropriate media kit will be prepared. For this purpose, guidelines will be sought from the existing success stories and expertise of the sister agencies will be availed. However, the campaign would not be based on one sided material or perceptions. Community indigenous knowledge, experience and practices will also be used in campaign kit. Awareness campaign would be two sided.

5. PROJECT SCHEDULE AND DELIVERABLE

5.1. Detailed Project Work plan

Activities	June	July	August	September	October	November
Inception Workshop						
Data and Information Collection						
Ecosystem Vulnerability Assessment						
Publication and dissemination material						
Pilot projects under adaptation measures						
Consultation meetings and workshops						
Community awareness campaigns						
Final workshop						

5.2. Project reporting Schedule

Draft Inception Report	July 2011
Draft Ecosystem Assessment Report	August 2011
Media Kit	November 2011

6. Project Risks, Strategic Challenges and Opportunities

One of the loopholes in advancing this objective remains the lack of significant data on the subject area, dearth of awareness and activities that are devoid of coordination and consultation among key stakeholders. The absence of existing examples on ecosystem management around the developing world is another contributory factor in attainment of the specific objectives.

6.1. Risks

Some of the perceived risks associated with the project are:

- Project may suffer smooth execution due to insufficient funding.
- Field visits may be delayed or curtailed due to harsh weather conditions.
- Lack of communication with local communities due to language barrier.

6.2. Threats

The following project threats have been identified at this stage:

- Low percentage of local populace interviewed and the areas visited during the field survey due to lack of funds and time of the study.
- Insufficient and imprecise data obtained on the issue due to lack of general awareness and perceptions about the environmental threats and climate change effects.
- Personal biases, exaggeration and irrelevant information introduced into the data due to the high rate of false opinions of the locals.

6.3. Opportunities

The predicted opportunities that can become available after the successful completion of the project are as follows:

- New vistas for obtaining future funding by launching pilot projects to counter the climate change effects identified during the course of this study.
- Brining the issue of environmental impacts on the communities to spotlight.
- Creating general awareness in the local communities about climate change effects.
- Building a pressure group to convince governmental intervention to protect the extinction flora and fauna species.
- Enhanced training and experiential learning opportunities would become available to the SDPI team.

7. Recommendations

The recommendations section would develop and propose methods through which key findings of the project could guide future CKNP management. Recommendations may include suggestions for effective improvements in the current institutional arrangements such as human resource and equipment, etc for CKNP management and monitoring to be properly documented. The recommendations of the report would focus on advising the advantages and disadvantages of using other available techniques and analysis tools in depths and to provide recommendations for further studies; and key lessons learnt from the study. The report shall include specific approaches taken for this project, and provide advice on improved methodologies for other similar initiatives that may be put forward in the future.

8. REFERENCES

- Diversity, C. o. (1993). Convention on Biological Diversity.
- ICIMOD. (2008). Community-based adaptation. Retrieved July 19, 2011, from ICIMOD: <http://www.icimod.org/?q=1168>
- Khan, B., & Ali, F. (n.d.). Understanding Sectoral Impacts of Climate Change on Gilgit-Pakistan (Pakistan). Gilgit-Baltistan: WWF Pakistan.
- Morgan, D. L. (n.d.). Focus Groups as Qualitative Research. Qualitative Research Methods Series, 16, 2. Sage Publications.
- UNEP. (2011). About UNEP: The Organization . Retrieved June 20, 2011, from United Nations Environment Programme <http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=43>

9. APPENDICES

9.1. Appendix I (Summary of Proceedings of the Inception Workshop)

The proceedings of workshop were kicked off by Shakeel Ahmed Ramay, Head of Climate Change Study Center at SDPI. Mr. Ramay stated that most of Pakistan's area was arid having many features of the tropics even though it could not be called tropical area. He added that the global warming and consequential changes in monsoon patterns and increased desertification would adversely affect Pakistan's agricultural production - a sector upon which a large proportion of the country's labor force depends for livelihood.

Javeriya Hassan, Research Associate at SDPI, apprised the workshop participants about the UNEP-CKNP Ecosystem Assessment Project and its objectives. She said that Pakistan's northern region had witnessed a higher temperature increase as compared to other parts of the country in the recent years. She stressed the importance of carrying out detailed study to understand the impacts of climate change on that region as climate change could negatively influence the rich biodiversity of the CKNP region, local agricultural practices and most importantly, it could even adversely affect the whole agricultural sector of Pakistan because of significant reduction in water flows in the Indus River system. Highlighting the importance of the project, she explained to the participants the three main components of the project that include the assessment of vulnerable ecosystem components, identification and assessment of appropriate mitigation and adaptation options, and the initiation of pilot projects.

At the initiation of the Discussion phase of the Workshop, it was acknowledged that the CKNP region had been ignored in general climate change discussions/debates and that the particular project would be a great initiative in the right direction. One of the participants, Munir Sheikh, stated that the list of indicators developed should include climate change indicators besides the ecosystem indicators. He said that work had already been done on climate change indicators by GCISC.

Ms. Aisha Khan, CEO of MGPO, said that mechanism needed for the development of the CKNP region included inclusion of women in development, dissemination of information on climate change to locals, better building practices, flood protection, construction of irrigation channels for timely availability of water for agriculture, and the construction of roads for greater market connectivity without much impact on wildlife.

Mr. Shafqat Kakakhel, former Ambassador, agreed with Ms. Khan and said that the attainment of food security should be one of the paramount objectives. He added that forests played an important role in watershed management and should be preserved. He was of the opinion that the remoteness of the area had contributed to the lack of infrastructure.

Mr. Ghanzaffar Ali, Head-Water Section and Glaciology Group of GCISC, said that impacts of climate change in the CKNP region and surrounding areas was not a localized phenomenon and could affect the rest of Pakistan. He said that the increased melting of glaciers would cause increased water flows and could result in greater silting of dams. Mr. Ali stated that a system of watershed management was required for the region there was a need for the preservation of pasture lands.

Mr. Ahsan Mir, Registrar of Karakoram International University, said that the greatest impact of climate change had been witnessed on the glaciers of CKNP region as compared to its ecosystem. According to him, the study should have primarily premeditated impacts of climate change on the park's glaciers. He further added that the increase in melting of glaciers would also affect sea intrusion in the south and the accompanying mangrove forests.

Mr. Ghanzaffar Ali commented that glacial melting contributed a significant amount to Pakistan's water resources and were the lifeline for the country. He said that the increased melting of these glaciers was a continuous phenomenon and therefore there was a need for monitoring of the country's water resources. He added that it was important to involve organizations such as EV-K2-CNR, WAPDA, and KIU to study that process. He also said that there was a need for better management of water. He stated that it was the mandate of GCISC to promote small projects which can help in monitoring melting process of glaciers.

Mr. Bastian Flurry, Projector Director at SEED, added that his organization was working towards collecting data on water quality and quantity. He hoped that the work being done on the region by different organizations would enable the creation of a knowledge hub and better management through collaboration.

Mr. Muhammad Munir Sheikh, Head of Climatology Section at GCISC, said that two additional ecosystem aspects needed to be considered in the list of indicators prepared by SDPI. He said that forests were vulnerable to climate change and therefore that aspect needed to be considered. He added that some work in that regard has already been completed by GCISC. Mr. Sheikh stated that the region was earthquake prone and therefore cheap building methods and a building code were needed.

Ms. Shahida Jamil, Director Planning at Pakistan Agricultural Research Council, pointed out that the agriculture sector had not been touched upon in the discussion. She said that though the phenomenon of climate change was reality but the need of the hour was to work on increasing people's incomes. According to Ms. Jamil, the exploitation of certain species

of the Angora rabbit for getting its wool, certain species of Angora goats with higher milk productivity, and medicinal plants such Sea-buckthorn could lead to higher incomes for inhabitants of the CKNP region. She said that deforestation was also an important issue for the region. She further added that there was great potential for generating more income from apricots and organic products in the region.

Dr. Vaqar Ahmed, Advisor at the Planning Commission of Pakistan, said that there was a need to look at the markets in the region. He said that there was a need for increased market connectivity, building regulations, and an alternative to agriculture as basis of income. Dr. Ahmed said that the devolution of power from the state to provinces meant that there were increasing budgetary limitations and challenges for the federal government and that would make it increasingly difficult for it to construct roads in the CKNP region. He said therefore it was pertinent to look at the local level and mobilize communities towards their own development. In this context he said that Public private partnerships were needed. He said that the Gilgit-Baltistan government also needed to come up with a policy that would revive tourism in the region.

Ms. Aisha Khan, in response to Dr. Vaqar Ahmed, said that the issue of lack of resources availability for infrastructure could in fact be applied for the whole of Pakistan. She said that when she talked about road access to CKNP, she meant in sense of water, agricultural production and consumption, and basic sustenance.

Mr. Ashiq Ahmad Khan, Former Chief Technical Advisor to WWF-Pakistan, talked about a survey he conducted in the Karakoram region in 2007 to explore indigenous knowledge of the region's inhabitants. He said that pastures in the region were degrading while glaciers were receding. According to him, people did not understand what was happening to their pastures. Mr. Khan said that length of seasons in some areas had changed by up to 12 days which could had a very significant effect on the local crops. Mr. Khan said that indigenous knowledge could be a very important factor in assessing the impacts of climate change. He mentioned an example from his survey of the white butterfly in which several aged locals who were interviewed said that a white butterfly species had disappeared in recent years and this had occurred simultaneously with decreased quality of pastures. Mr. Khan also said that decrease in the production of beans up to 95% in some areas was noticed.

Dr. Ejaz Ahmed, DDG at WWF-Pakistan, commented that the Aga Khan Foundation was working on implementing building codes in the region. He said that it was important to adjust building codes according to the prevailing conditions of the region. He said that for smooth execution of the project, it was necessary to compile a resource directory of the region, identify individuals and institutions that are working in the region, identify potential partners, and suggest and identify plausible interventions.

Mr. Arshad Abbasi said that forests cover was receding quickly and according to the PFI report; forests might be completely depleted by 2020. He said that the area had tremendous potential for electricity generation. He cited the example of Bhutan which was exporting 50,000MW to India. He said that Pakistan could potentially export electricity to Central Asian countries. He agreed with other participants that building codes were required in the region and that buildings made of stone and galvanized iron would be more cost effective. He said that there was also a need for wood intensive housing. He said that facilities were also needed for storage and processing of fruits.

Mr. Zafar Khan, Gilgit-Baltistan Program Officer at WWF-Pakistan, stated that his organization had worked on mitigation and adaptation strategies in the region. He said that pilot projects had been started, and work had also been done to cater for the erosion of river banks. He stated that Seebokthorn was an especially good soil-binder by quoting an example of tree plantations on the Shigar river bank. Mr. Khan emphasized that more

reforestation was needed on the river banks as it proved during the 2010 floods where the area having forest cover suffered lesser damages. He told that embankments were also constructed along the river and other large scale forestation and campsite preservation schemes had also been started. Mr. Khan added that some work was also done on the subject of Pasture management. He concluded that all effort was made to involve the local communities in the execution of these schemes.

Mr. Arif Hussain of Ev-K2-CNR said that the lack of access to roads and blockage of the available roads by landslides prevented large scale agricultural production and obstructed entrepreneurship. He described that his organization had imparted training to the locals on growing seasonal crops and had installed sensors in the river beds to monitor the flow of water. He added that the construction of some dams submerged some regions that were rich in mineral deposits.

Mr. Ahsan Mir said that 20 PhDs were being produced under the SEED project at KIU. He further added that Haigler and Bailey had conducted considerable research on CKNP and it could be referred to obtain the required data on CKNP.

Mr. Bastian Flurry said that the SEED Project was carrying out work in the areas of forestry, wildlife management and water management. He explained that the work was being done with a number of different agencies to promote synergies and complementariness with other organizations. He told that the Project for Attabad was aimed at studying drivers, causes and impacts of stringing together different streams.

Ms. Aisha Khan added that there was potential of wind and solar energy generation in the region. She informed the participants that moving towards the wind and solar energy would help towards protecting the forests.

Mr. Muhammad Munir Sheikh said that the Pakistan Metrological Department (PMD) had been conducting a survey of wind and renewable energy potentials in the northern areas. He was of the view that the data collected from this survey could be beneficial for the UNEP-CKNP Project. He added that the participation of communities was vital in that regard. He told that electricity was already short in the region and that mini-hydropower, solar, wind and other renewable energy projects would contribute towards safeguarding the forests. He described that it was important to use electricity for averting use of wood for fuel and to reduce the consumption of cylinder gas. He mentioned that work had already been carried out by Aga Khan Rural Support Program (AKRSP) on small mills, dynamo frames, gradient water, river water flow, huge gradient and river flow turbines.

Mr. Arshad Abbasi said that renewable energy projects such as wind projects had so far been failures in Pakistan. According to him, there was a need for a proper tapping of these resources and this would require commitment at institutional and governmental level.

Taking part in debate on that issue, Dr. Ijaz said that the hybrid system of wind and solar energy had proven to be more successful in the country's coastal areas. Dr. Ijaz said that biogas was feasible to a greater extent and quoted an example of a biogas plant that had been running for the past 26 years. He further added that WWF has facilitated at least 200 biogas projects. Dr. Ijaz described that the byproduct slurry from these projects is also usable as using it in agricultural fields can enhance productivity of crops. Additionally, Dr. Ijaz also talked about Solar Water heaters and mentioned that those heaters were installed in a mosque in Nathiagali and were still operational.

Mr. Ahsan Mir said that perhaps there was potential for floating wind turbines in the region with necessary changes in terrain of rivers.

Mr. Zafar Khan described that changes in the housing structures in the region had been observed. He said that people had been changing away from the unique housing style of the

region towards concrete. He opined that there was certainly potential for improving traditional housing structures as had been demonstrated by the work of AKRSP.

Ms. Aisha Khan said that these changes were more of an evolutionary change due to modernization than the changes in the regional climate. She was of the view that building structures were moving away from stone structures towards ugly concrete structures.

Dr. Vaqar reiterated that the CKNP region and its surrounding areas should have based their economies on self-sustenance.

Mr. Muhammad Munir Sheikh said the enhancement/introduction of fisheries of trout could help enhance livelihoods and tourism in the region. In response to this, Dr. Ijaz said that trout was an introduced species (introduced about 100-150 years ago) and perhaps there was a need for looking at species of fish indigenous to the region.

Dr. Ijaz said that cherries produced in Gilgit-Baltistan were available in Islamabad with or without road blockages that meant that some mechanism of supply from these areas was in place. Adding to this, Mr. Arshad Abbasi said that there were not sufficient fruit storage facilities in the region. A participant added that there was a need for processing facilities as well.

Mr. Ahsan Mir added that information pertaining to CKNP should be made readily available by the CKNP directorate. He said that there should also be a proper system of monitoring of the park. He also talked about community controlled hunting areas outside CKNP.

Concluding the discussion session of the workshop, the Chair, Munawar Saeed Bhatti of Pakistan Foreign Service remarked that some glaciers have receded by 1200-3500 meters in some South Asian regions. He said that the 10,000 square kilometers area of CKNP had much larger affect on Pakistan as the presence of glaciers in the region made it a lifeline for the rest of Pakistan. He stated that in 1951, water availability in Pakistan was 5000m³ per capita. Presently, it is less than 1000 m³ per capita and is expected to reduce to 750 m³ per capita by 2025. Mr. Bhatti quoted that according to some sources, 10% of glacial melting had already taken place. He added that it was important to look at livelihoods of people indigenous to the region, explore tradition knowledge and observe effects of modernity and climate change on the local culture. Mr. Bhatti said that the cyclone developing in the Arabian Sea near Karachi was the third cyclone to have appeared in the past 5-7 years. He said that it had never happened before and was likely an impact of the changing climate. He added the diversion of Brahmaputra River in Bangladesh might actually change the pattern of monsoons.

Mr. Bhatti, like other participants also said that there was a need for building codes to be practiced. He said that wood might actually not form weak infrastructure as perhaps it was the lack of knowledge and technology that was hindering the construction of wooden-made earthquake proof housing. He added that for earthquake proof housing, it was also imperative to make light infrastructure in order to save lives. He also added that insulation of housing could bring various benefits through its impact on energy use.

Mr. Bhatti agreed with other participants that nothing can be achieved without community mobilization by quoting an example of Maori Towns as source of revenue generation through tourism. He said the CKNP region was a potential goldmine in terms of tourism. He talked about the city of Sialkot which generates \$700-800 million foreign exchange for Pakistan and Sialkot Chamber of Commerce built roads and an airport without government help.

9.2. Appendix II (Interviews in Preliminary Visit)

9.2.1. Rustam Ali Mutahi (Teacher/Agriculturalist)

As compared to the present weather, winters were colder and summers were more hotter twenty five years ago. There is less snow on the mountains and it is hardly six inches. Last year, rainfall broke a 25 year record, which essentially entailed a considerable amount of downpour. Fifty years back though, there was significant snowfall in the region. In the past, it used to be so cold that during winter, trees used to bend and break; and cows who loitered out in the cold could die instantly. Now situation is different due to less cold and snowfall. The most famous fruit of Gilgit Baltistan is apricot. There are about 20-30 types of apricots in the area and one of them is used to extract oil. Apricot trees are used as fuel wood as they burn well. Cherries are also grown in the region too, and their harvesting season is starts after mid of May. There are about 5-6 types of mulberry, which have very sweet taste as compare to that grown in other regions of the country. There are some types of mulberry which are not edible. The local people sell the fruits at a cheap rate at a market in Skardu. The prices of fruits are higher in Rawalpindi as compare to Skardu. Hence, local people get less profit from this business. The yield of fruits is also affected due to climate change. Locals extract oil (Giri Oil) from apricot seeds which is worth Rs. 700 per kg. Personally, I can say that from 80 kg of apricot seeds, we used to extract about 1 mun (37.32 kg) of oil but now, we can extract only 5-20 kg of Giri Oil. Weather change has affected the growth of fruit trees which has resulted in low yield and availability of fruits. The crops sowed in the region are wheat (~10 canals) and barley (~3 canals), however the number of formers are more in region. The diet of GB inhabitants also includes wheat. However, in some places, corn is also harvested. It has been observed that there is growing trend of cultivating potato as a crop. Many people rely on the cultivation of the potato crop as they can earn more money from this crop. However, soil is not suitable for cultivation of other crops. The yield of wheat crop has decreased with the passage of time. The yield of fruits has increased due to the use of fertilizers. The milk production has remained the same and is not significantly affected due to climate change. The fertilizer is manufactured at home, organically by burying the cow dung and straws in the mud. The inorganic fertilizers are imported from Rawalpindi. Tourists visit GB during summer (June-August) and most of them come from Europe and the US. They come for hiking on the northern mountains, particularly K2. During the last four years, due to the problem of the Taliban, the numbers of tourists have steadily decreased. The name of the region was originally Northern Areas which was often confused with the FATA region which is greatly depicted in the media as a troubled area due to series of bomb blasts happened there. The name has now been changed to Gilgit Baltistan, due to which the numbers of tourists have increased. The area is very secure and there is no problem of Taliban here, however the region was affected by the negative propaganda in the media. There are very less educational facilities present in the GB region; and there are very few colleges. For higher education, the people go to Islamabad and Karachi. There is only one college in Skardu and it has co-education system. The principal in the college is a religious scholar and class rooms have curtains for separating boys and girls, so they cannot see each other. They travel together in buses but their seats are separated by a curtain. The girls sit at the back and the boys sit at the front seats. There are about 10-12 primary, middle and high schools within a distance of 10 km radius. There has been a growing trend of opting for education among people. In the past, there were many dropouts; however, people are sending their children to expensive public schools as well. Children go to school almost from every house now. Most of the households in Skardu are poor. Every individual household has its own land; however these lands do not have good productivity. There is range of occupations in the Skardu region like laboring, construction, livestock herding etc. When it snows, the livestock

have to be kept indoors as there is no grass outside. There are certain types of grass that do not wither. The educated people try utmost to stay behind in Skardu rather immigrate elsewhere. The general desire is to remain at home and the main reason behind this can be attributed to the prevailing sense of peace in the area. In comparison to the other provinces, there is no problem of violence and conflict. There is also no sectarian conflict. People of the Shia and Sunni sects intermarry and consolidate their family links. However, there is considerable conflict between these sects in Gilgit. Only the government can save the region from being eroded. Government is paying less attention on the development of the region as the chief minister does not have much authority. There is a small hospital of 30 beds and with only one doctor. If the intensity of cold is decreased earlier, the onset of the cultivation of crops has to be earlier than March and then it would be harvested in July, rather than August. The basic crop is wheat and much attention is not given on rice and maize cultivation. There are 10 types of vegetables and some of them are grown by using the greenhouse technique. However, there is need of resources for building a greenhouse. The music and dances have completely dissipated due to the religious scholars getting agitated about this. People who were involved in these professions have relinquished their talents. There are some old buildings such as the old mosque. The fort has been renovated by the Aga Khan foundation. The floods had no effect on the old buildings. People are not conscious about the need for preservation of the old buildings. The population growth rate has increased considerably. The growth rate is higher than how it was 30 years ago. People from other provinces are also migrated to this region. There has been more political consciousness among the people due to which the old king, Raja Sahib, has experienced defeat in the elections.

9.2.2. Akbar Hussain

I am working as a manager in LSO. I have Master Degree in Social Work from Karachi University. The main crops of the region are wheat, barley and potatoes and are grown in large quantities. I have imported seeds of these crops from Rawalpindi. The reasons why people are not inclined to growing vegetables is lesser profit in this business. There are Seebakthorn forests all around the region, whose fruit can be used to make jams, jellies and extracting oils. This year, people harvested about 60-70 tons of Seebakthorn. It is possible to grow vegetables by establishing tunnel system. Research is needed to get good quality of seeds for growing crops. People have enough income to smoothly run their kitchen. Agriculture is profession of 50% of populace. They can afford to buy good quality seeds and some of them travel to Rawalpindi for buying seeds. I have noticed that seeds of different crops are sown at different periods. The water requirements of the crops have increased. In the past, crops were watered only twice in a season. However, this year crops have required more watering and this is due to rise in temperature. The combustion of wood has increased due to increase in the demand of energy.. In my opinion, climate change has benefited the Gilgit-Baltistan region. The winter season has been curtailed by two months. Wheat harvesting season used to start on the 14th of August; now it starts few days early. The sowing of wheat seeds used to take place in March; but now it starts from 20th-22nd of February. We also cultivate vegetables and fodder. The productivity has been increasing with the rise in temperatures which is linked to climate change. In the past, people could not grow crops due to unavailability of seeds. However, now-a-days, potent varieties of seeds have been distributed by AKRSP to the local farmers. Initially, the seeds were distributed free of cost to generate awareness among the people. Now, people personally make the trip to buy the seeds. The source of water in Skardu is Baltoro Glacier, which is at the base of K2. River erosion has increased considerably in the past few years due to climate change. Melting of ice has increased in the glaciers and there might be water shortage in the future. Now, snowfall is inconsistent as sometimes there is no snowfall at all and sometimes there is a lot of

snowfall. Water can be stored in a reservoir and electricity can be generated from it. It had been very difficult to obtain a name for the province and development is relatively slow. A water reservoir is needed to be built in the region as the water goes wasted by falling into the river. There is sense among the people to conserve water. There are not many highly educated people in the province. There are schools for both girls and boys (primary and middle schools). There is a college in Shigar Khas. There is awareness among people about the importance of education, irrespective of their income/status. The drop-out of children is significant in the region; which used to be high in women but the trend has been reversed. Child labor has increased due to an increase in the cultivation of potatoes. In order to fill sacks with potatoes, the contractors hire the services of local children. Due to this, the enrollment of boys in the schools has decreased considerably. Employment opportunities have started increasing due to cultivation of potatoes. One of the reasons why vegetables are not grown in the region is the lack of cold storage facilities as the temperature has risen considerably over the past few years. Cold storage facilities cannot popup by default. In the past, the temperature was not as high as it is now; however, due to presence of a lot of trees, people cannot feel the difference. However, at higher altitudes, it gets really hot. There are about 78 households in this area but there is not a single dispensary. There is a medical center at Shigar Khas which has only one dispenser/compounder. There is a sanctioned post for a dentist which is lying vacant for many years. The population growth rate has increased and no efforts have been made to bring about family planning awareness among the masses; this is an indication of the lack of interest of social workers and institutions. Due to increase in temperatures, the growth rate has increased as in the past; there were fewer people in households. The numbers of households have also increased significantly; whereby land has undergone considerable division. The trend of migration has increased. Since the opening of the Shakra-e-Karakoram, the development progress has accelerated in the GB region. Social mobilization has been slow due to lack of maturity among people. The construction style of houses has changed. Previously, the houses were constructed by stacking wood blocks. In terms of culture, the living style has changed. The fashions styles have changed considerably too; especially the clothes worn in olden times cease to exist now-a-days. These changes have happened due to the media influx. There have been changes in dietary habits; traditional bread which was made from barley flour mixed with butter was served with gravy at marriage ceremonies; and that tradition has now vanished. Now, the dishes served at marriage ceremonies include rice and food with spices. The young people are not aware of old Buddhist relics. The herbs now grow at high altitude regions. In the past, there was more snowfall which is steadily decreasing. Last year, only one snow leopard was spotted at lower altitudes. I heard in a workshop that their existence is determined by territorial detectors each present at every 60 km radius. The numbers of snow leopards have declined as people hunt on them. However, due to conservation efforts of the WWF, the number of snow leopards has not decreased considerably. There is a ban on fishing in the Blind Lake and Conservation and Development Committee has been established.

9.2.3. Haji Muhadi (Age: 70 years)

There has been an increase in the intensities of the hot and cold weathers. The cold season lingers for six months and similarly the warm season prevails for another 6 months. The productivity of crops is increasing steadily. The reason behind this is that the population has increased. Nowadays, there is not even a single foot of snow accumulating on the hills. The winter season is very dry and its duration has shortened. Climate change has also affected the cultivation of crops. Snowfall starts late due to which we have to extend the date of sowing of seeds. The water obtained from melting snow is in large quantities. Due to the heat, the snow is melting faster. People sow wheat

and corn here. People who are living here for ages own larger areas of land like 10-40 canals. Crop cultivation takes place at a later date now. It is easy to get hold of food items here. The food requirements of the people are not entirely fulfilled by the produce obtained locally. The snowfall in recent months has affected the health of people as well. People travel outside the region to work in the cities. There is a primary school in the village which offers admissions to both girls and boys. Earlier, cultivation used to take place in January and February, now cultivation does not take place until April which has affected the yield of crops too. The government has set up a dispensary which is not regularly manned by a doctor. The snow has decreased but the duration of dry winter has increased, therefore, there is no shortage of water here.

9.2.4. Boatman at Upper Kachura Lake, Skardu

I am working as a boatman here for the last 20 years. Water decreases in winter and increases in summer. Twenty years ago, water used to be less in the lake (Upper Kachura Lake) as compared to now-a-days. The reason might be more snowfall on the mountains. Due to heat (rise in temperature) snow is melting fast and water level is rising in the lake. The fish mostly present in this lake are trout and yellow fish. There was more snow fall in the past as compared to now-a-days. The size of glaciers is decreasing due to rise in temperature. Lake water is clean and the incidents of diseases are extremely low. The number of fish in this lake has decreased with the passage of time. Previously, people were used to add fish in the lake; however, the desi fish has increased in quantity. Young generation is not interested to adopt the profession of boatmen, as the youth wants to get education for brighter future.

9.2.5. WWF

CKNP has an area of 10,000 km² and is the largest protected region of the country. Its buffer zone is 7400km². The park was notified in 1993 and its revised notification was issued in 1996. The forest cover of CKNP comprises mostly in Gilgit and Hunza valleys. Native plant species of the region is blue-pine. GB landscape is vulnerable to climate change; for being the most glaciated region and mountainous landscape. Sectors which exacerbate the climate effects are hydro-meteorological hazards, which are affected by factors such as the verticality of mountains; unstable terrains; presence of a large number of glaciers; presence of high altitude lakes, rivers and streams; GLOF and the entire area has a very fragile mountain ecosystem. A slight hydro-meteorological activity can disrupt the mountain ecosystem. Most of the livelihoods of the people revolve around agropastoral. Climate change effects are basically on food security; and water security is affecting the people at large. Climate change has had a varied impact on the species in the region; at some places it is positive whereas it is negative elsewhere. The floral species are particularly sensitive to the rising temperature. In the areas where there is a marginal double cropping seasons have experienced changes recently. In the olden days, there was no evidence of corn being grown in the region. In the past two years, however, I have seen maize growing there; and this is a positive trend. On the negative side, there are some places that are considerably at a higher altitude in the valley, where people used to cultivate wheat but are not doing so any longer. Some plant species are very susceptible to change in temperature. Only through research, we can identify species that can survive better under the changing climatic conditions. Due to shift in temperature (upwards or downwards), there is a change in the biodiversity of the plant species. One effect of climate change has been that the quantity of cream in cow milk has decreased due to the degradation of a species of grass. Further, the milk production has decreased. There has been no detailed research on crops grown in this region. Low lying areas, like Skardu town and areas adjoining Shigar (whose elevation is less than 4000-5000 ft.), can be used

for cultivating two crops in a year. Incidence of inter-cropping is sparse except in those regions where potatoes are grown along with the peas. At higher elevations, only one crop is cultivated. Marginal double cropping is a threshold level for moderate temperature. Some new invasive species have appeared in the region due to climate change and some species have shifted to elsewhere. Highly sensitive species cannot compete with the pace of climate change and temperature fluctuations. There have been some drastic changes in ecosystem in some places particularly in high altitudes as at higher altitudes the radiation is perpendicular. There have been instances of glacial retreat in Karakoram which has been noticed up to 8 km. The frequency of GLOFs has increased. Thirty five destructive GLOFs have occurred in the mountains during the past 30 years. People's property and crop lands have been affected by the incidence of GLOFs. Massive floods were recorded in 1905, 1956, 1969 and 2005. Frequent flash floods have also been recorded. It is important to perceive the community perception about the climate change effects. Prolonged summers and shorter winters have been observed. The year 2009 was the coldest winter in the history of the area due to melting and retreating of glaciers; the winter was not as extreme as it had been recorded during the last 50 years. During the history of Skardu, 1996 was the coldest year. The extreme extent of the cold weather was that the river Indus froze; and people used to drive their tractors on the frozen river as numerous anecdotal evidences have been collected. Now, the region does not witness that much cold. According to David's research on the region, the minimum temperature during winters has increased and the maximum temperature during summers has decreased. Hence, what people have been asserting so far is very much in line with the results of the research. David's study is very interesting understand the climate change effects in the region. David's research had differentiated among the Himalaya, Hindu Kush and Karakoram ranges. The snow-melting and temperature variations in the GB region would affect the entire country. Community perception restricted to Upper Hunza does not indicate any temporal fluctuation in climate change. However, they have also observed extinction of certain species. Five species of butterflies have become extinct; and grasshoppers and frogs have disappeared. There have been a dry spell and massive rainfall in 2010. There has been declining agricultural productivity and marketability of food products. Declining productivity is due to pest infestation. Climate change has initiated the debate on trans-boundary impacts. Some studies have used photosynthesis as major indicator. As the temperature rises, the rate of photosynthesis would increase. C4 plants would benefit more as compared to C3 plants; and most of the agricultural crops are C4. Increase in photosynthesis would increase the productivity of crops. Simultaneously, other risks would also increase. Enhanced agricultural productivity is a result of a number of factors like increased concentration of carbon dioxide. If an increase in temperature and carbon dioxide leads to an increase in photosynthesis, then it will also lead to an increase in the melting of glaciers; but, in the long run there would be drought. Soil fertility will increase henceforth. There have been agro-pastoral impacts on the communities due to the loss of agricultural land; hence, productivity of farmland and fruit orchards has declined.

9.3. Appendix III (Ecosystem Indicators)

- 1) Climate: wind speed/direction, temperature (ambient air and soil), solar radiation (total and photosynthetically active), humidity, precipitation (rainfall and snowfall), atmospheric pressure, mist, cloudiness and transpiration, and soil temperatures
- 2) Land use change: Quantifying and Monitoring Land cover/Land Use Change (Harmonized Legends) , Historical Trend Analysis, Overview and Assessment of

Impacts of Land cover/Land use Change, Modeling and Prediction of Habitat Change and Impact on Biodiversity

- 3) Cryosphere: Glacier Extent and Volume, Glacier Mass Balance, Melt Water Yield, Snow Cover, Snow Melt, Snow Gauging, Permafrost
- 4) Water Resources: Water Quantity, Water Quality and Sediment Production, Extent of Water Bodies (including potential GLOFs), High Altitude and other Wetlands, [UTF-8?]Springs and Water Sources – General condition
- 5) Ecosystem Function and Services: High Altitude Lakes and Wetlands, Role of Various Ecosystems in N and Water Cycles, Role of Forest in C Cycle and Resource Production, Role of Grazing Lands in C, N and Water Cycles, Soil Systems, Pollution, Plant Pest and Diseases
- 6) Biodiversity and Ecosystems: Biodiversity Assessment and Monitoring, Biodiversity along Ecotones and in Transitional Zones, Ecosystem and Ecological Community Change, Key Flora and Fauna, and Habitat, Vegetation Dynamics, Invasive Species, Forest Structure / Non-timber Forest Products / Medicinal Plants, Culturally Dependent Species, Impacts of Invasive Species, Agricultural Biodiversity and Genetic Resources
- 7) Risk and hazards: Floods/Potential Glacial Lake Flood Outburst (GLOF), Drought, Wildland Fire, Mass Movements, Landslide/Avalanches
- 8) Health Determinants and Outcomes Afflicting Humans and Livestock: Indicator disease(s) of climate change / vector borne
- 9) Mountain Economies: Agroecosystems and Livelihoods, Natural Resource-Based Employment and Income, Forest products, Mountain Pastures, Livestock numbers and composition, Valuation of ecosystem,
- 10) services, Cross Border Trade. Tourism and Recreational Economies
- 11) Society and Environmental Change: Governance Institutions, Rights and Access to Water Resources, Conflict and Peace, Traditional Knowledge and Belief Systems, Urbanization, Development (Infrastructure), Development Trajectory and Vulnerability, Cross Border Trade/Illegal Trade

9.4.Appendix IV

Questionnaire

UNEP-CKNP Ecosystem Assessment Project

Hunza, Ghanche, Gilgit and Skardu

Interviewer _____ **Signature** _____ **Date** _____

Supervisor _____ **Signature** _____ **Date** _____

A. General Information

1	Name of Respondent	
2	Age	
3	Gender	
4	Education	<input type="checkbox"/> Primary <input type="checkbox"/> Matriculation <input type="checkbox"/> Higher Secondary <input type="checkbox"/> Undergraduate <input type="checkbox"/> Postgraduate <input type="checkbox"/> PhD
5	Occupation	<input type="checkbox"/> Agriculture <input type="checkbox"/> Livestock <input type="checkbox"/> Wage labor <input type="checkbox"/> Business <input type="checkbox"/> Government employment <input type="checkbox"/> Private employment <input type="checkbox"/> Porter <input type="checkbox"/> Tour Operator <input type="checkbox"/> Other (Please Specify)_____
6	Name of Village	
7	Union Council	
8	Tehsil	
9	District	
10	Tribe/clan/bradri	

B. Soci-Economic

1	What is your monthly income?	<input type="checkbox"/> Below Rs. 5,000 <input type="checkbox"/> Rs. 5,000 – 10,000 <input type="checkbox"/> Rs. 10,000- 15,000 <input type="checkbox"/> Rs. 15,000- 20,000 <input type="checkbox"/> Rs. 20,000 or more
2	Besides from your main occupation, do you have any	<input type="checkbox"/> Yes <input type="checkbox"/> No

	other sources of Income?	
	a. If yes, what are these sources:	<input type="checkbox"/> Agriculture <input type="checkbox"/> Livestock <input type="checkbox"/> Wage labor <input type="checkbox"/> Business <input type="checkbox"/> Government employment <input type="checkbox"/> Private employment <input type="checkbox"/> Porter <input type="checkbox"/> Tour Operator <input type="checkbox"/> Other (Please Specify)_____
3	How many people do you have living in your household?	

C. Environment

1	Have you observed changes in the overall temperature in your region in the past 30 years?	<input type="checkbox"/> Yes <input type="checkbox"/> No
2	Have changes been observed in terms of rainfall in the past 30 years?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	a. If yes, has rainfall	<input type="checkbox"/> Increased <input type="checkbox"/> Decreased <input type="checkbox"/> Remain unchanged
	b. Have seasonal patterns of rainfall been altered?	<input type="checkbox"/> Yes <input type="checkbox"/> No
3	Have changes been observed in terms of snowfall in the past 30 years?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	a. If yes, has snowfall	<input type="checkbox"/> Increased <input type="checkbox"/> Decreased <input type="checkbox"/> Remain unchanged
	b. Have seasonal patterns of snowfall been altered?	<input type="checkbox"/> Yes <input type="checkbox"/> No
4	Have changes been observed in the past 30 years in terms of Land use?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	a. If yes, please explain the changes that you have observed	
5	Have changes been observed in terms of quality and availability of pasturelands?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	a. If yes, has it	<input type="checkbox"/> Increased <input type="checkbox"/> Decreased

	b. Have the changes in vegetation impacted human and animal life in the area?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
6	Have changes been observed in the past 30 years in terms of Plant species?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	a. If yes, have invasive plant species appeared?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	b. Have some plant species disappeared?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	c. Please explain the changes that you have observed	
7	Have changes been observed in the past 30 years in terms of Pest infestations?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	a. If yes , has the frequency of occurrence of pest infestation changed?	<input type="checkbox"/> Yes <input type="checkbox"/> No
8	Have changes been observed in the past 30 years in terms of soil fertility?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	a. If yes , has the fertility	<input type="checkbox"/> Increased <input type="checkbox"/> Decreased
9	Have conditions for crop growth changed, particularly for crops that existed in the past?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	a. If yes, have conditions	<input type="checkbox"/> Improved <input type="checkbox"/> Deteriorated <input type="checkbox"/> Cannot say
10	Have changes been observed in the past 30 years in terms of <u>crop yield</u> ?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	a. If yes, have conditions	<input type="checkbox"/> Improved <input type="checkbox"/> Deteriorated <input type="checkbox"/> Cannot say
11	Has there been a change in the type of crops being grown now?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	a. What new types of crops are being grown now?	
	b. Are there any crops that cannot be grown now?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say

	c. If yes, please list the crops that cannot be grown now.	
	d. What do you think is the reason behind this disappearance?	
12	What main fruit trees are grown in your region?	
	a. Have changes in yield of fruit trees been observed for the past 20 years?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	b. Have new diseases in trees been observed?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
13	What are the main domestic animals kept in your region?	<input type="checkbox"/> Goat <input type="checkbox"/> Sheep <input type="checkbox"/> Buffalo <input type="checkbox"/> Cow <input type="checkbox"/> Poultry <input type="checkbox"/> Mule <input type="checkbox"/> Donkey <input type="checkbox"/> Other_____
	a. Have changes in the health of these animals been observed in the past 30 years?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	i. If yes, has their health	<input type="checkbox"/> Improved <input type="checkbox"/> Deteriorated
	e. Have new diseases in these animals been observed?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	i. If yes, what types of new diseases have been observed?	
	f. Have changes in milk productivity of cattle been observed in the past 30 years?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	i. If yes, has it	<input type="checkbox"/> Increased <input type="checkbox"/> Decreased
14	In the past, have you observed any changes in terms of wildlife in your region?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	a. If yes, have invasive animal species appeared?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say

	<p>b. Have you observed any changes in terms of the following animal species?</p>	<p>Markhor <input type="checkbox"/> Increased <input type="checkbox"/> Decreased</p> <p>Ibex <input type="checkbox"/> Increased <input type="checkbox"/> Decreased</p> <p>Blue Sheep <input type="checkbox"/> Increased <input type="checkbox"/> Decreased</p> <p>Marcopolo sheep <input type="checkbox"/> Increased <input type="checkbox"/> Decreased</p> <p>Snow Leopard <input type="checkbox"/> Increased <input type="checkbox"/> Decreased</p> <p>Brown Bear <input type="checkbox"/> Increased <input type="checkbox"/> Decreased</p> <p>Wolf <input type="checkbox"/> Increased <input type="checkbox"/> Decreased</p> <p>Other _____ <input type="checkbox"/> Increased <input type="checkbox"/> Decreased</p>
	<p>c. Please explain any other changes that you have observed in terms of wildlife</p>	
<p>15</p>	<p>What are your sources of drinking water?</p>	<p><input type="checkbox"/> River <input type="checkbox"/> Groundwater <input type="checkbox"/> Spring <input type="checkbox"/> Nulla <input type="checkbox"/> Other _____</p>
<p>16</p>	<p>Have your water sources changed in the past few years?</p>	<p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say</p>

17	Has there been a change in the number of water bodies in your region?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	a. If Yes, have the number of water bodies	<input type="checkbox"/> Increased <input type="checkbox"/> Decreased
18	Have changes been observed in the past 30 years in terms of water availability during the year?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot say
	a. If yes, has this been over	<input type="checkbox"/> 1 Year <input type="checkbox"/> 5 Years <input type="checkbox"/> 10 Years <input type="checkbox"/> More than 10 Years
19	Has the quantity of water during the course of seasons been altered?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot say
	a. If yes: i. In Summer, has there been an <u>increase</u> or <u>decrease</u> ? ii. In Winter, has there been an <u>increase</u> or <u>decrease</u> ? iii. In Autumn, has there been an <u>increase</u> or <u>decrease</u> ? iv. In Spring, has there been an <u>increase</u> or <u>decrease</u> ?	<input type="checkbox"/> Increase <input type="checkbox"/> Decrease <input type="checkbox"/> Increase <input type="checkbox"/> Decrease <input type="checkbox"/> Increase <input type="checkbox"/> Decrease <input type="checkbox"/> Increase <input type="checkbox"/> Decrease
20	Do you feel that water quality has changed in the past 30 years?	
	a. If yes, has water quality	<input type="checkbox"/> Improved <input type="checkbox"/> Deteriorated
	b. If yes, have any diseases been observed from the degradation of water quality?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
21	Have changes been observed in the past 30 years in terms of Forest cover around your region?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	a. If Yes, has it	<input type="checkbox"/> Increased <input type="checkbox"/> Decreased <input type="checkbox"/> Remained same
	b. Why do you think this change has taken place?	
	c. Has your usage of medicinal plants changed in this time?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
22	Have changes been observed in the past 30 years in terms of Occurrence of Natural Disasters?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say

	a. If yes , how would rate their intensity?	<input type="checkbox"/> Weak <input type="checkbox"/> Moderate <input type="checkbox"/> Strong
	b. What forms have these disasters been in?	<input type="checkbox"/> Avalanches <input type="checkbox"/> Droughts <input type="checkbox"/> Flash Floods <input type="checkbox"/> Land sliding <input type="checkbox"/> Glacier Lake Outburst Floods (GLOFs) <input type="checkbox"/> Other (Please explain) _____
23	Have there been increased incidences of wildfires in your region?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	a. If Yes, have incidences of wildfires	<input type="checkbox"/> Increased <input type="checkbox"/> Decreased
24	Do you feel adequately protected from natural hazards?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say

D. Additional Environment Questions

	Climate	
1	Have changes been observed in terms of wind speed and wind direction in the past 30 years?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	a. If yes, has wind speed	<input type="checkbox"/> Increased <input type="checkbox"/> Decreased
	b. If yes, please explain how wind direction has changed.	
2	Have you observed changes in terms of the sun's intensity in the past 30 years?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	a. If Yes, has it	<input type="checkbox"/> Increased <input type="checkbox"/> Decreased
3	Have changes been observed in terms of level of mist in the air?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	a. If Yes, has it	<input type="checkbox"/> Increased <input type="checkbox"/> Decreased
	b. Have changes in seasonal patterns of	<input type="checkbox"/> Yes <input type="checkbox"/> No

	mist also been observed?	<input type="checkbox"/> Cannot Say
4	Have changes been observed in terms of the level of humidity?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	a. If Yes, has it	<input type="checkbox"/> Increased <input type="checkbox"/> Decreased
	b. Have changes in seasonal patterns of humidity also been observed?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
5	Have changes been observed in terms of the thickness of cloud layer?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	Cryosphere	
6	Have you observed a change in the size of glaciers in the past few years?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	a. If Yes, has it	<input type="checkbox"/> Increased <input type="checkbox"/> Decreased
	b. In this time, have you observed any glaciers that have completely disappeared?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
7	Have you observed a change in the rate of melting of snow?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
8	Have changes in terms of permafrost been observed on mountain peaks?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	Ecosystem Function and Services	
9	Have any changes been observed pertaining to environmental conditions of high altitude lakes and wetlands?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	a. If yes, please explain the changes that you have observed.	
10	Has the number of high altitude lakes and wetlands changed in the area?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	a. If yes, have the number of high altitude lakes and wetlands:	<input type="checkbox"/> Increased <input type="checkbox"/> Decreased
	Biological	

11	Have you observed any change in size of ecoton?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	a. If Yes, has it	<input type="checkbox"/> Increased <input type="checkbox"/> Decreased
12	Have any edge effects observed during last 10 years?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
	a. If yes, have plant varieties or animal varieties been affected?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	b. Please explain any other changes that have been observed.	
13	What other changes to your region's ecosystem have been observed?	
	a. What do you think is the main driver of change to the ecosystem?	<input type="checkbox"/> Habitat change <input type="checkbox"/> Climate Change <input type="checkbox"/> Invasive species <input type="checkbox"/> Other _____
	b. If the ecological community is changing, what do you think are its causes?	<input type="checkbox"/> Fire <input type="checkbox"/> Logging <input type="checkbox"/> Wind throw <input type="checkbox"/> Landslides

E. Health

1	Do you feel that people in your region meet their nutritional requirements?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say
2	Do you feel that the frequency of occurrence of diseases in the past 30 years has	<input type="checkbox"/> Increased <input type="checkbox"/> Decreased <input type="checkbox"/> Stayed Same
	a. If increased , what types of diseases have increased?	<input type="checkbox"/> Malaria <input type="checkbox"/> Dengue <input type="checkbox"/> Seasonal diseases <input type="checkbox"/> Food borne diseases <input type="checkbox"/> Water borne diseases <input type="checkbox"/> Diarrhea <input type="checkbox"/> _____ Other

	a. How is the local populace coping with these problems?	
5	a. What do you think is the reason for the increased incidence of diseases?	
6	Do you feel that people now are living longer lives?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Cannot Say

F. Social

1	What type of a dwelling do you reside in?	<input type="checkbox"/> Pacca <input type="checkbox"/> KatchaPacca <input type="checkbox"/> Katcha <input type="checkbox"/> Other _____
2	Are you provisioned with the following basic services?	<input type="checkbox"/> Electricity <input type="checkbox"/> Water <input type="checkbox"/> Heating <input type="checkbox"/> Solid Waste Management <input type="checkbox"/> Education <input type="checkbox"/> Health services <input type="checkbox"/> Other (Please Specify) _____
3	How much of your income is allocated toward household expenditure?	
4	What recreational activities do people in society usually undertake?	
	a. Have recreational activities that people undertake undergone a significant change in the past 30 years?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	b. If yes, what has been the cause of this	

	change?	
5	For your region, is there a trend of migration towards other regions?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	a. If yes, do migrants ever return?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	b. Is money remitted back to your region?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	c. Why do you think is the cause of this migration?	

G. Culture

1	Has a fundamental change in the region's culture been observed in the past 30 years?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	a. If yes, please explain this change	
	b. Why do you think this change has occurred?	
2	Are the types of clothes worn in your society similar to those worn in the past?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	a. What do you think is the cause of this?	
3	What is your traditional staple diet?	
	a. Have you observed a change in your staple diet in the past 30 years?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	b. Please explain the change that you have observed.	
	c. Why do you think this change has occurred?	

4	What is the traditional style of constructing buildings/houses in your community?	
	a. Have you observed a change in terms of material used in the building of houses in the past 30 years?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	b. If yes, please explain this change	
	c. Why do you think this change has occurred?	