INTRA-ANNUAL VARIABILITY IN STANDARDS OF WATER AND SANITATION IN UPPER HUMLA, NEPAL : AN INVESTIGATION INTO THE CAUSES, IMPORTANCE AND IMPACT

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Abstract

This study investigates the impact of seasonality on standards of water and sanitation in the mountainous district of Humla, Nepal. The research considers 'impact' on two levels: community level access and service delivery.

First of all, it examines annual variation in village level access to water and sanitation. Secondly, it looks at the wider picture of service delivery and considers how seasonal variations present opportunities and challenges for improvement in standards for water and sanitation.

Three case studies from Humla are presented which illustrate village level access to water and sanitation over a calendar year. These case studies summarise the content of 45 semi-structured interviews, 9 focus group discussions and 9 months of observational work in the district. Variations in weather, village population, infrastructure functionality, and environmental conditions are found to influence the experienced levels of access to water and sanitation at any given time.

The impact of seasonality on service delivery was investigated via 39 key informant interviews. Both climatic (e.g. weather) and non-climatic (e.g. budget timings) sources of seasonality are found to impact programme implementation. The mismatch of local seasonal calendars and those imposed by central hubs is found to cause particular difficultly in effective delivery of water and sanitation services.

The findings of this research have theoretical, methodological and practical implications. Theoretically, it is suggested that a mountain community's level of access to water and sanitation varies considerably over the course of a calendar year to the point where it needs to be considered if 'on the ground' standards are to be improved. Methodological guidance is provided detailing means of investigating seasonality and its impact on standards of water and sanitation in other scenarios. Practical suggestions focus on incorporating seasonality into assessments of access to water and sanitation and programme delivery in mountain communities.

List of Abbreviations

CDC	Centers for Disease Control and Prevention
CLTS	Community Led Total Sanitation
DDC	District Development Committee
DHS	Demographic Health Survey
DWSS	Department of Water Supply and Sewerage
D-WASH-CC	District Level Water and Sanitation Co-ordination Committee
FAO	Food and Agriculture Organization of the United Nations
GO	Government Organisation
KAP	Knowledge, Attitude and Practice
KIRDARD	Karnali Integrated Rural Development and Research Center
ICIMOD	International Centre for Integrated Mountain Development
JMP	Joint Monitoring Programme
KIRDARC	Karnali Integrated Rural Development and Research Centre
LNGO	Local Non-Governmental Organisation
MDG	Millennium Development Goal
MICS	Multiple Indicator Cluster Survey (MICS)
NGO	Non-Governmental Organisation
PRA	Participatory Rural Appraisal
UN	United Nations
UNICEF	United Nations Children's Fund
VDC	Village Development Committee
V-WASH-CC	Village Level Water and Sanitation Co-ordination Committee
WASH	Water, sanitation and hygiene
WATSAN	Water and sanitation
WHO	World Health Organization
WUPAP	Western Uplands Poverty Alleviation Project

1 Introduction

1.1 Chapter Outline

This chapter will introduce the thesis, the research problem it concentrates on and the corresponding aims and objectives. The key themes: (i) the relationship between seasonality and water and sanitation and (ii) measurement of access to water and sanitation, will be introduced and an initial justification of why this study is considered a contribution to knowledge will be made. The chapter will conclude with an overview of the structure of the thesis.

1.2 Research Context

Statistics from the 2013 World Health Organization (WHO) and United Nations Children's Fund (UNICEF) Joint Monitoring Programme (JMP) Report suggest that worldwide levels of drinking water and sanitation coverage were 89% and 64% respectively (WHO & UNICEF, 2013). According to the report, by the end of 2011, 768 million people relied on unimproved drinking water sources while 2.5 billion people did not use an improved sanitation facility.

As a result of these levels of access, diseases attributed to faeces continue to kill more people worldwide on an annual basis than Aids, TB or malaria (UN Water, 2008). Poor access to water and sanitation are either the chief or the underlying cause in over half of the annual 10 million child deaths from water borne disease.

Statistics of access to water and sanitation are typically given as annual figures: percentages of those with access to water, percentages of those with access to sanitation. These statistics depict a snapshot in time - but in many cases this snapshot may not be representative of the realistic situation on a daily basis. While these statistics prove useful for comparing inter-annual variations (year to year), they do not look at intra-annual variations (within a year), and the changes that may happen within a given year, i.e. the 'seasonality' of standards.

Seasonality exists in some locations more than others. Rural regions experience greater seasonality due to the inherent link between their agricultural lifestyles and the prevailing climate. Mountain environments experience a highly seasonal climate and as a result their populations typically live correspondingly seasonal livelihoods.

This research examines the link between seasonality and water and sanitation in the rural mountainous District of Humla, Nepal.

1.3 The Research Problem

There are few studies published which have sought to examine the links between water, sanitation and seasonality. This gap in literature was explored on two levels; community level access and programme delivery.

At the community level, a single snapshot figure is often taken to represent the standards of water and sanitation in an area for a year. Very limited published research has been carried out to determine how these standards may very over the course of a calendar year. Overall, it is hypothesised that these anomalies may lead to a lack of understanding of true levels of access to water and sanitation, and unreliable data overall.

At the programme level, a gap was discerned in published knowledge of studies which examine the interaction between seasonality and effective water and/or sanitation programme implementation in a developing nation. It is hypothesised that this lack of understanding may lead to sub-optimal programme implementation.

The overall problem identified, is that uncertainty exists around the impact of seasonality on existing standards of water and sanitation in developing nations and their improvement. .

This thesis focuses on this issue in the mountainous area of Humla District, Nepal – the justification for which is in section 4.4.2.

1.4 The Research Question

The research question which stems from this problem is as follows:

What is the effect of seasonality on standards of water and sanitation in Humla District, Nepal?

This question is addressed at both the community level and the programme implementation level

At the community level: How does seasonality impact on community level access to water and sanitation in Humla District, Nepal?

- What climatic and non-climatic seasons exist in Humla that may affect access to water and sanitation?
- Do community members' behaviours changes intra- annually in a way that affects standards of water and sanitation?
- Does functionality of community level water and sanitation infrastructure vary intra-annually?

At programme level: Does seasonality affect water and sanitation programme implementation in Humla District, Nepal?

- What seasonal calendars affect water and sanitation programme implementation?
- What are the seasonal barriers and opportunities for effective implementation of water and sanitation programmes?

1.5 Aims and Objectives

Following from the research question specified, the aims and objectives of this project are:

At Community Level

Aim 1: To investigate intra-annual patterns in access to water and sanitation for low income communities in Humla District, Nepal.

Objectives contributing to Aim 1 are as follows:

(a) Examine existing methods for studying the seasonal aspects of members of a mountain community's livelihood
(b) Develop a means of examining and reporting community level fluctuations in standards of water and sanitation over the course of a year
(c) Apply the methods developed in (b) to a set of communities in Humla, Nepal
(d) Provide a case study exploring the existence of intra-annual variance in standards of water and sanitation
(e) Assess if the intra-annual variations of standards of water and sanitation imply that one off snapshot statistics may be misrepresentative

At Programme Level

Aim 2: To determine intra-annual patterns of challenges and opportunities for improving standards of water and sanitation in Humla District, Nepal

Objectives contributing to Aim 2 are as follows:

(a) Identify the intra-annual challenges and opportunities faced by organisations working to improve standards of water and sanitation in a mountain setting
(b) Present a case study to investigate the existence seasonal variation of challenges and opportunities faced in provision of water and sanitation in Humla District, Nepal

The study focuses on access to, and provision of, water and sanitation. The researcher realises the great importance of hygiene practices in alleviating deaths due to diarrhoeal disease, and while encompassing hygiene was in the original aims of the project – the uncertainty in measuring hygiene in any context, added a level of complexity beyond the capability of the researcher in the time provided. Whilst strong reference is made to hygiene in the results of the project – the picture presented is not strong for it to be justifiably included in in the aims of the project.

The study will generate four key outputs: (i) an evaluation of the significance of intra-annual variations in standards of water and sanitation in a mountain setting (ii) selected case studies highlighting seasonal variation in standards of water and sanitation, (iii) an analytical report demonstrating the aspects of water and sanitation provision which vary seasonally, and (iv) recommendations for topics and methods of future research in the area.

1.6 Key Concepts and Definitions

This thesis is based on the interaction between access to water and sanitation, seasonality and a mountain environment. The core concept of access to water and sanitation is introduced in this section. More information on seasonality and mountain environments is provided in the review of literature contained in Chapters 2 and 3. A number of definitions are provided in this section to assist the reader in understanding the core areas of the study.

1.6.1 Key concept - Access to water and sanitation

Clear and relevant indicators charting access to water and sanitation are necessary to inform policy and planning for national governments and the international community (Kayser et al., 2013). Good indicators allow the water and sanitation sector to track trends and measure progress, and aid comparisons across countries, service providers and major technologies (Kayser et al., 2013). Despite this, there are no clear universally accepted definitions for access to water and sanitation (Bostoen, 2007). Different organisations have different end goals and varying means of collecting and analysing year to year data on progress toward these goals. The lack of meaningful indicators to "…*tell us our current situation, which way we are moving, and how rapidly we are progressing…*" was cited as one of the major obstacles in the road to sustainability in the water and sanitation sector in the future (Bostoen, 2007).

1.6.1.1 Requirements for access

There is variation in what is considered 'access' to water and sanitation across different organisations. The overall goal of the sector is to reach the Human Right for Water and Sanitation for All.

The Human Right to Water and Sanitation

On 28th July 2010 the United Nations (UN) General Assembly through Resolution A/RES/64/292 declared safe and clean drinking water and sanitation a human right essential to the full enjoyment of life and all other human rights (United Nations, 2010b). In November 2002, the UN Committee on

Economic, Social and Cultural Rights adopted its general comment No.13 to the right to water stating that “The human right to water entitles everyone to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic uses” (United Nations, 2010a). In April 2011 this was updated through Resolution 16/2 to include sanitation. The details provided by the UN on each key indicator are shown in Box 1.

The human right for water and sanitation is broad – while it is limited in that it focuses only on domestic[1] provision of water and sanitation, it does look beyond the physical presence of a water point or latrine to consider if the technology is safe, sufficient, acceptable, physically accessible and affordable. Whilst in principal these are very important characteristics of a service, measurement of these indicators is context specific and thus difficult to compile on a large scale.

1.6.1.2 Tracking Progress on Water and Sanitation

The WHO has been collecting data on drinking water services since 1962 and in 1990 joined with UNICEF to establish the Joint Monitoring Programme (JMP) to monitor national progress toward universal access to safe drinking water and sanitation. The JMP is the official UN mechanism tasked with monitoring progress toward the Millennium Development Goal (MDG) related to drinking-water and sanitation (MDG 7, Target 7c) which aims to: “Halve, by 2015, the proportion of people without sustainable access to safe drinking-water and basic sanitation” (World Health Organization and United Nations Children's Fund, 2013).

Access to drinking –water and basic sanitation is measured by the following MDG specified indicators:

- Proportion of population using an improved drinking-water source
- Proportion of people using an improved sanitation facility

Access to safe drinking water is measured by the percentage of the population using improved drinking-water[2] sources. An improved drinking water source is a source that, by nature of its construction, adequately protects the water from outside contamination – in particular, from faecal matter (WHO & UNICEF, 2013).

[1] Access to water can be considered in terms of both domestic and productive needs
[2] Drinking water is water used for domestic purposes, drinking, cooking and personal hygiene.

Box 1: Criteria of the Human Right to Water and Sanitation

1. **Sufficient** – Water supply and sanitation must be continuous and sufficient for personal and domestic uses. This includes drinking water, personal sanitation, washing of clothes, food preparation and personal and household hygiene.

2. **Safe** – the water required for personal or domestic use must be safe, therefore free from micro-organisms, chemical substances and radiological hazards that constitute a threat to health. Measures of drinking water safety are usually defined by national and/or local standards. WHO's Guidelines for drinking-water quality provide a basis for the development of national standards that, if properly implemented, will ensure the safety of drinking-water.

   Everyone is entitled to safe and adequate sanitation. Facilities must be situated where physical security can be safeguarded. Ensuring safe sanitation also requires substantial hygiene education and promotion. This means toilets must be available for use at all times of the day or night and must be hygienic; wastewater and excreta safely disposed and toilets constructed to prevent collapse. Services must ensure privacy and water points should be positioned to enable use for personal hygiene, including menstrual hygiene.

3. **Acceptable** - Water should be of an acceptable colour, odour and taste for personal or domestic use. All water and sanitation facilities and services must be culturally appropriate and sensitive to gender, lifecycle and privacy requirements. Sanitation should be culturally acceptable ensured in a non-discriminatory manner and include vulnerable and marginalised groups. This includes addressing public toilet construction issues such as separate female and male toilets to ensure privacy and dignity.

4. **Physically accessible** - Everyone has the right to water and sanitation services that are physically accessible within, or in the immediate vicinity of, their household, workplace and educational or health institutions. Relatively small adjustments to water and sanitation services can ensure that the needs of the disabled, elderly, women and children are not overlooked, thus improving the dignity, health, and overall quality for all. According to WHO, the water source has to be within 1,000 metres of the home and collection time should not exceed 30 minutes.

5. **Affordable** - Water and sanitation facilities and services must be available and affordable for everyone, even the poorest. The costs for water and sanitation services should not exceed 5% of a household's income, meaning services must not affect peoples' capacity to acquire other essential goods and services, including food, housing, health services and education.

Improved drinking water sources include piped household water connections, public standpipes, boreholes, protected dug wells, protected springs or rainwater collection. Unimproved drinking water sources include unprotected dug wells, unprotected springs, surface water, vendor provided water, bottled water or water delivered by tanker (WHO, 2000).

Access to sanitation is measured by the percentage of the population using an improved sanitation facility, where an 'improved sanitation facility' is one which hygienically separates human excreta from human contact. Access to basic sanitation is measured against the proxy indicator: the proportion of people using improved sanitation facilities.

Improved sanitation facilities include sewer connections, septic tank systems, pour flush latrines, ventilated improved pit latrines or a pit latrine with a slab or covered pit. Unimproved sanitations facilities include pit latrines without slabs or platforms, open pit latrines, hanging latrines, bucket latrines and open defecation (WHO, 2000).

The MDG takes a categorical and dichotomous value – a household has (or has not) "*access to an improved water source*" (Bostoen, 2007). Its techno centric view does not allow for analysis of factors as specified by the Human Rights Bill e.g. affordability, physical accessibility, safe; however, it is the only water and sanitation framework that is currently supported by data collection at scale, throughout the world, that can be aggregated and disaggregated at different geographical scales (Kayser et al., 2013).

This thesis seeks to investigate whether non-inclusion of seasonality in these statistics may be another way in which these figures fail to represent the reality on the ground.

1.6.1.3 Minimum Standards for Water and Sanitation

The Sphere Project provides a Humanitarian Charter and an identified set of indicators describing the absolute minimum conditions that must be achieved in delivery of water and sanitation. While these are typically used for decision making in humanitarian response they also serve as a set of indicators for reviewing if minimum standards have been achieved in any context. Core indicators form the water supply and excreta disposal sections of the Sphere Handbook are shown in Box 2[3].

These quantitative indicators provide an alternative means of considering if absolute basic standards of access to water and sanitation have been achieved.

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[3]Box 2 presents only the core indicators of relevance to this thesis. There are further comprehensive indicators related to water quality, hygiene promotion and drainage which have not been included. These are available on www.spherehandbook.org

This thesis will seek to explore the relevance of these indicators and their appropriateness over the course of a calendar year.

Box 2: Suggested indicators for water supply and quality, and excreta disposal from The Sphere Handbook (The Sphere Project, 2011)

Water Supply

- Average water use for drinking, cooking and personal hygiene in any household is at least 15 litres per person per day.
- The maximum distance from any household to the nearest water point is 500 metres.
- Queuing time at a water source is no more than 30 minutes.

Excreta Disposal

- All excreta containment measures, i.e. trench latrines, pit latrines and soak-away pits, are at least 30 metres away from any groundwater source. The bottom of any latrine or soak-away pit is at least 1.5 metres above the water table.
- In flood or high water table situations, appropriate measures are taken to tackle the problem of faecal contamination of groundwater sources
- Drainage or spillage from defecation systems does not contaminate surface water or shallow groundwater sources
- A maximum of 20 people use each toilet.
- Toilets are no more than 50 metres from dwellings.

1.6.1.4 Further concepts

Water

In discussion of access to water in this thesis the focus is primarily on domestic uses of water i.e. water for drinking, bathing, cooking and clothes washing. Irrigation and drinking water for livestock (productive uses of water) are discussed and considered independently.

Sanitation

In some literature, 'sanitation' can refer to environmental sanitation. This refers to the collection, transport, treatment and disposal or reuse of human excreta, domestic wastewater and solid waste, and associated hygiene promotion. However, when 'sanitation' is referred to in this research it is assumed to mean basic sanitation only, i.e. the disposal of human excreta to prevent disease and safeguard privacy and dignity.

Seasonality

Seasonality refers to any regular pattern or variation that is correlated with the seasons (Devereux et al., 2012a), a day of the week or another period of time. Some synonyms include: seasonal variation, periodic variation or periodic fluctuations.

Inter-annual and Intra-annual

An inter-annual process is one which occurs from one year to the next or between years. This is different to an intra-annual process which occurs in a time scale of less than a year (i.e. within a year).

Community

When referred to in this research, a community is typically taken to mean a geographical community, i.e. village population. Due to the remote location chosen for the research, village boundaries are clear and the members of that village are referred to throughout the research as a community.

Household

The household is often adopted as the unit analysis in development studies and can be thought of to represent one family. In Humla the typical physical 'household' often had more than one family living there (typically through presence of extended family). For the purposes of this research, a household was taken to mean any combination of people who lived under one roof.

1.7 Originality and Relevance of Thesis

Investigations of seasonality, access to water and sanitation at the community level and impacts on programme implementation are areas on which very little published literature exists. Mountain regions and the impact of periods of cold weather on access to water and sanitation are further areas which are not covered well in literature. This thesis also provides valuable contribution to knowledge on these topics.

This thesis is relevant to the ongoing attempts to deliver water and sanitation to the most marginalised. It is precisely because there has been such neglect of this area that there is such potential for action. The exploratory nature of this research has led to many questions remaining unanswered, however the contribution to knowledge with regard to the relationship water, sanitation and seasonality is considered significant and further recommended research is suggested in Chapter 10.

1.8 Boundaries of the Study

This thesis is highly specific to Humla District in Nepal and there is difficulty in drawing conclusions that specifically relevant for other areas with any degree of certainty.

The data collection by the researcher for this study took place over the course of one year only. While the deterministic (predictable) elements of seasonality can be explained with some certainty, it is possible that stochastic (unpredictable) elements skewed the data to only reflect the time period during which the researcher was present.

While interviews were based on what is 'typical' for the region, what is presented is realistically a best guess trend primarily formed through the recall of participants. A trend is not uncovered in absolute terms. With the impact of climate change, one must bear in mind that climatic seasonality is shifting, and thus the results presented in this study may not apply in a number of years' time.

No statistical significance, or numerical values are assigned to the degree with which seasonality is experienced – this thesis asks 'if' seasonality has an impact and seeks to explore the relationship, but was unable to assign a value to the magnitude of the impact.

The reality is that seasons are experienced in a holistic manner, while the researcher tried to cope with high interconnectedness of seasonality and water and sanitation – the lack of research in the area at times led to uncertain and shifting boundaries for the study.

1.9 Structure of the Thesis

This thesis examines the interaction between seasonality and water and sanitation in the mountain environment of Humla District, Nepal.

A distinct lack of literature was found which examined the impact and manifestation of seasonality in mountain regions and in water and sanitation, thus this research shall attempt to fill some of these gaps.

This thesis begins with two chapters to introduce the core themes of the research. Chapter 2 introduces the concept of seasonality and existing literature which details seasonal access, and delivery, of improved water and sanitation. Chapter 3 provides an introduction to mountain poverty, and again, relates this back to access to and delivery of improved water and sanitation.

Chapter 4 describes the conceptual framework on which this research is grounded, the research strategy and methodology used to achieve the aims and objectives, and justifies the choice of Humla, Nepal as a research area. It also details the pilot study which shaped the main body of this research and provides justification for the primarily qualitative methods chosen for this study.

In Chapter 5, an introduction to the case study area is provided. This introduction is based on both primary and secondary data. This chapter presents data which 'sets the scene' for undertaking this work in the area e.g. the observed conditions in Humla, the seasons and weather observed there, the livelihoods of the people.

Case study data collected during the period of field research (November 2011 to July 2012) specifically pertinent to Aim 1 of this research (community level access) is presented in Chapter 6. In this chapter commonalities and contrasts between the case studies are presented.

Chapter 7 provides a discussion of the results of this section and addresses the appropriate research questions related to Aim 1.

In Chapter 8, Aim 2 is addressed. This chapter also contains a discussion of the implications of the findings in relation to Aim 2 and its associated research questions.

Chapter 9 concludes this work. It reflects on the aims and objectives set and evaluates the performance of this research against them. Suggestions for continued work in this area are presented, with relevance for academics, policy makers and practitioners.

The aims and objectives are addressed in each chapter as shown in Table 1-1.

Table 1-1 Mapping of aims and objectives throughout the thesis

Aims and objectives	Relevant Sections
1. To investigate intra annual patterns in standards of water and sanitation for low income communities in mountain settings.	Chapter 6 Chapter 7
(a) Examine existing methods for studying the seasonal aspects of members of a mountain communities livelihoods	Chapter 2 Chapter 3
(b) Develop a means of examining and reporting an individuals and community's experience of standards of water and sanitation over the course of a year	Chapter 2 Chapter 4
(c) Apply the methods developed in (b) to a set of communities in Humla, Nepal	Completed in field
(d) Observe functionality of infrastructure in a mountainous settings and report on intra-annual variations	Completed in field
(e) Provide a set of case studies demonstrating if there are intra-annual variance in standards of access to water and sanitation	Chapter 6 Chapter 7
(f) Assess whether the intra annual variations of standards of water and sanitation imply that one off snapshot statistics may be misrepresentative	Chapter 7
2. To determine intra-annual patterns of challenges and opportunities for improving standards of water and sanitation in mountainous regions	Chapter 8
(a) Identify the challenges and opportunities faced by organisations working to improve standards of water and sanitation in mountain settings	Chapter 3
(b) Devise a method for collating opportunities and challenges faced by those working in water and sanitation to view the intra-annual variance of the challenges and opportunities faced.	Chapter 4
(c) Present a case study to demonstrate the seasonal variance of challenges and opportunities faced in provision of water and sanitation.	Chapter 8

1.10 Chapter Summary

This chapter has laid the foundations for the research. It has introduced and justified the aims and objectives and provided provisional cause for their investigation. The originality and anticipated contribution to knowledge from the research have been presented.

The reader has been provided with a structure of the thesis which details chapter content and areas of the thesis which deal with specific aims and objectives.

The next chapter will introduce the core theme of seasonality and review literature on work completed which details its impact on access to, and provision of, water and sanitation.

2 Seasonality, water and sanitation

2.1 Chapter Outline

This chapter will present the existing literature used by the researcher in investigating the primary themes of the project. The chapter first introduces the concept of seasonality, how it is measured and where it has been determined to have the greatest impacts. This is followed by a review of literature examining the relationship between seasonality, water and sanitation.

2.2 Seasonality

2.2.1 What is seasonality?

Seasonality refers to any regular pattern or variation that is correlated with the seasons. Seasons may derive from nature, or may exist in social and cultural behaviours or business and administrative procedures (Gill, 1991). Seasons in nature derive from the annual cycle of change in the Earth's climate e.g. changes in rainfall, temperature, day length and prevailing weather conditions. Many aspects of life are directly or independently dependent on climatic variations e.g. employment opportunities, food availability, demand for services etc. Non climatic seasonality includes those variations related to fixed calendar events, for example religious practices and festivals, policies, financial year and tax regulations (Anderson et al., 2009).

2.2.2 Measuring seasonality

The following section is summarised from pg. 186 of 'Quantitative Methods for Business' by Anderson et al., (2009) and diagrams are reproductions of those included in a lecture entitled *'Trends and Seasonality using Multiple Regression with Time Series Data*' delivered in the University of Nevada (University of Nevada, ND).

2.2.2.1 Time Series Data

A set of statistics collected at regular intervals is known as a time series. To observe seasonality, these intervals must allow for data collection at more than one point in a calendar year.

Time series data occur in many application areas, including:

- Economics - e.g. monthly data for unemployment
- Environmental – e.g. daily rainfall, air quality readings
- Finance- e.g. daily exchange rate, share prices
- Sanitation – e.g. annual measurements of access to improved sanitation

A time series of any data can typically be described by a classical decomposition into four components; trend, seasonal, cyclical and irregular (Srivastava et al., 1989).

Trend Components

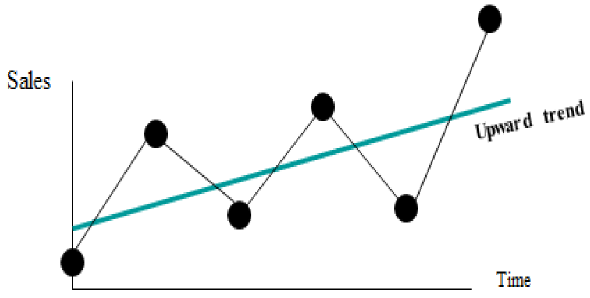

Figure 2-1 Trend components of a time series (University of Nevada, ND)

Long-run increase or decrease of mean over time

- Data taken over long period of time
- Trend can be upward or downward
- Trend can be linear or non-linear

Example: increasing ownership of mobile phones worldwide

Seasonal Component

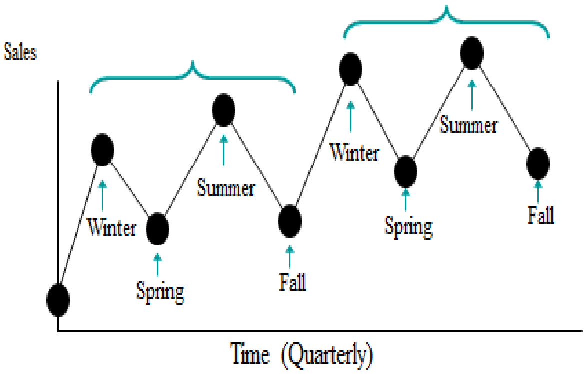

Figure 2-2 Seasonal components of a time series (University of Nevada, ND)

Cyclical fluctuations related to the calendar

- Short term wave-like patterns
- Observed within one year
- Often monthly or quarterly
- Could be deterministic (predictable) or stochastic (maybe partially repeats itself, partially predictable)

Example: increased retail sales at Christmas

Cyclical Component

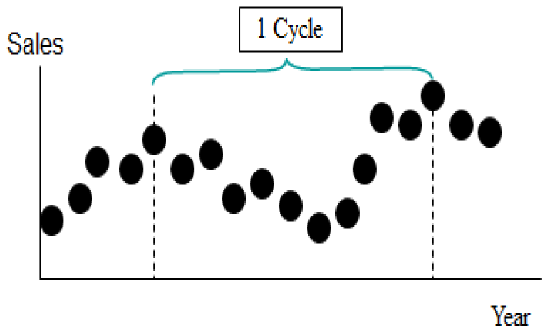

Figure 2-3 Cyclical components of a time series (University of Nevada, ND)

Cyclical fluctuations not tied to calendar (such as a business cycles)

- Long-term wave-like pattern
- Regularly occur but may change in length
- Often measured peak to peak or trough to trough

Example: UK Unemployment

Irregular Component

Irregular economic fluctuations result from unusual events, such as floods, strikes, civil strife, large bankruptcies and terrorist incidents. The impact of these fluctuations is usually limited to a certain industry or market.

Example: Flooding may affect the distribution capability within a specific region.

2.2.2.2 Analysing changes over time

When analysing changes over time one can prepare either a stock, or a flow series. A stock series is a measure of certain attributes at a point in time, like a stocktake. A flow series is a measurement of activity over a given period of time (University of South Carolina - Arnold School of Public Health, 2006). A population count is a stock take. Numbers of births and deaths per day are examples of flow series that affect the stock. The main difference between a stock and a flow series is that a flow series more directly contains effects related to the calendar, while a stock analysis seeks long terms trends of capital (Anderson et al., 2009).

A product that experiences a seasonal demand pattern has a repeatable shape during a given time frame. The time frame may be monthly (school books), weekly (shopping), daily (lunch) or yearly (sun tan lotion). These fluctuations may be missed when using stock takes only. By 'taking stock' one may miss the turning points and fluctuations of a series e.g. a yearly stock take in June suggests book sales are going up but misses peaks of sales before school starts in September and at Christmas time.

2.2.2.3 Seasonal Adjustment

In the analysis of trends, seasonal adjustment is typically used to remove systematic and calendar related events from a trend to see the true underlying movement of the time series (when seeking non-seasonal trends). Seasonal trends should in theory happen with the same magnitude during the same time period each year, thus they can be removed or separated to ease focus on other components.

This technique is used often in unemployment rates, consumer spending, airline prices and many others to seek underlying trends rather than seasonal highs and lows. In central statistical agencies, the methods used are highly complex and allow for evolving seasonal patterns. A hypothetical example of seasonally adjusted data of timber

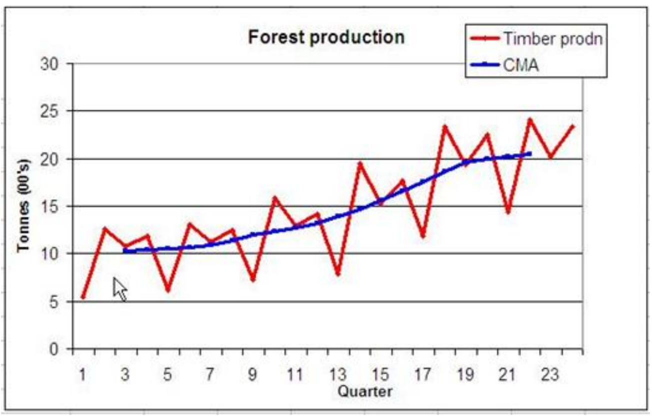

Figure 2-4 Elimination of seasonality from forest production to see overall data (Nayland College of Mathematics, ND)

production in a forest is in displayed in Figure 2-4. Eliminating seasonality allows the overall trend or central moving average (CMA) to be seen (Nayland College of Mathematics, ND). Standard practice in measuring poverty reduction (in all areas) typically seeks to eliminate seasonality to keep sight of the moving average – when the fluctuations are severe, this may represent a time of the year when families are extremely impoverished (Chambers, 2012). Depending on the intended use of the data, presence of seasonal components may be a help or a hindrance. The next section seeks to explore the relevance of seasonal data in poverty reduction.

2.3 Seasonality and Poverty

In many low income areas, particularly those with an agricultural based livelihood, the effect of seasonality on levels of poverty can be significant due to a lack of resources to cope with these seasonal fluctuations in health, wealth and resources. As a result, "*some of the poor get poorer on a seasonal basis, and some of the poor are not poor all of the time*" (Yaqub, 2000; p1).

While the relationship between time and poverty is frequently analysed, the trends examined are inter-year (i.e. a. stock take) while little attention has been paid to the intra-year variations which may drastically change an individual's, a family's or a community's experience of poverty (i.e. seasonal fluctuations) (Chambers, 2012). A UNDP Poverty Analysis Manual for Benin measured poverty by trimester and found that in 1994/95 poverty ranged from 26% in March to May to 43% in September to November (Aho et al., 1998 ;160). Similarly, a study in Ethiopia calculated poverty among 1141 rural households to be 34.1% in lean months before the 1994 harvest, 26.9% around harvest time and back to 35.4% in the 1995 lean season (Devereux et al., 2012a; p5, Dercon and Krishnan, 1998).

Despite evidence of the significance of seasonality of poverty, the reality is that measurements of poverty are data intensive even when seasonality is not considered. As a result, few in-depth studies looking at the relationship between seasonality and poverty exist.

2.3.1 Who seasonal poverty affects

Chambers (2009) states that experiences of seasonality can vary by location, occupation, gender, wealth and poverty, age, caste and class, and control of resources. As a general rule, he states that seasonal poverty is particularly prominent in communities which have one or more of the following characteristics:

- Rural
- Agricultural
- Marginalised

- Poor
- Tropical

Rural communities are particularly susceptible to seasonal poverty as many of the human activities and natural processes which govern rural life are closely linked to the seasons (Chambers et al., 1981). This is a result of the high correlation between rural livelihoods and dependency on agriculture as the primary income source.

Communities that are marginalised and poor are vulnerable to seasonal poverty as they lack political influence and the resources necessary to deal with seasonal fluctuations in their resources, health and/or wealth. Populations in the tropics experience high levels of climatic variation, and thus need coping strategies to deal with a wide range of extremes.

2.3.2 Exploring manifestations of seasonal poverty

The primary group investigating how seasonal poverty manifests is based at the Institute of Development Studies (IDS) in Sussex, UK. The working group in IDS has been behind the organisation of 2 conferences to promote the need for increased research on the relationship between seasonality in poverty. In 1978, the conference “Seasonal Dimensions to Rural Poverty”, led to the publication of a book of the same name in 1981. Ten years later, Gill from IDS published “Seasonality and Agriculture in the Developing World” (Gill, 1991). In 2009, 21 years after the first conference, another conference, “Seasonality Revisited: Perspectives on Seasonal Poverty” was held in IDS and lead to the publication of the most up to date book on seasonality and poverty, “Seasonality, Rural Livelihoods and Development” in 2012 (Devereux et al., 2012b).

In Chapter 1 of the book, Devereux et al (2012a) describe the culmination of these and other existing resources on seasonality as follows:

> *“All these publications identified and provided evidence for a similar set of insights: that climatic seasonality shapes and structures rural lives and livelihoods in the tropics in profound but often negative ways; that consistent patterns in these impacts can be discerned across countries as diverse and distant as Bangladesh and Zambia; and that development interventions must account for seasonality in their design and implementation, or they will be compromised and could even fail”*
>
> (Devereux et al., 2012a, p5)

A review was performed on references included in “Seasonality, Rural Livelihoods and Development”, of those which exclusively mentioned ‘season’, ‘seasonal’, ‘seasonality’ the topics primarily explored are shown in Table 2-1.

Table 2-1 A summary of reference studies included in 'Seasonality, Rural Livelihoods and Development ' (Devereux et al, 2012a) that included season, seasonal or seasonality in their title

Topic	**No. of Studies**
Nutrition/ Food Security/Hunger/Famine	15
Poverty (incl. coping strategies)	15
Health (incl. births, diarrhoea, HIV)	13
Wage/Income	9
Agriculture	8
Livelihoods (incl. migration)	7
Employment	5
Wealth	5
Social Protection	3
Education	2
Gender	1
Irrigation	1

From this table it can be seen that most often seasonality is most often studied with regard to poverty, nutrition, health and household income and wealth. Agriculture is also a major theme but often manifests in some of the other topics mentioned. Irrigation is the only theme mentioned which in centred on aspects of water access.

2.3.2.1 Health

The relationship between health and seasonality has been comparatively well explored in both Western and developing societies. In linking the two Drasar et al., (1981) state:

“The main climate factors determining the transmission of infections are rainfall and temperature. They affect disease by way of breeding of vectors, the survival of pathogenic organisms, and the proliferation rate of microbes in the environment”.

(Drasar et al., 1981, p102)

Wet and warmth are a combination that leads to diseases such as malaria and gastrointestinal conditions (Grant, 2005); diarrhoea (Kale et al., 2004, Drasar et al., 1981, Dostie et al., 2002) and malaria (Orkin, 2009, Chuma et al., 2006). In colder climates, conditions become favourable for tuberculosis and colds, with adverse weather also hampering accessibility to health care facilities (Mabaera et al., 2009). Magnitudes are variable and in many cases significant; in Madagascar, child mortality was found to triple between the harvest and the hungry season due to diarrhoea and malnutrition (Dostie et al., 2002).

Seasons exert external influences but also result in modification of endogenous factors. Externally, seasons and weather influence human behaviour. In the colder seasons people tend to stay indoors, leading to prolonged exposure time to patients with transmissible pulmonary tuberculosis, and resulting more frequently in successful transmission. Adverse weather may not only force people to spend more time indoors, but may also hamper accessibility to health care facilities (Mabaera et al., 2009)

Manmade (or non-climatic seasons) have also been shown to have an impact on health – for example, pregnant Islamic Gambian women showed significant weight loss during a month's fasting for Ramadan (Cole, 1993).

2.3.2.2 Nutrition

According to Vaitla et al., (2009) most of the world's acute hunger and under nutrition occurs in the annual "hunger season". They describe it as "*the time of the year when the previous year's harvest stocks have dwindled, food prices are high and jobs are scarce*"(Vaitla et al, 2009, p1). The authors explain that a combination of low production levels, inadequate storage facilities, and accumulated debt may all combine to force families to sell or consume their agricultural production before the new harvest.

Seasonality of food shortages often coincides with the increased prevalence of diarrhoea and other diseases during the rainy season; the resulting lean season exacting a heavy toll in the form of increased rates of malnutrition and child mortality (Dostie et al., 2002). This results from the combination of the illness, a loss of appetite and the struggle to retain what has been eaten (Vaitla et al., 2009).

In many cases annual cycles of seasonal hunger are predictable and are coped with through a variety of insurance mechanisms including selling off surplus animals, mild rationing, and seasonal migration (Devereux, 2009). However the poorest often do not have these resources to call on and suffer significantly in the lean season despite its predictability (Vaitla et al., 2009).

2.3.2.3 Income and wealth

Seasonality in household income and consumption in rural agrarian societies of developing countries is a common phenomenon (Chiwaula and Waibel, 2011). Household income and consumption tends to be high during the harvesting seasons and low during lean seasons when crop stocks are depleted.

This seasonality is by and large predictable, but shocks to the system e.g. a drought leading to poor crops, can have a significant effect on these patterns. “Asset buffers” are necessary to lift families above a threshold level that protects them against seasonal poverty ratchets (Devereux et al., 2012a; p3). Christiansen and Boisvert (2000) recommend that rather than investing in increased crop production, more money should be channelled towards stabilising agricultural income and consumption variability.

2.4 Seasonal Blindness

The fluctuating aspects of many dimensions of poverty imply that a snapshot at a point in time will be unable to represent stability of dimensions over longer periods of time (McKay & Lawson 2002), yet comparatively few studies exist which examine seasonality.

Following the publication of “Seasonality, Rural Livelihoods and Development” in 2012, John Macgrath in a blog for Oxfam declared “Seasonality is back in season!” Mr Magrath welcomes the return of the ‘trend’ for seasonality but expresses confusion as to why there is so little work in the area. An excerpt is presented below:

> *I declare an interest because I think that seasonality is one of those things that is staring us in the face so closely that we don't see it properly; we take it for granted as "just another thing poor people have to put up with" when it could illuminate our understanding, analysis and practice.*
>
> *But am I right? Or do people working in development say a) we recognise seasonality but actually, we don't see it as particularly important compared to other influences on poor people's lives, or other ways into helping them tackle their problems? Or b), we think it is important but we think that it is already incorporated sufficiently into planning for long-term development, humanitarian response and, in particular, social protection initiatives?*
>
> (Magrath, 2012)

Not only do those working in development choose to not look at seasonality, in some cases statistics gathered purposely eliminate seasonality through counter-seasonal or a-seasonal bias to gain overall trends (Chambers, 2009).

Publications from IDS suggest a number of other reasons why seasonal poverty is subject to bias. Chambers (2012, p89) summarises these as shown in Figure 2-5.

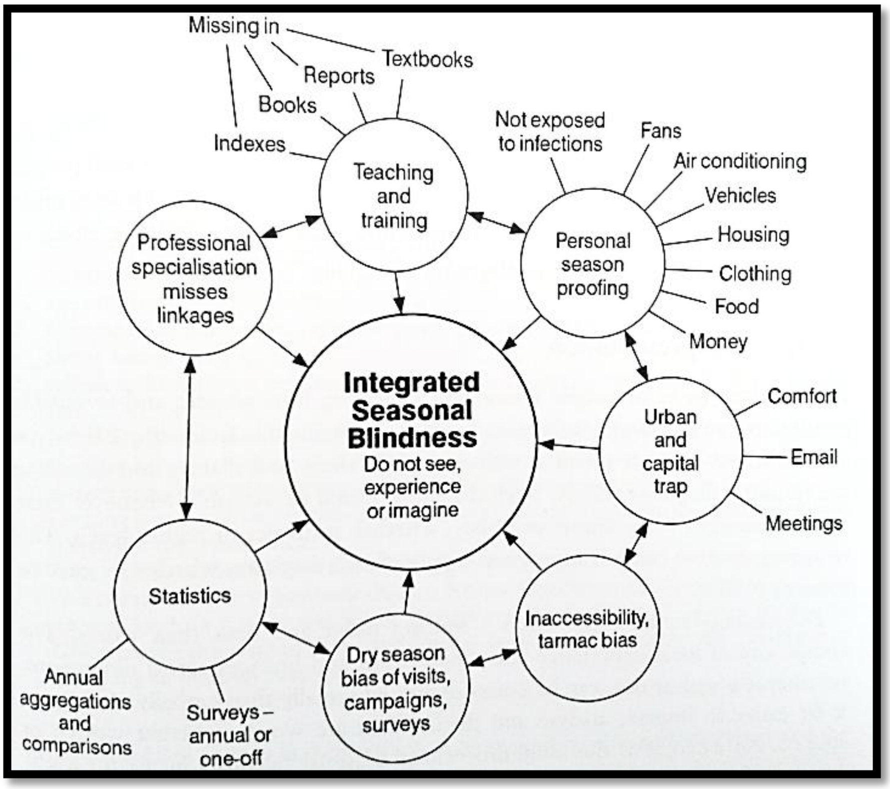

Figure 2-5 Integrated Seasonal Blindness as described by Robert Chambers (2012, p9) in 'Seasonality, Rural Livelihoods and Development'(Deveruex, et al, 2012a).

He describes development professionals as "season proofed" and "season blind" (Chambers, 2009). As can be seen from Figure 2-5 many of the factors in this are centred round the professional themselves. While at times areas may be inaccessible due to weather; the primary issues stem from a (i) a lack of teaching, training and documentation on the topic, (ii) the ability of more wealthy people to 'season proof' through use of fans, air conditioning, vehicles, housing etc., (iii) the 'urban and capital' trap in which an individual can live with increased comfort and access to the internet, (iv) the tarmac and dry season biases which contribute toward keeping development professionals away from rural field sites, and (v) the way in which statistics are prepared with a purpose of eliminating seasonality.

The following section explores some of the reasons for seasonal blindness in more detail.

2.4.1.1 Data

Lack of familiarity – not typically measured

Use of measurements for poverty has long been focused on preparation of aggregate statistics for comparison. In a 1999 literature review by Yaqub, only five of the 44 countries classified as having 'low' human development indicators by the UNDP had household level of data that permitted any analysis of the dynamics of poverty (Baulch and Hoddinott, 2000, Yaqub, 2000).

Even in cases where methods for seasonal analysis do exist, they are data intensive and the value of what they can contribute to programmes is uncertain. This 'value' is of great importance as there are significant costs involved in collecting data throughout the year, then analysing and reporting findings by season.

Ambiguity

There is also a certain ambiguity about seasonality. It is far reaching in its impacts and nuanced by multiple and complex livelihoods (Devereux and Sabates-Wheeler, 2009). Seasonality is also inherently associated with weather and nature; uncontrollable and far-reaching forces. The IDS group make it clear in "Seasonality, Rural Livelihoods and Development" that it is not the weather at fault in causing seasonal poverty; in fact the weather exposes the fundamental inequalities in resource distribution and access to services. Sabates- Wheeler (2012) argues that this simplistic focus on climate as a driver of vulnerability is detrimental to our ability to tackle it.

As Chambers (2012) summarises in a riddle:

And statisticians too declare

They have a seasonal nightmare

An average is but a dream

When season's means aren't what they seem

(Chambers, 2012, p87)

In this riddle, Chambers (2012) explains the difficulty caused to statisticians, in compiling data where a mean or average may not be appropriate.

2.4.1.2 Inaccessibility and Tarmac Bias

Tarmac bias permeates many streams of development work. It occurs when researchers, practitioners and policy makers chose to visit communities that are accessible via a good road (or alternative transport method). Typically some of the most deprived populations live in areas with poor accessibility; with seasonality exacerbating this by rendering many villages completely unreachable during particularly certain times of the year (UN Mongolia, 2010).

Figure 2-6 Poor road conditions exacerbated by seasonal rains in Liberia (photo from Luttermoser, 2012)

In an article by John Luttermoser, the photo in Figure 2-6 is presented as he describes the chaos of complete inaccessibility in the rainy season to the Nimba County region of Liberia (Luttermoser, 2012). Luttermoser describes lines of trucks stuck for days due to the poor road conditions with no means of escape. This leads him to conclude that the next trip to Liberia “was going to be in the dry season” – exhibiting how poor accessibility can lead to dry season bias.

2.4.1.3 Personal Season Proofing

Many people who work in development (and also those who don’t) prefer to live in comfortable and familiar surroundings. Rural areas with seasonal climates do not typically entice those who prefer comfort. A personal reluctance to move and be forcibly exposed to a seasonal way of life can be off-putting for many. The modern comforts which typically protect us from seasonality may not exist in areas experiencing seasonal poverty. This is particularly true in mountain communities where difficulties in access and demanding living conditions create particularly unfavourable seasons in which researchers do not want to work (Chambers et al., 1981; Ericsson et al., 2001).

2.4.1.4 Urban and Capital Trap

The urban and/or capital trap is again one that permeates many areas of development. Michael Lipton in his 1977 work ‘Why poor people stay poor: urban bias in world development’ was one of the first to suggest that development is hampered by groups of decision makers all residing in cities and lacking communication with rural areas (Lipton, 1977). Government and aid workers typically prefer not to live in rural communities lacking services and means of communication (Chambers et al., 1981).

2.4.1.5 *Dry season Bias*

Such is the reluctance of government and aid workers to visit communities in the rains that in Bangladesh northern visitors are known as sheether pakhi – a winter bird that comes from January to March (Chambers, 2009). Surveys, campaigns and assessments are rarely carried out in rainy seasons. The seasons in which poverty is highest and living conditions worst can also be the ones when the poor are least visible.

2.4.1.6 *Professional Specialism*

Seasonality manifests in multiple dimensions of peoples livelihoods – food availability health, prices, employment, wealth – thus to assess the impact of seasonality, one must seek for a holistic view across many systems. However, professionals through all industries are increasing encouraged to acquire a specialisation. This single focus approach to work hinders the attainment of an integrated, well linked picture of how seasonality interacts with rural systems. Furthermore single sector response systems may not be capable of dealing with the findings that present integrated problems. As Devereux et al summarise:

"Rural people experience seasons in a holistic manner, and professional outsiders should do the same"

(Devereux et al., 2012a; p3)

2.4.2 Measuring seasonal poverty – the seasonal calendar

One method used to gain an understanding of the complexity of people's lives is known as a seasonal calendar. Seasonal calendars originate from Participatory Rural Appraisal (PRA) techniques and are used for the purposes of presenting large quantities of diverse information over a common time frame (Almedom et al., 1997), typically a calendar year.

The calendar identifies cycles of activity that occur within the life of community e.g. illness, livelihoods, agricultural calendars etc. Identified cycles may be important in determining, for example; labour availability, timing for project activity, potential absorptive capacity for new activities, times of diseases and food shortage and variation of cash flow.

Data are typically collected from community groups using any available materials such as seeds, stones, beans, soil, sand, leaves, ash etc. to rank the importance or magnitude of a given activity according to a specified time period (e.g. week, month, season, local measurement of time). Some examples are presented in Figure 2-7 and Figure 2-8.

Figure 2-7 shows an example of a seasonal calendar taken from the FAO Group Savings Resource Book (FAO, 2002). In this example community members highlight their seasonal income and outgoings by drawing a table and laying a stone in the relevant box. Figure 2-7   presents a version of the calendar drawn for recording purposes by a facilitator.

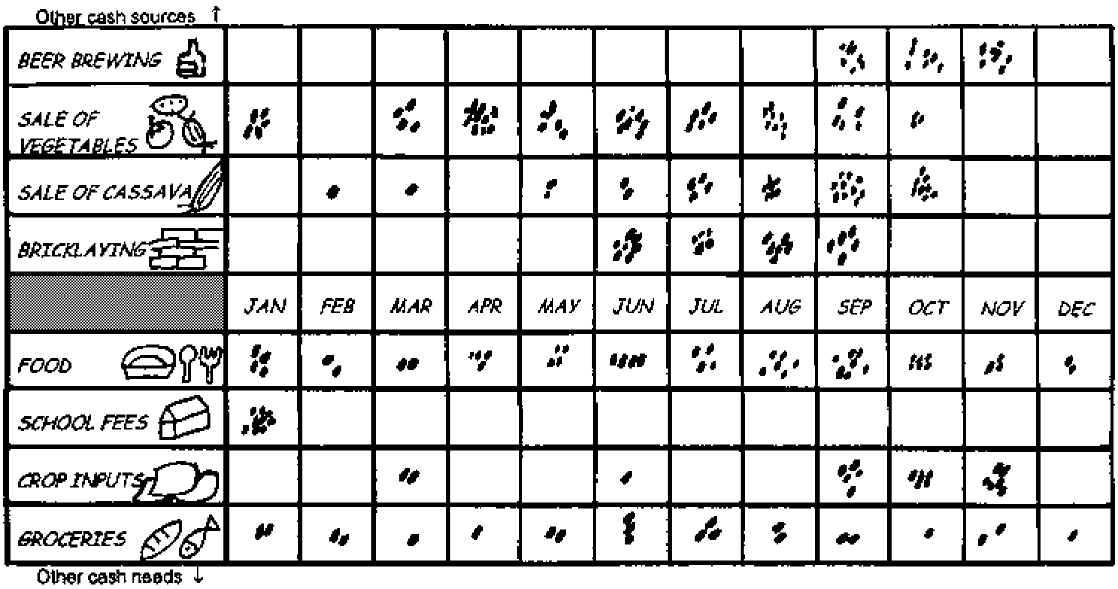

Figure 2-7 Example seasonal calendar from the Food and Agriculture Organization (2002)

This seasonal calendar focuses on income generation and expenditure over the course of a year. This basic example shows that June to September is a strong time for employment, with community members engaged in sale of vegetables, sale of cassava and bricklaying. Expenditure varies throughout the year but January is a key month due to the payment of school fees and cost of groceries. A calendar as simple as this can give good insight to monthly patterns of priorities in a community (FAO, 2002).

Seasonal calendars in this basic form may then be transformed to diagrammatically represent magnitude in an easier to read fashion. In the example provided in Figure 2-8, the labels on the vertical axis signify a little (*kidogo*), medium/average (*wastani*/*kiasi*), and a lot (*sana*) in *Kiswahili*. The information provided in this case also included adult illnesses, and it was suggested that the same climatic and illness pattern occurred most years (Almedom et al., 1997).

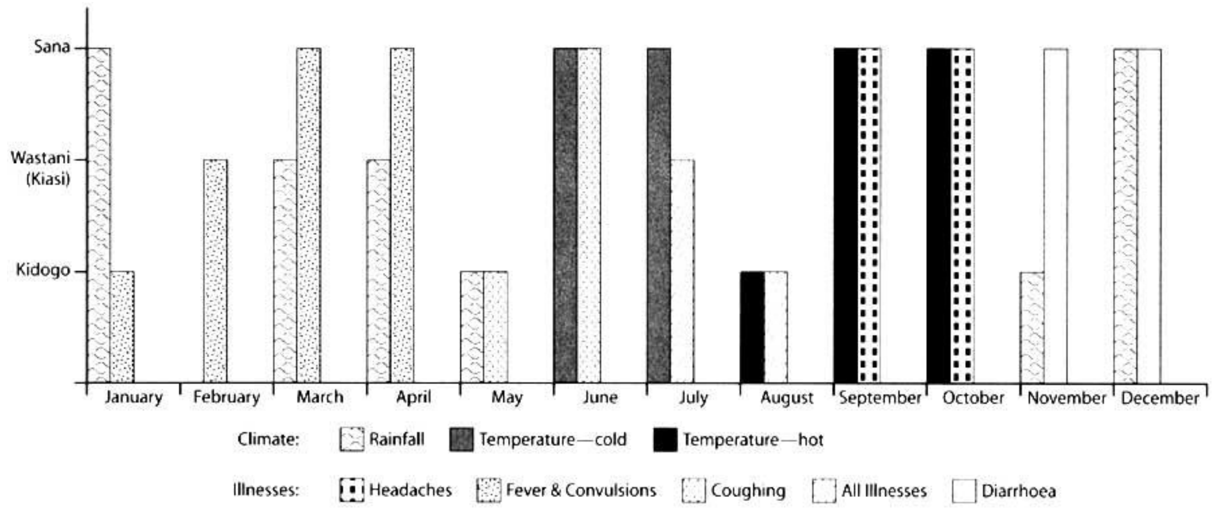

Figure 2-8 Illnesses and climate in Asanje, Tanzania (N=16). Taken from Almedom et al (1997)

2.4.3 Addressing seasonal poverty

2.4.3.1 Institutional Level

The Seasonality Revisited International Conference in 2009 concluded that the costs of ignoring the seasonal dimensions of poverty are enormous in terms of both finances and wellbeing - yet this is rarely reflected in the policies of the sectors it most affects, social protection and agriculture. With the increasing effects of climate change, building seasonality into policy may be more relevant than ever before. To minimise seasonal "blind spots", Sabates-Wheeler and Devereux (2012) recommend that policymakers

"…explicitly recognize that

1. *Seasonality is a predictable stress and driver of rural 'poverty ratchets ';*
2. *Seasonality is embedded within all aspects of rural lives and livelihoods;*
3. *The impacts of seasonality are mediated by systems of access and distribution – which makes seasonality a political, not just a technical, issue."*

Sabates-Wheeler and Devereux (2012, p295)

2.4.3.2 Community Level

Seasonal vulnerabilities frequently underpin tip-overs into crisis and thus need to be evened out to reduce risk. Coping strategies of people need to be enhanced so that they lead a-seasonal livelihoods (Sabates-Wheeler and Devereux, 2012). To do this requires an understanding of the complexity of people's lives and a movement away from seasonally disaggregated data to appropriate, longitudinal, multi-sectoral studies and interventions. Yet the problem remains that despite its importance, "*seasonality does not seem to be a category on many professionals' mental maps*" (Chambers, 2012; p87)

2.5 Seasonality and Access to Water and Sanitation

Whilst it is not widely reported, many studies have recognised that seasonality is an important component of the assessment of water access (Action Against Hunger, 2009, Coulter, 2010, Coulter et al., 2012, Almedom et al., 1997, Centre for Disease Control, 2008, Dessalegn et al., 2013, Bostoen, 2007). Studies which look at the interaction between seasonality and sanitation are few. The following section will explore the contents of these existing studies.

2.5.1 Should seasonal access to water and sanitation be measured?

In his thesis investigating an improved way of measuring access to water, Bostoen states that *"One of the main problems with cross –sectional surveys is that they only give a snapshot of the situation at the moment of the survey*" (Bostoen, 2007, p11). This is the primary reason for incorporation of seasonality in surveys of access to water and sanitation – to investigate if the 'snapshot' applies year round and if so if the variations are worthy of consideration in planning and implementation of water and sanitation programmes. From the experience of Coulter (2012) in rural Ethiopia, *"Understanding seasonal access to water is mandatory for understanding periods of resilience and vulnerability within the yearly cycle",* "…..to incorporate seasonality improves targeting, timing of monitoring and responses".

The earliest mention of seasonality and water in published literature retrieved by the author was from Gerry Gill (1991) in his book 'Seasonality and Agriculture in the Developing World: a problem of the poor and powerless'. On pg13 he notes that "*In the dry season it may be necessary, particularly for women and girls, to trek long distances to fetch water, and this will tend to reduce the quantity consumed even for drinking purposes. In the rainy season there may be ample quantities of surface water, but it may also be contaminated with pollutants washed in to it by the rain*".

(Gill, 191, p13)

In currently available literature, the relationship between seasonality and drinking water supply has been considered in a range of contexts; at times as the exclusive aim of a project (Coulter et al., 2012), but primarily as a subset of the study. The following section presents an insight on seasonality from Ethiopia (Coulter et al., 2012, Dessalegn et al., 2013), Burkina Faso (WaterAid Burkina Faso, 2013), Kenya (Bostoen, 2007), Laos (Bostoen, 2007), Cambodia (World Toilet Organization, 2010), India (Pattanayak et al., 2010) and Benin (IOB & BMZ, 2011)

2.5.1.1 The impact of seasonality on water source selection

In considering if seasonality was worthy of inclusion in indicators of access to drinking water, Bostoen(2007) looked at the percentages of households using alternative drinking water sources over the course of a year in Korogocho, Kenya (411 households) and Thakhek, Laos (998 households)[4] . In Kenya seasonal variations were found to be of a good confidence interval and the primary drinking water source was found to be representative for most of the year with less than 10% variation in water source all year and less than 5% in each month except January, February and September during drier periods of the year.

In Laos, results were of a similar percentage: at peak dry times up to 12% of people interviewed used an alternative drinking water source, but only 2-3% used an alternative drinking water source not fit for drinking (see Figure 2-9).

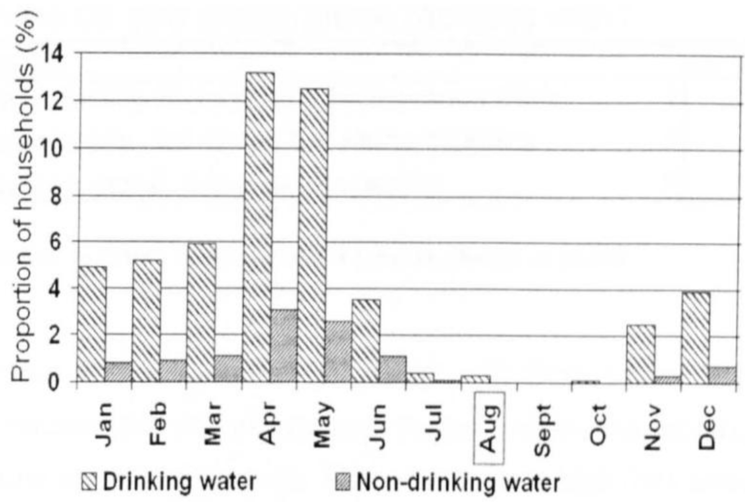

Figure 2-9 Seasonal variations in household water sources from Thakhek, Laos (Bostoen, 2007)

While in these cases the seasonal shifts in water source selection were found to be negligible Bostoen (2007) continued to recommend the inclusion of seasonality in standard local water and sanitation surveys deeming it an important factor to consider.

Other studies have found more significant variation. In a Knowledge, Attitudes and Practice (KAP) study of 124 households in South Sudan, Action Against Hunger state that 99% of people were accessing safe water sources in the dry season but 28% of those switched to rainwater provided surface water in the rainy season. Therefore, while water was sufficient year round – it was actually the relative abundance of water in the rainy seasons that lead to people using unimproved sources.

A study conducted by the World Toilet Organisation in Cambodia published in 2009 found similarly large shifts (World Toilet Organization, 2010). In the wet season 80% of people surveyed used rainwater harvesting while in the dry season needs were met through a combination of tubewells and boreholes (52%), surface water (23%), Cart with small tank (6%), public tankers (3.5%) and a variety of alternatives (all <3%). This change in source was found to double the price of water (from

[4] This was carried out through insertion of a question regarding the months of non-operation of each source mentioned in the questionnaire.

67 riel per day on average in wet to 134 on average in dry). In the dry season 22.6% of people were found to be paying for a primary water source, with just 3% in the wet season. Collection time was found to vary significantly but remained acceptable in increasing from 1.5 minutes to 10 minutes. This is in contrast to the Action Against Hunger Study – where the rainy season led to increased use of 'improved' sources of water and easier access.

In Ethiopia, Dessalegn et al., (2013) again focused on a set of communities largely dependent on rainwater. And while, similar to Cambodia, access to water was typically cited as better in the rainy seasons – the source was felt to be a very risky one due to the ever-present possibility of rain failure, with those depending on spring, surface water and rainwater harvesting particularly vulnerable to rainfall variability.

In the dry season he found that, not only did people have to travel further, but often an entire village was dependent on one deep borehole and thus queues were very long. WaterAid Burkina Faso found a similar situation in their studies and found that these extreme queues were leading to conflict over water between people, livestock keepers and farmers (WaterAid Burkina Faso, 2013).

As shown in Figure 2-10, Dessalegn et al., (2013) found that in one Ethiopian district (Konso), that water collection was found to take between 2-5 hours longer in the dry season due to the increased distance travelled and queues.

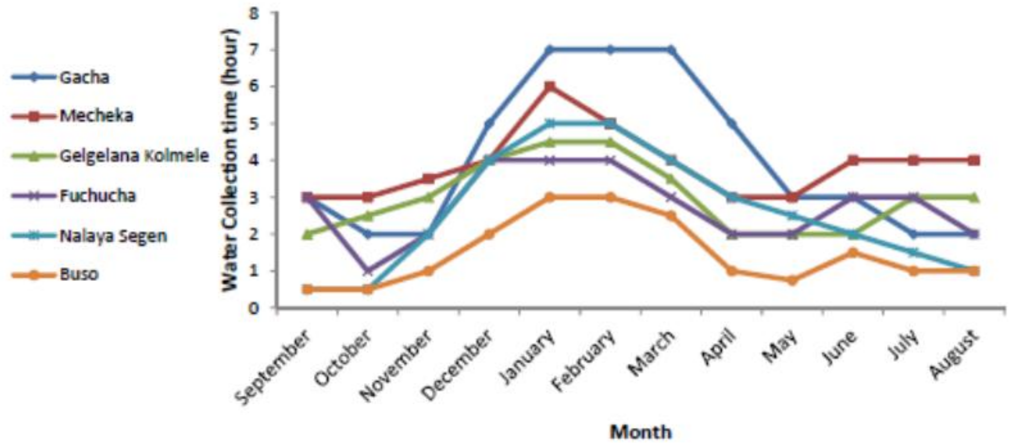

Figure 2-10 Seasonal time taken to collect water in a six villages of Konso District, Ethiopia (Dessalegn et al., 2013)

In some instances, the dry season also led to higher demand due to increased consumption both by humans and livestock due to higher temperature and the lower water content of the livestock fodder, and in some cases to provide for livestock watering and domestic bathing and laundry (which in the wet season could be practiced at open sources). Dessalegn et al found that in some areas – dramatic distance and time increase led to decreased collection, but in the majority of cases there was increased demand despite the increased time/distance. Thus demand was found to be inelastic, in spite of the rapidly rising costs (both time and money). Figure 2-11 shows this effect for villages in Shinile and Konso Districts of Ethiopia, where in some cases number of jerry cans collected per day can be seen to increase in the dry season, and in other cases can be seen to decrease. The households of Mermesrsa can be seen to collect four jerry cans in the wet season and ten in the dry season, while the households of Gaad decrease their collection from ten jerry cans to seven.

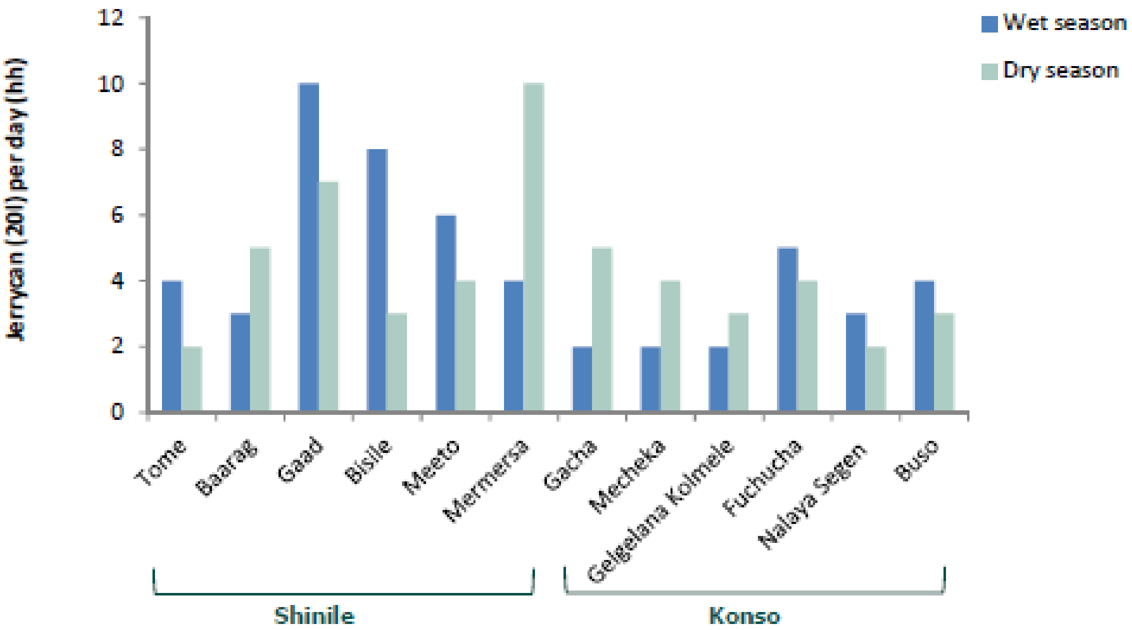

Figure 2-11 Reported daily water collection (in 20l jerry cans) in wet and dry seasons of a normal year (Dessalegn et al., 2013)

Dessalegn et al., (2013) also noted the overlap of peak water collection times and peak working times with women noting that:

"The high season of work and shortage of water join together. We lose two days of farm work for the purpose of travelling and collecting water".

Focus group participant, taken from Dessalegn et al (2013)

In another Ethiopian based study, Coulter (2008) did research which focused entirely on the link between water cycles and labour cycles. In a study of both domestic and productive water use, she found high correlation between access to water and rainfall levels, with a significant variation in source and time taken observed. In the wet seasons households would access water at nearby ponds and seasonal pools. In the dry seasons, the pastoralists excavated water from dried river bed pits and were forced to migrate during the second half of the longer dry season to perennial rivers to secure enough water. Again the times of peak demand for water were found to overlap with peak times of work.

As shown in Figure 2-12, Coulter (2008) plotted a seasonal calendar which showed collection time for each source of water by month of access, which when combined with knowledge of other seasonal activities, gives an insight to household decision making on labour allocation among domestic and productive activities.

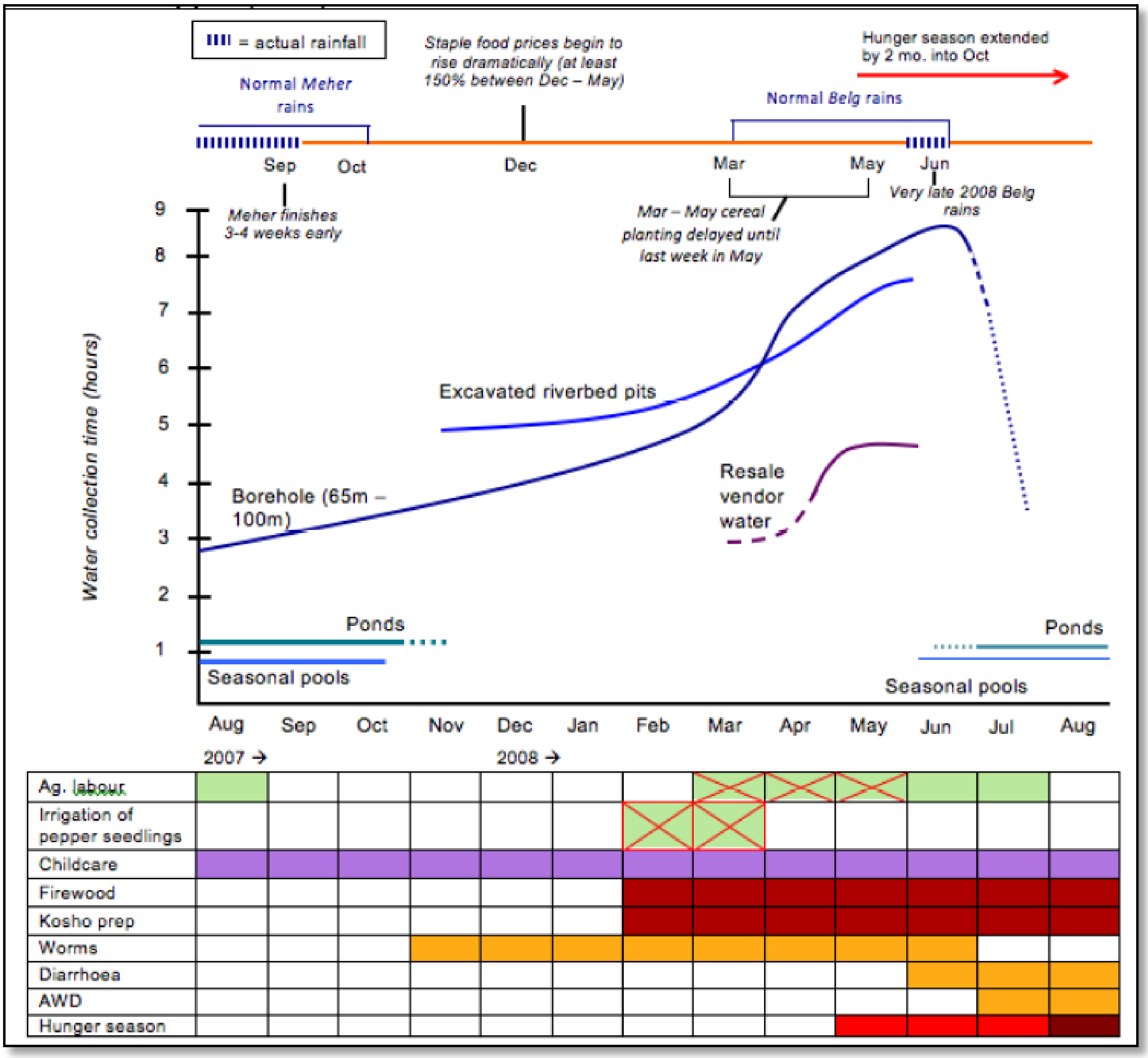

Figure 2-12 Seasonal calendar of water access in a hazard year in Alaba Mareko Lowland Pepper Livelihood Zone (Coulter 2008)

In the diagram, Coulter presents water access in the top portion with the y axis representing variations in time taken to collect water (from 1 – 9 hours) over the course of the calendar year (on the x-axis). Collection times of over 5 hours are seen from March – June when the queues at boreholes build and people turn to excavated river beds and water vendors to try to fill their water needs.

Primary livelihood events of the families are seen in the bottom of the Figure. These include labour activity and health risks. Peak season for agricultural labour and firewood collection are seen to overlap with times of peak time for water collection. Figure 2-12 also highlights the seasonal shift s in water quality experienced by the Ethiopian people in Coulter's study. Diarrhoeal peaks were found to occur around the time the population returned to using pools – intestinal worms were found to be linked with excavated river pits.

Through this analysis of livelihoods and water access, the importance of a family's wealth in access to water was also identified. As seen in Figure 2-13, while all households were seen to have water access for livestock drop by nearly 60% from the wet to the dry season; wealthier households were able to mobilise resources (family members, hired help, donkey and cart) to ensure that their household and livestock continued to go get 85-90% of their water needs. In contrast, poorer families were found to cut down on use, or purchase water from a vendor in order to keep family members available for labour. From this investigation Coulter highlighted that each year poor households were struggling to meet water demands and are particularly vulnerable to shifts in the rainy season (or short rainy seasons).

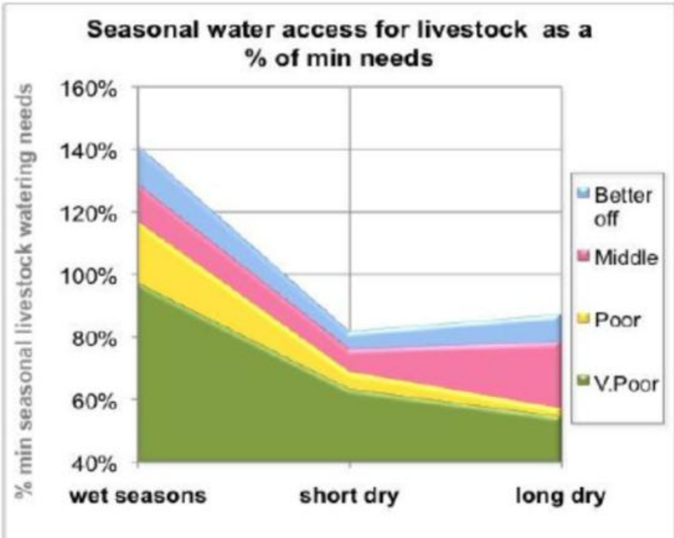

Figure 2-13 Seasonal access to water for livestock - a comparison by wealth (Coulter, 2008b)

Coulter's study is representative of many, where the shift to (typically) surface water or open water sources led to a decrease in water quality with bouts of diarrhoea typically being associated with the rainy season (Action Against Hunger, 2009, Dessalegn et al., 2013). The exception is in Cambodia, where the shift to rainwater harvesting led to increased drinking water quality in the rainy season (World Toilet Organisation, 2010). Dessalegn et al (2013) found that in the dry season – a reluctance to travel to distant safe sources with large queues was causing some households to use unsafe water closer to home. He also found that residents of one village (Gelgelana-Kolmele) reported that their spring became 'contaminated' (by which they meant bad smells) during the wet season and when this happened they would resort to sources outside of their village[5]. Often these sources were unimproved (rivers), thus impacting statistics on those using improved water sources.

In a study specifically looking at water quality across the seasons, Pritchard, Mkandawure et al., (2007) tested 21 covered /protected wells and five open/unprotected wells in Malawi at 4 different times of the year. Total coliforms and faecal coliforms were higher in the wet season (Feb and April) than in the dry season (August and October) – although quality was low overall. 80% of shallow wells in the dry season did not meet guidelines from the Ministry of Water; this increased to 100% in the wet season. Of the protected wells, 50% failed to meet faecal coliforms guidelines in the dry season and this increased to 94% in the wet season. It was concluded that the shallow wells are grossly contaminated microbiologically and this contamination is worse in wet season.

Overall seasonality has been noted to influence quantities available at a source, time taken for collection of water and quality of water at a source. In some areas the rainy season led to improved water access, but lowered water quality due to sourcing of water from unimproved sources. In others where rainwater is collected – an improvement is seen in both quality and quantity. The need to seek water in the dry season has been shown to impact on peoples livelihoods activities – using time needed for agricultural work for water collection. The need to use alternative water sources to meet demand in the dry season, and the use of surface water in the rainy season has been shown to lead to negative impacts on health. Coulter has shown the ability of the wealthy to 'buy their way' out of the variations to a degree, whereas the ultra-poor must allocate human resources more strategically. Overall, depending on the context, water source selection can be seen to have a negligible shift between seasons (Kenya, Lao) or a significant one worthy of consideration in planning and decision making (Ethiopia, Cambodia).

2.5.1.2 The impact of seasonality on sanitation

The impact of seasonality on sanitation is less well documented – with some alluding to the fact that it is worthy of pursuit (Chambers, 2009, Bostoen, 2007), but few including it in analyses (World Toilet Organization, 2010, U.S. Centers for Disease Control and Prevention, 2006, Ekane, 2012). In a 2011 survey by the Overseas Development Institute (ODI), information related to climate change and water is collated with an aim "to summarise current understanding of climate change projections and scenarios, and the impacts climate change may have on water resources, and water supply,

[5] Dessalegn et al., (2013) note that local perceptions of water quality do not necessarily correspond with source type (improved versus unimproved sources, or surface water vs groundwater). As these perceptions are key determinants of which sources people actually use, this suggests that there is a disjunction between the views, opinions and understandings of interveners – whether government, NGO or private sector – and communities.

sanitation and hygiene (WASH) in Sub Saharan Africa and South Asia". On page vi the report states that "it is important to note the marked absence of literature on climate change and sanitation". A key conclusion in the report is that more research is required to better understand the impacts of climate change on existing sanitation systems and to identify effective responses to current and future climate change.

In Kampong Speu, Cambodia, the World Toilet Organization (2010) looked at use of existing latrines across the seasons. They found that among the 148 latrine owners surveyed (pour flush and dry latrines), that latrine usage for those who owned dry latrines changed significantly with the seasons, with 79.3% of adults using latrines in the wet season, to 55.2% in the dry season. Children were found to have similar behaviours with 61% using latrines in the wet season compared with 52% in the dry season. Flies and smell were typically cited as reasons for non-use. The seasonal differences were not significant for those who owned flush/pour flush latrines – with reported use of 94% for adults in the wet season and 92% use in the dry season. Thus the choice of technology was seen to have a great impact on year round usage. This also had a large impact on satisfaction with latrines, with 95.8% of pour flush latrine owners satisfied with their system, and 75.8% of dry latrine users satisfied. In another independent analysis of Kampong Speu, a study found that open defecation was also found unpleasant in the rainy season due to the need to walk across fields in the mud and respondents getting wet while outside (Anand and Jenkins, 2010).

Another study which documents seasonal suitability of latrine systems was completed by the U.S. Centre for Disease Control and Prevention (CDC) for the American Red Cross. Following Hurricane Mitch in 1998 an abundance of work on sanitation had been carried out improving sanitation across El Salvador, Guatemala, Honduras and Nicaragua. This survey was carried out in 2006 to reflect on the sustainability of the interventions. A sample of 8 communities from the 4 countries was selected for investigation. In 3 of the communities (La Ceiba (El Salvador) and Guayabo (Guatemala) Marcovia (Honduras)) open pit latrines were found to be problematic as they were overflowing during the rainy season. In Marcovia the problem was found to be so bad that standing sewage was the norm in the community throughout much of the rainy season. In Guayabo, the pits were found to be full in the rainy season and become unusable (U.S. Centers for Disease Control and Prevention, 2006). Throughout the communities pit collapse and seasonal flooding of pits was common place.

The same complaints were reported in Angkor Chum District of Siem Reap province of Cambodia on a separate report to examine the return to open defecation in the area following the Community Led Total Sanitation Process (CLTS) (Illian and Cikhartova, 2012). In one village, half of the villagers (111 households) constructed latrines in the first CLTS process, with all but one of these was destroyed in the first post CLTS rainy season. Several were rebuilt and destroyed during the second rainy season. In another village, all 65 newly constructed pit latrines were destroyed.

The report describes the issues with latrines selected as follows:

"Unfortunately, the pit latrine designs that the homeowners selected were flimsy, and they were built in low lying areas that were subject to rainwater flooding. When the pits filled with rainwater in the rainy season, the wood floors washed away, the faeces lifted out of the pits, mixed with mud, and inundated the areas around the houses. The villagers describe the quagmire as disgusting and filthy. They could not use their latrines for weeks at a time during the rainy season and had to rebuild them annually. The poorest of the poor did not have help or the materials to rebuild their pit latrines even if they had been inclined to do so".

(Illian and Cikhartova, 2012, p5)

Thus the latrines were actually leading to increased health risks by flooding close to individuals homes, at times to the point of pit destruction. In the dry season primary complaints regarded disgust at the amount of flies and worms present in the pits. This was cited as causing disease, with all interviewees reporting increased ill health in the dry season.

This experience led to both village chiefs interviewed stating that they would never build latrines again because of this bad experience. However 75% of those interviewed said that they would consider latrine construction if it could be robust, dignified and capable of withstanding the rainy season. In one of the only references to seasonality and open defecation, three respondents in a focus group conducted as part of the study explained that they got a headache or stomach ache when they had to walk long distances to defecate in the heat of the dry season.

In a study of Burea District, Rwanda, looking at the difference between policies, stated beliefs and actual practice, Ekane et al., (2012) found that during the rainy season logs at the entrance to, and within latrines, became wet, soft and slippery. The participants of their focus group discussions reported that people, especially children, can slip and fall into latrine pits, especially in the rainy season and during the night. Because of the poor superstructure in the latrines, people reported using an umbrella, leaves, or whatever is to hand, to cover themselves up when they visit the latrine in rainy periods. Similar to the Central American study, the shallow pits were also reported to quickly fill with water in the rainy seasons – forcing villagers to construct new pits.

In one of the only reports of non-climatic seasonality influencing water and sanitation standards, Ekane et al (2012), noted a tendency for poor use of Urine Diverting Dry Latrines in the season where villagers brew sorghum drinks. The increased alcohol consumption was noted to lead to increased misuse of the facilities through urination in the faeces department (Ekane, 2012).

While the dry season has been reported to lead to increased discomfort in using latrines due to smell and flies, the more common reported problems occurring when looking at seasonal sanitation are issues of flooding and pits filling in the rainy season. Construction of technologies unsuitable for year round use is a significant issue; in some cases forcing people to resort back to open defecation. None of the reports reviewed contained details on open defecation and seasonal shifts in habits.

2.6 Seasonality and Programme Delivery

The following section examines the ways in which seasonality may impact provision of quality water and sanitation programmes.

2.6.1 Technical Aspects

Technology selection in implementation of water and sanitation programmes can be unsuitable for year round use due to prevailing environmental conditions. This was particularly seen in pit latrine flooding in Cambodia (Anand and Jenkins, 2010, Illian and Cikhartova, 2012) and across Central America (U.S. Centers for Disease Control and Prevention, 2006) where flooding of pits was common.

Following the flooding of pits in Angkor Chum District of Siem Reap province of Cambodia, Illian and Cikhartova (2012) advise that there are two distinctively different Cambodia's which need to be considered in designing pit latrines: Dry-Cambodia which exists between December and April and Wet-Cambodia which exists between May and November.

"Living conditions and construction needs differ significantly between the two. Many pit latrine designs suitable for Dry-Cambodia are useless in the wet season. In fact, the dry season designs are contributing significantly to open defecation recidivism".

(Illian and Cikhartova, 2012, p5)

They provide a series of recommendation for 'season proofing' latrines in Cambodia – recognising that this increased investment in robust infrastructure may affect the affordability of the system through increased need for concrete and other materials.

Other technical issues mentioned throughout reports with regard to the rainy season include risks of washing out infrastructure submerged in or crossing rivers in high flow in wet season. (U.S. Centers for Disease Control and Prevention, 2006), changing faecal sludge characteristics affecting pit emptying (Bassan et al., 2013), the pooling of water and creation of vector breeding habitat in the wet season (Dessalegn et al., 2013, U.S. Centers for Disease Control and Prevention, 2006), pit collapse (Anand and Jenkins, 2010, Illian and Cikhartova, 2012), poor quality of shallow groundwater immediately after rainfall (Godfrey et al., 2005, Calow et al., 2011)and for months during the rains (Pritchard et al., 2007).

Figure 2-14 shows the dramatic shifts in river level of the River Oju in Nigeria. While this is an extreme example, it is not uncommon for many rivers to experience dramatic shifts in seasonal water levels, or in cases, to exist only seasonally.

Figure 2-14 Difference in seasonal flow of the River Oju, SE Nigeria: mid wet season (left), mid dry season 4 months later (right) (MacDonald et al., 2005)

In the dry season the largest environmental shifts seen are in water availability with dropping groundwater levels and decreasing flows in rivers (MacDonald et al., 2005). Figure 2-15 shows the care that needs to be taken in siting groundwater pumps due to the shifts in groundwater level from the wet to the dry season.

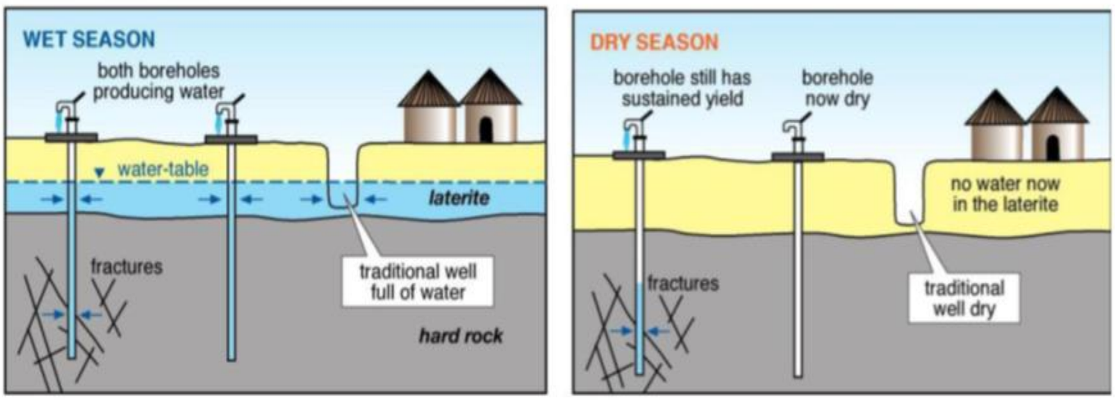

Figure 2-15 Implications for water supply caused by a drop in seasonal groundwater tables (MacDonald et al., 2005)

The CDC found in infrastructure implemented post Hurricane Mitch in 2006 that:

"…even the typical annual rainy season can cause disruptions in a water system. This finding indicates that project design needs to better account for such events, especially to avoid potential washouts from high flows in rivers and streams".

(U.S. Centers for Disease Control and Prevention, 2006)

Engineers need to consider the environmental changes in an area over the course of a calendar year in selection, operation and maintenance of technological interventions. However, the point that Illian and Cikhartova (2012) make about increased cost (for 'season-proofing' latrines) is a valid one. Building infrastructure that copes for all seasons and environmental conditions has a high probability of being more expensive.

2.6.2 Access to Programme Location

Of the concepts introduced in Section 2.3.3., inaccessibility and tarmac bias, and dry season bias continue to apply for water and sanitation programme delivery. In areas with poor road infrastructure the degree of permeability of a village system's boundaries varies by season since transport becomes more difficult and villages correspondingly more isolated, during the rainy season (Gill, 1991). In some cases this will impact transport of machinery or materials to the area, or even inhibit access of staff (IOB & BMZ, 2011). While not widely documented – restricted access, particularly in the rainy season is a known issue among development professionals (NGO personnel based in Sierra Leone, personal communication, 28th January 2014).

2.6.3 Budget

In a review of work undertaken by German and Dutch organisations in Burkina Faso a reference was made to the mismatch of availability of funds with times available for work. The example presented was one in which delays in the community and a long time finalising procurement procedures led to funds from drilling of boreholes becoming available for use in the area from June to July. However, the rainy season in the area normally starts in June, thus being an unsuitable time for transport of drilling equipment and drilling of boreholes. However, budget restrictions needed the money to be spent in time and this lead to a haphazard attempt at drilling (Policy and Operations Evaluation Department of the Netherlands Ministry of Foreign Affairs and German Federal Ministry for Economic Cooperation and Development, 2011). From this case it can be interpreted that budget calendars need to consider alongside the operational calendar of the area in question. However, no further literature was obtained which validated this point.

2.6.4 Income

Income availability of community members is an important consideration for asking them to invest in projects/products. Research by the World Toilet Organization showed large variations in peak income month among the community of Kampong Speu and noted its importance for timing of investment in latrines (World Toilet Organization, 2010). Figure 2-16 shows the differences seen through the year. While no significant difference between those who do and do not own latrines, it is clear that there is a decrease in income from May to October and thus this is unlikely to be a time when investment will occur. The relationship between income and seasonality was discussed in Section 2.3.2.3.

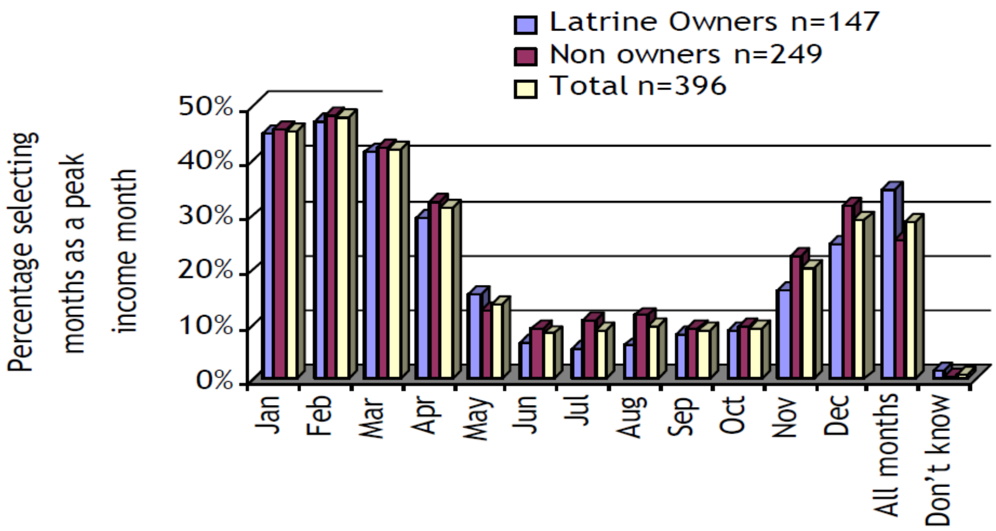

Figure 2-16 Income seasonality of 396 interviewees in Kampong Speu, Cambodia (World Toilet Organization, 2010)

2.6.5 Timings of labour availability

Seasonality may impact project timings and labour availability. In rural Zimbabwe Klassen (2011) found that community members were unavailable for project assistance in the early rainy season when most rural families were needed to work in the fields. If labour assistance is necessary it should thus be timed to avoid peaks in existing labour calendars (Klassen, 2001; Tillett, 2008).

The seasonal work load of community members is also important to take into consideration in timings of surveys. UNICEF Mozambique noted the dates they carried out a survey in 18 districts as having taken place in September and October, as a survey in the rains "*would be much more difficult since many people would be working in the fields for most of the day*"[6] (United Nations Children's

[6] The disadvantage of this occurred in one of the main health indicators of the survey in which interviewees were asked "the number of days sick in the last 6 months due to waterborne diseases" – this resulted in more than 90% 'zero' days due to the timing (it was predicted this would be much more if the survey had taken place just after the rainy season). Requests to change to 12 months were dismissed as 6 is standard in health surveys internationally.

Fund Mozambique, 2009, p45). Tillett (2008) describes a struggle for participants for his data collection due to its timing during the harvest season in Nepal.

2.6.6 Measuring Project Impact

Seasonality and timing of data collection may impact the monitoring of project impacts. In some of the examples described in 2.5.1.1and 2.5.1.2 it is clear to see that monitoring conducted at different times of the year may lead to different results. The Policy and Operations Evaluation Department of the Netherlands Ministry of Foreign Affairs and German Federal Ministry for Economic Cooperation and Development (2011) consider this effect in their estimates of the impact of water and sanitation interventions in Benin. Four surveys were carried out in undertaking this evaluation: 2 in the rainy season (July 2009 and 2010), and 2 in the dry season (February 2009 and 2010) (IOB and BMZ, 2011).

The survey reports a 'profound influence of the rainy season on choice of water'. When monitoring value for money from investment in new 'improved water points'– the differences are not visible in the rainy season when rainwater is used. In the rainy season, 33% of households were found to use rainwater as the primary drinking water source and 38% as an alternative water source. As a result the impact of improved sources on collection time, choice of source, quality and treatment were found to be negligible, while analyses in the dry season show the access to water as much improved. In the second year of the survey (2010) the impact in the rainy season was found to increase due to a particularly poor rainy season and this too, if not backed-up through the use of data from another rainy season could have skewed results by up to 41%.

This is one of the fundamental issues this thesis attempts to tackle: the fact that statistics taken at different times of the year may lead to misleading representations of progress.

2.7 Lack of investigation

In some contexts presented, it can be said that seasonality does have a significant influence on a community's experience of access to water and sanitation and on some of the decisions made in implementation and monitoring of projects. Yet, even when seasonality is measured, practitioners often seek to eliminate seasonality through counter-seasonal or a-seasonal biases (Chambers 2009).

In Section 2.3.3, the reasons for 'seasonal blindness' across the development sector have been given as:

- Lack of familiarity with measuring seasonal data;
- Ambiguity and complexity of data collection;
- Inaccessibility and tarmac bias;
- Personal season proofing ;

- Urban and capital trap; and
- Dry season bias.

Many of these also apply to seasonality and water and sanitation and lead to the lack of work in the area. Throughout the literature, there appeared to be particular wariness of the ambiguity and complexity of data collection (Bostoen, 2007; Coulter, 2012).

The World Health Organisation (WHO) and the United Nations Children Fund (UNICEF) have recognised the need for seasonal data, particularly with regard to water sources – however, in 2004 they decided against including seasonality in the Demographic Health Survey (DHS) and the Multiple Indicator Cluster Survey (MICS) due to 'the difficulty in data collection, interpretation and analysis, when taking into account use of a different source for part of the year' (WHO and UNICEF, 2004).

In a 2006 analysis of the current indicators used to assess access to drinking water and sanitation, the WHO and UNICEF again recognised seasonality (as well as time and distance to the source, quality of the drinking water service and affordability) as an area worthy of inclusion in drinking water and sanitation surveys. However, they advised that for seasonality to be incorporated into surveys would require too many questions and thus could not be dealt with in surveys not specific to drinking water, sanitation and hygiene issues (WHO and UNICEF, 2006)

As Bostoen (2007) highlights in his consideration of the merits of including seasonality in assessments of water and sanitation access:

1. **It's complicated**

"Seasonal variations in water supply are complicated to assess, particularly among nomadic and semi-nomadic populations. It is difficult to express seasonality in a simple yes or no. If a household has 10 months of access to an 'improved' waster source and two months non access does that mean that they have no access according to indicators? "

(Bostoen, 2007)

Water security from the perspective of a community is very difficult to reduce to a single diagnostic and seasonality adds an extra dimension to an already complex and disputed monitoring system.

2. **It cannot be fixed by measuring at the perceived 'worst' or fixed times of year**

Recommendations that the survey is best held when water is scarce might be a good idea. However, the dry season is not necessarily the worst case for access to improved water sources. Timing the survey in a specific season may not always be realistic. Asking the questions during the dry season could lead to recall and strategic bias.

Incorporating seasonality cannot be done by moving studies to a fixed time of the year as it may then miss out on hazards and vulnerabilities at other times of the year.

2.8 Climate Change and Seasonality

Understanding seasonal water access in normal years should help the sector to uncover important lessons for: (a) resilience building measures; (b) timing of monitoring during all years; and (c) hazard year response and response targeting (Coulter, 2010), and this is likely to become more important according to the 2001 Overseas Development Institute survey on WASH and climate change (Calow et al., 2011)

According to the study there is large uncertainty with respect to climate change predictions and impacts on future water availability and quality in Sub Saharan Africa and South Asia. However, global warming is projected to cause an intensification of present climate and hydrological variability, causing many extreme events (e.g. tropical storms, flood, and drought) to increase in frequency and intensity. Rainfall is predicted to become more seasonal resulting in increasing seasonality of river flows, modification of groundwater recharge patterns and reduced reliability of surface water resources (Calow et al., 2011). These changes may reduce the reliability of rainwater harvesting schemes (Dessalegn et al., 2013); increase the need for and reliability on natural and man-made water storage (Calow et al, 2011); increase dependence on groundwater in Africa and South Asia (Calow et al., 2011), and potentially lead to increased breaching of low capacity sewage and drainage systems (Shrestha, 2009).

In terms of water quality, climate change is likely to exacerbate existing problems. More intense rainfall events will result in increased turbidity of surface water as well as higher (seasonal) contaminant loading of shallow groundwater, possibly leading to an increase in water-borne disease (Calow et al., 2011).

Calow et al (2011) further state that "*water is predicted to be the primary medium through which early climate change impacts will be felt by people, ecosystems and economies*"; so while some areas may remain unaffected by seasonal variation at present, the current trend is toward more seasonal weather and thus more seasonal livelihoods and water access – it could be that seasonality will become worthy of consideration everywhere.

2.9 Chapter Summary

This chapter has introduced the concept of seasonality and how it is measured. It has introduced the seasonal calendar and explained its use for measurement of seasonal trends. The manifestations of poverty have been discussed and specific information has been provided on seasonality and nutrition, income, livelihoods and health. The chapter has also considered the relationship between seasonality and water and sanitation, and considered reasons for the lack of work in this area.

If the human right to water and sanitation entitles people to a water source and sanitation that is sufficient, safe, acceptable, physically accessible and affordable it is clear to see that the degree to which these conditions are met may vary seasonally. Water quantity, water quality and usability of latrines have been shown to change between seasons, with further variations shown between geographical regions. Similarly it can be seen how presence of an improved water source or sanitation system may give misleading statistics on its actual use year round.

The contexts in which the most abundant information has been provided from are Ethiopia (periods of extreme drought) and Cambodia (periods of significant rainfall). Other areas have been shown not to have significant seasonality in water supply (e.g. Kenya, Laos (Bostoen, 2007)).

Seasonality has been shown to affect programme implementation via technical aspects of projects, budget, labour availability, income of the community members and access to the community.

It has been concluded that further work in the area of seasonality, water and sanitation is necessary, but that it is prevented through seasonal blindness (a combination of urban and tarmac bias, dry season bias, season proofing, ambiguity and complexity of data, and lack of training in the area). It is predicted that climate change may lead to increased seasonality and that these analyses may become of greater significance.

The impacts of the contents of this chapter on the shape of the investigation are shown in Table 2-2.

The next chapter investigates the other core theme of this research; water and sanitation in mountain environments.

Table 2-2 The key findings from this chapter and their impact on the study

Finding	Impact on Study
Seasonality can be both climatic and non-climatic	Investigation must look beyond climate based sources of seasonality
Trends are composed of trend, seasonal, cyclical and irregular components	Research must seek to differentiate between and not incorrectly attribute results to seasonality
Water and sanitation have been shown to vary seasonally in some studies	This investigation is justified and there is the potential for seasonality to exist
Previous studies have found changes between consecutive rainy seasons to be significant	This study will be limited to one year due to time constraints and may miss these changes
Climate change may exacerbate seasonality	Climate based seasonality may not be static and may change particularly in coming years
There is professional neglect of seasonality in many sectors, including water and sanitation	No fixed means of investigating seasonality in water and sanitation exists
There are seasonal peaks and troughs of labour availability particularly in agricultural communities	Data collection may be difficult at different times of the year
Access to rural areas may vary seasonally	Access to sites for data collection may be difficult at different times of year
Some of the most reliable texts on seasonality are 10+ years old	Caution must be taken in accepting any of the claims made as still relevant
The link between water, sanitation and seasonality is poorly examined	This research has the potential to contribute to knowledge in this area

3 Mountain Environments, Water and Sanitation

3.1 Chapter Outline

This chapter presents a review of literature which details mountain poverty and its causes. It further considers access to, and provision of, water and sanitation in a mountain environment. The shorter length of this chapter reflects the relative paucity of published literature on the subject.

3.2 Introduction to Mountain Poverty

The UN Environmental Programme (2002) defines a "mountainous environment" as having any of the following characteristics:

- Elevation of at least 2,500m;
- Elevation of at least 1,500m, with a slope greater than 2 degrees;
- Elevation of at least 1,000m, with a slope greater than 5 degrees;
- Elevation of at least 300m, with a 300 m (980 ft.) elevation range within 7 km

Using these definitions, a report from The Panos Institute (2002) determined that mountains cover 33% of Eurasia, 19% of South America, 24% of North America, and 14% of Africa. As a whole, 24% of the Earth's land mass is mountainous.

Mountains provide fresh water for most of the urban population living in the lowlands, the Earth's greatest biodiversity and recreation destinations. Yet despite their bounty, today mountain regions are almost synonymous with low income populations and poor infrastructure. It is a known fact that poverty levels are higher in mountains than in other parts of the same country (ICIMOD, , 2010) and some estimates state that 80% of mountain people live below the poverty line (The Panos Institute, 2002); however as Levin (2006) describes in Box 3, this was not always the case.

Box 3. The Historical Power of Mountains – Levin (2006)

The Incan Empire controlled nearly a third of the South American continent from 1438 to 1533 AD from a town situated deep in the Andes Mountains (called Cusco) at a height of 3300 meters above sea level. Without the invention of the wheel or iron, the Incas were able to secure thousands of miles of land and rule by federation from an environment that offered few natural resources for them to exploit. The Mongolian empire controlled nearly a third of the world's population, and yet was founded in one of the world's highest mountain regions.

Mountains have born and bred some of the world's strongest and diverse people on earth, but somehow at the turn of the 20th century, the strategic advantage of high altitude for war-making has turned into a hidden curse for spurring economic development.

In the past isolation was an advantage for security and hence stability. But in a steadily more globalised world, this advantage has turned into a disadvantage.

The Kathmandu based International Centre for Integrated Mountain Development (ICIMOD) state that in many countries with mountainous regions, even if the Millennium Development Goal of halving poverty by 2015 is achieved at the national level, poverty will still remain prevalent in the remote and unfavourable environments of the mountainous (ICIMOD, 2010).

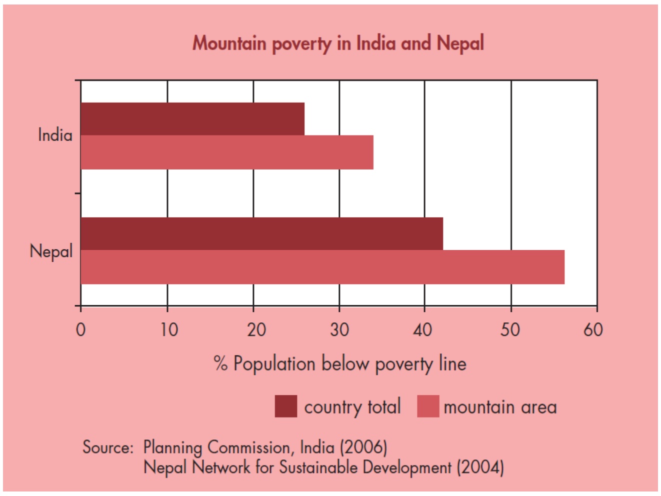

Figure 3-1 Disparities in country wide and mountain poverty in Nepal and India (ICIMOD, 2010)

Figure 3-1 presents the proportion of the population below the poverty line in Nepal (2004) and India (2006). In both cases the percentage of people below the poverty line in mountainous areas (bottom bar in chart) is at least 10% greater than the county average (top bar in chart).

Figure 3-2 looks specifically at Nepal, and shows the percentage of people experiencing non-food poverty in a range of geographical areas of the country. In the graph, Kreutzmann (2001) includes data from the Nepal National Livelihood Standards Survey from 1995/96 and 2002/03. Mountain/hill non-food poverty can be seen to be higher than all other geographical areas. Not only this, but it is the only area not to show an improvement in poverty level over the 7 year gap.

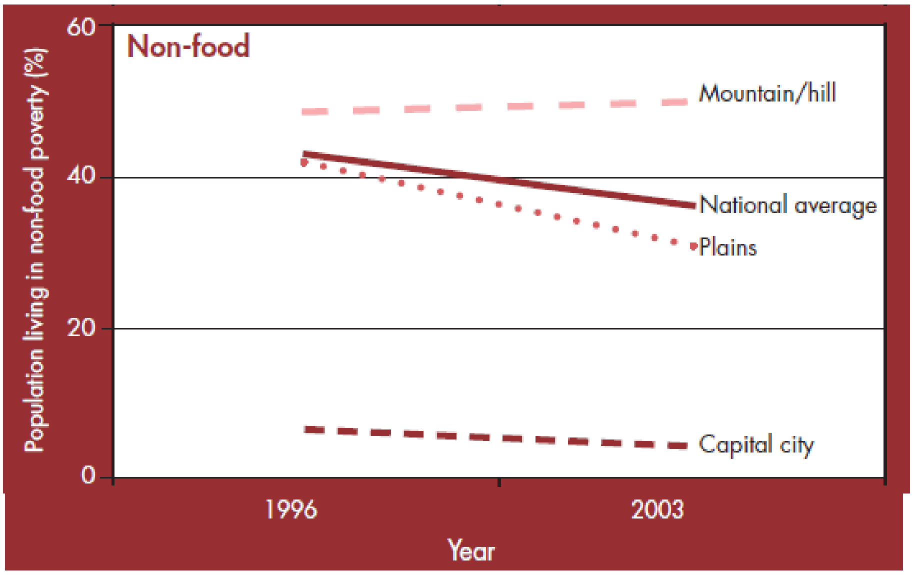

Figure 3-2 Mountain poverty by different geographical regions in Nepal (taken from Kreutzmann (2001))

In an investigation of appropriate development indicators for mountains in South Asia, Kreutzmann (2001) found a disparity between human development and poverty in mountain regions and the rest of the country for each case investigated (Tajikistan, Pakistan, India, Nepal) with further large disparities between different mountain communities within the same country.

Women are frequently cited as those who suffer most in mountainous communities (ICIMOD, 2010). Box 4 presents some details of the plight of livelihoods led by women in mountainous areas.

Box 4. The Situation of Mountain Women (FAO, 2002)
Mountain women face many of the same challenges as women throughout the developing world, with limited access to education and health care, and restricted involvement in, for example, policy- and decision-making. Women lack economic independence, rarely hold ownership and tenure rights to land and other natural resources, and usually have difficulty obtaining advance warnings related to natural disasters.

Women also have heavier workloads than men. While agricultural and livestock tasks are shared fairly evenly, women are also responsible for the collection of water, fuel, wood and fodder, the preparation of food, and the care of children. This situation is aggravated by the altitudes, steep terrains and isolation of mountain areas.

In mountain communities, men often have to leave their communities for short-term or seasonal trading and herding purposes, leaving women to maintain farms and households and participate in small-scale trade and income-earning activities. Increasingly, however, the outmigration of men to lowland cities or further afield is leaving women as the heads of households for longer periods.

Even when they have these additional responsibilities, few women are given title to farmland, which is often a requirement for receiving bank loans, subsidies, other forms of assistance or access to agricultural extension services. This hampers women's efforts to improve or expand farm activities and earn cash income.

The impacts of climate change, environmental degradation and deforestation are increasing the hardship of mountain communities, particularly for women, who now have to travel greater distances to collect fuel and fodder, while crop failure is becoming more frequent. The reported consequences include food deficits, growing outmigration and even the trafficking of mountain girls and women to lowland cities.

From the information provided in Box 4 it is clear that an analysis of mountain poverty should include a focus on the role of women. As it is typically women who collect water (Asaba et al., 2013), this is of particular importance for this research.

3.2.1 Causes of mountain poverty

From a review of literature, some of causes for the disproportionate levels of poverty in mountains are:

- **Lack of voice**- those residing in mountain communities live far from the centres of commerce and power, so they have little influence on the policies and decisions that affect their lives (FAO, 2012).

- **Accessibility/remoteness** – accessibility to mountainous regions and within mountainous regions can be extremely difficult due to the environmental conditions. This can lead to a problem in getting in and out of the region to access goods and services.

- **Lack of infrastructure** – according to ICIMOD (2010) there tends to be inadequate investment in infrastructure in mountain communities – "*inadequate investments in public infrastructure such as roads, electricity, water supply, public schools, and health facilities, further constrain opportunities to escape poverty".* Infrastructure provision in mountain communities is also noted to be more expensive due to access.

- **Lack of employment** – sources of income and employment are extremely limited in a mountain environment. Due to the environmental and climatic conditions, difficult terrain, and high production costs, economic activities in mountains rarely achieve the scale and profitability of those in the low lands (FAO, 2012).

- **Variable land quality**– While some mountains are high in biodiversity, others can be very rocky, infertile with steep slopes. Thus the opportunities for successful agricultural practice are limited (Khawas, 2002, Kreutzmann, 2001).

A combination of these qualities can contribute to the disparity between levels of poverty in mountains in comparison with country level averages. However, the specifics of mountain poverty and reasons why mountain poverty differ from national poverty remain unaddressed (ICIMOD, 2010). ICIMOD (2010) and Kreutzmann (2001) attribute this at least in part to the tendency of NGOs and GOs to overlook mountain poverty.

3.2.2 Overlooking mountain poverty

Despite the prevalence of the gaps between levels of poverty in mountain areas and national averages, it is often overlooked and frequently remains unaddressed (The Panos Institute, 2002, Parvez and Rasmussen, 2002). The remoteness and inaccessibility of mountain regions can lead to bias against research and development work in these communities. The following are contributing reasons to why mountain poverty is frequently overlooked from a number of literature sources.

1. **Lack of understanding**

"What the eye does not see, the heart does no grieve about"

(1830 J. L. Burckhardt Arabic Proverbs 109)

Mountain communities lack a voice and are seldom considered as important stakeholders in country level policies, plans or strategies. Their inaccessibility, remoteness and lack of infrastructure mean they frequently fall victim to the 'urban' and 'inaccessibility' biases (ICIMOD, 2010).

In his 1981 text, with reference to underdevelopment in rural areas, Chambers details the tendency of urban biases to restrict governmental and non-governmental professions to service laden, comparatively conformable urban centres (Chambers et al., 1981). Due to the lack of infrastructure development in some mountainous areas this remains the case (ICIMOD, 2010).

2. **Generalisation of data**

Generalisation of national statistics further removes mountain communities from a government or non-governmental worker's mind. Generalised country level statistics disguise the extreme forms of socioeconomic, political and cultural heterogeneity that may exist within a country (Kreutzmann, 2001), and may shield a decision maker in a capital city from the realities of what exists in a country's mountain communities.

3. **Holistic nature of the problem**

Mountain poverty is multi-faceted and complex. To investigate mountain poverty (or indeed poverty in any other geographically extreme context) the interrelationship between natural and human factors must be taken into account (Kreutzmann, 2001). Knowledge of environmental conditions and individuals' behaviours, and the relationship between them, are necessary to gain a deeper understanding of mountain poverty.

3.3 Addressing mountain poverty

Advances to assist in addressing mountain poverty as suggested by available literature include:

1. **Development of regional analytical framework to describe mountain poverty**

Mountain poverty is not well understood and assessment techniques used in other geographical regions often do not apply, e.g. if earning less than $2 per day is considered as being in extreme poverty in a country, does the same standard apply to those who live in the mountains where access to goods and services can cost almost twice as much. Separate indicators need to be developed to describe mountain poverty (Kreutzmann, 2001).

2. Preparation of socioeconomic datasets by region

To aid in addressing mountain poverty, socioeconomic datasets would need to be prepared and presented by region. In many cases this is done, and then eliminated through compilation of national statistics. Certainly these statistics aid comparison, but they can also hide biases for and against development in certain regions (Kreutzmann, 2001).

3. Inclusion in policy

On a very large scale, the geographies of poverty are vaguely known e.g. the sub Saharan Africa is less developed than Europe, rural areas are by and large less developed than urban areas; however the intricacies of geography at the smaller scale are often not incorporated into policy and decision making. Since geography is not something that can be controlled by a policy maker, it is rarely incorporated or considered as a factor that can be manipulated to aid in bettering the welfare of its people (Levin, 2006).

3.4 Water and Sanitation in Mountain Environments

There is a lack of specific literature detailing delivery of or access to water and sanitation in a mountain environment; however there is literature on some of the features of a mountain environment which has received published coverage; namely water and sanitation in a cold climate and water and sanitation in remote settings. As a result the information presented in this section will primarily be sourced from these resources and will be presented under the assumption that a mountain environment (as defined in this work) is predicted to be remote and experience a cold climate[7].

3.4.1 Applicability of Standards in Mountains

In describing the role of engineers towards the sustainable development of the built environment, Cruickshank and Fenner (2007, p111) describe the environmental system in place as "inevitable". They continue to explain that "the laws of nature are non-negotiable, and everything must operate

[7] While it is impossible to define temperature drop with altitude (or lapse rate) for all areas due to context specific details, International Standard Atmosphere's (ISA) are calibrated on an average 0.65 degrees Celsius drop per 100m. Thus there can be large variation in the degree of cold experienced by populations living in a mountain environment.

within them" (Cruickshank and Fenner, 2007, p111).With this in mind, it is somewhat surprising that standards of evaluating the impacts of this engineering with regard to improving access to water and sanitation, take no account of these environmental differences.

The applicability of the Millennium Development Goals (MDGs), the definition of 'improved[8]' water and sanitation and the applicability of Sphere standards have been questioned when it comes to colder climates (O' Hara, 2000; Smith and Buttle ,2004; McKee et al.,2006; O' Hara et al., 2008). It is argued that some of the standards which apply elsewhere are not suitable for communities in a cold or mountainous environment, and that tailoring of existing definitions to context is necessary.

To provide access to water and sanitation that is 'sufficient', 'safe', 'acceptable', 'physically accessible' and 'affordable' as required by the Human Right to Water and Sanitation brings different challenges in the cold. The Sphere minimum standards specify that a water point must be within 500m from a household (The Sphere Project, 2011). While a distance of 500m may not be a barrier in some areas of the world; in others, where the climate is cold and inhospitable, or where the terrain is difficult, going 500m could be far more difficult. O'Hara, Hannan et al (2008) argue that maximum distance to a source is one standard which is particularly weak in transfer from country to country and across geographical differences. They recommend that the maximum distance to source needs to reflect the physical conditions of a given region or country (O' Hara, Hannan et al. 2008).

Sphere standards also require that 'people have adequate numbers of latrines, sufficiently close to their dwellings, to allow them rapid, safe and acceptable access at all times of the day and night'. Latrines must be 'sited, designed, constructed and maintained in such a way as to be comfortable, hygienic and safe to use' (The Sphere Project, 2011). It is clear that different guidelines will be necessary if cold weather is prevalent. Access to outdoor latrines may be hazardous in times of snow/icy ground, particularly at night time; with ground conditions likely to make access very difficult for the elderly and almost impossible for the disabled (Women in Europe for a Common Future, 2007). A 'sufficiently' close latrine may be at a much closer distance in cold conditions. Provision of lights may also be necessary at night time. To ensure 'acceptable access' to shared facilities, queuing time must be kept to an absolute minimum.

In a survey which took place from 2001-2005 of 18,428 individuals from Armenia, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia and Ukraine, over 75% of those living in rural areas were found to only have access to only outdoor sanitation facilities (McKee et al. 2006). Whilst these facilities may have been 'improved' and provided positive statistics for UN reports; their adequacy

[8] As defined by the Millennium Development Goals (see Section 1.6.1)

may be questioned for use in the prevailing conditions of the surveyed areas. This aligns with reports that simple indicators of activity, or presence of infrastructure, are often inadequate in reflecting the achievement of basic development goals (Cruickshank and Fenner, 2007).

Comfort of a sanitation facility is another factor to consider in a cold environment. A wintry period in December and January, when the ground in western Canada is colder than usual, was (and perhaps still is) designated by the Haida Indians as Kong Kyaangaas, or "stand-up-to-shit month" (Lewen, 1999). Comfortable access to sanitation in a mountain environment will require different facilities to those areas with different prevailing weather.

Smith and Buttle (2004) report a number of ways in which the cold weather influences use of water and sanitation infrastructure. The cold temperatures are reported to make queuing for water and sanitation facilities uncomfortable and the recommendation provided is to limit exposure through minimising queuing. While a queue of 5 minutes is acceptable in a warmer environment, it may be unacceptable in a particularly cold environment. In the longer term, acquiring investment from users in sanitation facilitates is predicted to be more difficult as shelter is prioritised above all else.

Stintzing et al., (2007) advise that the overall differences experienced in the hot summers and cold winters of many cold regions imply that systems should be analysed from a dual perspective in order to ensure year round functionality.

3.4.2 Mountain Programme Delivery

This section contains a review on the factors that may affect implementation of water and sanitation programmes in a mountain environment as compiled from a review of the literature. A primary consideration when working in mountain environments is the variation of the climate and environmental conditions from year to year, season to season and day to day, at different altitudes and on slopes with different exposure (FAO, 2012). A further challenge is presented by the widely varying environment: while mountain environments have many factors in common, they are also widely diverse – with topography, altitude, geology and soil type all likely to influence technology choice and accessibility.

Key impacts on programme delivery were found to stem broadly from technical factors, accessibility, budgeting, and the fragility of the environment.

3.4.2.1 Technical factors

A number of technical factors were found to influence delivery of water and sanitation programmes in a mountain environment. Climate and weather is known to have a bearing on people's approach to water, sanitation and hygiene, yet no specific guidelines or means of analysis have been developed for low cost water and sanitation systems which are used in cold (Avvannavar & Mani 2007) or mountainous environments. Of the work which has been completed in cold regions, the majority has been carried out by organisations such as the U.S. Army for their military bases, and bears little relevance to communities in which finance is an overarching constraint (Smith, 1996).

In the 2004 publication, "Out in the Cold", Smith and Buttle detail considerations for emergency water supply and sanitation in cold climates. Many of the lessons from this are relevant for construction in mountain environments as summarised in Table 3-1.

Table 3-1 Issues associated with water and sanitation provision in cold regions (Smith and Buttle, 2004)

Area	Points of Note
Construction	• Frozen ground increases difficulty associated with access, excavation, pipe laying, pipe maintenance and foundation construction • Challenge getting necessary materials to site • Difficult to use and cure concrete • Difficult to establish foundations in frozen ground
Operation	• Water freezes in pipes, reservoirs, sewers and/or drains resulting in physical damage or blockage[9] – frozen faeces may do the same • Decreased rates of biological activities and chemical reactions may require an increase in treatment time for water or wastewater. • Impermeable ground impedes drainage • Latrine pits fill inefficiently due to frozen waste • Latrine pits may collapse as ground thaws • Ground outside and floors in latrines get slippery • Ice blocks may block intakes • Small amounts of water freeze so difficult to implement hand washing facilities

It can be seen from Table 3-1 that the cold weather in a mountain environment is predicted to have an influence on the construction and operation of a water and sanitation system. The majority of this table lacks significant scientific backing to state the exact causes and prevalence of these changes; nonetheless the book provides useful information to those operating in a cold or mountainous environment.

[9] The power of frozen water should not be estimated, when water freezes and becomes ice the effect of its expansion can exert pressures as high as 2500kg/cm2. This is the same as a static head of water approximately 25km high (Smith and Buttle, 2004)

In terms of construction, physically getting materials to site can be a struggle with use of concrete and establishing foundations cited as particular difficulties. Curing of concrete can be an issue due to the significant amounts of water required, while rocky and frozen ground can prove an issue for foundation establishment.

In terms of operation of water and sanitation infrastructure, frozen water is the primary issue. Frozen water exerts a very high pressure and is liable to damaging infrastructure e.g. pipes. Smaller, standing water is more likely to freeze and thus immobilises outdoor hand washing devices or water for latrine flushing.

The frozen and/or rocky ground causes issues for infiltration from the pits of latrines. The expansion and contraction of the ground as is it freezes and thaws is liable to cause pit collapse and disturb buried pipes. The frozen surface also prevents infiltration both from inside the pit and from the surface. Smith and Buttle (2004) also report that pits have been noted to fill fast due to a ‘stalagmite effect’ where by waste freezes upon entry to the pit and leads to faster filling of the middle section of the pit as waste fails to spread out and settle. In Armenia, a WECF analysis found that urine and water on the floors of school latrine was susceptible to freezing when temperatures fell below zero, leaving pupils afraid to use the facilities for fear of slipping into them (WECF, 2007).

Other issues inside the pit centre on uncertainty of waste processing times – particularly if the waste is to be used as compost. As Drangert (1998) reports, in compost produced at high temperatures (50-70 ^{o}C) and low moisture, the bacterial and/or pathogens present in the faecal material are quickly destroyed. However he advises that in China where faecal compost is commonly used, it is kept for 20 days in summer and 60 days in winter. Temperature is the most important factor affecting the die off rates of pathogens (Haug, 1993) but no concrete guidance exists as to how long waste should be stored before it is applied in fields.

Adapting basic water and sanitation technologies to be fit for use in the cold is a challenge. In e-mail conversation, an engineer with extensive experience with UNICEF in rural Bolivian schools said of his experiences with latrines in cold areas that ‘Nothing seems easier to build than a latrine. Yet to keep them in operation successfully (especially in colder rural areas) is one of the biggest challenges that I know’.

3.4.2.2 Accessibility

Accessibility is typically poor due to the particular terrain in mountain areas. Steep slopes and harsh conditions challenge mobility. The cost of service delivery in mountain environments can be very high due to the need to import all materials to the area (assuming a lack of production nearby) and the difficulties involved in transport of materials within mountainous areas (assuming road infrastructure is poor or lacking) (Kreutzmann, 2001, International Centre for Integrated Mountain Development, 2010).

Poor infrastructure reduces the ability to trade and affects the supply, availability and price of agriculture inputs, such as seeds, fertilisers or pesticides, which are needed for food production. It also reduces the availability of affordable foods other than those that can be obtained locally, and limits income generation opportunities (Jenny and Egal, 2002). As a result of these constraints, the income in mountain households may be low. This low income is compounded by the fact that spending on fuel for heating, clothes and food will be substantially higher in a colder climate (Manfield et al., 2004). This increased cost of living may affect the money available when working with mountain communities and the level of subsidies (if any) community members might be given on a new latrine, soap, or development of a water point.

The UNICEF Engineer based in Bolivia also warned that '*Accessibility influences the software aspects of programme delivery too. Operation and maintenance, education, training and site visits are all slowed (or halted) through poor accessibility in mountains*'.

(Personal Communication, 25-09-10)

3.4.2.3 Fragility

Mountains are a high risk environment. In implementing infrastructure based projects in a mountain region, one must bear in mind that they are high risk fragile environments where avalanches, landslides, volcanic eruptions, earthquakes and glacial lake outburst floods threaten life (FAO, 2012). These harsh, unpredictable conditions need to be considered in programme implementation and may lead to a number of serious 'risk' factors that may need to be considered in delivery of infrastructure.

3.5 Chapter Summary

This chapter has given an overview of the existence of mountain poverty, its route causes and requirements for its improvement. Mountain poverty is multifaceted and intensified through remoteness, poor accessibility, the challenging physical environment and marginalisation. This combined with a lack of understanding from urban based decision makers contribute to the high levels of poverty observed and lack of progress made.

While there is not an abundance of literature detailing water and sanitation provision or accessibility in a mountain environment, there are a number of aspects particularly related to the climate, terrain and resultant accessibility of the area that are predicted to have an effect on accessibility and programme delivery. Information has primarily been drawn from literature which examines the link between water, sanitation and cold climates.

The key findings from this chapter which will influence the rest of the study are shown in Table 3-2.

The next chapter discusses the rationale for selection of Humla as a research location and the research strategy and methods employed to reach the aims and objectives of the study.

Table 3-2 The key findings from this chapter and their impacts on the study

Key Finding	Impact on Study
Data on mountain poverty is often lost through generalisation	It may be difficult to get data on Humla specifically. Results produced in this study may also be lost to generalisation, or may not be of interest to professionals as they are too specific
Women are at particular risk in mountain environments	Study should seek to get a good gender balance of participants to get both male and female views.
Mountain communities suffer neglect due to their poor access and remote location, thus there is a lack of understanding of these areas	Professionals interviewed outside of Humla may not be aware of the problems faced in the District
Accessibility and infrastructure is poor	The study may be challenging to carry out and may be slowed due to poor means of access and communication
Indicators for access to water and sanitation may not be relevant for a mountain environment	Even baseline measurements of access without including seasonality may be difficult to obtain
There is low availability of literature detailing provision of water and sanitation in a mountain environment	This study has the potential to contribute to knowledge. However, the approach will need to be exploratory and flexible.

4 Research Design and Methodology

4.1 Chapter Outline

This chapter outlines how the research design and methods appropriate for the research aims were selected and implemented.

The first section of the chapter introduces the conceptual framework and an introduction of the practical, social and theoretical elements of the research design. Section 2 of this chapter describes the research methodology. It focuses on the choice of Humla as a case study area , the data collection techniques selected to fulfil the aim, and the pilot study used to test and refine these. Section 3 describes how data collected for the thesis were analysed, organised and presented. Section 4 presents a critical reflection on the choice of methods in this research and their adequacy for obtaining valid, objective and accurate answers to research questions.

The research questions this research strategy and methods were designed to address are:

What is the effect of seasonality on standards of water and sanitation in Humla District, Nepal?

At the community level: How does seasonality impact on community level access to water and sanitation in Humla District, Nepal?

- What climatic and non-climatic seasons exist in Humla that may affect access to water and sanitation?
- Do community members' behaviours changes intra- annually in a way that affects standards of water and sanitation?
- Does functionality of community level water and sanitation infrastructure vary intra-annually?

At programme level: Does seasonality affect water and sanitation programme implementation in Humla District, Nepal?

- What seasonal calendars affect water and sanitation programme implementation?
- What are the seasonal barriers and opportunities for effective implementation of water and sanitation programmes?

This chapter begins by examining the conceptual framework of the research.

4.2 Conceptual Framework

Miles and Huberman (1994) define a conceptual framework as a visual or written product, one that "*explains, either graphically or in narrative form, the main things to be studied – the key factors, concepts or variable s and the presume relationships among them*" (Miles and Huberman, 1994, p18). Maxwell (2012) advises that the conceptual framework should primarily be a conception or model of "*what is out there that you plan to study and what is going on with these things and why – a tentative theory of the phenomena that you investigating"* (Maxwell, 2012, p35). This section introduces the conceptual framework of this study which was used to frame the aims, research questions and methods of this research.

4.2.1 Domains of the research

This research aims to fill the gaps presented in the mapping of the literature review within the context of Humla District Nepal. Figure 4-1 shows the domains of interest of the study. The aims of the project are primarily centred on exploring Z (aspects common to seasonality, mountain poverty and standards of water and sanitation), but in doing so the sections marked Y (seasonality and mountain poverty, and seasonality and standards of water and sanitation) must be better understood. The bottom of the diagram shows the points X at which the research must start: an assessment of current standards of water and sanitation through a community level assessment and an insight to the potential future standards through examination of programme implementation.

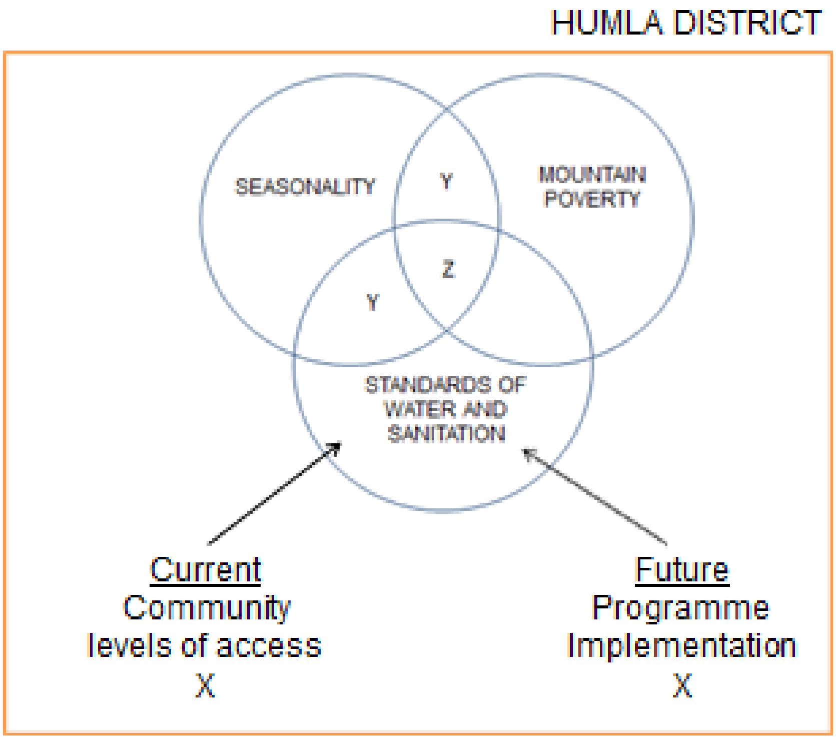

Figure 4-1 The domains of the research (Source: Author)

4.2.2 Hypothesised Issues

Through analysis of the literature review contents, a problem tree shown in Figure 4-2 was developed to represent the core problems under analysis in the research. Starting at the bottom of the diagram, the roots of the tree (or causes) have been identified as the data intensive process of investigating seasonality, the bias of investigators and the lack of precedents or standards for analysis of seasonality and its impact on water and sanitation standards. The literature review has confirmed the diagram up to the dashed red line. Above this line is the hypothesised result of this lack of data eventually leading to the needs of the target population not being met. The upper portion of this diagram is investigated in this research.

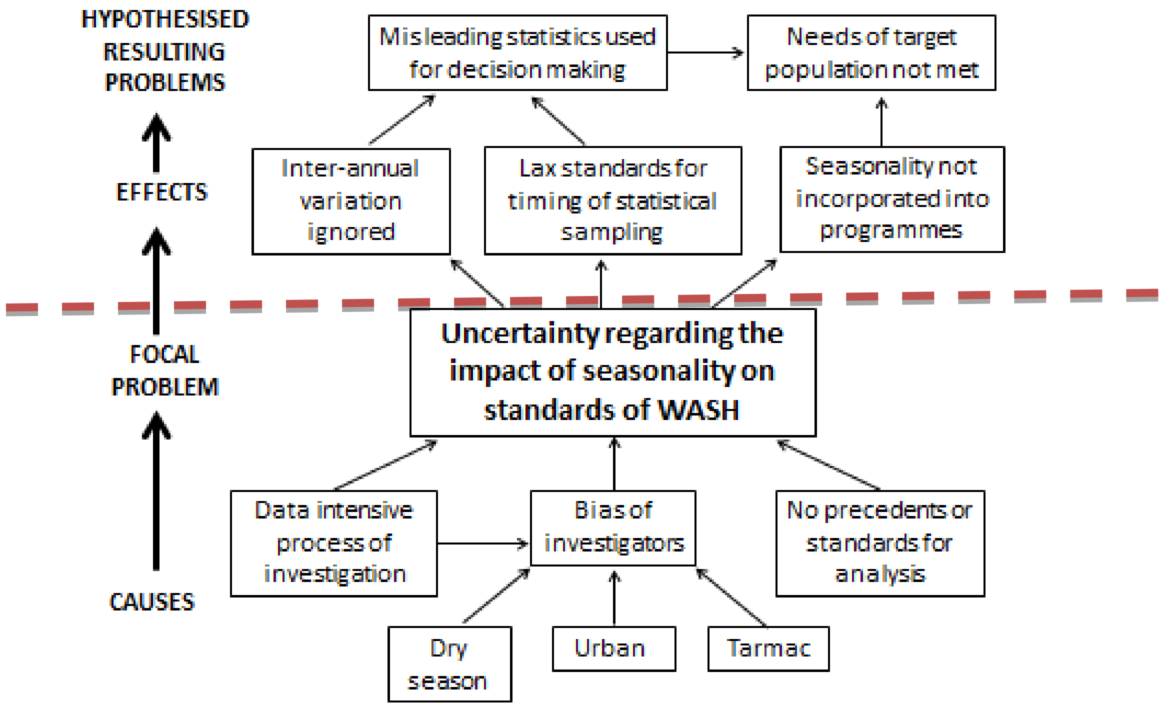

Figure 4-2 Framing the problem under analysis in this thesis (Source: Author)

4.2.3 Seasonality and access to water and sanitation

Seasonality and its impact on standards of water and has not been specifically investigated in a mountainous context. This section presents an example which represents one of the hypothesised issues. If one takes as an example, reported drinking water coverage for an area is 64%. This statistic represents that at any time in a given year, 64% of the population have access to an adequate drinking water supply (Figure 4-3).

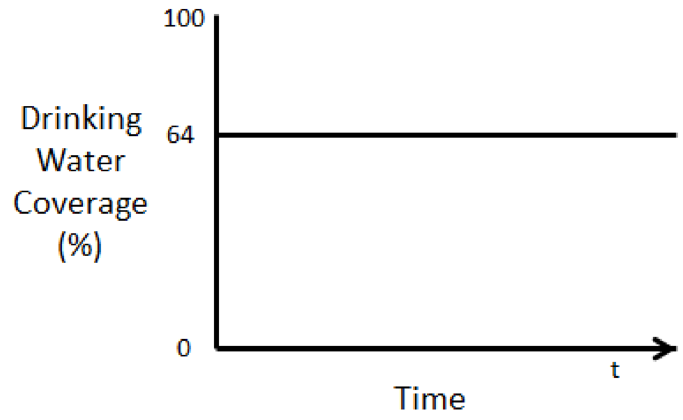

Figure 4-3 Constant access to an improved water source for 64% of the population over time.

After a given period of time, typically a year or above, a review may take place which has found access to drinking water has improved by 'x percent' of the population. As a result, the coverage in the area jumps to '64+x %', as seen in Figure 4-4.

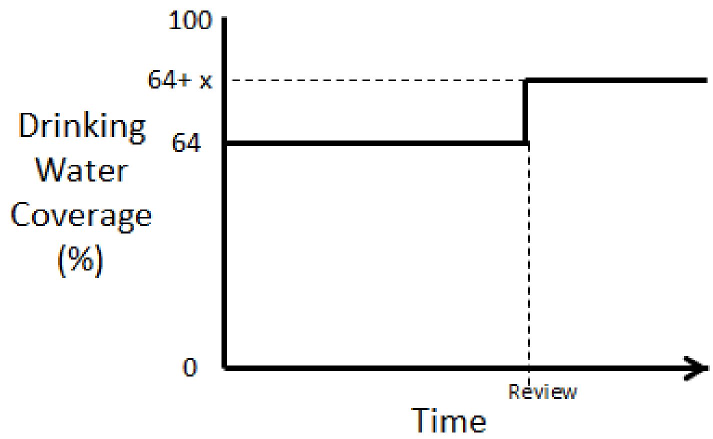

Figure 4-4 Improved water access following a yearly review

The assumption may be that coverage has increased more gradually over time as per the dashed line in Figure 4-5. The gradual increase over time may not be important as long as annual reviews can confirm that, when analysing the big picture, progress is being made.

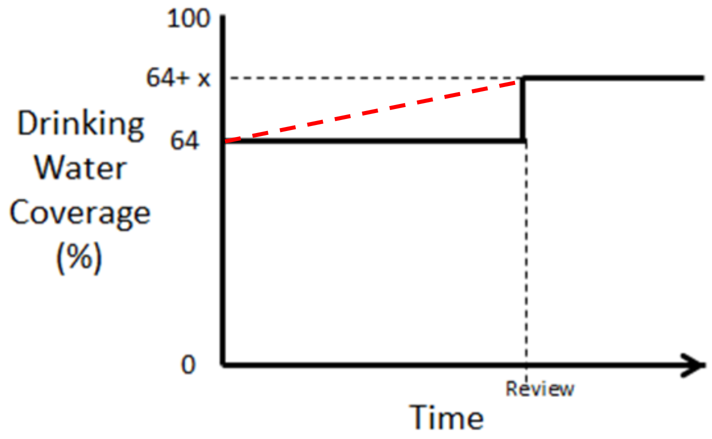

Figure 4-5 A gradual improvement in access to water over time

If seasonality is considered, rather than this general increase, one may see peaks and troughs of access to drinking water over the course of the year. Figure 4-6 shows a very basic version of this – in this case variance is shown to centre on a general increasing trend. In the hypothetical case of Figure 4-6, sampling time may make a significant difference to the percentage measured. In the February peak, a misleading picture of access may be gained compared with the experience of the population in a June – July drought. Intra-annual variation (i.e. the difference between a% coverage and b% coverage) may lead to a misleading statistic being used for the decision making process.

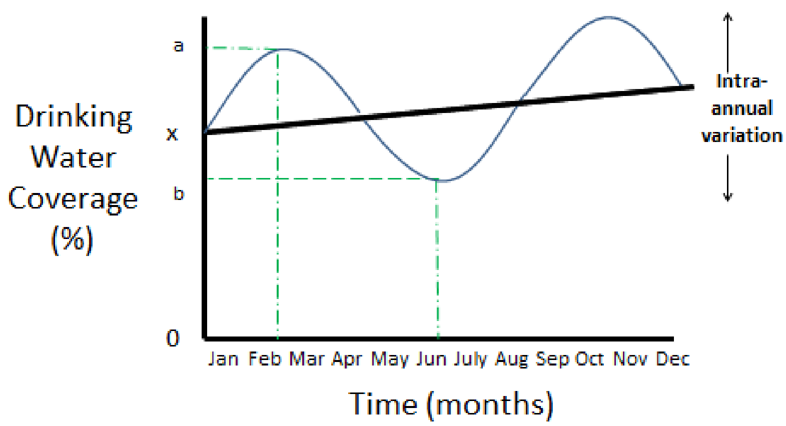

Figure 4-6 Seasonal access to water over the course of a year

If statistics are taken annually at the same time, the rate of increase (or decrease) may be representative of the changes of coverage in the area i.e. sampling in February each year may lead to the upper estimate of coverage being taken every year and thus comparison of these may well represent the shifts in coverage in the area.

The more significant problem that exists is that the picture seen in February may grossly misrepresent the struggles of the population to access water in June and July and thus work which tackles these shortages may not take place – as these shortages may not be known to exist.

The opposite may of course apply, if the June/July statistics are taken and under represent coverage in the area. This could be used tactically by an organisation looking for increased donor funds for an area or a government looking to attract more organisations.

When inter-annual variations of drinking water supply are taken at different times of the year, this may in some cases mean they are incomparable and invalid as a measurement tool for progress.

4.3 Research Strategy

4.3.1 Introduction

Research is a systematic process of inquiry to create new knowledge. To achieve this, a guiding research strategy is needed to ensure consistency and appropriate methods and techniques are used to address the aims and objectives of the study. To maintain consistency in the approach to addressing the objectives of the study, it is first necessary to consider ones epistemological and ontological position – the next section explains the epistemological and ontological positions assumed in this research.

4.3.2 Epistemology and Ontology

Epistemology describes the relationship between the researcher and what is being researched. Ontology describes how one perceives the nature of reality. It enables of the researcher to uncover how their perceptions of human nature impact on the approach they adopt to reveal certain truths (David and Sutton, 2004).

According to Creswell (2003) there are two ways of knowing: positivism and constructivism. A positivist epistemological perspective assumes that reality can be described through empirical observation, measurement and quantification (See Table 4-1). Positivists use a deductive approach toward research and theory (Bryman, 2004). A constructivist perspective assumes that views of phenomena are socially constructed, where different people experience different realities (Berger and Lukmann, 1967). Constructivism emphasises the generation of a theory (Bryman, 2004) and questions the ability for a research to remain fully objective.

Conventionally quantitative techniques are perceived to be rooted in positivist theory, employing a deductive research strategy whereas qualitative research is more rooted in interpretative theories using induction methods (Grix, 2001).

Table 4-1Primary differences between positivist and constructivist approaches as described by Creswell (2003, p6)

Post positivism	**Constructivism**
Determination	Understanding
Reductionist	Multiple Participant Meanings
Empirical Observation and Measurement	Social and historical construction
Theory Verification	Theory Generation
Deductive Approach	Inductive Approach

This research stems from a constructivism perspective where it is exclusively recognised that the presence and training of the researcher had a significant effect on the results produced.

The realisation of this impacted the research methodology in the following ways:

1. **Open research and respondent driven interviewing**

While the researcher had the specific aim to investigate the impact of seasonality on water and sanitation in Humla, she at all stages tried to allow the conversation with respondents to flow onto the matters that the they considered most important – thus not allowing her priorities to supersede theirs. As a result, research methodologies, and even aims (see section 4.3.6) had a degree of flexibility throughout to ensure that the problem dealt with in this thesis was not a researcher driven priority formulated as a result of her training.

2. **Researcher Training**

There was also a risk of researcher bias in processing of the data. The researcher's training in engineering risked a bias on more technical issues throughout the preparation of results. To alleviate this risk the researcher attended many cross-disciplinary trainings and conferences prior to departure to the field to gain exposure to wider water and sanitation issues beyond the technical. While it does not appear in the literature review, the researcher read an abundance of basic literature on water and sanitation to expand her knowledge.

3. **Increased Importance of Triangulation**

To further alleviate the bias of the researchers training on interpretation of the data collected, it was attempted at all stages to triangulate any available data with data from another source.

4. **Researcher Meetings**

During the field work, the researcher held research meetings with her Nepali research assistants whereby a discussion was had about what each had observed and/or learned that day. This opened discussion and debate on the reason for what was observed or noted to ensure the researcher was not drawing conclusions about the data in isolation.

Overall, despite these efforts, the reality is that this thesis is still primarily a reflection of the researcher's interpretation of the data collected. Rather than try to avoid this in the thesis, it is instead brought to the fore through the presentation of the researcher's diary as a data source – so that the reader may judge for themselves if they agree with what was observed.

4.3.3 Purpose of the Research

This thesis seeks to build bridges between several disciplines: engineering, sociology, psychology and anthropology and leans towards an ethnographic nature fulfilled by case studies. The different purposes of research and their relevance to this study are presented in Figure 4-7 in a framework adapted from Tiberghien (2002).

This research moved between these groupings. It began as exploratory in questioning whether seasonality was worthy of pursuit and to be considered of importance. In the pilot study, this became more descriptive following interviews which ascertained that yes; seasonality did exist and manifested itself by a number of different means. The main body of field research sought to explain some of the occurrences, but kept an exploratory element by investigating new manifestations of seasonality related to water and sanitation as they occurred.

Purpose of Research

Exploratory	Descriptive	Explanatory
Summary • New or little written about issue • Asks 'what is this about?' • Goal to formulate more precise questions and methodologies (for future research) • Creative, open minded, flexible research • Uses qualitative data extensively	*Summary* • Begins with a well-defined subject • Asks 'how did it happen, who is involved?' • Provides detailed verbal or numerical picture • Uses most data gathering techniques: surveys, field research, content analyses, historical, comparative	*Summary* • Issue and description already known • Asks 'why did it happen?' • Determines accuracy of theory/principle • Builds on exploratory and descriptive, looking for causes and reasons • Links different issues or topics under general statement
Relevance: high throughout research – particularly in early stages	**Relevance**: important in understanding the nature of exploratory findings	**Relevance:** high in late stages of research. Basic explanations sought for uncovered issues

Figure 4-7 Purpose of the research Source: Author, adapted from Tiberghien (2002).

The research methodology adopted allowed for exploration of new insights and sought basic explanations for those uncovered in earlier stages of the research. In no case was the level of explanation so in depth that further research would not be warranted, but in most cases underlying reasoning was uncovered for seasonal standards of access to water, and sanitation and hygiene.

Worthy of note is the underlying uncertainty about the more basic human behaviours when considering access to water and sanitation. Thus whilst data was considered on how these shift through the year – the origins of the more basic nature of the behaviour (e.g. the thought process behind open defecation) were not investigated.

4.3.4 Use of the Research

The greatest development impact of research occurs when it informs policy or practice (Alker and Fisher, 2009). It is anticipated that the use of this research will be both basic and applied. It is anticipated that the research outcomes will provide generalised foundations for further applied research, and also generate outcomes considered useful for direct use by practitioners and decision makers. The uses of both and likelihood of their relevance is shown in Figure 4-8.

Use of Research

Basic (Academic/Pure) Research	Applied Research
Summary • Used to advance fundamental theoretical knowledge of the social world. • Provides generalised foundations for applied research • Research intrinsically satisfying – judged by other sociologists • Problems/subjects selected with freedom • Most commonly explanatory • Primary consumers are scientific community **Relevance:** high – introductory study which provides the basis further study	*Summary* • Used to solve specific problems – target orientated • Research part of job – judged by non-sociologists • Scientific rigour may be compromised for quick usable results • Most commonly descriptive • Primary consumers are practitioners and decision makers **Relevance:** medium – engages with the issues of reliance on snapshot data and provides policy based recommendation

Figure 4-8 The nature of the use of research and the relevance to this study. Source: Author, adapted from Tiberghien (2002)

The exploratory approach of this study means that it primarily is contributing to basic research.

4.3.5 Time Dimensions of the Research

Time Dimensions of Research as described by Neuman (1997) are portrayed in Figure 4-9 along with comments on their relevance to this study. This thesis is primarily based on case studies. There is also an element of longitudinal research in that the case study sites were revisited at different times during the year.

4.3.6 Evolution of the Research Aim

The initial aim of this thesis in October 2009 was to 'investigate the impact of a cold climate on standards of water, sanitation and hygiene in mountainous settings'. This was due to a lack of research on standards of WASH in mountainous areas as noted in the publication, 'Out in the Cold' (Buttle and Smith, 2004). Upon initial pursuit of this aim, the wider question of seasonality was considered and it was noted that this too was rarely described in published literature, yet was determined to be an important factor for consideration through conversation with WASH practitioners at a number of learning events.

It was realised that data presented for a study in the cold season, would be less meaningful without a means of comparison to other seasons. A pilot study made by the author in March 2011 (section 4.4.4) confirmed these thoughts, and the aim evolved to include all seasons.

Time Dimensions of Research

Cross-sectional	**Longitudinal**	**Case Studies**
Summary • Snapshot and descriptive **Pros:** Simple, cheap **Cons:** Doesn't capture change **Relevance**: Low – research avoided snapshots in favour of a more comprehensive picture	*Summary* • Examines features of people, groups, orgs, at more than one time **Pros:** Powerful, charts change **Cons**: more complex and costly **Relevance:** medium – limited by project timeframe – greater longitudinal aspects would have contributed to the project.	*Summary* • In depth analysis of a few people, groups or events over time (days, years) intensely • Often exploratory but can be descriptive or explanatory **Relevance:** high –main data source for research

Figure 4-9 Time dimensions of research as described by Neuman (1997) and their relevance to this thesis

The final aims of the study – which did not become fixed until after the pilot study, are:

1. **To investigate intra annual patterns in access to water and sanitation for low income communities in Humla District, Nepal**
2. **To determine intra-annual patterns of challenges and opportunities for improving standards of water and sanitation in Humla District, Nepal**

The aims of this study have different levels of analysis. The community levels aims are investigated by community and feature a combination of data collected from individuals and community assessment of infrastructure. The programme implementation aims are investigated at the district level combining information about the district collected from individuals.

4.3.7 Data required

To fulfil the aims of this study, data were required on a number of levels: the household, the community, the district and the country.

Household level

At the household level it was required to collect data which showed how seasonality manifested in the lives of individuals. It was also important to gain an insight to how individuals perceived their access to water and sanitation changed over a calendar year.

Community level

At the community level it was necessary to investigate what infrastructure related to access and water and sanitation was present in a community, and how it was observed to function. It was also necessary to get a demographic overview of the community population and what calendars the community lived by.

District level

At the district level, data were collected with regard to the current programmes working toward improved water and sanitation and their current challenges and opportunities.

Country level

Data on country level policies and statistics on access to water and sanitation was necessary to gain an overview of current access to water and sanitation and related targets.

4.3.8 Timeline of work

The operational plan for this research was split into sections as follows:

1. Preparation
    a. Initial literature review and preparation of data collection techniques
    b. Pilot study
    c. Revision of data collection techniques
2. Data collection
3. Data analysis
4. Report writing

The time line of how these phases were executed is shown in Table 4-2.

Table 4-2 Timeline of PhD operational plan with years shown in left hand column and months in the top row

<table>
<tr><td colspan="2"></td><td colspan="12">Months</td></tr>
<tr><td colspan="2"></td><td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td></tr>
<tr><td rowspan="5">Years</td><td>2009</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td colspan="3">1 (a)</td></tr>
<tr><td>2010</td><td colspan="12">1 (a)</td></tr>
<tr><td>2011</td><td colspan="2">1 (a)</td><td colspan="3">1(b)</td><td colspan="5">1(c)</td><td colspan="2">2</td></tr>
<tr><td>2012</td><td colspan="7">2</td><td colspan="5">3</td></tr>
<tr><td>2013</td><td colspan="4">3, 4</td><td colspan="8">4</td></tr>
</table>

The first part of the process, the preparation for data collection, was designed in Loughborough UK and piloted in Mustang District, Nepal from March to May 2011. The research methods were further developed in Loughborough for 6 months before a return to Nepal, this time to Humla District from November 2011 to July 2012 (reasons for which are presented in 4.4.4). Thus a complete year was not spent in Humla, but all seasons were experienced.

Within these steps, the work completed was as follows:

Preparation

(i) A comprehensive literature review of available methodologies

(ii) Development of a detailed research methodology appropriate for the study aims

(iii) Identification of units of analysis and preparation of qualitative and quantitative data collection instruments

(iv) Sourcing of local interpreters and translators to determine relevance of instruments to context and clarity of questions

(v) Pre-testing of data collection instruments

(vi) Modification of data collection instruments based on pre-testing feedback

Data Collection

(i) Collection of secondary data through a comprehensive review of literature;

(ii) A period of adjustment in the chosen research area

(iii) Sourcing local level translators and interpreters

(iv) Collection of primary data at the community level

(v) Adjustment of data collection methods where appropriate

(vi) Data entry, verification and triangulation, and preparation for data analysis

Data analysis

The data analysis involved subjecting data to appropriate qualitative and quantitative analysis to interpret their meaning. This entailed development of a set of nodes for coding, in depth coding of results and interpretation of the coding structure to determine results. Analysis also entailed development of a means of presentation of the results.

Report Writing

The report writing phase involved preparation, presentation and explanation of results for presentation in a thesis.

4.4 Data Collection

This section details the methods used for data collection, the choice of mountainous areas and Humla specifically as a research area and the lessons learned from the initial pilot study.

4.4.1 Choice of mountainous regions for research

The research was narrowed to the investigation of seasonality in mountain communities due to

1. Highly seasonal climate
2. Cold season
3. Small communities

Seasonal climate

While seasonality manifests in ways other than climate, it was decided to investigate the research problem identified in a mountainous context in anticipation that the area might show distinct divisions between multiple seasons thus contributing toward ease of data analysis.

Cold season

The aims of this research are based on a better understanding of the seasonal fluctuations of standards of water and sanitation, and their improvement; however the original research aims (see section 4.3.6) explicitly sought a better understanding of water and sanitation in areas with a cold climate. As a result, whilst the aims were shifted to a gaining a broader understanding of seasonality, the research area continued to be located in a region experiencing a cold climate.

Small communities

Cities are complicated systems to understand in a holistic exploratory manner as was necessary for this research study. Attempting to understand in depth the complexity of seasonality in a city was deemed impossible considering the time constraints of this study, thus small communities were preferred to permit more detailed study and analysis.

4.4.2 Rationale for case study area selection

The fieldwork for this study took place in the upper region of Humla District, Nepal. Nepal is a landlocked country in South Asia which borders the People's Republic of China to the North and the Republic of India to the South, East and West.

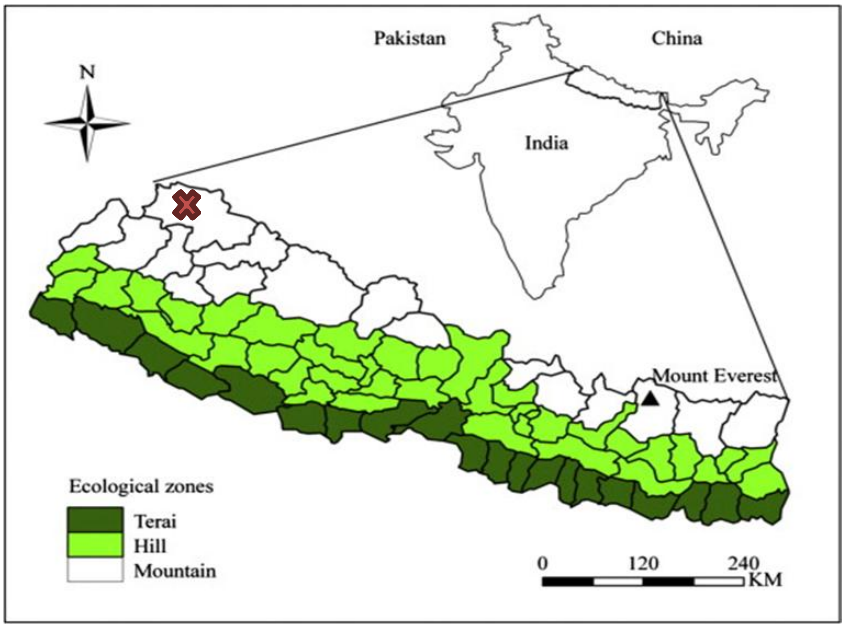

Figure 4-10 Location of Nepal with 'x' marking Humla District (Chhetri, Chaudhary et al., 2012)

Humla is the highest, most remote and north-westerly region of Nepal with an elevation range from 1,524 metres above sea level to 7,337 meters above sea level (Roy, 2010). The high altitude areas of Humla experience significant seasonal weather shifts.

The selection process for choosing the Upper region of Humla is shown in Table 4-3.

Table 4-3 Criteria for selection of Upper Humla as case study region

Area	Criteria	Options considered	Selection	Reasoning
Country	1. Mountainous region 2. Seasonal climate 3. On-going work to improve standards of WASH 4. Appropriate for researcher travelling alone	-Russia -Kyrgyzstan -Tajikistan -Nepal -China -Bhutan	Nepal	1. Abundance of work in WASH sector 2. Relative ease of logistics e.g. access, visa 3. Existing contacts
District	1. Mountainous 2. On-going work to improve standards of WASH 3. Seasonal Climate	-Humla -Jumla -Mustang -Mugu -Dolpa	Humla	1. Recommendations from NGO and GO officials 2. Information gained in pilot study (Section 4.4.4) 3. Research bias
Region	1. Seasonal climate 2. Long cold periods	-Lower Belt -Middle Belt -Upper Belt	Upper Humla	Most seasonal climate with periods of cold weather
Community	1. Similar size 2. Different castes 3. Differing levels of accessibility	Upper Humla communities	-Kermi -Chaggaunphaya -Simkot	1. Availability of research assistants 2. Logistics

In his 1990 book "Karnali Under Stress: Livelihood Strategies and Seasonal Rhythms in a Changing Nepal Himalaya", Barry C. Bishop reports that very few studies had been carried out in the Karnali region of Nepal (the region which Humla is in) (Bishop, 1990). Rabindra Roy re-emphasises this point with regard to Humla 20 years later in his 2010 PhD on the "Contribution of Non Timber Forest Products to livelihood in Upper Humla, Nepal" (Roy, 2010). In his 2008 study Will Tillett expresses surprise at the lack of research in Humla District despite it being one of the districts with the lowest sanitation coverage in Nepal (Tillett, 2008). This apparent research bias was a contributing motivation for the research in this work in selecting Humla as a case study site.

Upon arrival in Humla case study sites had not been selected and it was decided to choose villages based on what was practical. Before the detailed case study investigations began, two months were spent in Humla to become better acquainted with the area. This time was spent getting to know people in the district and finding research assistants, interpreters and translators

The main criterion to fulfil was that each village represented one of the three main castes in Humla: Lama, Chhetri or Thakkuri, and Dalit. This decision was based on the work by McKay (2002) which showed significant differences between the castes. A large number of Humli communities fit these criteria and the case studies were ultimately chosen on the basis of the advice of respected informants. Completion of three case studies allowed for a balance between generalisation, and in depth data gathering in the available 9 month time period.

Villages selected are shown in Table 4-4.

Table 4-4 Selected communities for research

Caste	Village
Lama	Kermi
Chhetri/Thakkuri	Chaggaunphaya
Dalit	Simkot Ward 1, Maathi-lo gaun

For the Dalit investigation, one ward of the district capital of Simkot was selected rather than selecting a village outside of the district capital. Other Dalit communities did not have the means to support a researcher and two assistants carrying out a prolonged investigation. Simkot Ward 1 exists separately from the main body of the town in what was previously a separate village called 'Maathi – lo gaun' or the 'Upper Village' (which also contains Ward 2). While it was not the original intention to select only a portion of a community for study, this was a necessary to select this area due to the circumstances.

Due to the lack of motorable road in Humla, case study sites had to be accessed on foot following a flight to the district headquarters of Humla, Simkot (Figure 4-11). Thus for practical issues, the communities chosen for analysis lie within 12km of each other and Simkot. Timing of research arrival to the area (December) meant that villages further to the north could not be reached due to poor road conditions (Figure 4-12). Local people also advised that the researcher stay in the lower altitudes to prevent any altitude related illness. Thus there was an 'altitude' and 'accessibility' bias in the choices of case study village. Further baseline data on the case study sites is presented in Chapter 5 which sets the scene for the research area.

Figure 4-11 A view of Simkot airport and surrounding village (Author, 2012)

Figure 4-12 A section of path to the North of Simkot - such hazardous walkways prevented researcher access to villages far from Simkot in Winter (Author, 2012)

Practicalities restricted the programme level investigation to one district level case study only.

4.4.3 Selection of data collection techniques

In selection of data collection techniques, a balance between conciseness and richness of data had to be found, with the priority being to understand the whole system Figure 4-13 shows the core components of qualitative and quantitative research and comments on their relevance for this study. The focus on qualitative research was a product of the pilot study –discussed in section 4.4.4.

Data Collection Techniques

Quantitative	Qualitative
Summary • Theory largely causal and deductive; positivist approach • Measure observable facts • Data in form of numbers • Analysis proceeds by discussing how, for example, statistics relate to hypothesis • Researcher removed from research process Relevance: low – researcher could not be removed from this process and pilot study proved exploratory data could not be a measureable observable fact	Summary • Theory can be causal or non-causal, often inductive • Data in form of words/pictures • Invariably seeks to construct representation based on in-depth detailed knowledge of cases • Focus on interactive processes • Interpretive and critical thematic analysis • Analysis proceeds by extracting themes/generalisations from evidence and organising data to present consistent, coherent picture • Researcher included as integral part of research process Relevance: high – qualitative research almost exclusively to allow a flexible approach to levels of exploration, description and explanation.

Figure 4-13 The relevance of quantitative and qualitative research techniques to this study. Source: Author, adapted from Tiberghien (2002)

4.4.4 Pilot Study

A pilot study for this research was made by the author in Mustang District from mid-March to mid-May 2011. The primary goal of the pilot visit was to determine realistic further lines of enquiry for the remainder of the PhD research. The pilot was also used to:

- Test the adequacy of research instruments – in this case a questionnaire;
- Identify future potential technical/logistical/personal issues likely to impact the main study;
- Collect preliminary data;
- Determine necessary resources for main study; and
- Establish links with Nepal based NGOs.

The pilot was successful in all of these goals. Following the pilot the aims of the PhD were confirmed and it was determined that qualitative methods were fundamental for the in-depth exploration of seasonality and water and sanitation by allowing for the complexity of the issue and the interaction of its components. An abundance of contacts were made and the researcher became far more informed of the realities of field research. No data from the pilot are included in this text.

The reason for this, is that a questionnaire was prepared as a primary data collection method and brought to the field. During the time, the researcher felt that the questionnaire was proving restrictive in terms of the data collected. While answers to the questions asked were being provided, the information which often accompanied the answers of these verbally administered questionnaires was far richer with data relevant to the study.

Due to the fact that the researcher had anticipated collecting data via a number of researchers administering questionnaires, no voice recorder was brought on this field visit and thus the data collected when the questionnaires begin to become less structure and evolve into interviews was not well recorded as it was solely noted in researcher notes.

Mustang was determined to be the incorrect choice for research on seasonality. The population in Mustang earn their living from the tourist trade during certain months of the year. In the winter, during heavy snows, a large proportion of the population migrate south to a second home – typically in Kathmandu. As a result, seasonal variations in terms of access to water and sanitation were not experienced by a significant section of the population of Mustang.

The researcher returned to the UK and developed clearer objectives for the study based on this information. Training was then undertaken in administering semi structured interviews and on data processing techniques to allow the researcher to use these research methods successfully.

Months into the main body of field work, the field notes relay satisfaction with this change in approach.

I still feel confident in my decision not to use questionnaires or surveys in the main study– I'm sure I would get beautiful graphs but I don't trust the information.

Field notes, 05-02-12

Based on recommendations received from government officials and NGO workers in Kathmandu during the pilot, Humla was among the top recommendations for districts in which to study seasonality.

4.4.5 Selection of Qualitative Modes of Enquiry

Qualitative research was chosen as the predominant mode of enquiry following the pilot study for the reasons detailed in the preceding paragraph. Qualitative research was found more useful, due to the fact that it is more concerned with interpreting than counting (Gibbs, 2011). Following the pilot study it was clear to the researcher that this was the more relevant to the fulfilment of the research aims.

While many authors argue for the use of mixed methods for increased validity (Bamberger et al., 2006, White, 2008), the quantitative elements of the research originally envisaged were cut. The researcher realises that this removes the ability of the results of this research to be generalised to reach a wider audience but due to time constraints a decision had to me made to focus on qualitative. As Mintzberg (1979 ,p.587) describes

> *"…while systematic data creates the foundation for our theories, it is the anecdotal data that enables us to do the building…..we uncover all kinds of relationships in our hard data, but it is only through the use of soft data that we are able to explain them".*
>
> Mintzberg (1979, p 587)

There are some key elements that characterise qualitative research design and this investigation strongly relied on three principles put forward by Rubin & Rubin (1995) in their book 'Qualitative Interviewing, The Art of Hearing Data': qualitative research designs must be flexible, iterative and continuous.

4.4.5.1 Flexible

Flexibility is a vital characteristic of qualitative research methodologies – particularly when researching in the field. Constant adaptation to the way the investigation naturally unfolds is required. Assumptions need to be suspended to remain sensitive to new concepts that emerge through the interviews (Rubin and Rubin 1995). Field researchers rarely follow fixed steps. In fact, flexibility is a key advantage of field research, because it allows shifting direction and follow leads (Neuman 1997). In the beginning, the researcher may expect little control over data and little focus. Once socialised to the setting, however, he or she focuses the inquiry and asserts control over the data (Neuman 1997). In data collection through interviewing, flexibility means the possibility of adjusting the questioning; so that the interviewees are asked about the parts of the subject that they know best (Rubin and Rubin 1995).

Generally speaking, flexibility also meant that a certain level of uncertainty had to be maintained with respect to the planning of the research. As described in section 4.4.2 the case studies were not all chosen in advance, and were selected according to what was practical upon arrival in Humla.

4.4.5.2 Iterative

The process of collecting information, analysing it, identifying concepts, and testing them is cyclical (Rubin and Rubin 1995). At the beginning of the research, the idea is to get a general picture, and data collection methods are used to gather a wide range of ideas. At first everything seems relevant, then, selective attention focuses on specific questions and themes. As ideas emerge, they are examined in depth through more directed interviews. By refining these ideas, new concepts come out, which are relevant to the study and feed this cyclical process. As Neuman (1997) puts it, qualitative research is non-linear. It is 'more of a spiral, moving slowly upward but not directly. With each cycle or repetition, a researcher collects new data and gains new insights'. The data collection phase is considered complete when each additional interview brings no significantly new concepts.

4.4.5.3 Continuous

Continuous design means that the work should be redesigned at several points in the research. The design is not restricted to its initial definition. Ideas can emerge in the first stages of data collection, which suggest the use of other techniques, or the interviewing of an unexpected group of people about an issue that was not addressed first, but which is relevant to the global purpose of the research (Tiberghien 2002).

4.4.6 Methods Used

Methods used in the field based section of this PhD are shown in Figure 4-14 . This diagram shows the shift from quantitative methods used in the pilot study (blue circles) to the qualitative methods used in the main body of research (red triangles). This entire framework is carried out within the bounds of a case study. These axes were chosen as opinions and attitudes of the community members and professionals based in the area were deemed key to answering the research questions. Behaviours of the community members were of importance, but difficult to ascertain using any method other than observation.

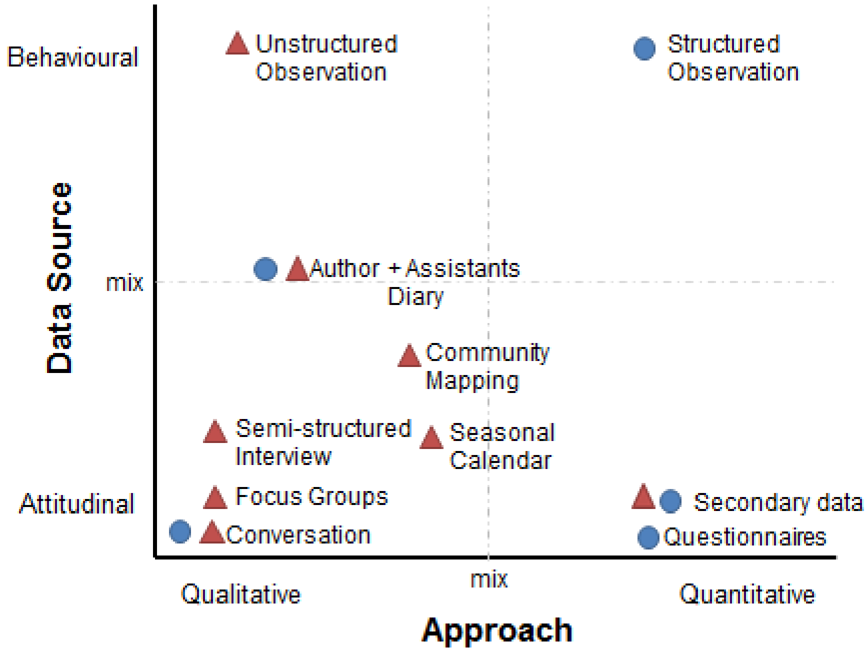

Figure 4-14 Methods of data collection used in this research showing the shift from the more quantitative methods used in the pilot study (blue circles) to an almost entirely qualitative study in the main research visit (red triangles)

The secondary data referred to consists of records provided by government and non-governmental organisations including census reports (country and district level), programme reports and strategies.

4.4.6.1 Literature Review

> *"The novice researcher may think that the purpose of a literature review is to determine the answers about what is known on a topic; in contrast, experienced investigators review previous research to develop sharper and more insightful questions about the topic"*

(Yin, 2009, p14).

Very few recent studies have been in completed in Humla and as a result not many are referenced in the previous chapters or were available for use in the development of the methodology for this study. The most up to date and relevant (and thus the primary data sources for knowledge gained on Humla) are listed in Table 4-5.

4.4.6.2 Case Study Research

A case study focuses on one or a few instances of a particular phenomenon with a view to providing an in depth account of events, relationships, experiences or processes occurring in that particular instance (Denscombe, 2007). Case study research helps the researcher connect the micro level, or the actions of individual people, to the macro level, or large scale structures and processes (Neuman, 2006).

Caution must be exercised in planning the methodology for case studies in the field as they are all in some way open ended and flexible. This flexibility is entirely dependent on the ability, the experience, and the ingenuity of the investigator; who needs to be able to observe, interview, record, and continuously review the material collected (Gillham, 2000).The methodology for this study attempted to incorporate this flexibility whilst specifying a clear means by which data will be collected to ensure it will be relevant to proving the main aim.

Implementation in the field

This study uses a case study of three communities; Kermi, Chaggaunphaya and Simkot Ward 1 to investigate the community level aims of the project, aim 1; and a case study of Humla District (specifically Upper Humla) to investigate aim 2 at the programme level. There are two main reasons the community based research was based on several case studies. These are similar to those provided by Tiberghien (2002) in his PhD thesis investigating sanitation provision in rural Mexican communities, who found that by:

1. Using the same methodology in several case studies, the versatility and robustness of the approach can be tested in varying circumstances.
2. Replicating the study in several communities, the uniqueness of each situation can be determined and generalisations can be drawn, while respecting the distinctiveness of each community.

Table 4-5 Primary literature sources used to compile contextual background to study

Author	Year	Title	Location	Methods	Details
Kimber Haddix McKay	2002	Health Needs in Two Ethnic Communities of Humla District, Nepal	Upper Humla - Thehe, Santa, Syada, Kholsi, Kermi, Yelbaun, Yengar	105 interviews averaging 25-30% of all households in village. Group interviews and individual interviews employed.	A primary healthcare baseline study focusing on hygiene and sanitation, immunization, vitamin programs, disease prevalence, childbirth, family planning and anthropometry
Rabindra Roy	2010	Contributions of Non-Timber Forest Products (NTFPs) to Livelihood in Upper Humla, Nepal	Upper Humla - Khagalalgaan and Syaandaa VDC over 2 months	Sample size of 57% of 497 households. Data from herbarium collection, semi structured questionnaire, participant observation, focus groups and informal interview	PhD thesis to identify NTFPs of Humla and assess their contribution to livelihood in Nepal
Rural Village Water Resources Management Project	2010	Rural Village Water Resources Management Project (RVRMP) Phase II in Far and Midwestern Regions, Nepal	Desk based – focus on Far Midwestern regions	Review of organisations activity in previous 5 year cycle	Summary of RVWRMP efforts to achieve improved well-being and reduced poverty in their project VDCs
Naomi M. Saville	2001	Practical strategies for pro-poor tourism: case study of pro-poor tourism and SNV in Humla District, West Nepal	Desk based – focus on Humla District	Literature review and strategy development	Investigation of potential for improved tourism in Humla
Will Tillett	2008	Appropriate Approaches to Hygiene and Environmental Sanitation in Remote Communities of Mugu and Humla Districts, Western Nepal	13 communities in lower Humla and Mugu over 7 weeks	87 semi structured interviews conducted with community members and key informants	Masters thesis in Cranfield University investigating appropriate and effective approaches to hygiene and environmental sanitation for communities in Mugu and Humla Districts, North West Nepal

4.4.6.3 Semi structured interviews

A less structured interview type lends itself to collecting qualitative data. A semi-structured interview can be supported with an interview guide to cover some main points but allows flexibility in the order and line of questioning to follow up on interesting topics (Scott, 2011).

Implementation in the field

Semi- structured interview were conducted at the community level and at the programme implementation level. At the community level, topical semi structured interviews were conducted where broad topics of seasonality and water and sanitation were introduced. As themes emerged, some conversations would begin with narrower themes as specified by the primary investigator based on feedback from the research assistants e.g. sanitation specific interviews, clothes washing specific interviews etc.

In these unstructured open-ended conversations, the topics unfolded naturally. The researcher continued to interview in each community until data saturation was reached. In most cases this equated to a representative from approximately one fifth of the households in the village. The study aimed to get equal numbers of male and female respondents. According to McKay, villagers are intimately aware of the conditions of life in every household in their village (McKay, 2002), thus small numbers of interviews could lead to a comprehensive view of conditions in the area.

Interviews typically took place in a respondent's home. Oral permission was sought from the participant for the interview. With permission, all interviews were recorded with a voice recorder. Interviewees were offered assurances of anonymity in every case. Interviews typically lasted approximately 30 minutes to 1 hour. The researcher was present during the interview where possible, observing communication behaviours and interactions between translators and participants.

Prior to beginning interviews in the community, the researcher and her assistants would remain in the area observing and conversing informally with community members to build rapport. In a further effort to build relations, the interviewer would chat informally for a few minutes before beginning the main body of the interview. The unstructured approach to interviewing gave control to the interviewee and acknowledged the richness in their opinions. The interviewer assumed the position of informed ignorance and learned from the respondent. Of course sometimes this meant interviews drifted from the aims anticipated by the interviewer but valuable insights to water and sanitation in the area were none the less gained. Research assistants expressed difficulty in remaining flexible in their approach, while also obtaining answers that contributed directly to the aims of the project.

In many cases it was difficult to conduct interviews in private places. This was particularly difficult when interviewing women, as men (e.g. husband, son) would insist on sitting in on the interview to observe what was happening – in some cases this would make the interviewee reluctant to share openly. In some cases, the research assistants would ask the external party to leave, but in some situations this was inappropriate and the interview content was adapted to suit the circumstances.

It is difficult to isolate the women without men drifting in and out of the room wondering why we've asked to speak to their wives and not them.

(Field notes, 10-02 -12)

Availability for interviews changed over the months when the researcher remained in the field, with interviews particularly difficult in harvest and at times in the winter season. One case study site was discarded due to the lack of men in the area during a month long visitation of a high Lama priest.

The weather is terrible so it makes it difficult to get people for interviews when groups of people aren't just sitting on the roof as they normally do

(Field notes, 16-02-12)

A summary of interviews conducted at the community level is presented in Table 4-6.

Table 4-6 Summary of interviews conducted at the community level

Location	Kermi	Chaggaunphaya	Simkot - W1	Total
No of households	~80	~70	~60	~210
Total Interviews	16	16	13	45
Interviews Female	10	8	6	24
Interviews Male	6	8	7	21

In each case data saturation was reached following interviews with a representative from 20% of the households. Conversations took place with many more people but this figure typically represented the amount of official recorded interviews that took place prior to saturation.

An acceptable gender balance was achieved with more women being interviewed overall.

Key informant interviews were more directed at programme implementation and seasonality. There was less freedom for the key informant to shift the topic of conversation from that which met the aims of the researcher. These interviews were typically held in the office or home of the informant. A total of 39 key informant interviews were carried out. The backgrounds of the interviewees are presented in Table 4-7 and summarised in Figure 4-15 .

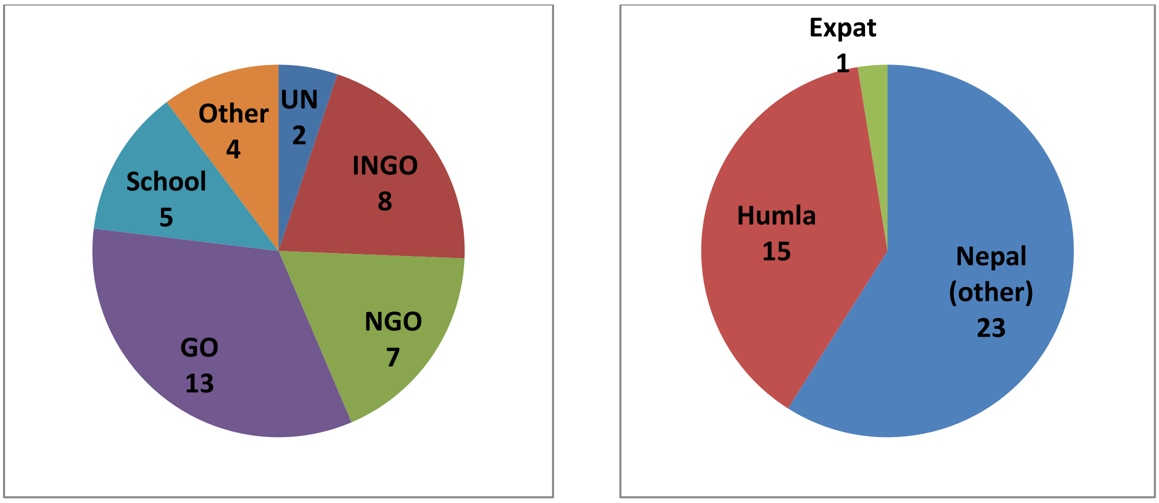

Figure 4-15 Summary of key informants occupations and birthplace (N=39)

It can be seen that a good balance of NGO and GO workers was achieved. Due to the majority of the interviews taking part in Humla, many of the programme implementation staff were Humli or Nepali. A distinction between these is made in Figure 4-15 as the knowledge of Humla from those ever from other parts of Nepal, was often found to be of a poor standard. It is therefore important to note that effort was made to interview individuals who were born and raised in Humla.

Only one expatriate was interviewed officially though many were conversed with more informally in Kathmandu.

Transparency of the interviews was improved by inserting a log section as a commentary at the start of each interview transcript. The log describes:

- How the information was recorded
- Where the interview took place
- The general atmosphere of the conversation
- Extra comments deemed of relevance

While community member interviews were taped using a voice recorder, key informant interviews were not as the recorder induced suspicion and, what were perceived to be, less honest answers.

It is very evident that appearance of the tape recorder inhibits interviews from professionals, making them far less likely to drift from the 'company line'. After a number of uses, I have decided to cease taping key informant interviews in a bid to get more honest answers. The researcher and assistants should also not be seen to be noting down controversial points made my informants!

(Field notes, 06-01 -12)

Table 4-7 Summary of key informant interviewee details (N=Nepali, H= Humli, E = Expat)

KI	Position	Organisation	Birthplace
1	Programme Manager	NGO	Nepal - other
2	Researcher	Independent	Nepal - other
3	Country Programme Manager	INGO	Humla
4	Local technical staff	NGO	Humla
5	Local technical staff	NGO	Humla
6	Programme Manager	NGO	Humla
7	Headmaster	School	Humla
8	Health Post Worker	INGO	Humla
9	Local Staff	DGO	Humla
10	Auditor	DGO	Nepal - other
11	Hindu Healer	Healer	Humla
12	Technical staff	NGO	Nepal - other
13	School Teacher - primary	School	Nepal - other
14	Water Management Committee Members	DGO	Humla
15	Country Programme Manager	INGO	Expatriate
16	Visiting Technical Staff	INGO	Nepal - other
17	Local Technical Staff	GO	Humla
18	Regional Programme Manager	NGO	Nepal - other
19	General Staff	LGO	Nepal - other
20	Local Engineer	INGO	Humla
21	Local Engineer	INGO	Nepal - other
22	Consultant	UN org	Nepal - other
23	Teachers - secondary	School	Nepal - other
24	Teachers	School	Nepal - other
25	Water Management Committee Members	DGO	Humla
26	Humla Programme Manager	GO	Humla
27	Local engineer	GO	Humla
28	Humla Programme Manager	UN	Nepal - other
29	Proprietor	Business	Humla
30	Lead Engineer	GO	Nepal - other
31	Field staff	NGO	Nepal - other
32	Headmaster	School	Nepal - other
33	Buddhist healer	Healer	Nepal - other
34	Field Engineer	GO	Nepal - other
35	Technical Advisor	INGO	Nepal - other
36	VDC Officer	DGO	Nepal - other
37	District Programme Manager	GO	Nepal - other
38	Environmental Engineer	GO	Nepal - other
39	Rural Programme Officer	INGO	Nepal - other

4.4.6.4 Focus Group Discussion

Powell and Single (1996) define a focus group discussion (FGD) as: "*a group of individuals selected and assembled by researchers to discuss and comment on, from personal experience, the topic that is the subject of the research"*. Group dialogue tends to generate rich information, as participants' insights tend to "trigger" the sharing of others' personal experiences and perspectives in a way that can more easily or readily tease out the nuances and tensions of complex topics and subjects – a dynamic that is not present during key informant interviews (OMNI, ND). Focus groups allow the researcher to gather large amounts of information in a short period of time (Morgan & Krueger 1993). A balance needs to be found between number of participants and depth of information; sizes recommended vary typically between 6-12 participants (McDaniel and Gates, 2010, Powell R.A and Single H.M, 1996, OMNI, nd, Kitzinger, 1995). Participants can be selected based on gender, age, power or cliques; they may be selected via nomination, random selection, or may all be the members of the same group or volunteers.

Implementation in the field

Focus group discussions were typically mixed caste, age and mixed sex. In some cases single sex focus groups were held to focus on issues such as menstruation (females) or the practicalities of men bathing (males). Participants were typically selected by a trusted key member of the community e.g. leader, health volunteer, elderly members of the community. A summary of focus groups which took place is shown in Table 4-8.

Table 4-8 Summary of focus group discussions

Location	Kermi	Chaggaunphaya	Simkot - W1	Total
Households	~80	~70	~60	~230
FGDs	3	3	3	9
FGD male	-	1	1	2
FGD female	-	2	1	3
FGD mixed	3	-	1	4

Focus groups were conducted in Kermi first and were initially all mixed. Following initial data collection it became apparent that there would be value in splitting participants and a number of single gender FGDs were conducted. In Simkot focus groups were held with younger males and females (under 30) separately, and an older mixed group.

Oral consent was sought to record the discussions. They took place in any available sheltered space – from schools to local tea houses. 6 informants were typically invited to attend to ensure that all participants based on a review of literature, which recommended this as an optimum amount to ensure participation from all (MacDaniel and Gates, 2010; Powell R.A and Single H.M., 1996; OMNI, ND; Kitzinger, 1995).

Dominant individuals were present at times but groups were managed in a way that enabled all participants to contribute. Debates in the focus groups proved useful for uncovering true behaviour. However some of the truths which emerged through these debates cast doubt over the reliability of some previous responses in interviews, particularly with regard to open defecation.

<u>It is very frustrating when a discussion in a focus group casts doubt over information presented in an interview. Of course there is evidence that when questioned about ones hygiene behaviour, one is likely to exaggerate so this is hardly a surprise. At least the focus groups are highlighting the areas in which I need to watch for these deviations from the whole truth!</u>

(Field notes, 26-03-12)

4.4.6.5 Observation

Participant observation is a widely used qualitative research method which often complements others such as interview techniques. Participant observation is essentially where the researcher immerses themselves in the social context they aim to observe. This method can provide rich qualitative data, including non-verbal data (Bryman, 2004).

Table 4-9 summarises the advantages and disadvantages of structured observations (specific to environmental health studies) as presented by Bostoen (2007).

Table 4-9 Advantages and disadvantages of structured observation from Bostoen (2007)

Advantages	Disadvantages
Information on the physical environment and human behaviour can be recorded	Behaviours can be correctly recorded but misinterpreted through the observer
Observer can 'see' what the untrained eye can miss, as he/she is focusing on the issue	Behaviour may change due to the presence of the observer
Information can be collected on people that cannot take part in interviews	To increase accuracy there is an opportunity for repeated observations
This information can be checked against other sources, e.g. claims of behaviour in interviews can be checked with observed behaviour	The first day of observation is more reactive than observations on later days
	It is time consuming and therefore expensive

While the observations completed in this study were unstructured, many of the same issues were found to be relevant.

Implementation in the field

Unstructured participant observation took place as a by-product of the research team living in the communities under investigation for the duration of the research. By living in the area, the researcher had the opportunity to acquire first-hand information, and hands on experiences of the living conditions and livelihoods of the villagers. Increased familiarity with the researcher increased openness a great deal, thus improving the reliability of the data.

Some days between interviews would be spent purely observing, e.g. walking around a village with a notebook and a heightened awareness of observed activities near taps or in households. The reality in the field was that the author could not observe in any way discreetly or unnoticed. Sitting in the village, the researcher would typically be surrounded by children or community members and find it quite difficult to simply observe. Due to this 'presence' of the researcher in the village, it is possible behaviours were altered when the researcher was nearby. Local research assistants were weak at observation as activities that seemed 'normal' to them were worthy of note for the researcher.

4.4.6.6 Field notes

Field notes are an on-going stream-of-consciousness commentary about what is happening in the research, involving both observation and analysis – preferable separate from one another (Eisenhardt, 1989).

Both the research assistants and the author kept a diary of their experiences and what they observed and how they felt research was progressing; observations and analysis were discussed separately. These points were reflected on each day to share learning points and emerging themes day to day.

Field notes and observations were used to establish and triangulate presence of infrastructure in each community.

4.4.7 Research Assistants

Sourcing research assistants was particularly difficult in Humla, after some time a male and female were recruited that spoke Lama, and a male and female who spoke Nepali. The Lama speakers were from Humla, and the Nepali speakers were from the Kathmandu area. The Lama speakers did not have good written English, thus a translator, Sonam Norbu Lama from Humla but living in Kathmandu was employed to translate the interview transcripts. A summary of information on the research assistants is presented in Table 4-10.

Table 4-10 Research assistants basic details

Assistant No.	Gender	Birth place	Qualification	Translation provided
1	M	Humla	Grade 12 education.	Lama to English
2	F	Humla	Grade 12 education	Lama to English
3	M	Kathmandu	Bachelor's degree	Nepali to English
4	F	Kathmandu	Bachelor's degree	Nepali to English
5	M	Humla	Bachelor's degree	Transcription of Assistant 1 & 2's interviews

Figure 4-16 shows the role of the research assistants in acquiring data from interviews. Reading from left to right one can see that themes for interviews were generated in English and then translated to either Lama or Khas. Interviews would then be administered in the same language with provisional feedback on interview content being fed back to the researcher in English which in some cases led to adaption of the themes for interviews. These adapted themes would then be translated back to Khas or Lama and more interviews would take place. Only at the end of this process were interviews all transcribed fully into English. Clearly the translator has a significant role in the collection and synthesis of data. To alleviate the risk associated with this, two interviews from each assistant were translated by another translator for verification. While there was some variation found in nuances of the text the basic messages were unaffected.

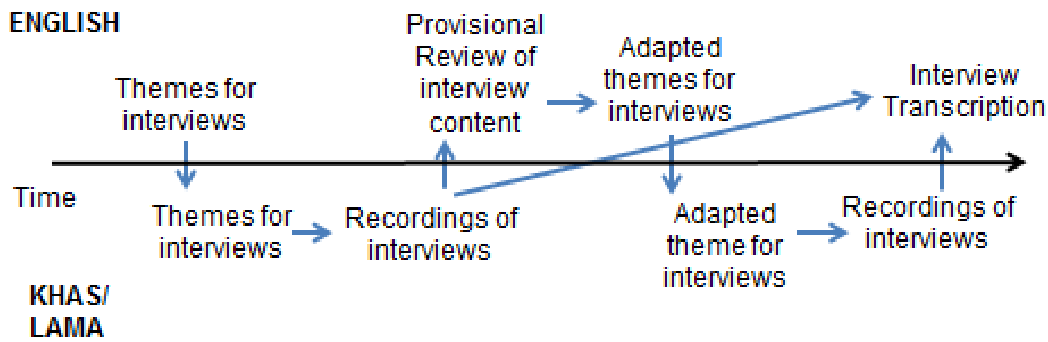

Figure 4-16 The role of the translator in acquiring data from interviews (Source: Author)

4.4.8 Triangulation of Data

Data reliability and validity was increased through triangulation of information between interviews, observations, field notes and focus group discussions. In some cases these information sources showed discrepancies, examples of which are discussed in the results of this thesis.

4.4.9 Data Collected

A summary of the data collected for this research is presented in Table 4-11.

Table 4-11 Data collected at the community level for Aim 1

Location	Kermi	Chaggaunphaya	Simkot - W1	Total
Total Interviews	**16**	**16**	**13**	**45**
Interviews Female	10	8	6	24
Interviews Male	6	8	7	21
FGDs	**3**	**3**	**3**	**9**
FGD male	-	1	1	2
FGD female	-	2	1	3
FGD mixed	3	-	1	4

The data from these interviews were compiled with unstructured observation and field notes to generate outputs for Aim 1: To investigate intra-annual patterns in access to water and sanitation for communities in Humla District, Nepal.

The primary information for Aim 2: To determine intra-annual patterns of challenges and opportunities for improving standards of water and sanitation in Humla District, Nepal; came from literature, secondary data, observation of infrastructure and 39 key informant interviews.

4.5 Answering the research questions

A combination of all these research methods was used to address the research questions. The contribution of each source is shown in Table 4-12, where SSI-C is community level semi structured interviews, SSI-KI is key informant semi structured interviews, FGD is a focus group discussion, OBS is unstructured observation, FN is field notes and SD is secondary data.

Table 4-12 Methods used to answer the research questions

Question	SSI -C	SSI - KI	FGD	OBS	FN	SD
At the community level: How does seasonality impact on community level access to water and sanitation?	X	X	X	X	X	X
What climatic and non-climatic seasons exist in Humla that may affect access to water and sanitation?	X		X			
Does community members' behaviour change inter- annually in a way that affects standards of water and sanitation?	X		X	X	X	X
Does functionality of the community water and sanitation infrastructure vary inter-annually?	X	X	X	X	X	
At programme level: Does seasonality effect programme implementation?	X	X		X	X	X
What seasonal calendars effect programme implementation?		X		X	X	
What are the seasonal barriers and opportunities for effective implementation of WASH programmes?	X	X		X	X	X

4.6 Data Analysis

Steps in the data analysis involved: transcription, data familiarisation, data cleaning, compilation, analysis and synthesis.

All focus groups and interviews were translated and transcribed by the research assistants (and an external hired translator in the case of interviews in Lama). Prior to the thematic analysis of the data, the researcher read all transcriptions twice to increase data familiarisation.

Initially brief verbal codes were assigned to small chunks of data in Microsoft Word. The process of coding was guided by the research questions; as a consequence the coding of information was orientated toward the identification of factors that:

(a) Related to seasonal standards of water and sanitation at the community level, or
(b) Related to the challenges and opportunities of programme implementation in Humla and how that varied seasonally.

For (a), the thematic codes which were developed are presented in Table 4-13.

These did not match for all case studies and some had different emerging themes to others. A short paragraph summarising findings for each sub-category (along with similarities and differences across groups) was noted. This process was also applied to observations and field notes.

Some key questions were answered through transfer of answers to an Excel spread sheet (e.g. does interviewee have a latrine? Where does participant get drinking water in each season?) in which replies were collated and sorted for ease of comparison.

For (b), the Programme implementation, the codes which emerged upon provisional analysis of the data is shown in Table 4-14.

Table 4-13 Summary of thematic codes used for data analysis of community interviews and focus groups, where (S) denotes those areas compiled by season

<table>
<tr><th>THEME 1: Drinking water</th><th colspan="2">THEME 2: Non – drinking water</th></tr>
<tr><td>Drinking water source (S)
Alternative drinking water source (S)
Issues with primary water source (S)
Extra details on primary water source
Water for animals (S)
Water quality (S)
Water treatment (S)
Queue (S)
Collection timings
Difficulty with collection (S)
Opinion of infrastructure in place</td><td colspan="2">Bathing location (S)
Bathing issues (S)
Daily bathing
Bathing amount (s)
Clothes washing (S)
Clothes washing issues
Wastewater disposal
Irrigation
Solid waste
Water at grazing site</td></tr>
<tr><th>THEME 3: Sanitation</th><th colspan="2">THEME 4: Village information</th></tr>
<tr><td>Latrine owned (Y/N)
Why or why not?
Age of latrine
Status of latrine (e.g. operational)
Latrine constructed by...
Latrine Use (S)
Permanent latrine difficulties
Anal cleansing
Open defecation issues (S)
Permanent open defecation issues
Open defecation location</td><td>Climate change
Water scarcity
Increasing population
Electricity
Livestock and disease
Irrigation
Expansion of taps
Grain millwheel
Job opportunities
Harvesting
Education</td><td>Firewood
Grass for animals
Communications
Healthcare
Fertiliser
NGO perceptions
GO perceptions
User committees
Development
Gender balance</td></tr>
<tr><th>THEME 5: Illness</th><th colspan="2">THEME 6: Menstruation</th></tr>
<tr><td>Peak illness time
Cause of Illness
Prevalent illness
Perceived vectors for disease</td><td colspan="2">Ease
Material Used
Washing during menstruation
Life during menstruation</td></tr>
<tr><th>THEME 7: Livelihood</th><td colspan="2"></td></tr>
<tr><td>Activities by family member (S)[10]</td><td colspan="2"></td></tr>
</table>

[10] A seasonal calendar of activities was compiled for each family member

Table 4-14 Summary of thematic codes used for data analysis of Programme Level interviews

THEME 1: The Community	THEME 2: The Physical Environment
Humli Attitudes User Committees Influence of Caste Capacity of community Availability of community	The Natural Environment Accessibility Remoteness Transport Applicability of standards Infrastructure issues
THEME 3: The Institutional Environment	
Organisation Details • Priorities • Bias Influence of Politics Donor Understanding of Humla Communication Budget Co-ordination	Corruption Work of NGOs Work of GOs Monitoring/Evaluation Operational Months Capacity of staff Relevance of policy

4.7 Critique of methods

While methods were chosen carefully, there were some practicalities which caused difficulty in implementation. This section provides a brief summary of some of the issues faced in implementing the aforementioned techniques in the field. The research environment was found to be challenging due to the complexities of working with different cultures, values, belief systems and languages as described by Temple and Young (2004).

4.7.1.1 Language barriers

Some respondents with quite strong English asked for interviews to be conducted in English. This sometimes led to a poor interview as their English was not strong enough to express themselves clearly. The author feared insult would be caused if the interviewee was asked to speak through the interpreter, so interviews continued in English. In some instances this led to a loss of data due to the need for the interview to remain in very basic areas of conversation.

It is difficult to interview people who speak ok, but not great English. You don't want to insult them by suggesting that you use the translator, but they cannot express themselves fully and conversation remains basic.

(Field notes, 15-02-12)

4.7.1.2 Sourcing research assistants

As Wax (1971, p17) describes:

"Usually a beginner arrives in the field ready and eager to begin "gathering data". Then, for weeks, and sometimes for months, he gropes and wanders about, trying to involve himself in various kinds of human or social relationships that he needs, not only in order to accomplish his work but because he is a human being. He tries to make the acquaintance of as many people as possible, he tries to tell them who he is and what he hopes to do"

(Wax, 1971, p17)

This was found to be the case in this work. While local NGOs had offered their assistance in the research – an attempt was made to retain a level of independence to avoid bias in the responses of interviewees due to the presence of staff of an organisation working in the area. This led to a difficulty in locating research assistants. To retain a balance of emic and etic viewpoints, two of the research assistants employed were from Humla, and two from Kathmandu.

Issues as described by Wax (1971,p3) on reflecting on research by outsiders were found to hold true:

> *"The outsider doesn't know the meaning or the patterns, the insider is so immersed that he may be oblivious to the fact that the pattern exists"*

(Wax, 191, p3)

Thus overall, the research assistants from Kathmandu proved stronger assistants as they saw similar patterns to the primary investigators. At times those from inside the community failed to spot patterns related to the aims of the project; however they were far stronger at building rapport and knowing key figures in the communities.

4.7.2 Impact of translators

> *"In an international setting, the conduct of research poses a number of special methodological challenges for the researcher, particularly in the establishment and maintenance of rigor if she has to rely on others for collecting, translating and interpreting various types of data"*

(Mill and Ogilvie, 2003)

Recognising the influence of translation and subsequent interpretation on the data and the validity of the final outcomes of the research is vital because, as (Temple and Young, 2004, p.171) suggest: "*The translator always makes her mark on the research, whether this is acknowledged or not…"* (Kirkpatrick and van Teijlingen, 2009).To assume that translators are merely transmitters of neutral messages is likely to inhibit access to understanding the translation process and the emerging data (Larkin et al., 2007).

It is recognised that the use of research assistants and their subsequent translation of data threatens the robustness of the data collected, and the validity of the outcomes. In a bid to combat this, daily meetings were arranged to talk in depth about information gained that day as a team. Both of the researchers from Kathmandu had studied in the United States of America, thus this was not seen as much of a threat with these researchers.

In some cases it felt as though all conversations were not fully fed back to the lead researcher, but attempts were made to follow up on conversations where possible.

Sitting here and feeling all the potential information rush by your ears is really quite stressful!

(Field notes, 15-03-12)

4.7.3 Failure to translate information earlier

While daily meetings were held with research assistants to determine the key points of the day, interview translation was not completed until all interviews had been completed. In hindsight, it may have been an improvement to translate some interviews fully before proceeding with the rest of the data collection. As a result, some key themes worthy of pursuit in questioning were only uncovered by the researcher upon her return to the UK.

4.7.4 Lack of quantitative data collected

In a bid to understand the 'story' of access to water and sanitation in Humla, the focus was shifted towards qualitative information. During the research process, the researcher realised the immense value quantitative data measured seasonally would add to this study. Unfortunately no prior arrangements had been made to bring equipment to the field, and this 'realisation' occurred after the winter season where the greatest information could have been gained, and thus comparisons with other seasons could not be drawn. This is recognised as a limitation of the study as a whole, which is discussed further in the conclusions chapter.

4.8 Logistical Issues

At times the logistics of completing research was difficult due to the lack of infrastructure.

Table 4-15 shows how poor infrastructure affected the research and coping mechanisms put in place.

Table 4-15 Coping mechanism for lack of infrastructure in case study area (Source: Author)

Lack of infrastructure	**Coping mechanism**
Lack of electricity to charge laptop	Second battery purchased and both charged when power was available.
Lack of electricity to charge voice recorder batteries	Large amounts of batteries purchased
Lack of light to work in the evening	Attempt to conduct interviews in daylight hours
Lack of space in community members homes to stay (especially as team of three)	In Simkot and Chaggaunphaya the research team stayed in a small tea shop within the community
Poor access to villages	Flexible plan maintained

4.8.1 Availability of Interviewees

At certain times of the year community members were particularly busy and unavailable for interviews e.g. during harvest season. Community members were by and large very busy (apart from during the winter season) and it was at times difficult to find an hour to sit together. Many key figures in delivery of water and sanitation were often absent for large portions of the year, thus making it difficult to obtain information from them.

Seeking the affects of seasonality also suffers from some seasonal implications. During harvest, participants are far too busy to take part in interviews unless one travels to the field with them to help and discuss water and sanitation at the same time. When trade routes open, men can be difficult to find in the communities (apart from Chaggaunphaya where trading is not so prevalent)

(Field notes, 23-06-12)

Government officials have been all but absent for the duration of winter. Conducting any interviews related to aim 2 of this study has been nigh on impossible – which is a result in itself. Complete absence of the relevant staff.

(Field notes, 12-02-12)

4.9 Presentation of Results

Results are presented primarily through seasonal calendars and quotes from interviews.

4.9.1.1 Seasonal Calendars

Seasonal calendars are presented such that the first section represents spring, then summer, autumn and winter. The start of spring does not correspond to the start of the Nepali or the Gregorian calendar (as used in the UK). Thus, unlike most calendars, the first month of the year is not the starting point of these calendars – the first season of the year is. This was done to ease of understanding prevailing conditions by season.

The number of respondents who provided data for each seasonal calendar is presented underneath in the figure caption. In most cases, the data in a seasonal calendar is followed by a number. This number represents how many respondents highlighted a particular point. The reader must bear in mind that all respondents may not have been asked particularly about a certain point and that this is only a representation of those who brought up a particular issue of their own accord. As a result, the relevance to the total number of interviewees cannot be taken as any form of percentage of people who agreed or disagreed.

4.9.1.2 Text Based Results

Quotes from semi structured interviews are presented in bold and italicised font in inverted commas. Each interview quote is followed by a reference to the interview it is from, in the format:

(Abbreviated case study name x – gender), where x = interview number.

For example, (K1 –F) is interviewee number one from Kermi, and is a female.

(C2-M) is interviewee two from Chaggaunphaya and is male.

The numbers represent the chronological order in which the interviews were taken. In each case study, the numbers start from 1. The abbreviations for the case studies are Kermi – K, Chaggaunphaya – C, Simkot Ward 1 – S.

Key informant interviews are referenced in the format (KIy), where y is the number of the interview. For example, (KI34) is key informant number 34.

Quotes from focus groups are also presented in bold and italicised text in inverted commas. They are referred to in the format:

(FGDz-Abbreviated case study name), where z is the case study number.

For example, (FGD1-K) is the first focus group discussion from Kermi.

Field notes are presented in non-italicised bold font, without inverted commas. They are underlined to make them distinct from the quoted text and presentation of data. Quotes from field notes are referenced as follows: **(Field notes, dd-mm-yyyy).**

4.10 Chapter Summary

This chapter has summarised the conceptual framework, research strategy and methodology used in this research. As can be expected in exploratory research, the methods used were flexible, to a degree, to cope with the introduction of new information and themes.

Reasons for the selection of Humla have provided as well as a brief introduction to the case study sites. Lessons learned from the pilot study and their impact on consequent research decisions have been presented.

The main weakness of the data stems from the fact that it was translated many times, and at times this was completed by different people. There has been an attempt to reduce the risk of this through back translation and duplicate translations.

The research is strongly qualitative, and was processed with themes that emerged following data immersion. It is recognised that additional quantitative data would have enhanced this study overall. A summary of the strengths and weaknesses of the methodology is presented in Table 4-16.

A further reflection on the research design is provided in the conclusion to this work.

The next chapter begins the results section of this work and introduces the case study areas based on some available secondary data and initial primary data collected during the initial research period.

Table 4-16 Strengths and weaknesses of the chosen research methods

Strengths	Weaknesses
Small community size allowed for data saturation to be reached	Low population density led to small numbers of interviews
In depth qualitative study conducive to understanding the details of the research aims	Case studies all with 20km of each other – possibly lack of applicability of data elsewhere
Triangulation of interviews with observation, field diaries, focus group discussions and secondary data collection	Dependence of end data processed by researcher on interpreters and translators
Flexible nature allowed for adaption to emerging themes	Research design and processing completed by 'outsider' with biased view
	Bias too far toward qualitative research.

5 Introduction to Case Study Area

5.1 Chapter Outline

This research is based in, and specific to, Humla District, Nepal. The following chapter presents baseline data about the district which is necessary for the reader to understand before presentation of data more pertinent to the aims and objectives of the research in Chapters 6-8.

This data includes information on the location of the case study sites, population densities, the income and 'development' levels in the district and basic infrastructure available. This data stems from a mix of observation, community interviews and secondary data sources e.g. census.

Three crucial points for understanding consequent data analysis (in Chapters 6-8) but not directly linked to water and sanitation are presented; these are

- An introduction to the seasons observed in Humla
- The weather experienced during these seasons
- How the seasons influence the livelihoods of the people in the area

Investigation of these issues is fundamental to understanding a holistic picture of seasonal access to water and sanitation (Aim 1), and programme delivery (Aim 2).

5.2 Location of Case Study Sites

The case study region is presented as a map in Figure 5-1 and in satellite form in Figure 5-2 where:

1 – Kermi
2 – Chaggaunphaya
3 – Simkot

The red square on Figure 5-1 corresponds with the area shown in Figure 5-2.

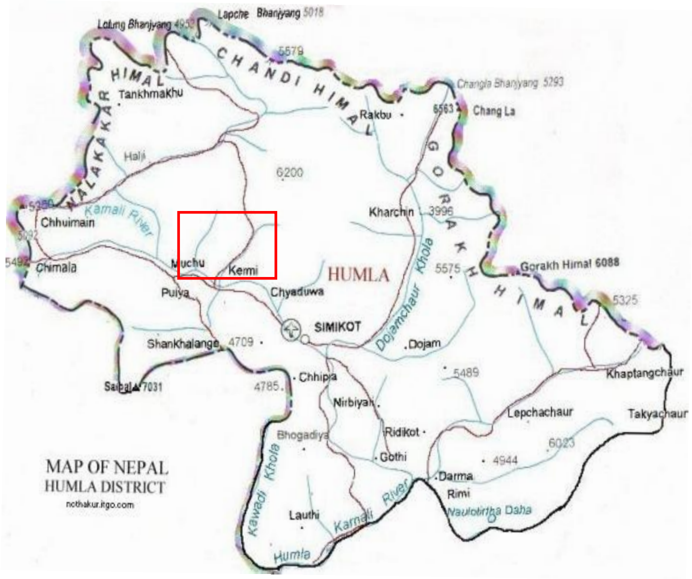

Figure 5-1 A map of Humla which highlights the area in which research was completed (Roy, 2010)

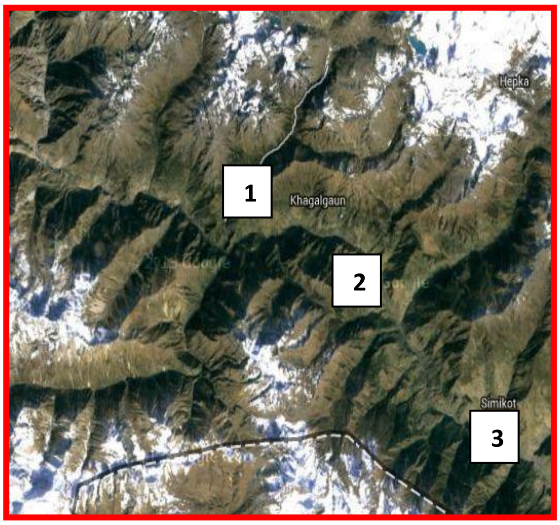

Figure 5-2 A satellite photograph of the research area taken (courtesy of Google Maps)

There are no motorable roads to or within Humla. Simkot, the district capital, has a domestic airport which is the only means of transportation to the nearest cities, Surkhet and Nepalgunj. The airport in Simkot is small and can cope only with light aircraft such as a Twin Otter or helicopters (Nepal Institute of Development Studies, 2005). The reliability of the service is completely weather dependent and flights can only take place if weather is deemed safe.

A motor road is approaching Simkot from the Tibetan border allowing better access of goods to the border. On foot this is a five day walk. If travelling south, one must walk approximately 7 days to meet a road head in Saanphe Bagar, Achhaam district or from the district headquarters of Kalikot and Dailekh districts (Lama, 2002, Roy, 2010). This road is blocked with snow in the winter and unsafe in the rainy season.

Figure 5-3 Map showing accessibility of Humla by plane (Lama, 2002)

Distances between case studies, and their distance from the main trading route are summarised in Table 5-1. The main trade route for this portion of Humla follows the Karnali River from Simkot to Talakot on the Chinese border, and can be seen running from the South East of Figure 5-2 to the North West.

Table 5-1 Accessibility of case study sites

No	Village Name	Accessibility on foot	Hours from Simkot*	Altitude [11] (m.a.s.l)
1	Kermi	Along main trade route from Simkot to China	10	3008
2	Chaggaunphaya	45 minutes up moderate incline from main trade route to China	5	2500
2	Simkot – W1	Upper part of district capital, 10 minutes up steep incline from Simkot town centre	0	2970

* - walking pace for outsider

5.3 Population

According to the same census (CBS, 2012), Humla has an estimated total population of 50,858 people; 25,883 of whom are male and 25,025 females. The district area is 5655km^2, thus the density of people is on average 9[12] people per km^2 - though when one accounts for the land on which one may actually live in Humla, this is realistically higher. The average household size is 5.37 people.

No accurate population data was available for the case study villages. Estimates provided from community interviews are shown in Table 5-2 along with the population density as observed by the researcher, from most dense (1) to least (3)

[11] Data from RIDS NEPAL ND. RIDS Nepal Partner Villages Data. *In:* NEPAL, R. (ed.). www.rids-nepal.org.

[12] This compares with 4,416 people per km^2 in Kathmandu and 3 people per km^2 in the most sparsely populated district, Manang

Table 5-2 Case Study Population and Density

Case Study	Population	Observed Density
Kermi	500	3
Chaggaunphaya	460	2
Simkot W1	260	1

5.4 Ethnicity

Humla is a mix of both Hindus from the south, and Tibetan Buddhists who once crossed the border from Tibet into Nepal due to conflict in their own state – thus the Buddhist influence is stronger in Humla than other districts. Castes, or social groups, of Nepal are not reported by district in the 2011 census but the 2001 census reports castes in Humla as *Chhetri-Thakuri* [63.7%], *Lama* [16.1 %], *Brahmin* [6.2 %], and *Dalits* [9.22%] (Central Bureau of Statistics, 2002). The Lamas belong in the Tibeto-Burman language group, primarily speaking what translates to English as 'Lama' and the Chhetri-Thakuri and Dalits are of the Info –Aryan language group speaking an ancient version of Nepali called Humli-Khas (Roy, 2010). Communication between the groups is conducted in a local dialect of Nepali called Khas.

The main religions practiced in the district are Hinduism (81.8%) and Buddhism (18.1%) – this compares with a 9% average number of Buddhists throughout the country.

According to McKay (2002):

> *"compared with Hindus, Buddhist villagers tend on average to be slightly wealthier, to eat more whole grains and less rice, to be higher in elevation, for girls to marry later, for women to start reproducing later, and to be less superstitious about disease causation (perhaps because of the long tradition of Tibetan medicine, which is similar in many ways to traditional medicine)".*
>
> *(McKay, 2002, p8)*

The case studies tried to get a balance of all ethnic groups, Kermi is predominantly Lama, Chaggaunphaya is Chhetri-Thakuri and Simkot-W1 comprises of Dalits.

5.5 Development

In a 2003 report from ICIMOD et al., (2003), Humla ranked 74 out of Nepal's 75 districts for development. Humla's rankings are shown in Table 5-3 and include a breakdown into indicators of (i) poverty and deprivation, (ii) women's empowerment, (iii) social-economic and infrastructural development, with Humla scoring poorly in each.

These rankings reflect views from previous studies which state that the living conditions are harsh; the growing season is short and the area is almost completely lacking infrastructure (Roy et al., McKay, 2002, Tillett, 2008)

Table 5-3 Humla ranked under a number of development criteria out of the 75 districts in Nepal (ICIMOD et al., 2003)

Criteria	**Ranking (out of 75 Districts in Nepal)**
Overall Composite	74
Poverty and Deprivation	73
Women's Empowerment	73
Social-economic	72
Infrastructural development	72

More recently, the Nepal Human Development Report of 2009 reported that Humla continued to rank as the second worst district in the country with a HDI of 0.37 (UNDP, 2009)

Humla is known as a food deprived area and Humlis (residents of Humla District) are regular recipients of food aid from the UN's World Food Program (WFP) and Nepal Food Corporation. A report from the Humla Development Initiative states that before the emergence of "chartered rice" in the mid-1970s, that famine was not a prominent feature of Humla. The report blames the deliveries of rice for created a "recipient mentality" and further promoted a rice-based diet or 'Bhaate Culture' among all social groups in Humla (Roy et al., 2009).

This "recipient mentality" is further alluded to in the work of Tillett (2008) who found communities of Humla and neighbouring Mugu to 'lack social cohesion, leadership and initiative'. He uses a case study from Mugu to illustrate his point (Box 5).

Box 5 Anecdotal evidence of attitude toward NGOs from Mugu Tillett (2008)

The NGO selected and then launched a water supply (GFS (gravity fed system)) project in a community, using cash for work (CFW) scheme for unskilled local labour. Upon scheme completion, the NGO left the community. Some of the community members then sabotaged the GFS, and then applied to the NGO for assistance to rehabilitate, to get repeat employment form the CFW scheme. In this, the benefit of the scheme was seen (by some) as a mode of employment, not necessarily for the end product (a functional GFS).

Villages within Humla are not marked according to their HDI on an individual basis, however initial observations (e.g. of house size, crops, available money, clothing) brought the researcher to the conclusion that the Lama's of Kermi were the most (comparatively) wealthy group under analysis, while those in the Dalit community of Simkot-W1 were the most impoverished.

5.6 Governance

Local Governance has been a strong feature of Nepal's organisational structure since the promulgation of the Local Self Governance Act in 1999 (Nepal Democracy, 2001). There is a two tier system of local governance, with village and municipal bodies as the lower tier and district bodies as the higher (UNESCAP, 2004). District Bodies are called the District Development Committee (DDCs) and the village bodies are called Village Development Committees (VDCs) (or municipalities in more urban areas).

VDCs are responsible for facilitating partnerships between the community and the public sector for improved service delivery. Each VDC typically represent nine wards, the smallest administrative unit of Nepal (Roy, 2010). A ward chief will feed back to the VDC Chair who in turn feeds information to the DDC for decision making. VDC leaders are typically highly respected by their communities and have strong influence on the success or failure of developments in their region (McKay, 2002).

Roy (2010) explains the classification of a VDC as follows

> *"Where a village is large, a VDC will consist of one village or even a subsection of a village, but in areas of sparse population they may represent a collection of villages. The committee itself consists of number of elected village level representatives and a chairman or woman who represents the village at the District Level on the District Development Committee (DDC)".*
>
> (Roy, 2010)

Humla has 27 VDCs which are typically divided into three regions based on their location from the district headquarters, Simkot; namely lower, middle and Upper Humla (Roy, 2010). This study is conducted in Upper Humla only due to the higher elevation in this area and consequently more seasonal weather.

Kermi is in Khangalgaun VDC, Chaggaunphaya is in Dandaphaya VDC and Simkot is in Simkot VDC.

5.7 Case Study Infrastructure

The following infrastructural observations were made across the case study sites and are useful to note for future discussions of water and sanitation infrastructure.

5.7.1 Within village access

The villages under analysis are all on a slope; within village slopes vary from mild to extremely steep. The majority of paths within the villages are un-surfaced mud paths. As a result of these muddy slopes, even within village access was observed to be difficult for the elderly, injured or disabled.

Figure 5-4 Mud paths between homes in Kermi (Author, 2012)

Between the homes and throughout the villages are paths with an abundance of animal excreta and solid waste. The presence of animals in the ground floor of each dwelling means that excreta are regularly found more densely in and around households. Domestic greywater is dumped on the paths and land surrounding households, thus as livestock trample and people walk, an organic slurry is created on the paths. This excreta filled slurry can be dragged into homes by the shoes of its occupants. There is also a risk of soil based helminths for those without shoes (a regular sight in Simkot-1). Figure 5-4 shows an example of a mud path between homes that was observed as being particularly slippery following snow melt in February.

5.7.2 Housing

For such a vast area, with a reported population density of only 7 people per km^{2}the settlements of Humla are relatively densely populated in their centres. Figure 5-5 shows an aerial view of Chaggaunphaya and its surrounding landscape. Homes can be seen in terraces and separated, but all remain within a quite defined village boundary (limited by land usable for construction).Higher altitude seasonal settlements used for grazing with animals are more dispersed with single houses or 2 to 3 terraced homes as in Figure 5-6.

Figure 5-5 A view of Chaggaunphaya village close to the river Karnali (Author, 2012).

Figure 5-6 A basic stone home from a seasonal settlement used by people from Kermi (Author, 2012).

The housing structure within villages was found to be as described by Tillett (2008); a ground floor filled with animals, a first floor for family living and a grain store on the second floor (see Figure 5-7). Access to the living space is typically via a ladder carved in wood – this was noted to present difficulty in bringing goods to and from the home, and for access for children, elderly, disabled, or injured people. One such ladder, providing access from the living space to the roof can be seen in the upper left of Figure 5-8.

The roof of the family living space serves as a social area in times of good weather with many people gathered on the roofs to talk, play cards or wash hair. The flat roofs were found to be troublesome in the winter season as snow builds up and needs to be scraped off on a regular basis. It is also a weak point in terms of leakage of water into the home. However it was deemed necessary to keep the roof flat due to the social and working area it provides. Whilst animals are typically kept on the bottom floor, they are not always cows and buffalo as suggested by Figure 5-7. Other animals included donkeys, horses, goats and chickens.

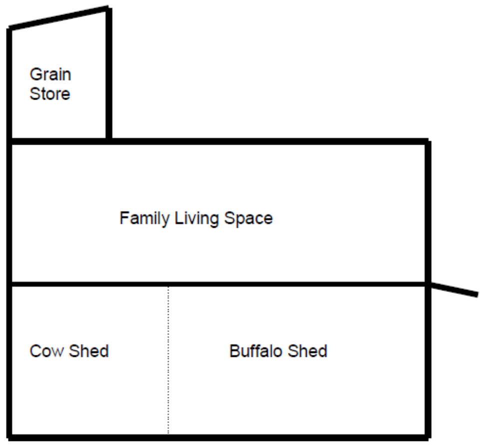

Figure 5-7 Cross sectional view (vertical section) of housing structure in Humla as described by Tillett (2008)

Figure 5-8 A typical home owned by Dalit families in Simkot (Author, 2012)

Whilst the layout remained the same, the quality and size of homes was found to vary significantly. The homes in Simkot-W1 offered the poorest example of these structures; small mud homes in long terraces with billowing smoke and visibly dirty; while some in Kermi were under reconstruction to very large detached stone based structures with corrugated iron roofs.

In all cases water had to be carried up the steps of these houses to the family living space. Greywater was often thrown from the first floor living space. Latrines were found to be at a distance from the homes (thus requiring descending these outdoor stairs to access).

5.8 Case Study Seasons

Before collecting information on water and seasonality in the case study sites, it was first necessary to determine the local perception of a season. The following section shows the results of this process, a process directed at answering research question 1(a): **What seasons exist in a high altitude community that may affect access to water and sanitation?**

5.8.1 Nepali months

In Humla, the traditional Nepali calendar is observed. This Nepali Calendar is based on the Bikram Sambat (B.S.) calendar and is approximately 56 years and 8 months ahead of the Gregorian calendar (as used in the UK). The Bikram Sambat calendar is mostly used in Nepal and in some areas of India, Indonesia, Bangladesh, Sri Lanka, Thailand, Malaysia and Bhutan. In Nepal the new year starts in the middle of April (approximately the 17th) in a month called Baishākh.

Table 5-4 shows how the months of the Nepali calendar align with the Gregorian calendar. The number of days in a month can change each year in the Nepali calendar and as a result they roughly correspond to the middle of the Gregorian calendar months.

Table 5-4 The months of the Nepali calendar with the corresponding months of the Gregorian calendar

Nepali Months (Latin alphabet)	Nepali Months (Devanagari alphabet)	Days	Corresponding Gregorian Months
Baishākh	बैशाख	30 / 31	mid-April to mid-May
Jesṭha	जेष्ठ or जेठ	31 / 32	mid-May to mid-June
Asār	आषाढ or असार	31 / 32	mid-June to mid-July
Shrawan	श्रावण or साउन	31 / 32	mid-July to mid-August
Bhadau	भाद्र or भदौ	31 / 32	mid-August to mid-September
Asoj (or Ashad)	आश्विन or असोज/अगहन	30 / 31	mid-September to mid-October
Kartik	कार्तिक	29 / 30	mid-October to mid-November
Mangsir	मार्ग or मंसिर	29 / 30	mid-November to mid-December
Poush	पौष or पुष/पूस	29 / 30	mid-December to mid-January
Magh	माघ	29 / 30	mid-January to mid-February
Falgun	फाल्गुन or फागुन	29 / 30	mid-February to mid-March
Chaitra	चैत्र or चैत	30 / 31	mid-March to mid-April

5.8.2 Identification of seasons

The starting point of all focus groups was identification by participants of the seasons commonly referred to in the area.

In the UK, the four conventional temperate climate seasons appear in a yearly calendar; Spring (March, April, May), Summer (June, July, August), Autumn (September, October, November), and Winter (December, January, February). The Meteorological Office (The Met Office), the UK's national weather service, use the first day of the month to mark the transition into a new season. On their website, the Met Office state that traditionally spring starts on the night of the vernal equinox, the 20th/21st March, whilst the transition to Summer occurs on the Summer Solstice, the 21st June. Despite this, they use the first day of the month for statistical and historical reporting purposes (Met Office News Blog, 2013). Thus in the UK, one's interpretation of a season is subject to variation and whether official or traditional dates are used.

In Nepal, there is no official convention for seasons, although in conversation with Nepali friends and colleagues Spring, Summer, Autumn and Winter were found to be the norm. FGD participants in cases study sites were asked to divide the months of the year into the seasons they would use to describe a typical year.

Table 5-5 shows the UK months, the Nepali calendar and the seasons identified by each FGD. Focus groups are shown on the left of the table with majority opinion on what seasons are experienced compared with Nepali and Gregorian calendar shown across the table.

Table 5-5 Summary of FGD description of seasons

UK Calendar	**A**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**
Nepali Calendar	**B**	**J**	**A**	**S**	**B**	**A**	**K**	**M**	**P**	**M**	**F**	**C**	
Source	**Seasons**												
(FGD1-K)	Spr	Summer			Autumn			Winter			Spring		
(FGD2-K)	Summer			Rainy				Winter				Sum.	
(FGD3-K)	Spr	Rainy			Autumn			Winter			Spring		
Kermi	**Spr**	**Summer/Rainy**			**Autumn**			**Winter**			**Spring**		
(FGD6-C)	*Rainy*						*Winter*				*Warm*		
(FGD7-C)	*Spr*	*Rainy*			*Autumn*			*Winter*			*Spring*		
(FGD8-C)	*NO DATA*												
Chaggaunphaya	***NO MAJORITY***												
(FGD9-S)	*Rainy*						*Winter*						
(FGD10-S)	*Spr*	*Rainy*			*Autumn*			*Winter*			*Spring*		
(FGD11-S)	*NO DATA*												
Simkot	***NO MAJORITY***												

Descriptions of the seasons varied from focus group to focus group; from the conventional spring, summer, autumn and winter in FGD1-K to a two season rainy and winter season in FGD9-S.

The pattern identified by the majority, and thus used for analysis of results in this research is in Table 5-6.

Table 5-6 Seasons used for analysis of seasonality in Humla

Season	Spring	Summer/Rainy	Autumn	Winter
Months	Falgun Chaitra Baisakh	Jestha Asar Shrawan	Bhadau Asoj Kartik	Mangsir Poush Magh

5.9 Case Study Weather

Prevailing weather for each season was identified in focus group discussions.

A ranking exercise was used to describe rain, snow, temperature and degree of wind. Participants were asked to do this with regard to a typical year in the last 5 years. Scores used for ranking are shown in Table 5-7:

Table 5-7 Ranking scores used for weather analysis in FGDs

Rank	Rain and snow	Temperature	Wind
0	None	Low	None
1	Some	Average	Some
2	A lot	High	Strong

An example section of a seasonal calendar for weather is shown in Figure 5-9.

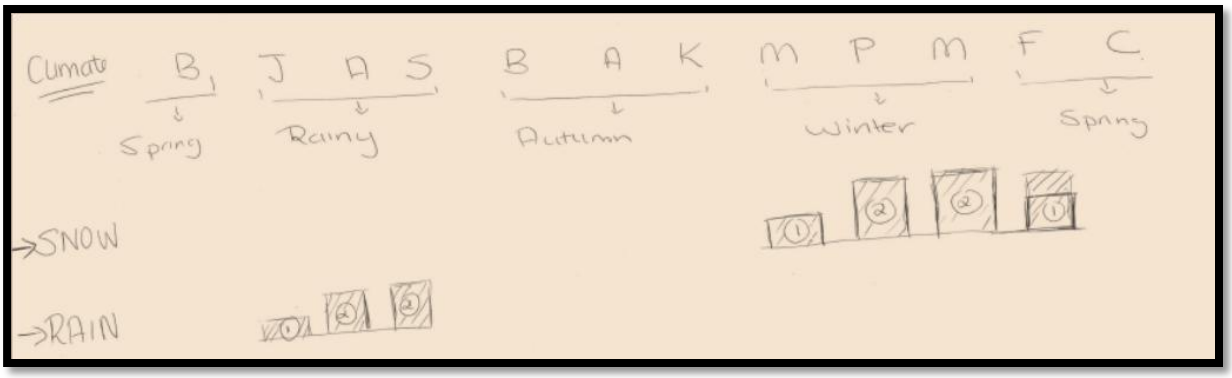

Figure 5-9 Example seasonal climate calendar from Kermi (Author, 2012)

In this example seasons can be seen to be Spring, Rainy, Autumn and Winter. Snow occurs in Winter at strength 1 in Mangsir (M) and strength 2 in Poush (P) and Magh (M)[13]. The month of Falgun (F) in Spring had initially been allocated 2 but upon discussion among the group was brought down to 1. .

[13] The Nepali calendar has two months which begin with M, A and B. In hindsight these should have been labelled differently in the calendars and presentation of results but this was not done due to an assumption that a reader could interpret which month was being referred to, based on the context in which it was being discussed.

Rain can be seen throughout the rainy season, with strength 1 in Jestha (J) and strength 2 in Asar (A) and Shrawan(S). The small range of options offered by the facilitators did restrict the degree of accuracy in these calendars

For each month a value for each weather condition was determined by the focus group. These values were added to the values given in other focus groups in that community and the median was calculated for the monthly value of each weather condition. The results of this are shown in Figures Figure 5-10 to Figure 5-12, with an overall median for the case study area shown in Figure 5-13. B* represents Baisakh, the first month of the year.

As can be seen from the preceding figures, all case study areas are reported to have rain of varying intensities throughout the summer/rainy season. The greatest amount of snow occurs in Poush, Magh and to a lesser degree Falgun. Temperatures peak in the summer/rainy season, with the winter particularly cold. The wind picks up in autumn and is of medium intensity throughout the winter. Weather seen in each area is very similar with minor differences in each characteristic.

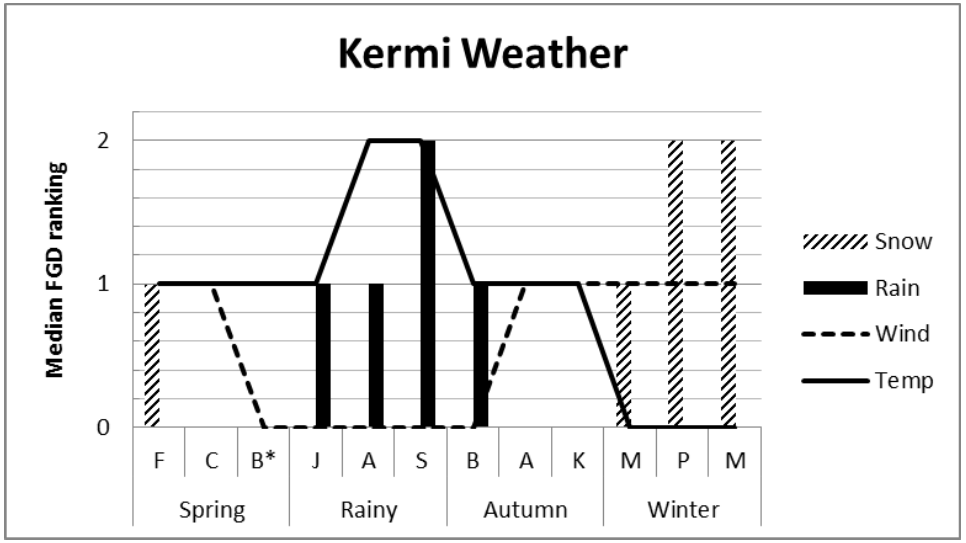

Figure 5-10 Climate data from Kermi FGDs

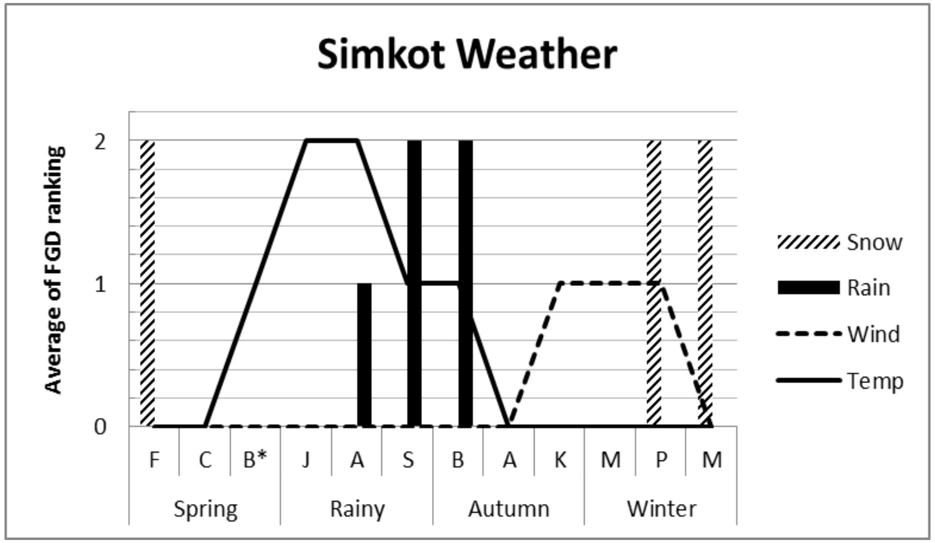

Figure 5-11 Climate data from Simkot-W1 FGDs

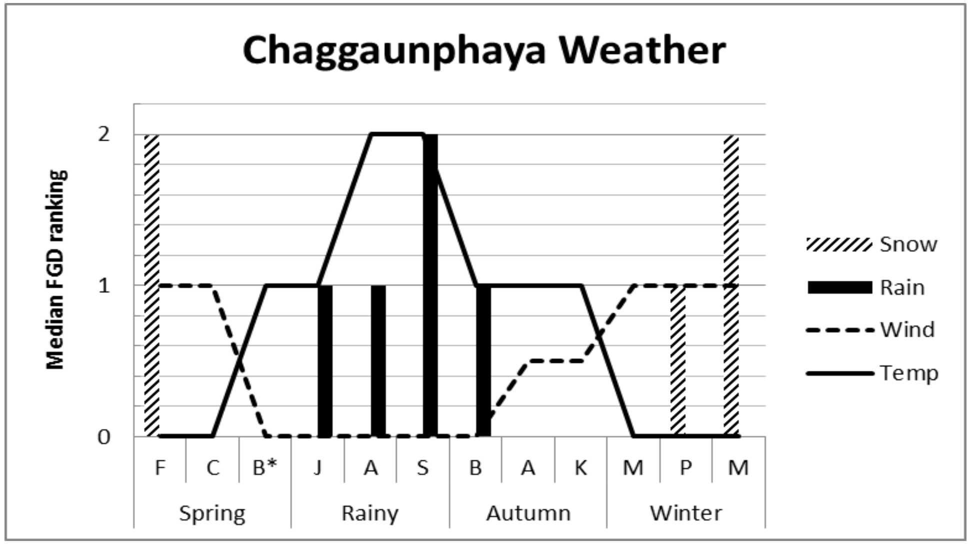

Figure 5-12 Climate data from Chaggaunphaya FGDs

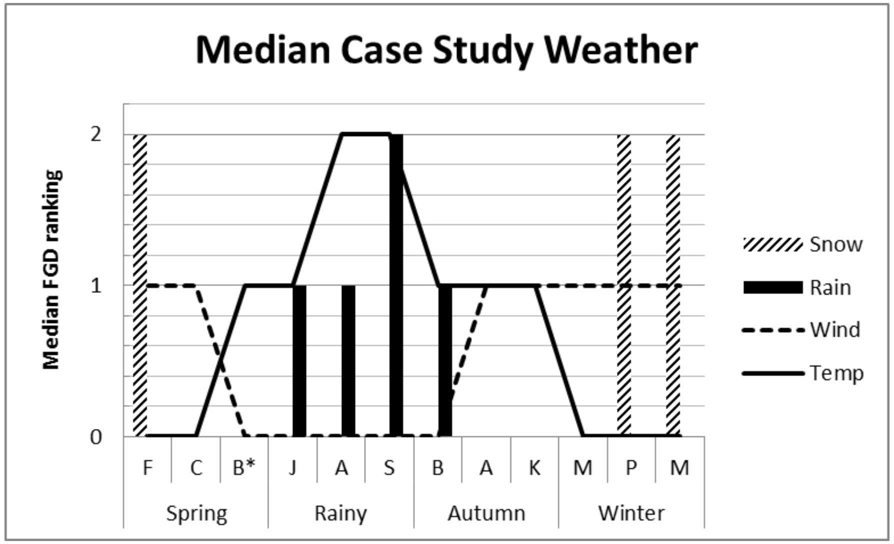

Figure 5-13 Median values of weather across the case study area

5.9.1 Comparison with Secondary Climate Data

Local secondary data was sought to triangulate the weather data provided byt the focus group participants.

Secondary data for temperature (max and min) and rainfall from a recording station in the capital of Humla, Simkot, were obtained from the Nepal Department of Hydrology and Meteorology. This data set comprised of daily values which covered the time from Kartik 2068 to Shrawan 2069[1] (corresponding to October 2011 to August 2012). Data for a full year was unavailable. Temperature data can be seen in Figure 5-14, while rainfall data is presented in Figure 5-15.

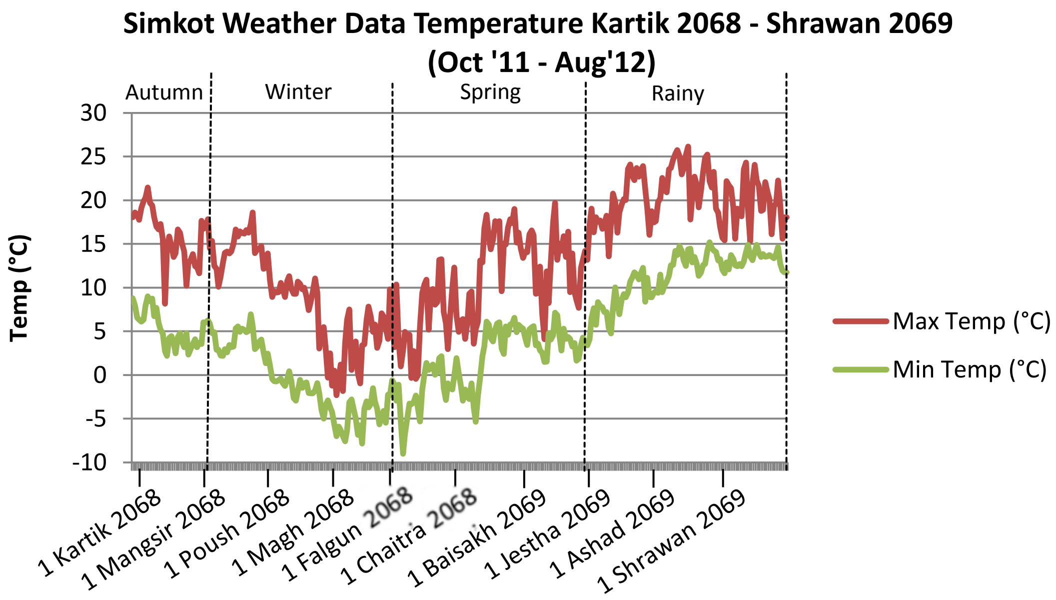

Figure 5-14 Temperature data from Simkot Kartik 2068 - Shrawan 2069 (Source of data: Nepal Department of Hydrology and Meteorology)

Figure 5-14 shows that for the year 2068-2069 minimum temperatures of below 0^{o}C occurred from Poush to Chaitra (mid December to mid April). Maximum temperature of 20^{o}C is seen to occur in Ahsad and Shrawan (mid June to mid August).

Figure 5-15 shows precipitation data from Simkot in the same months.

[1] The Nepali calendar is a Bikram Sambat (B.S.) era calendar which is 47 years ahead of the Gregorian equivalent. It has months of similar length to the Gregorian calendar, though the start dates of the B.S. months roughly correspond with the middle of the Gregorian months e.g. 1 Kartik 2068 corresponds with 15 October 2011. A full explanation of the B.S. calendar is presented in Chapter 6.

Simkot Weather Data – Precipitation Kartik 2068 – Shrawan 2069

(Oct '11 – Aug '12)

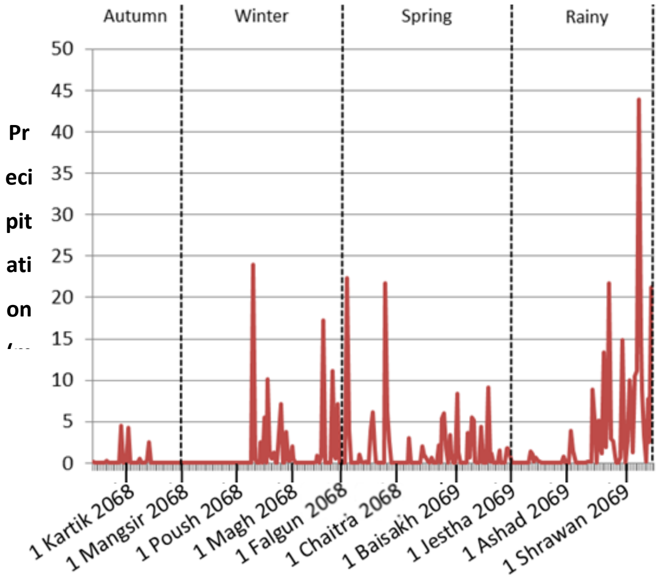

Figure 5-15 Rainfall data from Simkot - Kartik 2068 - Shrawan 2069 (Source of data: Nepal Department of Hydrology and Meteorology)

Daily peaks of precipitation are seen to occur from Poush to Chaitra (mid December to mid April), and again in Ahsad and Shrawan (mid June to mid August).

Overall a strong agreement is seen in typical weather noted by the FGD participants and data collected in Simkot by the Nepal Department of Hydrology and Meteorology.

Through analysis of both primary and secondary data sources, a seasonal weather pattern is exhibited in Humla with cold wet winters, a moderate spring (both in terms of precipitation and temperature), a hot summer season with a distinct rainy season and a moderate autumn. This seasonality (should the weather be similar during the data collection period) allows for investigation of water and sanitation access during periods of intense rain and cold, and moderate heat.

5.9.2 Climate change

Scientific research on climate change in Nepal reports that the most pronounced increases in temperature will occur in the mountainous regions. Studies project that annual precipitation will increase significantly if CO_2 concentration doubles; it will likely become drier during the dry season, with a significantly wetter monsoon season (as much as three times the current rainfall) (IIED 2008).

The research suggests that climate change and rising temperatures in the mountainous areas of Nepal will lead to a 'too much and too little' water scenario.

Glaciers retreat due to an increase in temperature and lead to a loss in water storage capacity. In the initial melting phases, this will lead to an increase in available water in river systems by approximately 5.7% - but will overall lead to a 28% decrease by the end of the century (Devtoka 2012).

While no studies specific to Humla on climate change are available, as a general rule water borne and vector based diseases are predicted to increase with increased temperature and precipitation. This fact has already been observed in other districts of Nepal (IIED 2008).

While quantifying observed climate change was not an aim of this study, it is of relevance in considering the temporal applicability of the results obtained. Without specific questions on the topic, 32 interviewees noted a shift in weather in recent years when discussing seasons. Focus group discussions were asked to identify seasons, but no time period was attributed to how long these 'seasons' existed as they do now. The same approach applied to the weather identification charts in the previous section – respondents were not asked to describe the weather in the previous year, or provide an average that described the previous 20 years; they were simply asked to rank the weather.

What emerged through interviews was that the shift in climate in recent years may mean that a summary of the past year, and a summary of the same weather patterns 20 years ago, may have been quite different.

"When I was young snow used to come down very thick so that people couldn't move outside" **(K3-M).**

"*Now-a-days the climate has become moderate*" (FGD1-K).

Of the 32 interviewees who mentioned climate change, 6 described a complete change in weather, 11 reported a decrease in rainfall and 22 noted that snow levels had reduced. 3 respondents (all young adults) specifically noted that they saw no change in climate but said that their elders did.

One respondent from Kermi enthused that the weather was getting "better and better' (K7-F) and three respondents in Simkot were pleased that the increased temperature extended the growing season for their crops and allowed them to try new and better farming. In the other case studies, water scarcity attributed to a decrease in rain and/or snow appeared to far outweigh the benefits of increased temperature.

"*…without snowfall we have water scarcity. If there is less quantity of water in the channel, irrigation and electricity is impossible and our mill wheel doesn't work*" (K11-F).

"It is much drier than it used to be. It doesn't rain as much and we cannot produce as much food" (**KI8).**

23 out of the 32 people who spoke about climate change specifically mentioned increased water scarcity as a resultant problem. Prayer and song were used to encourage rain in dry periods.

***"When it doesn't rain in the Jestha/Asar months the women go to the "Sim[1]" and women sing songs"* (S25-M).**

No mention was made in shifts in health or hygiene practices due to this change in seasons. Though, typically the presence of vectors were certainly noted to increase with increased temperature.

5.10 Livelihoods

To gain an insight to behaviours in a community likely to impact access to water, sanitation and hygiene, it was first necessary to undertake a livelihoods analysis to establish the prevailing activities undertaken in the community in a typical year.

The most extensive report on livelihoods in Upper Humla is the PhD of Dr. Rabindra Roy on 'Contribution of Non-Timber Forest Products to Livelihood in Upper Humla, Nepal. He reports the main sources of income in Upper Humla as agriculture combined with trading (Roy, 2010).

Agriculture is the main source of income for many despite the fact that only 1% of land is available for agriculture and a land holding of just 0.52 hectares is typical per household due to the mountainous terrain (Saville, 2001). Farm productivity in Humla is greatly restricted as more than 50% of the land is at a slope of more than 30 degrees (Saville, 2001). Tillett (2008) reports that crops produced include rice, millet, maize, wheat, pulses, and, to a lesser extent, vegetables. Animals such as buffalo, cows, goats and chickens are also reared. .

Tourism is a growing area of employment in the district. Its mountainous landscape is a draw for the more adventurous tourist, but the district level infrastructure does not currently support tourism and thus tours charge high prices for the provision of all necessary goods when on a trek in the region.

Other jobs in the area include local porterage, government posts, NGO posts or labouring on a cash/food for work development project in the area. Some adults are also known to seasonally migrate in search of work (Tillett, 2008).

An insight to livelihoods in the case study locations was gained through focus group discussion and triangulated using information from the interviews. The livelihood calendars collected from the four case studies are presented in Table 5-9. Overlap was significant and as a result a master calendar is

[1] A 'sim' is a small bog. Simkot is named after its 'sim'.

presented. There were some inter-case study differences, thus all communities are listed to the right of the table with an X indicating the predominant activities which were found to take place there.

The activities are split into 'core' activities and 'regular' activities. If a focus group discussion and 50%+ of interviewees mentioned an activity, it was considered a core activity. If an activity was mentioned in a focus group and by less than 50% of the interviewees it was deemed a 'regular' activity. Activities on Table 5-9 are shaded differently depending on if they were core or regular activities. The corresponding colours are shown in the legend in Table 5-8.

Table 5-8 Legend for Livelihood Activity Tables

Colour/Shading	Implication
	Core activity
	Regular activity
o	Activity which involves leaving the home for 1 week+

Activities covered in diagonal lines are activities which involve a family member being away from the case study site for at least a week. In terms of an individual's water and sanitation access this was significant as it meant their experience was likely not be a function of conditions at their home.

Information was also gathered to gain a better understanding of the amount of time children spent in their homes over the course of the year in school. The master calendar for schools is presented in Table 5-11.

On initial inspection it can be observed that activities are primarily agricultural based. Women lead the agricultural activities, with assistance on more physical tasks from the men. Women are also responsible for household tasks and chores, while men are more likely to travel for work and trading. A breakdown and explanation of the calendar by season is presented in the following sections.

Table 5-9 Seasonal livelihood calendar for all case studies

Months		F	C	B	J	A	S	B	A	K	M	P	M			
Seasons		**Spring**			**Summer/Rainy**			**Autumn**			**Winter**			**K**	**C**	**S**
ALL	Ploughing fields													X	X	X
	Fertilise fields													X	X	X
	Planting crops													X	X	X
	Summer graze				o	o	o	o	o					X	X	
	Harvesting crops													X	X	X
	Tending to animals													X	X	X
	Collecting herbs													X	X	X
	Collecting firewood													X	X	X
	Praying + worshipping										o	o	o	X		
	Move south										o	o	o	X		
MALE	Trade in Talakot	o	o	o	o	o	o	o	o	o				X		
	Trade in Simkot	o	o	o	o	o	o	o	o	o					X	X
	Carrying/Cutting stones															X
	Tourist porters		o	o	o											X
	Haymaking													X	X	X
	Feed animals													X	X	X
	India for Balsa wood										o	o	o	X		
	Build homes in Simkot										o	o	o	X		X
	Play cards													X	X	X
FEMALE	Cooking													X	X	X
	Cleaning													X	X	X
	Minding children													X	X	X
	De-stoning fields													X	X	X
	Make flour in mill													X	X	
	Irrigation													X		
	Make blanket													X	X	X
	Collecting apricots													X		

Table 5-10 Key for understanding seasonal school calendar

Colour/Shading	Implication
	Typical school year
	Periods of potential absence from school

Table 5-11 Seasonal school calendar for all case studies

Months	F	C	B	J	A	S	B	A	K	M	P	M			
Seasons	Spring			Summer/Rainy			Autumn			Winter			K	C	S
PRIMARY															
In community													X	X	X
Boarding													X		
Travel to and from school													X		
Summer graze													X	X	
SECONDARY															
In community														X	X
Boarding													X		
Travel to and from school													X		
Harvest													X	X	X

5.10.1 Livelihoods Overview

Agriculture is the dominant feature of the typical household calendar in the case study sites. While men assist in some of the more physical agricultural activities, women were found to manage the bulk of agricultural work. Men in the area focus on income generating activities both within and outside the communities. As a result, men are more likely to be away from the household than women.

For schooling (as shown in Table 5-11), children from Lama Communities were observed to be more likely to attend schools outside of Humla. Both Simkot and Chaggaunphaya have secondary schools and thus in these communities students predominantly remain at home. Even in Hindu villages without a secondary school, the children are much more likely to remain in the district. The researcher observed that many Lama Community members have strong connections in Buddhist schools in Kathmandu and India and thus the children travel there for education. Some Lama children also attend a large Buddhist school in Yalbang, to the north of the District.

5.10.1.1 Summer graze

Every year, for much of the rainy and autumn seasons, one or two members of each household leave the village with farm animals (primarily cow, jhoba and goat) to higher altitudes rangelands of Humla that stretch as far as the Tibetan border. These sites are known as the 'Kharka'.

Typically elder members of the family or parents with young children were found to make this journey. The majority of people spend this time living in tents and gradually moving to higher altitudes. Some families have basic stone homes to live in at some graze sites.

Women particularly expressed mixed opinions of life at the grazing sites.

"Summer graze depends on weather. If it's raining more, it's difficult. If not, it's quite easy"

(K12-F)

From collating opinions it appears that in times of good weather the graze site appears to be pleasant and relaxed, with women reporting a drastically reduced work load when compared with the one they would have at home. Many find life at the graze to be more convenient:

"I go from Chaitra to Kartik. I like living there much more. The water source is nearby, the forest is nearby; there is also lots of grassland for cattle to graze" **(C5-F).**

"At the 'Kharka', there is plenty spring water, fodder and firewood; we don't have to go far to collect them" **(C1-F).**

"Tents are separate there but people help each other a lot" **(C5-F)** **.**

But most conversation focused on the poor conditions when weather conditions are bad:

"Water is very close to our tent in summer graze but it is extremely cold. There is water everywhere. The worst thing about summer graze is when our body gets wet from rain and the land is totally covered by fog" **(K10-F).**

"Our tent is so poor and it is muddy. It leaks so summer graze is horrible and nasty" **(K10-F)**

Families with young children were found to take their children to the graze. The primary school headmaster in Kermi (KI7) said it was the main reason for absence from his classes.

Only one interviewee said that she disagreed with the practice of bringing children to the graze as many suffered from cough and gastritis there (K11-F). However, some families believed bringing children to the graze was good for their health due to the lack of flies at the higher altitude sites (K12-F).

5.10.1.2 Trading

As soon as weather permits (primarily dependent on snow melting), trading and transport of goods from communities both to Talakot (on the border with Tibet) and Simkot was observed to begin. This is almost exclusively done by men.

Along the route it was typical for the men to stay in 'teashops' (usually a one room sitting room, restaurant, bar, bedroom which many could sleep in) or bring tents. The tea shops open seasonally along the trading route and are a source of business for those in Simkot and Kermi. Shops for traders are not popular for those in Chaggaunphaya as they are off the main trading route[1].

For many, trading of goods is the main source of income for the household. Typical goods traded included wood, food, alcohol, clothes and electronics.

"There are more jobs transporting rice and other food supplies from China to here. We don't have enough food production from our farms to eat. Transporting foods is the main source of income" **(C10-M).**

[1] Though there are many shops for the students who attend the local school

5.10.2 Spring

The following section presents a brief overview of life in the case study sites in the spring. Table 5-13 presents the primary living activities. As a reminder, the code for these tables is presented in Table 5-12.

Table 5-12 Legend for livelihoods activities information

Colour/Shading	Implication
	Core activity
	Regular activity
o	Activity which involves leaving the home for 1 week+

Table 5-13 Spring livelihoods calendar - all case studies

Months	F	C	B			
Season	**Spring**			**K**	**C**	**S**
ALL						
Ploughing fields				X	X	X
Fertilise fields				X	X	X
Planting crops				X	X	X
Tending to animals				X	X	X
MEN						
Trade in Talakot	o	o	o	X		
Trade in Simkot	o	o	o		X	X
Collecting herbs	o	o	o	X	X	X
Carrying/Cutting stones						X
Tourist porters		o	o			X
WOMEN						
Cooking				X	X	X
Cleaning				X	X	X
Minding children				X	X	X
De-stoning fields				X	X	X
Make flour in mill				X	X	
Irrigation				X		

In the three communities, agriculture dominates activities in the spring.

We are very busy in spring season. We have lots of farming, including clearing stones from fields, ploughing and planting new seeds

(K8-F)

Figure 5-16 Ploughing fields with jhobu in Chaggaunphaya (Author, 2012)

In all case studies, ploughing was carried out using animals (typically jhoba) and very basic machinery (shown in Figure 5-16). This was the main agriculture activity that men helped with, due to its intense physical nature.

To fertilise fields, the manure and hay mix from the bottom floor of houses is removed and carried in baskets to the fields.

School children were noted to miss school for some days to assist with this.

Irrigating fields was mentioned regularly as one of the most difficult times of year. In Kermi irrigation is a dominant occupation of the spring season.

"In spring I am busy irrigating. This takes nearly 3 months" **(K7-F).**

People of Chaggaunphaya did not have the option of irrigating their fields due to water shortages, and residents of Simkot-1 did not regularly irrigate their land due to lack of water availability at higher altitudes for gravity fed systems. Land close to the home was at times watered by carrying buckets from a water source.

In all cases, animals typically remain in the home for early spring and must be tended to during this period. In cold weather, food and water is brought to the animals for fear of them getting an injury in the snow; but with any sunshine or improvement in conditions, animals are brought to graze by nearby water sources.

While women are busy with agriculture, the arrival of the spring weather and melting of the snow allows men to begin some money-generating activities e.g. trade. Depending on the weather, the snow from the high pass from Simkot to Talakot will eventually melt and open the gates to China for exchange of goods.

Spring also sees the arrival of tourists in Simkot and some men there are employed as porters and chefs for these groups.

"From Chaitra, we carry loads to China for tourists" **(S25-M).**

Men from Simkot are particularly involved in this work as Dalit farms in Simkot are smaller than the typical farms in the other case study sites and require less work.

Spring was typically reported as a lean season for most families. During the winter season, no new crops have grown and little or no money has been generated as a result of the weather.

Many children from Lama Communities are absent in boarding school. Hindu children begin school in Humla in early spring.

5.10.3 Summer

Typical activities observed and reported in interviews and focus groups for the summer/rainy season are shown in Table 5-15.

Table 5-14 Legend for livelihood activities information

Colour/Shading	Implication
	Core activity
	Regular activity
o	Activity which involves leaving the home for 1 week+

Table 5-15 Summer/rainy season livelihoods calendar - all case studies

Months	J	A	S			
Seasons	**Summer/Rainy**			**K**	**C**	**S**
ALL						
Summer graze				X	X	
Harvesting crops	o	o	o	X	X	X
MEN						
Trade in Talakot	o	o	o	X		
Trade in Simkot	o	o	o		X	X
Collecting herbs				X	X	X
Tourist porters						X
WOMEN						
Cooking				X	X	X
Cleaning				X	X	X
Minding children				X	X	X
Make flour in mill				X	X	
Irrigation				X		X
Collecting apricots				X		

The beginning of the rainy season (pre rains) marks the departure of many more people from the communities of Kermi and Chaggaunphaya both for trading and grazing of animals on higher plains.

"In summer season we are comparatively busy with working activities, and that time we go to Talakot for business and shift grazing land from one place to another" **(K3-M).**

"In the rainy season I go towards Yari to graze cattle. I don't know much about what happens in the village. I leave in Baisakh and come back in Kartik. Many people go together" **(C4-F).**

In the maathi gaun (upper village) of Simkot these activities are not as common, as trade can take place in the village centre and animals graze comparatively nearby.

Some family members remain at home to continue with irrigation and to care for more children attending local schools. Kermi was noticeably empty at this time of the year.

<u>It's amazing to think how many people live here, yet the area looks completely abandoned. Women spend all day in the fields, many men are gone trading, many families are at the graze. Certainly in the day time the village looks completely empty</u>

(Field notes, 05-05-12)

When the rain starts life can be comparatively quiet for those who remain at home.

***"In very rainy time we cannot work"* (K5-M).**

Trading slows when the rains begin as the mountain paths to Talakot are susceptible to landslides in times of heavy rain.

5.10.4 Autumn

Predominant livelihood activities in the three case study sites are presented in Table 5-17.

Table 5-16 Legend for livelihood activities information

Colour/Shading	Implication
	Core activity
	Regular activity
o	Activity which involves leaving the home for 1 week+

Table 5-17 Autumn livelihoods calendar - all case studies

Months	B	A	K			
Seasons	Autumn			K	C	S
ALL						
Summer graze	o	o		X	X	
Harvesting crops				X	X	X
Collecting herbs				X	X	X
MEN						
Trade in Talakot	o	o	o	X		
Trade in Simkot	o	o	o		X	X
Haymaking				X	X	X
WOMEN						
Cooking				X	X	X
Cleaning				X	X	X
Minding children				X	X	X
Make flour in mill				X	X	
Collecting apricots				X		

Harvesting crops dominates the Autumn season and as a consequence it was repeatedly referred to as the busiest time of the year. In most households, those grazing and trading would return in the Asoj or Kartik to assist with the harvesting, transporting, drying and processing of crops. Some school children also go home to assist in this process. The return of the community and their animals increases the pressure on infrastructure.

***"Autumn is busy because it's harvesting time"* (FGD1-K).**

***"Asoj and Kartik are the busiest"* (K9-F).**

***"The most demanding time is in Kartik when we have to harvest. Then we have to process the grains and store them"* (S25-M).**

When finished, trading continues to ensure homes are stocked for the winter. Others collect medicinal and high value herbs from high mountain slopes in the district.

***"After finishing harvesting, people disperse to collect their needs for the winter. Some go to Talakot, some for to collect yarsagumba[1] and some go to collect other herbs"* (KI-7).**

It is towards the end of the Autumn season that a family's finances were reported to peak; all crops are harvested, processed and stored, and months of money generating activities start to wind down because of the weather.

5.10.5 Winter

In the Winter, life shows down in the District as agriculture and trading grind to a halt. Table 5-19 shows the primary activities during winter season.

Some community members depart Humla to Kathmandu, the border town of Nepalgunj or India. Those who remain live a slower life, tending to animals and collecting wood. Some move to Simkot for home construction.

***"Easiest life is in winter as we do not need to work hard. We just look after our animals and eat and sit"* (C8-M).**

Lamas were found to be more mobile, and some would leave the area to travel south. It was common for young men to travel to India to (illegally) source Balsa wood in making cups and bowls used for religious ceremonies the Tibetan market. Praying and worshipping in local monasteries was also a regularly mentioned winter activity in Kermi.

[1] Yarsagumba (or Yarchagumbu) is a very high value herb that grows in pastures above 3,300m .It is a combination of a yellow caterpillar and a mushroom and is primarily exported for used as a treatment for impotency.

Table 5-18 Legend for livelihoods activities information

Colour/Shading	Implication
	Core activity
	Regular activity
o	Activity which involves leaving the home for 1 week+

Table 5-19 Winter livelihoods calendar - all case studies

Months	**M**	**P**	**M**			
Seasons	**Winter**			**K**	**C**	**S**
ALL						
Tending to animals				X	X	X
Collecting firewood				X	X	X
Praying + worshipping	**o**	**o**	**o**	X		
Move south	**o**	**o**	**o**	X		
MEN						
Carrying/Cutting stones						X
Feed animals				X	X	X
India for Balsa wood	**o**	**o**	**o**	X		
Build homes in Simkot				X		X
Play cards				X	X	X
WOMEN						
Cooking				X	X	X
Cleaning				X	X	X
Minding children				X	X	X
Make flour in mill				X	X	
Make blanket				X	X	X

"In winter season very few people follow after wood bowl and collect it from a far distance in far places of Nepal and India. Some people construct houses in Simkot. Most of us just live here sitting and eating in winter because we have collected our basic needs" **(K3-M).**

In Simkot, the options for making money were a little better in the winter. An abundance of new homes in the area means that cut and shaped stones are a valuable commodity. Many respondents from Simkot, particularly Dalits, mentioned gathering stones as a valuable income source.

Length of day restricts all of these activities in the winter.

"During Poush and Mangsir, the days are shorter and colder – so, we make less money" **(S24-M).**

<u>**On a cold day the streets are completely empty, but the minute the sun comes out people pour out of their homes to take advantage. It's then that you realise how many people have been hiding inside their homes around the fire**</u>

(Field notes, 26-12-11)

Money generating options are limited in the winter without migrating. Thus families are dependent on crops and money generated in the other seasons.

Overall livelihoods were found to be greatly restricted by the seasonally cold weather

"The cold weather and the snow are the most inconvenient aspects of living here" **(C1-F).**

5.11 Case Study Health

Health

Very little specific data exists regarding health of the population in Humla. Attempts were made to gain seasonal health data for the case studies communities but in health centre were either illequipped to deal with such a request, or unwilling to be of assistance. It is recognised that this data would have greatly enhanced understanding of consequences of seasonal access to water and sanitation and it is recommended that further studies in this area do their best to acquire this data.

Some previous data on health exists which is from areas surrounding the case study sites. In a 2002 report (1999 data), McKay conducted a health Needs Assessment in five communities of Humla for a collaborative work between the University of Montana and an international NGO working in Humla, the ISIS foundation. In the study, the primary diseases recognised by villagers and village leaders are polio-like symptoms, TB-like symptoms, goitre, lameness, deafness, blindness and infertility. When discussed with each household, the average number of cases of diarrhoea per household at the time of survey was found to be 0.54 and 0.25 for children and adults in Hindu houses respectively; and 0.45 and 0.06 for children and adults in Buddhist households respectively (all measurements taken in the dry season). No explanation is provided for the difference between Hindu and Buddhist populations.

McKay notes that:

"*Every person with whom the research team discussed the incidence of diarrhoea was careful to point out that diarrhoea was not a problem during the dry season (the time of study), but that it was a severe problem during the wet season*". This is the only reference to seasonality in the report.

Tillett (2008) also attempted to quantify disease prevalence in Humla by visiting the District Health Office in Simkot. The top 10 outpatient diseases for 2006 are reported in Table 5-20.

Table 5-20 Top 10 outpatient diseases in Humla District in 2006. Data from the District Health Office in Simkot in Novermber 2007. Taken from Tillett (2008)

Rank	Males	Females
1	Diarrhoea	Diarrhoea
2	Acute Respiratory Infection	Acute Respiratory Infection
3	Intestinal Worms	Intestinal Worms
4	Skin Diseases	Gastritis
5	Abdominal Pain	Skin Disease
6	Eye Complaints	Abdominal Pain
7	Chronic Obstructive Pulmonary Disease	Eye Complaints
8	Arthritis	Ear Infection
9	Toothache	Chronic Obstructive Pulmonary Disease
10	Ear Infection	Toothache

Waterborne diseases such as diarrhoea and intestinal worms can be seen to be a significant cause of illness in the area, as well as acute respiratory infections predicted by Tillett (2008) to be a function of the poor stoves in the area.

There are two hospitals in Simkot and *'theoretically 26 government run health posts scattered across the district but many are closed, and the few that are open have little or no medicine'* (Foundation Nepal, 2013)

McKay (2002) found that because of these issues, people are often unwilling to travel to the nearest health post as they cannot predict if the post will be open when they arrive and if medicine will be available. McKay's description of Nepal's National Polio Day highlights some of the problems faced in providing healthcare in Humla.

> *"Nepal cannot keep up with the health demands of its population, in part because of an under-funded health system, but also because many districts are remote and communications and delivery of supplies are extremely difficult, if not impossible. During the data-collection period, the National Polio Day occurred, on which the Polio division at UNICEF attempted to vaccinate every child less than ten years of age in Nepal. It was a massive effort, requiring intensive coordination and organization, and many children were vaccinated. However, in Humla vaccinating all children was simply impossible due to the distance of many villages from Simkot and the absence of a cold chain along the way. In order to reach all of the children in the district, health workers had to*

walk from Simkot with coolers containing the vaccine. The coolers kept the vaccine cold for a maximum of three days—but many villages in Humla are more than four hard days walk from Simkot. And because villagers did not know that the vaccinators were coming, more than 75% of Lama children needing vaccination were in even more distant yak pastures, as they always are at that time of year. These factors combined made the total-eradication goal of the UNICEF Polio division impossible, at least in Humla".

(McKay, 2002, p251)

For improved health care in Humla, McKay recommends a strong referral to a local health centre where serious complications can be addressed, a more careful allocation of resources from the Ministry of Health, and 'up-skilling' of staff in health posts to prevent many Humli's suffering from very treatable illnesses.

5.12 Chapter Summary

This chapter has introduced some baseline conditions existing in the villages selected for case study research. Basic details of accessibility, infrastructure, income generating activities, seasons and weather have been introduced. Livelihoods and weather have been found to vary seasonally, in a relatively predictable manner.

The basic seasons and prevailing weather of the area has been examined through focus group discussion ranking exercises and semi structured interviews. The climatic seasons which will be used as the basis for analysis in the results of this research have been selected as (i) spring, (ii) summer/rainy, (iii) autumn, and (iv) winter. In the most basic of terms, the weather is dry and of moderate temperature in the spring, hot and wet in the summer/rainy season, warm and dry during the harvest and cold with periods of heavy snowfall in the winter. Secondary data has shown that from October 2011 to July 2012 the temperatures ranged from -10^{o}C to highs of 26^{o}C , with precipitation in the rainy season reaching a maximum of 24mm in a day, to 44mm of snow in a day in the winter (all secondary data collected in Simkot).

The primary non-climatic season seen to exist has been the school year.

Livelihoods of the inhabitants of each case study village were observed to be largely a function of the seasons, as is common in many agricultural based communities (Chambers, 2012). Populations present in the communities were found to vary significantly on an inter-day basis and on an inter-season basis due to absence for trade, grazing and long days spent on agricultural activities. Opportunities for income generation and agriculture were restricted most severely by the colder winter months. Farmers in Lower Humla may get 2 harvests per season but those in Upper Humla get one only. Poor access and extreme weather limits income generation through trading for those who remain in the district. The number of animals in the village was also found to be a function of the seasons with higher weather forcing some animals to higher altitudes.

Prolonged periods of absence by some community members from the village, variable numbers of people and animals in the village at any time and varying levels of inhabitant's activity are noted as key points which may have an impact on access to, and standards of water and sanitation experienced.

The presence of a cold season and the observed semi-migratory nature of the population add a further dimension to the investigation. While previous studies of seasonality of water and sanitation covered in the literature review have examined the differences between a wet and a dry season (Bostoen, 2007; Coulter,2012; Desalegn,2013; World Toilet Organization, 2010), this study will examine the fluctuations between an estimated four seasons (based on available weather data). This is predicted to add an additional degree of complexity to the research, particularly due to the presence of a cold season (a phenomenon which has not been well explored in studies of water and sanitation).

The following chapter focuses exclusively on data collected at the community level to address Aim 1. While Chapter 6 presents this data and provides the initial exploration of the findings case by case, Chapter 7 provides an overarching analysis of the data.

6 Water and Sanitation in Case Study Sites

6.1 Chapter Outline

The data presented in this chapter is predominantly focused on addressing Aim 1: **To investigate intra-annual patterns in access to water and sanitation for low income communities in Humla, Nepal**.

This chapter first introduces secondary information that discusses access to water and sanitation in Humla. Following this, an introduction to the typical water and sanitation infrastructure observed in the case study communities is presented. Finally, each case study is presented on a case by case basis, with details on seasonal access to household water, bathing water, clothes washing and sanitation. There is some discussion of results on a case by case basis, but overarching conclusions and more in-depth discussion is presented in Chapter 7.

6.2 Water and Sanitation Coverage in Humla

Of the 9437 houses in Humla, 6,601(66.9%) are reported to access water from a tap or piped supply, 2,540 (26.9%) from a spout and 195 (2.1%) from a river or stream; overall improved water coverage is reported as 93.8% (DDC Humla, 2004).

McKay (2002) reports than in the Upper Humla villages under analysis in the study that:

"no one has to walk for water, due to the central taps and plentiful streams in and around the village"

(McKay, 2002)

National sanitation coverage is less but improving. It remained at 43% in 2010 despite a target of 70% by 2010 as envisaged by the Government's three years' interim plan (2007-2009) (Government of Nepal, 2010). However, this does compare well to 1990 when nationwide access to improved sanitation was just 7% (Government of Nepal, 2010).

Table 6-1 shows national access to different 'levels' of sanitation. There is a great disparity by area; urban access to improved sanitation is estimated at 50% while rural is 32% (Central Bureau of Statistics, 2012). Humla has the second worst district coverage statistics in the country.

Table 6-1 Sanitation coverage in Nepal and Humla (CBS, 2012)

	Improved	Shared	Unimproved	Open defecation
Nepal	35	15	5	43
Humla	27	0	23	50

WaterAid Nepal (2010) suggests that the current government reported coverage statistics are likely to be a significant overstatement. In any case, Nepal is far from its 2017 target to have universal access to water and sanitation (more on this is Section 8.3.1.1), and 10,500 children are still estimated to die on an annual basis due to water-related disease (WaterAid Nepal, 2009).

In a study undertaken by Action Contre La Faim in 2007 of 240 randomly selected households in rural communities of Humla, and neighbouring Mugu, it was found that:

- Less than 10% of households use latrines
- 28% of respondents washed hands after defecating
- 70% of respondents only washed monthly in winter

(ACF (2007) unpublished study – reported by Tillett (2008))

In his 2008 study on environmental sanitation in Humla, Tillett (2008) reported that:

"Open defecation is prevalent in the area and poor hygiene and environmental management practices create serious public health risks ….

….although hygiene and sanitation may be the priority of the outsider; they are lower priorities to the communities, particularly in light of uncertainties of food and water supplies".

(Tillett, 2008)

McKay confirms that:

"*…most people claimed to wash their hands after urination/defecation, but in the many months that the author spent in Lama villages doing anthropological research this was rarely observed".*

(McKay, 2002)

No one in McKay's Upper Humla based study of three communities said they used latrines, though people were found to be generally receptive to the idea.

With regard to challenges faced for programme implementation in Humla, Tillett (2008) is the only study to have examined specifically this topic. From his work on approaches to environmental sanitation and hygiene in Lower Humla and Mugu, Tillett (2008) highlights the key challenges as:

- Hygiene and sanitation are low priorities to the communities
- Current approaches to WASH are focused on hardware which are limiting the impacts of projects and reinforcing the community's feelings of dependency and external assistance
- Local skill base is weak and should be developed
- Whilst work on latrine construction is carried out there is a lack of focus on sustained usage
- Remote location means that conventional designs for latrines incur high per capita costs, pose challenges for reliability and the user's ability to sustain them
- Poor coordination and overlapping of projects exist due to poor partnerships between NGOs and local government

(Tillett, 2008)

From the work of Tillett (2008) it appears that a combination of technical, institutional and social challenges hold back development of more effective approaches to provision of environmental sanitation and hygiene in lower Humla and Mugu; however no data are available regarding water supply or specific to upper regions of Humla.

Details are provided in this report regarding status of sanitation and hygiene but these were not incorporated in the development of methods for this report due to the fact that the information was primarily gathered in the lower regions of Humla which comprise entirely Hindu populations. McKay (2002) alluded to strong differences between populations of lower and upper Humla due to the Tibetan influence, thus the author anticipated differences in the water and sanitation knowledge, attitudes and practices.

In lower Humla and Mugu, Tillett (2008) confirms relationships between seasonality and settlements, activities, migration, finances, health problems, water availability and consumption patterns of soap but does not seek to explore them in depth. In the only quantitative reporting on seasonality Tillett examines drinking water sources in both the "rainy" and the "dry" seasons but finds little difference between the sources (Figure 6-1). While the sources appear to be very varied, the changes from the dry to wet season are not significant. No reference is made to differences during cold periods.

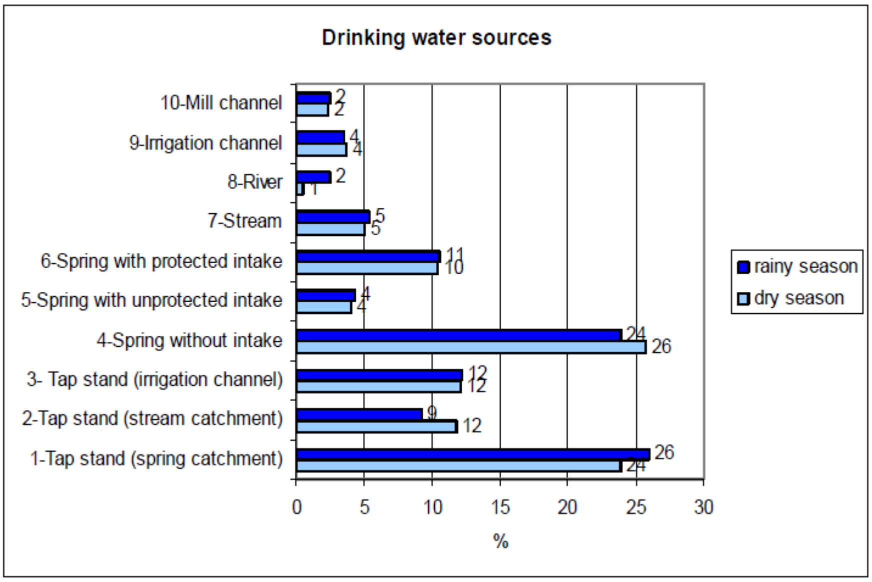

Figure 6-1 A seasonal analysis of water source from communities in Humla and Mugu (Tillett, 2008)

Tillett also alludes to the fact that "the environmental health situation of communities was variable spatially, and, it is predicted seasonally", but does not elaborate further on this point.

This study will explore these seasonal changes more in depth, and will expand the basis of analysis to include the autumn and winter seasons.

6.3 Water Infrastructure

The following section provides information on commonalities in terms of water infrastructure between each of the case study sites. Variations from the norm will be discussed in the sections of this chapter that are case study specific.

6.3.1 Source

Water sources assessed in each village were gravity fed systems with intakes from springs or rivers. The distance from source to tap was widely variable. When visited, sources were found to be poorly protected at the intake. An example is presented in Figure 6-2 where an unprotected perforated intake pipe of approximately 60mm diameter can be seen in a river bed.

Despite the risk of freezing posed by the cold weather, exposed pipe between the source and the outlet was a common sight. Figure 6-3 is just one example of the substantial portions of exposed and vulnerable pipe seen in each community.

In some cases the water source was unknown in the community (e.g. some sources in Simkot) or else inaccessible due to distance from the community (Kermi).

Break pressure tanks were found to be necessary in Humla due to the high altitude difference between the source and the outlet. At times, these tanks were found to be used as water sources for families at seasonal settlements.

Figure 6-2 An intake from a river using unprotected perforated piping (Author, 2012)

Figure 6-3 Exposed pipe was found to be commonplace both at the source and between the source and the outlet (Author, 2012)

6.3.2 Taps

In all cases under analysis the primary source of water was found to be from a cemented standpost. The tap stands are typically designed as shown in Figure 6-4. Taps were rarely seen to have any means of stopping water, with the physical taps missing in all cases, leaving a constantly flowing supply.

In many cases water came to the tap stand via a plastic pipe as is the case in Figure 6-4.This was attributed to the fact that the internal metal pipe was found to freeze in the winter and was inaccessible for easy defrosting; thus the supply line would be removed from entering.

Figure 6-4 A typical concreted standpost. In this case with water arriving via a plastic pipe held by a stone to the left of the main body of the tap with the main outlet redundant (Author, 2012)

Figure 6-5 A horse drinks directly from a standpost apron in Kermi (Author, 2012)

Very few drinking facilities were specifically available for animals (only one – in Chaggaunphaya), and queues of animals were regularly seen at taps; queuing either to drink from the tap itself or from the surrounding apron (Figure 6-5). Animal waste was observed in abundance around the taps and was considered to be a public health risk.

6.3.3 Drainage

Community level drainage systems are poor in each case study. Some tap stands have concreted aprons which feed into mud lined channels to nearby crops. More often, water was observed to flow down the village via a natural drain.

Waste water from households was noted to be disposed of indiscriminately on the street. Some households have a dishwashing area on the first floor roof, from which water flows onto the paths below, creating a muddy walkway.

6.3.4 Collection and Storage

Figure 6-6 A collection vessel at a tap (Author, 2012)

Water was observed to be typically collected in a large jerry can (or a series of jerry cans) with a lid – the collection container often was observed to have attached ropes to assist with carrying (see Figure 6-6). Collection of water for domestic use in households visited was, without exception, completed by the women and children of the household.

The water collected is typically stored in the jerry can and poured as needed, with some dispensed into smaller containers for ease of use around the home – particularly for face and teeth washing.

6.3.5 Treatment

Centralised treatment was not a feature of any of the case study water supplies. Some centralised treatment was reported for other sources in Simkot but not for the Ward under investigation.

Household treatment was never observed by the researcher – water was boiled regularly but typically for taste and comfort – not increased quality.

6.4 Sanitation Infrastructure

The following section provides an introduction to typical sanitation infrastructure as observed throughout the case study sites. Any deviations from this are presented in the sections of this chapter which focus on each case individually.

6.5 Latrine

Latrines observed were primarily

- Pit latrines (Figure 6-7)
- Offset pour flush latrines (Figure 6-8)
- Raised latrines (Figure 6-9)

Local engineers advised that:

"*Twin pits are optimum. So much water will infiltrate that by the time one fills, the other will have emptied*" (KI31)

"You *should always offset pits so you can just dig and empty*" (KI29).

Most latrines observed were constructed with the assistance of NGOs or GOs and thus many had externally sourced plastic pans cemented in place (though typically not with a U-bend water seal design). In the absence of plastic pans, sloped cement floors were used to direct water into a hole.

Pits observed were both cubic and cylindrical and some were lined with rocks. Despite the fact that KI31 recommended twin pits, the vast majority of designs were observed to have a single pit.

Most latrines noted were relatively new due to an initiative from the government in the past year to construct latrines. In many cases, homeowners would admit to building the latrine to comply with regulations only and have no true intention for all family members to use it.

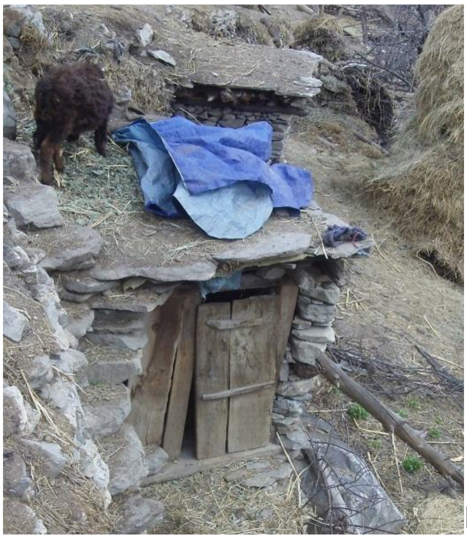

Figure 6-7 A typical basic pit latrine in Chaggaunphaya (Author, 2012)

Figure 6-8 A modern government provided offset pour flush pit latrine (Author, 2012)

Figure 6-9 A raised pit latrine in Chaggaunphaya (Author, 2012)

Figure 6-7 to Figure 6-9 show some typical latrines from the area of variable quality. In Figure 6-7 a basic pit latrine can be seen in the yard of a home in Chaggaunphaya. A ladder (not in photo) must be descended to reach the level of the latrine. This example has a wooden door and plastic squat plate inside. Figure 6-8 is a modern government provided offset pit latrine in Simkot. The door can be seen to be locked to prevent other users in this dense village using the facility. Figure 6-9 shows a side view of a latrine in the same area as Figure 6-7. In this case the owners have chosen to raise the latrine to the level of the town path (denoted by X) where one can enter conveniently without the need to descend form the main walkway. A raised pit can be observed in the fields below path level. This latrine can be emptied from the back via the area marked with the rectangle. In this Hindu village, this waste is not used for fertiliser but is disposed of.

Overall latrines across all case studies were noted to be small, dark and unpleasant.

In some villages further north of the case study sites, composting latrines were found to be prevalent. Due to time constraints these villages were not studied as they could not be reached in winter. The composting latrines were found to only be used in winter to gather as much fertiliser as possible before the spring. Wood shavings or ash are thrown in the pit after defecation. These composting latrines were within interviewees homes on the first floor – the only inside latrines to be seen in Humla. The waste dropped down to a bottom floor pit emptied via a hatch. Users did complain of a smell in the house at times but appeared very satisfied with this system.

As a result of this system, Lama people were found to be far more open to the prospect of using human waste as fertiliser. They were also more comfortable with latrines in close proximity to the home. Kermi was reported to have composting latrines in past years but no reliable information was gathered with regard to why they ceased to exist.

6.5.1 Superstructure

The superstructure of the latrine is typically made from local stone (in a similar manner to the homes) with a sloped tin roof. No mortar is used in the construction of the superstructure, thus allowing natural ventilation. This is sometimes increased by the presence of a glassless window. In cases without this window, the inside of the latrine is particularly dark, even in day time.

The latrine doors are often made from wood and attached to the frame using locally made hinges. Locking mechanisms are typically poor. A door could be locked when inside by turning a block of wood or propping a stick against it. Quite often, latrines were observed to be padlocked to prevent use by neighbours.

The latrines observed were often small and cramped, particularly in terms of height. Floor space is kept to a minimum and it is difficult to turn or place feet wide either side of the latrine pan.

No latrines were observed to have lights or paths for ease of access.

6.5.2 Latrine location

Latrines are typically within 10-15 metres of a household. In areas with sufficient space latrines were observed to be at a distance from the home. In areas with less space, latrines are adjacent to the animal housing in the bottom floor of the house, and in one case the latrine was within the bottom floor of the house.

Access to latrines at a distance from homes was found to be far more difficult, depending on the underfoot conditions.

Hindu populations were found to be particularly in favour of latrines remaining far from the home.

6.5.3 Anal cleansing

Water, leaves and rocks were all reported as means of anal cleansing, depending on location of the latrine or open defecation site. Lama people were found to use stones more often than Hindus, with many Hindu interviewees expressing disgust at this practice.

Figure 6-10 A blocked latrine from use of stones for anal cleansing (Author, 2012)

6.5.3.1 Water container

In many instances, no water is stored in the latrine and the user must carry it from the home. Most latrines observed to be in use did have a bucket or plastic jug left in the latrine for flushing – but the container was not always filled with water. Many latrines also have a stick to aid flushing and push stools from the pan. In some cases a cleaning brush was seen in the latrine.

6.5.4 Latrine use

Latrine use was difficult to evaluate, with many interviewees claiming that all family members used the facilities daily. However it transpired in some instances that:

- Some only used the latrine when they could not travel further e.g. when ill, or at night
- Children were not allowed to use the latrine, for fear of making it dirty

- Latrines were used for stools only, and urination takes place anywhere space can be located e.g. on the house roof at night time
- Elderly and ill family members at times use a container inside the home
- Facilities were not available at times when families were on the move e.g. for grazing

(Field notes, 07-07-2012)

6.5.5 Use by children

Children were rarely if ever noted using latrine facilities. In schools in Kermi and Simkot some facilities in schools were noted to have different size pits and slabs for use by children – but in the typical household openings to pits were designed for adults. Children were reported in interviews to go the latrine in available spaces in the town. Toddlers were observed to wear split trousers and to go the latrine in any available space, including on floors indoor in homes. The use of potties was introduced to one home by the researcher and found to be an overwhelming success from a relieved family who no longer needed to clean their child's waste from the floor.

6.5.6 Open defecation

Open defecation was prevalent in all communities investigated. Human waste was not, however, particularly noticeable in village centres. Open defecation, at least by adults, did seem to be relatively well confined to areas outside of the community. Interviewees questioned about this noted a significant decrease in the prevalence of human waste in village centres in recent years, attributing the change to better levels of education. In some instances open defecation would occur right next to the last house by the village boundary and thus the health risk from faeces was more prominent in some areas of the community than others.

6.5.7 Handwashing facilities

Designated hand washing facilities were not seen in any instance other than at a hostel in Simkot.

In most cases a tap nearby is visited for handwashing, or a jug of water taken from a household pan and used with soap. Typically respondents claimed to wash their hands after defecation but no concentrated effort was made to verify the truth in this.

Figure 6-11 Handwashing facilities in the Nepal Trust Guest House in Simkot (Author, 2012)

6.5.8 Menstruation

The practice of Chhaupadi ('chhau' means menstruation and 'padi' means woman) is a Hindu tradition that considers secretions associated with menstruation and childbirth to be impure. As a result, many women across Nepal must spend days outside of their home while menstruating. The news article in Figure 6-12 was in the Kathmandu post on 03/01/12 explaining the suffering of women menstruating outside of the home in cold weather.

As the article explains" *females must live outside the house during their monthly periods and are not allowed to touch other family members, crops, water and livestock".*

This was found to be common practice in Humla in Hindu households (i.e. not in Kermi). In Chaggaunphaya there were a number of specially constructed 'menstrual huts' for women, while in Simkot W1 the women often slept outside on the balcony of their homes.

Winter aggravates ordeal of women in Chhaupadi shed

ARJUN SHAH
BAJURA, JAN 2

AS a sudden drop in the mercury hits life across the country, Sharmila Raut of Gurdukhati in Bajura finds it hard to stay in a small shed without enough clothes during the menstrual period.

The 35-year-old has been following this age-old Chhaupadi tradition, wherein females must live outside the house during their monthly period and are not allowed to touch other family members, crops, water and livestock, among others.

"Even though it is difficult to stay outside, especially in winter, I cannot dare protest the tradition," said Raut, who has been following the tradition since she was 16.

Raut's problem is shared by a large number of women in the district, where Chhaupadi is deeply rooted. "Women observing the tradition are facing hardships due to the cold," said Mohanraj Jaishi of an NGO.

Media person Rama Khadka said women cannot resist the tradition and are left with no option other than living outside their house. "Anything that they happen to touch during the period is considered impure. So they are not allowed to stay inside their house," she said.

Human rights activist Kalpana Saud said postnatal and unmarried women go through difficult ordeals.

Chairperson of District Women Rights Forum Rukmani Shah said unmarried women are supposed to observe six days of period though the married ones observe only four days. "Women are being subjected to domestic violence in the name of Chhaupadi," she said.

Figure 6-12 Newspaper article from 'The Kathmandu Post' on 03-01-12 detailing the effect of the cold temperatures on menstruating women (Author, 2012)

Women's opinion on this practice was widely varying – some found the experience positive, with comfortable huts, time with friends, and less work to do. While others lived in great discomfort outside and spent their days doing very physical labour such as carrying rocks or fetching firewood, rather than their traditional agricultural activities.

The following sections provide an individual analysis of the unique aspects of WASH infrastructure in each case study followed by an analysis of the seasonal access to water and sanitation in each case. While the previous section was primarily based on observations of the researcher and assistants, the following sections make use of community level interview and focus group discussions.

6.6 Kermi

A summary of data collected in Kermi is presented in Table 6-2 and Table 6-3. This was supplemented by the researcher diary and observation.

Table 6-2 Research details for Kermi

Case Study No.	1
Population	~500
Households	~80
Visited	Dec '11, Jan '12, Feb '12, May' 12, June '12
Research Assistant	1, 2, 5

Table 6-3 Interviews and focus group discussions in Kermi

Interviews		**Focus Group Discussions**	
Total	16	Total	3
Male	10	All Male	0
Female	6	All Female	0
Mixed group	0	Mixed group	3

Figure 6-13 A view of Kermi village from east to west (Author, 2012)

Kermi is a village situated in Khangalgaun VDC at an altitude of 3008 m.a.s.l.. It has a population of approximately 500 people in 80 households (an approximation based on data from: Central Bureau of Statistics, 2002, Roy, 2010). The households are in quite close proximity; however the researcher judged Kermi to be the least densely populated of all the case studies. In fact, there is a lot of construction work in Kermi as village members exchange their mud walled homes for stone homes with tin roofs (see Figure 6-13). The village lies on a moderate to steep slope. Kermi is an entirely Lama village, consisting of ethnic Tibetan Buddhists, who speak Tibetan as their first language. The majority of the population, particularly the males, also speak

Nepali. The village lies directly on the trading route from Simkot to Hilsa, and is a popular stop due to its large natural hot springs. The springs bisect the village into upper and lower parts.

For a remote location, Kermi is comparatively rich in amenities, boasting a primary school, a health post provided by the Scottish registered NGO, The Nepal Trust, two village monasteries and a camp site. Kermi also has reliable hydroelectricity. Some water from the hot springs is diverted via a micro-hydro plant also provided by The Nepal Trust. Each house in the village has access to electricity for a fee collected by a management committee. The micro hydro plant is manually switched on for provision of electricity in the morning and late evening.

Modes of external communication are poor in Kermi due to its intermittent availability of mobile phone signal. Internally, village level communication and character is strong. Neighbours were witnessed on two occasions to assist in the construction of the home of another as a favour.

(Field notes, 04-01-12).

Agriculture dominates activities in the village and there is a relative abundance of arable land in close proximity to the village. Animals kept in Kermi include jhobu[1], cows and horses. These are moved to high altitude grazing sites in the warmer summer months.

On first impressions, Kermi appears comparatively clean in comparison with other communities in Humla. There is very little solid waste visible in the community itself but there is an abundance of animal excreta. The streets are free from human excrement, and only in rare cases was open defecation noted.The community are noticeably clean and well-kept, with great pride in household cleanliness.

6.6.1 Seasonal Access to Water in Kermi

6.6.1.1 Water Infrastructure

Figure 6-14 The natural hot springs in Kermi (Author, 2012)

The most dominant feature of Kermi's water infrastructure is its hot springs (as seen from one of many pools in Figure 6-14). The springs are filled with (almost uncomfortably) hot water for 12 months of the year and are frequently full of residents and visitors bathing and washing clothes.

The spring water is typically clean (apart from some washing powder and soap packets) and water remains clear until the

[1] A type of yak

summer period when there is some algal growth.

The village has 5 working taps to serve its 500 strong population – these were constructed between 1989 – 1992 (as estimated by interviewee K3-M – a resident who worked on the project).

All 16 respondents reported getting their drinking water from these taps. Taps were typically found to be in good working order with at least an intermittent supply of water coming to each. Certainly this was judged by the community to be a vast improvement on the open channels which delivered water 20 years ago (and are still in use for irrigation).

***"At this time the water in channel would freeze completely in winter so there used to be very little water, and sometimes we would need to walk to the source. Nowadays the situation is very comfortable"* (K1-M)**

There were some complaints that some taps in the village worked better than others.

***"Upper tap is not useful for drinking water; we must bring it from the lower tap; that is quite far from our house"* (K12-F)**

This complaint was common among residents in the upper half of the village who then had to walk a relatively short horizontal distance (~200m) to another tap. However, the difficulty of travelling this distance was accentuated by a very steep descent to the lower functioning tap and a very steep ascent when travelling back to the home with water.

Storage for the taps did exist until a landslide wiped out the tanks. Now the water is directly drawn from 'the monastery river'. This source was not visited due to inaccessibility.

Animals are particularly abundant in Kermi and thus were regularly found to cause queues as water points (see Figure 6-15).

Figure 6-15 A queue for water in Kermi (Author, 2012)

People were regularly seen to queue behind animals and give them priority for water.

Water from the taps was found to flow into natural drains to fields in need of water below. These channels are not well defined.

6.6.1.2 Household water – seasonal assessment

The first seasonal calendar of water access is presented in Table 6-4. It considers the primary water access point, back up sources, collection difficulties and times of day, quantity and quality of water available at the access point, demand for water, queues, treatment and year round infrastructure problems.

The Table is presented with Nepali months and seasons across the top with primary issues and comments relating to that month seen below it. The number of people who mentioned an issue is contained in brackets after the issue itself.

If Falgun (F) is taken as an example, it can be seen that water is typically collected from a tap with the hot springs as a back-up. There are difficulties in collecting water as the ground is slippery with snow. The quantity of water available is low, but the demand is high as all people and animals are in the village. As a result the queues are reported to be the highest at this time. The water was described to at times have a 'soapy'[1] colour but is treated by no one. This white soapy colour was attributed with snow melt in the spring, with community members describing only a slight shift in colour and not in taste or smell. This 'soapy' colour was predicted by the researcher to be mineral deposits from the rocky ground from which the winter snow was melting (similar to the white mineral deposits one observes if in an area of hard water).

The primary infrastructure issues stem from the tap being dry, and the yearlong problems of the taps located far from the home, upper taps failing and water wastage due to taps being left constantly on.

[1] Word as translated by research assistant– interpreted to mean a white appearance

Table 6-4 Summary of data describing seasonal household water access in Kermi

<table>
<tr><td colspan="13">Household Water Kermi</td></tr>
<tr><td>Months</td><td>F</td><td>C</td><td>B</td><td>J</td><td>A</td><td>S</td><td>B</td><td>A</td><td>K</td><td>M</td><td>P</td><td>M</td></tr>
<tr><td>Seasons</td><td colspan="3">Spring</td><td colspan="3">Summer/Rainy</td><td colspan="3">Autumn</td><td colspan="3">Winter</td></tr>
<tr><td>Source:</td><td colspan="12">Tap (16)</td></tr>
<tr><td>Back up:</td><td colspan="12">Hot springs (5)</td></tr>
<tr><td rowspan="2">Collection -difficulties</td><td>Snow (5)</td><td colspan="3"></td><td colspan="3">Slippery with rain (5)</td><td colspan="2"></td><td colspan="3">Slippery with snow (5)</td></tr>
<tr><td colspan="6"></td><td colspan="3">Too busy with work (6)</td><td colspan="3"></td></tr>
<tr><td>-times</td><td colspan="12">Typically very early morning and evening (5)</td></tr>
<tr><td>Quantity</td><td colspan="3">Very Low (6)</td><td colspan="3">Very high (5)</td><td colspan="3">Acceptable (2)</td><td colspan="3">Low (5)</td></tr>
<tr><td>Demand</td><td colspan="2">High – all people and animals in village (7)</td><td></td><td colspan="4">Lower – many people gone to grazing lands and/or China (6)</td><td colspan="2">High – all people home for harvest (7)</td><td colspan="3">High all people and animals in village (7)</td></tr>
<tr><td>Queues</td><td colspan="2">Highest (4)</td><td>Highest (6)</td><td colspan="6">Acceptable (2)</td><td colspan="3">High (2)</td></tr>
<tr><td rowspan="2">Quality</td><td colspan="3">White soapy colour (3)</td><td colspan="6"></td><td colspan="3"></td></tr>
<tr><td colspan="12">Fine all year (4)</td></tr>
<tr><td rowspan="2">Treatment</td><td colspan="9"></td><td colspan="3">Mostly drinking boiled/tea (4)</td></tr>
<tr><td colspan="12">Never treating (12)</td></tr>
<tr><td rowspan="4">Infrastructure problems</td><td colspan="3">Dry (2)</td><td colspan="2"></td><td colspan="4">Tank/pipe blocked with leaves(6)</td><td colspan="3">Tap/pipe frozen (5)</td></tr>
<tr><td colspan="12">Taps far from home (4)</td></tr>
<tr><td colspan="12">Upper taps fail most often and lower taps must be used (4)</td></tr>
<tr><td colspan="12">Tap left running 24 hours (2)</td></tr>
</table>

Note: numbers denote number of respondents who mentioned an issue. Negative responses were not recorded.

In Kermi, the taps were found to be reliable as primary supplies for water. If taps were not in use the hot springs are a constantly available alternative. Quantity of water in the taps was found to be a problem in spring, with 6 respondents describing it as very low.

***"In the spring season the main water resource can sometimes dry out and then there is very little water"* (K1-M).**

In spring, all animals are in the village and thus demand is high for this small amount of water. Queues can therefore be long.

Another observed issue with an abundance of animals being in the community is that it led to an increased amount of animal waste around the community. Since animals were sharing the same water supply as humans, this led to an abundance of animal waste around the water points. This was observed by the researcher, but not noted as an issue by any respondents in interviews or focus groups.

In terms of water quality at the primary access points, spring is the only season when it is noted to deteriorate:

***"Sometimes our drinking water is not good in colour and it comes like soaps foam especially in spring season"* (K3-M)**

However, in no instance did this perceived decrease in water quality result in treatment of water in the home.

During the summer season, there is lots of rain, so quantity available at the primary supply point improves. Some members of the community start to bring their animals to the higher altitude grazing sites, resulting in shorter queues.

***"Big quantity comes in summer – it is rainy season"* (K5-M).**

***"In summer season people go elsewhere and their livestock are taken away. So that's why summer season is easier than winter to get water"* (K4-M).**

While water quantity is improved in this season, ground conditions become worse due to the rain, and thus physical access can be more difficult:

***"In rainy season the way becomes muddy and it creates difficult walking conditions"* (K5-M) (FGD1-K)**

The slippery ground was noted to cause particular issues when carrying containers full of water.

In autumn, people begin to return for the harvest and the population increases. However, quantity is typically adequate to meet demand due to replenishment of the source during the rains. As leaves fall from the trees in this season they can cause increased blockages in the water system.

Figure 6-16 A young girl from Kermi carries water from a tap in winter (Author, 2012)

Figure 6-17 A tap in winter season in Kermi (Author, 2012)

Access to water in areas with snow has not been widely covered in literature. Figure 6-16 and Figure 6-17 show some scenes observed in the winter season in Kermi. Figure 6-16 shows a young girl collecting water using a number of containers (including one strapped to her back) during snowfall. Slipping on snow covered surfaces was reported to be a significant risk while carrying water to the home.

Figure 6-17 shows a typical tap in Kermi following a recent snowfall. Surfaces can be seen to be covered in snow, but water continues to flow. Water freezing in the base of the tap was reported as a hazard while collecting water.

Blockages in winter are typically caused by cold temperatures freezing the infrastructure:

***…in winter sometimes the tap is frozen and sometimes the pipe is also frozen* (K5-M).**

The return of all animals and people to the village for the winter causes an increase in demand and queues is high.

***"In winter season water is not enough because numbers of people increase and many livestock's are gathered at the tap"* (K4-M).**

Irrigation was another dominant use of water in Kermi that is not included in Table 6-4. Demand for irrigation has reportedly increased because, in previous years, avalanches provided enough water to irrigate the arable land through snow melting at higher ground into river channels, or through melting directly on the farming land, at approximately the right time of year.

"Irrigation is the biggest problem here" (K5-M) (K6-F) (K12-F)

"Scarcity is becoming more frequent and this is leading to increasing water dispute in our village" **(K15-F)**

Shortages of water for irrigation were reported to be increasing, and thus leading to disputes in the community.

"If there is small size of water, sometimes we dispute over irrigation" **(K13-F).**

6.6.1.3 Bathing – seasonal assessment

Seasonal information with regard to bathing in Kermi is presented in Table 6-5. The table summarises information on bathing location, logistics, safety, queue, access, privacy and regularity.

As can be seen in Table 7-3, bathing in Kermi takes place in the hot springs year round. Some members of the community use the tap in summer when they are too busy to visit the springs, or when it is very warm.

In spring, bathing is comfortable but the springs are busy as people come from other villages in search of the healing properties of the hot springs. In summer, the crowd dies down but other risks appear.

"Summer is easier to take a bath but there is a sort of danger from landslide due to big rains" **(K5-M).**

In autumn the biggest reported obstacle to bathing was time.

"*We wash our clothes and our bodies at the hot spring but as we are so busy we have very little time to go"* **(K15-F)**

Rates of washing were reported to be much lower in winter due to the extreme cold. Washing and drying oneself was reported to be difficult in the winter.

"It is more difficult to take a bath in winter due to the extreme cold and thick snow. Winter is more challenging also because of the risk of avalanche" **(K8-F).**

On any particularly sunny day, the springs were noted to be very busy as everyone came to wash.

Table 6-5 Summary of data describing seasonal bathing practices in Kermi

<table>
<tr><td colspan="13">Bathing Kermi</td></tr>
<tr><td>Months</td><td>F</td><td>C</td><td>B</td><td>J</td><td>A</td><td>S</td><td>B</td><td>A</td><td>K</td><td>M</td><td>P</td><td>M</td></tr>
<tr><td>Seasons</td><td colspan="3">Spring</td><td colspan="3">Summer/Rainy</td><td colspan="3">Autumn</td><td colspan="3">Winter</td></tr>
<tr><td rowspan="2">Location*</td><td colspan="3">Hot spring (16)</td><td colspan="3">Hot spring (10)</td><td colspan="3">Hot spring (10)</td><td colspan="3">Hot spring (16)</td></tr>
<tr><td colspan="3"></td><td colspan="3">Tap (5)</td><td colspan="3">Tap (5)</td><td colspan="3"></td></tr>
<tr><td>Logistics</td><td colspan="2"></td><td colspan="5">Travelling/Away from Kermi (2)</td><td colspan="2">Too busy – harvest</td><td colspan="3">In Kermi with free time</td></tr>
<tr><td>Safety</td><td colspan="3"></td><td colspan="4">Fear of landslide from heavy rain (2)</td><td colspan="2"></td><td colspan="3">Risk of avalanche (1)</td></tr>
<tr><td>Queue</td><td colspan="3">Busy on warm days: everyone in village and people from elsewhere come (2)</td><td colspan="3">Less people in village so a bit easier to find space at spring (4)</td><td colspan="3"></td><td colspan="3">Busy on warm days: everyone in village, people from elsewhere come (4)</td></tr>
<tr><td>Access</td><td colspan="3"></td><td colspan="3">Slippery path</td><td colspan="3"></td><td colspan="3">Thick snow</td></tr>
<tr><td rowspan="2">Privacy</td><td colspan="12">Difficult for women (particularly young girls) to get privacy – especially at busier times (5)</td></tr>
<tr><td colspan="12">Shy men struggle to find space (1)</td></tr>
<tr><td>Temperature effect</td><td colspan="3"></td><td colspan="3">Warm so may visit tap (4)</td><td></td><td></td><td colspan="4">Extremely cold - don’t wash thorough and hard to dry (5)</td></tr>
<tr><td rowspan="2">Bathing regularity</td><td colspan="7"></td><td colspan="2">Less - too busy</td><td colspan="3">Less - too cold</td></tr>
<tr><td colspan="2"></td><td colspan="7">Many people in areas with no bathing facilities e.g. summer graze, en route to China</td><td colspan="3"></td></tr>
<tr><td>Bathing amount</td><td colspan="9">8-10 times/month (4)</td><td colspan="3">4-5 times a month (4)</td></tr>
</table>

***"Sometimes there are big gatherings in hot spring and it is difficult to get a chance to clean our bodies and clothes because other people come here to take a bath as a traditional healing method*" (K8-F).**

<u>The springs are so much more busy when the weather clears off – any sunny day in winter brings everyone to the spring.</u>

(Field notes, 05-02-12)

The number of people at the hot springs was noted to peak prior to and during festivals – a non-climatic source of seasonality at the springs.

Privacy was found to be an issue year round, with women struggling to find bathing spots away from others.

"*We always feel uneasy during bathing there because the males come close and we get shy. Sometimes they are already there and we have to wait in the distance*" (K7-F).

***"If young girls go to the hot spring they are harassed by boys"* (K12-F) (K14-F).**

Bathing regularity was very variable between community members, but regularity was reported as less in winter in all cases

"*I take a bath one time in three days. In summer I feel hot so bath often. In winter season I take a bath four times in a month"* (K4-M).

6.6.1.4 Clothes Washing – seasonal assessment

Data on clothes washing are summarised in Table 6-6. The data provide information on location and logistics of clothes washing.

Table 6-6 Summary of data on seasonal clothes washing in Kermi

<table>
<tr><th colspan="13">Clothes Washing - Kermi</th></tr>
<tr><td>Month</td><td>F</td><td>C</td><td>B</td><td>J</td><td>A</td><td>S</td><td>B</td><td>A</td><td>K</td><td>M</td><td>P</td><td>M</td></tr>
<tr><td>Season</td><td colspan="3">Spring</td><td colspan="3">Summer/Rainy</td><td colspan="3">Autumn</td><td colspan="3">Winter</td></tr>
<tr><td rowspan="2">Location</td><td colspan="12">Hot Springs (7)</td></tr>
<tr><td colspan="3"></td><td colspan="4">Tap (2)</td><td colspan="5"></td></tr>
<tr><td rowspan="3">Logistics</td><td colspan="3"></td><td colspan="3">Difficult to carry clothes on slippery ground</td><td colspan="3"></td><td colspan="3">Difficult to carry clothes on slippery ground</td></tr>
<tr><td></td><td></td><td></td><td colspan="3">Difficult to dry clothes in times of heavy rain</td><td colspan="3"></td><td colspan="3">Difficult to dry clothes when cold</td></tr>
<tr><td colspan="7"></td><td colspan="2">Too busy to wash</td><td colspan="3"></td></tr>
</table>

Washing of clothes was found to take place at the hot springs year round and was uniformly carried out by women (K7-F)

Access, temperature and space were the main issues that arose in discussion of clothes washing.

Access was variable due to prevailing ground conditions, which made transport of a basket of heavy wet clothes difficult. Low temperature led to discomfort in washing clothes.

***"It is also hard to wash clothes. My hands are cracked and cold; winter is so harsh"* (K6-F).**

Like bathing, access became an issue when the hot springs were very busy

6.6.2 Seasonal Access to Sanitation in Kermi

6.6.2.1 Sanitation Infrastructure

A few latrines can be seen in the area but they were very rarely observed to be used. Khangalgaun VDC is one of the first being targeted in Humla by the Government Sanitation Master Plan and as a result there is a strong government push for 100% sanitation coverage. The population have been threatened with removal of their rights to government allowances and passports should they not construct a household latrine.

Of the 15 people asked, 6 had a latrine, 2 had a broken latrine, 1 person had a latrine under construction and 6 had no latrine. Of those with latrines (and broken latrines), 1 person had independently constructed their latrine and 7 had assistance from government or non-governmental organisations.

Of the 6 people with working latrines, 4 were constructed in the year prior to the interviews (which were conducted in January and February 2011), 1 was constructed in the previous 2-5 years to the interview and the independently constructed latrine was over 10 years old.

Those interviewed who had no latrine blamed space (1), access to materials (1) and a lack of interest (2).

Though use of latrines was widely reported, the researcher rarely observed anyone entering or exiting a latrine apart from herself and her current research assistant.

I've been here for a few days now and I'm not sure I've seen anyone use the latrine apart from X and I

(Field notes, 01-12-13)

Some agreed that many were not using their latrines and gave a variety of reasons.

***"In Kermi lots have latrines but only about 3 people use them"* (KI36).**

***"I think they are lazy and also fear falling into the pit"* (K8-F).**

"*If we ask them they say they feel disgusted to enter the latrine*" (K8-F).

"*The elderly find it difficult to use"* (K1-M).

Due to the large number without latrines, open defecation is prevalent in the community and typically occurs in the fields behind the community. An abundance of human waste can also be found near the hot springs – this is a cause for concern particularly during the rains when the waste may be washed into the hot springs. Latrines were constructed close to the springs to combat this but these soon filled and have not been emptied or moved (see Figure 6-18). A washing station also lies abandoned at the hot springs (see Figure 6-19). Interviewees said they broke just weeks after installation due to children and animals cutting the pipes delivering water to the station.

Figure 6-18 A filled latrine pit (one of two) by Kermi hot springs (Author, 2012)

Figure 6-19 An abandoned washing station at Kermi hot springs - local people blame children for cutting the pipes to this station (Author, 2012)

6.6.2.2 Sanitation – seasonal assessment

A summary of information related to latrine use and open defecation in Kermi is presented in Table 6-7. The data in this table primarily describes ease of use and contributors toward level of comfort experienced.

In terms of comfort, those with latrines in Kermi reported a strong seasonal presence of flies and smell which peaked in the summer season.

***"We have no medicine to stop it smelling. Due to this we need lots of water to keep the latrine clean"* (K3-M).**

In winter season, the main problems stemmed from the difficulty in storing small amounts of water for flushing. Access to latrines themselves was also particularly difficult during times of snow due to slippery ground conditions.

Figure 6-20 A jug frozen in flushing water in a home in Kermi (Author, 2012)

<u>Going to the latrine at night on the frost is simply terrifying!</u> (Field notes, 05-02-13)

For those openly defecating, poor access to open defecation sites on the boundaries of the village (most often, by the hot springs), led to defecation closer to the home in winter time. If just passing urine, some community members were noted to relieve themselves close to the home or on the clay roofs. The elderly, sick and young would regularly go the latrine close to the home all year round.

In summer, a fear of snakes lying in the surrounding grass was found to be a concern when defecating outside .In other seasons, the lack of long grass led to difficulty in finding a private place.

***"Outside was scary in summer as we had a fear of snakes in the grasses"* (KI7).**

Prevailing weather conditions affected comfort of openly defecating, with the experience being more uncomfortable in the rains and snowy periods.

"Going outside is more difficult in winter than in summer" (K12-F)

Diarrhoeal incidents were more likely to occur in summer, and led to increased discomfort.

***"It is also difficult to go to the latrine in summer season because at the time our stomach is not well balanced due to diarrhoea"* (FGD1-K)**

The presence of the open defecation areas in proximity to the hot springs was of concern to the researcher, as is shown in the following field note:

<u>In a way it makes sense to me that people defecate near the springs. People go in the morning to get hot water and wash themselves so it makes sense that one might defecate while there as there is an abundance of hot water nearby. My concern is that in rainy season this waste is washing into the springs. An even bigger risk I can see is when it snows. Is it possible that the snow, while melting into the river brings this this waste from the ground with it into the springs? Animals also defecate here so there is quite an abundance of waste. This makes me concerned for</u>

<u>the seasonal quality of the springs – but I have no water quality testing kit with me so I cannot follow this up.</u>

(Field notes, 01-02-12)

This effect was of concern to the researcher due to the fact that the hot springs were used for bathing, clothes washing, and as a back-up water source. Unfortunately, as the field notes suggest, no testing could be done to validate this observation due to the lack of available equipment. It is recognised that in this case quantitatively tested data would have proved useful for triangulation of results.

Table 6-7 Summary of data on seasonal latrine use and open defecation in Kermi

<table>
<tr><td colspan="13">Basic Sanitation – Kermi</td></tr>
<tr><td>Months</td><td>F</td><td>C</td><td>B</td><td>J</td><td>A</td><td>S</td><td>B</td><td>A</td><td>K</td><td>M</td><td>P</td><td>M</td></tr>
<tr><td>Seasons</td><td colspan="3">Spring</td><td colspan="3">Summer/Rainy</td><td colspan="3">Autumn</td><td colspan="3">Winter</td></tr>
<tr><td colspan="13">LATRINE USE</td></tr>
<tr><td rowspan="2">Comfort</td><td colspan="3">Smell (2)</td><td colspan="3">Smell (7)</td><td colspan="3">Smell (2)</td><td colspan="3"></td></tr>
<tr><td colspan="3">Flies - bite during use (1)</td><td colspan="3">Flies - bite during use (2)</td><td colspan="6"></td></tr>
<tr><td rowspan="2">Ease</td><td colspan="3"></td><td colspan="3">Diarrhoea makes use difficult (2)</td><td colspan="3"></td><td colspan="3">Flushing water frozen (4)</td></tr>
<tr><td colspan="12">Elderly and children find it difficult to use (2)</td></tr>
<tr><td colspan="13">OPEN DEFECATION</td></tr>
<tr><td rowspan="3">Location</td><td colspan="12">Far from home, near old tap - sometimes a little closer at night (3)</td></tr>
<tr><td colspan="12">Children and elderly may go closer to home in pit (2)</td></tr>
<tr><td colspan="9"></td><td colspan="3">Closer to home if heavy snow (1)</td></tr>
<tr><td rowspan="3">Comfort</td><td colspan="12">Shame for women and fear of being caught (4)</td></tr>
<tr><td colspan="3"></td><td colspan="3">Fear if snakes in grass (2)</td><td colspan="3"></td><td colspan="3">Very cold (3)</td></tr>
<tr><td colspan="3"></td><td></td><td colspan="3">Can get very wet (1)</td><td colspan="5"></td></tr>
<tr><td>Ease</td><td colspan="3"></td><td colspan="3">Unsettled stomach so need more regular trips (3)</td><td colspan="3"></td><td colspan="3">Very thick snow (6)</td></tr>
</table>

6.6.3 Menstruation – seasonal assessment

In Kermi, no seasonal differences were noted in menstruation and its practice throughout the year. As a Lama community, the families do not practice Chhaupadi and no restrictions are placed on women while menstruating.

Women reported the use of pads or pieces of cloth during menstruation to contain their bleed.

"I have no problem menstruating – sometimes before pads our blood would go right to our knees but now pads are available and life is easier" **(K14-F)**

Pads are only available from Simkot and were a very high price due to the transport costs from southern Nepal. There are no facilities specifically for disposal of pads, yet none were seen as solid waste in the community.

6.6.4 Kermi Summary

Kermi has 5 taps in which its 500 strong community can access water. These taps were found to be mostly reliable year round, with major disruptions caused by the combination of water shortages at the source, and all people and animals being in the village in the spring season. Physical access to the taps is a problem in the rainy and winter seasons, particularly just after a rainfall or following melting of snow.

The hot springs in Kermi are unique in the district due to their large size. They allow for relative comfort in bathing and clothes washing year round. However, they lie down a steep slope from the village and suffer from the same access problems as water collection for the home (slipperiness). Regularity of clothes washing and bathing decrease in winter due to this, but decrease at other times of year due to peaks in work load e.g. harvest, irrigation. On sunny days or prior to festivals the springs are particularly busy and is difficult to find room or privacy.

Of the 15 people asked, 6 had a latrine. High temperatures caused discomfort in its use due to flies and smell in the summer/rainy season, while in the winter season the primary issues stemmed from physical access to the latrine and frozen flushing water.

Open defecation was found to be most uncomfortable in periods of extreme weather (rain and snow) and during times of stomach upsets in the summer/rainy season.

Overall seasonal variation in access is seen in all areas under analysis. While none of the variations are extreme, there are subtle differences in access stemming from increased or decreased sufficiency, safety, accessibility, and usability of water and sanitation infrastructure during the year.

6.7 Chaggaunphaya

Chaggaunphaya is a Hindu village located in Dandaphaya VDC at an approximate altitude of 2,500 m.a.s.l. Details of research completed in Chaggaunphaya are presented in Table 6-8 and Table 6-9

Table 6-8 Research details for Chaggaunphaya

Case Study No.	2
Population	~360
Households	~70
Visited	Jan '12, Feb '12, May' 12, June '12
Research Assistant	3, 4

Table 6-9 Interviews and focus group discussions in Chaggaunphaya

Interviews		**Focus Group Discussions**	
Total	16	Total	3
Male	8	All Male	1
Female	8	All Female	2
Mixed group	0	Mixed group	0

The population of Chaggaunphaya are of the Thakkuri caste, a caste considered a 'ruler' clan. Thakkuris are commonly thought of as being similar to Chhetris (the main caste in Humla), but consider themselves of a more important ranking. The inhabitants of Chaggaunphaya are from the Singh and Shahi families, and the two tend to intermarry.

The settlement is dense in patches with many homes attached in rows of 10+. Homes are the same layout as those in Kermi but are constructed in mud more often than stone and much smaller inside.

Figure 6-21 A view of a portion of Chaggaunphaya from the school yard (Author, 2012)

The village lies approximately 45 minutes up a steep incline from the main Simkot-Hilsa route, and is not an area that benefits from passing trade or tourism. That said the population of Chaggaunphaya changes significantly during the year due to the presence of a 400 student secondary school in the village.

The school can be seen to the foreground of Figure 6-21 and the boarding houses are the tin roofed buildings in the background. The main village population live in the flat roofed homes seen behind this. The school operates from March to November with 150 boarders and 250 day students.

Corruption was a dominant feature of conversations in Chaggaunphaya and a much higher level of suspicion was observed between villagers, particularly those in power. The same sense of unity felt in the Lama villages was not a feature in Chaggaunphaya. Some men were seen working together on housing construction, but others spoke of significant division within the community.

Figure 6-22 A healthpost building in Chaggaunphaya that was never staffed (Author, 2012)

Chaggaunphaya has many shops due to the presence of the school. It also has the outer shell of a health post, constructed by an NGO but never staffed. Many Dhamis (traditional healer) were visible in the village and were clearly held in high esteem by community members. Some houses had solar electricity in Chaggaunphaya but the majority were without power.

Much smaller animals are kept in this Hindu community, primarily goats and chickens. Larger animals were said to be too high of an investment. More typically, people farmed crops but there were often complaints of poor production:

***"We do farm but nothing is produced. We work extremely hard in the fields but there is no production"* (C2-F).**

The areas dependence on rain for irrigation has in recent years led to poor returns resulting in a higher dependency on food aid in the community.

There is noticeably more solid waste visible upon entering Chaggaunphaya than was seen in Kermi. The majority of this waste blows towards the southern side of the village. This relative abundance of solid waste exists as a result of the presence of basic grocery shops in Chaggaunphaya established primarily to serve the school children.

There is less animal waste visible in the village as there are fewer animals, though there is visible humans waste at the periphery of the village.

6.7.1 Seasonal Access to Water in Chaggaunphaya

6.7.1.1 Water infrastructure

Access to water was found to be a very controversial topic in Chaggaunphaya. An existing water supply constructed from a spring in 2048 BS[1] was said to work well, however money was donated by

[1] Equivalent to 1991 in the Gregorian calendar

an NGO for a ‘politically driven’ improvement to this scheme. A new supply was constructed, drawing water from a river. Within months this ‘improvement’ had been wiped out by a landslide.

***“An intake in a stream was a terrible idea – it gets carried away by floods, and you get murky water, sand and pebbles”* (KI20).**

“*Yes, there was a project worth 1 crore*[1] *last year. Half went into people’s pockets*” (C8-M).

The project was widely reported to be corrupt from start to finish with very large amounts of money being diverted from the supply improvements to the pockets of local figures of importance.

The source of the newly constructed system was visited by the researcher during the field work. It was a 4 hour walk from the community. The poor engineering decisions were immediately visible upon arrival. The intake was clearly in an area susceptible to landslides (the centre of a river filled with loose boulders), and there was a distinct lack of care taken to cover the pipes between the intake and the community. Photographs of the visit are shown in Figure 6-23 and Figure 6-24.

As a result, at the time of this study, access to water in Chaggaunphaya was particularly poor due to this ‘improvement’. Water from the temporarily fixed supply was feeding 1 tap at the secondary school (which has a small reservoir attached (Figure 6-25)) and 5 other taps around the village. The tap in the school was found to be the most reliable source due to this storage.

***“The taps could dry any moment. They could dry right now; they dry in the morning one day and night the next”* (C4-F).**

***“That (water from the tap) is only enough for people to drink. It is not enough to use for anything else. Sometimes, there is hardly enough to drink. If you want to wash clothes or bathe sometimes, you have to fight with people”* (C2-F).**

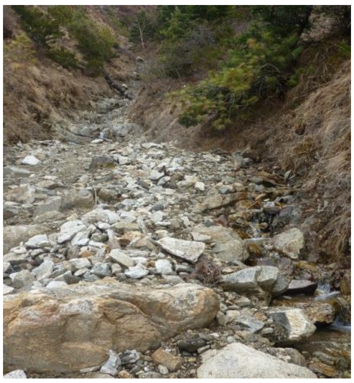

Figure 6-23 A landslide covers the 'improved' water source (Author, 2012)

Figure 6-24 The temporary pipe arrangement in place to keep a supply of water to Chaggaunphaya (Author, 2012)

[1] A crore is a unit which refers to ten million. In this case it refers to ten million Nepalese rupees

Figure 6-25 Tap at Chaggaunphaya school with attached reservoir (Author, 2012)

"There is one spring. You can get only around 2-3 containers of water and it dries. No, if the whole village goes there to collect water, then it's not enough. It's only enough for 2-3 families" **(C3-F).**

Other community members would travel to the Karnali river in these times of shortages. It is a steep 30 minute walk down from the village but could take up to an hour while carrying water on the way back due to the heavier load.

"They have to go to the Karnali River to get water. The water flows at such speed; some children have been swept away by the river while fetching water" **(C1-F).**

The 4 hour walk to the water source from the town must now be undertaken regularly by village members to assess issues with the supply.

"After 3-4 days, 5-10 people from all wards go and fix it. In the meantime, we go to the river" **(C4-F).**

When they are menstruating, women may not use the taps (even if they are working) and stay outside in a shed called a 'Khullo'- more in Section 6.7.3.

In Chaggaunphaya, a more distinct effort was made to capture drainage water into ponds for animals as shown in Figure 6-26. 3 out of 5 taps made use of drainage water in this way. These ponds were used often but were found to contain lots of algae.

The use of these ponds did cause a problem when using soap at the taps, as soapy water could not be allowed to enter the animals' drinking pond.

Figure 6-26 Drainage from a tap feeds into a small pond for animals in Chaggaunphaya

No irrigation system exists in Chaggaunphaya.

6.7.1.2 Household water – seasonal assessment

A summary of seasonal water access in Chaggaunphaya is shown in Table 6-10 (note: this table extends over 2 pages).Seasonal differences in access to household water in Chaggaunphaya paled in comparison to the overall year round shortages and uncertainty which impacted their access to water constantly.

***"Sometimes the tap breaks due to people cutting the pipes or the pipes being disconnected by some unknown reason. It doesn't depend on the seasons- it's the same in winter and in rainy season"* (C2-F).**

"*There is no certainty for water – the two Karnalis flowing below us are the only reliable sources of water for us*" (C10-M).

Some faults were, however, noted to vary during the year. Breakages in the infrastructure were noted to happen more often during the rainy (summer) season.

***"This frequently gets blocked due to landslides in the monsoon. This damages the tank and stops the supply"* (KI13).**

"*Typically, there is no water during the monsoons. It's not because there is less water at the source, but because of landslides that damage the pipeline"* (C8-M).

The long length of the pipeline made it susceptible to damage. This was a particular problem in the summer and autumn seasons, when people from other areas were in the area of the pipeline for seasonal grazing.

Some interviewees complained that animals were more likely to break the pipeline at this time and also that the people accompanying the animals were prone to taking water from break pressure tanks and reservoirs along the pipeline. This was blamed as a significant source of contamination in the water source.

***There is a Lama village above us; they wash their clothes and let their animals drink from the reservoir tanks along the way* (C8-M).**

Figure 6-27 Young boy at a graze site takes water at a break pressure tank of the main Chaggaunphaya water supply 3 hours away from the village (Author, 2012)

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Table 6-10 Summary of data describing seasonal household water access in Chaggaunphaya

<table>
<tr><th colspan="13">Household Water Chaggaunphaya</th></tr>
<tr><th>Months</th><th>F</th><th>C</th><th>B</th><th>J</th><th>A</th><th>S</th><th>B</th><th>A</th><th>K</th><th>M</th><th>P</th><th>M</th></tr>
<tr><th>Seasons</th><th colspan="3">Spring</th><th colspan="3">Summer/Rainy</th><th colspan="3">Autumn</th><th colspan="3">Winter</th></tr>
<tr><th>Source:</th><td colspan="12">Tap (16)</td></tr>
<tr><th rowspan="3">Back up:</th><td colspan="12">River (11)</td></tr>
<tr><td colspan="12">Tap at school (5)</td></tr>
<tr><td colspan="12">Spring (5)</td></tr>
<tr><th>Collection</th><td colspan="3"></td><td colspan="3">Slippery in rains</td><td colspan="3"></td><td colspan="3">Slippery in snow</td></tr>
<tr><th>-difficulties</th><td colspan="6"></td><td colspan="3">Too busy - especially if source broken(4)</td><td colspan="3"></td></tr>
<tr><th>-times</th><td colspan="12">Typically very early morning and evening (4)</td></tr>
<tr><th rowspan="2">Quantity</th><td colspan="12">Unpredictable all year (7) - can never confidentially say there will be water the next day (2)</td></tr>
<tr><td colspan="3">Very Low (4)</td><td colspan="3">Very high (7)</td><td colspan="3">Low (4)</td><td colspan="3">Low (6)</td></tr>
<tr><th rowspan="2">Demand</th><td colspan="3">Animals need lots of water (4)</td><td colspan="4">Lower - some have left for graze (4)</td><td colspan="2">High - everyone home for harvest (6)</td><td colspan="3">Very high - everyone in village. Many animals (5)</td></tr>
<tr><td colspan="9">School children in village- increase demand (2)</td><td colspan="3"></td></tr>
<tr><th rowspan="2">Queue</th><td colspan="12">Queue is a function of if the tap is actually working and the quantity coming - typically long (2)</td></tr>
<tr><td colspan="9">Extra-long if school tap breaks (1)</td><td colspan="3"></td></tr>
<tr><th rowspan="3">Quality</th><td colspan="3">Poor as snow melts (3)</td><td colspan="3">Sandy and murky in rains (3)</td><td colspan="6"></td></tr>
<tr><td colspan="9">Poor as neighbouring village are bathing and letting animals drink from reservoirs (6)</td><td colspan="3">A little cleaner as not so many people washing in tanks</td></tr>
<tr><td colspan="6">OK (3)</td><td colspan="6">OK (6)</td></tr>
<tr><th rowspan="3">Treatment</th><td colspan="3"></td><td colspan="4">Let sand sink to bottom and drink from top (5)</td><td colspan="5"></td></tr>
<tr><td colspan="12">Boil, but for taste, not treatment (3)</td></tr>
<tr><td colspan="12">None (4)</td></tr>
</table>

Table 7-7 continued

<table>
<tr><th colspan="13">Household Water Chaggaunphaya - continued</th></tr>
<tr><th>Months</th><th>F</th><th>C</th><th>B</th><th>J</th><th>A</th><th>S</th><th>B</th><th>A</th><th>K</th><th>M</th><th>P</th><th>M</th></tr>
<tr><td rowspan="9">Infrastructure Issues</td><td colspan="12">Taps regularly without water (16)</td></tr>
<tr><td colspan="12">Neighbouring village - cut/disconnect pipes, bathing, washing clothes, water for animals from reservoirs (6)</td></tr>
<tr><td colspan="12">Source comes from a great distance and is difficult to find the problem and to get there and fix it (1)</td></tr>
<tr><td colspan="3"></td><td colspan="6">Those at grazing land cut pipe to give to animals (5)</td><td colspan="3"></td></tr>
<tr><td colspan="3"></td><td colspan="6">Animals at graze damage pipes (3)</td><td colspan="3"></td></tr>
<tr><td colspan="3"></td><td colspan="3">Sand clogs pipeline/tanks (4)</td><td colspan="3">Leaves clog pipeline (2)</td><td colspan="3"></td></tr>
<tr><td colspan="3"></td><td colspan="3">High pressure may blow tap off pipe (1)</td><td colspan="3"></td><td colspan="3"></td></tr>
<tr><td colspan="3"></td><td colspan="3">Landslides damage pipeline (7)</td><td colspan="3"></td><td colspan="3">Frozen pipes (10)</td></tr>
<tr><td></td><td colspan="6">Breaks particularly often at this time of year and most men are out of town so difficult to fix (1)</td><td colspan="4"></td><td></td></tr>
</table>

Alternative Sources	**River**	**Spring**
Time taken (one way)	1 hour	30 minutes
Difficulties encountered	Very fast flowing Very difficult to walk back up the hill to the village with water Risk of falling rocks during rains	Low flow Constant queue

Quality was noted to deteriorate in the rainy season also:

"*The water is murky in the monsoons – very few people boil water still. I, too, still drink cold water*" (C10-M).

Table 6-10 shows that the rainy season was cited as a time of murky, sandy water – while poor water quality in the preceding season was thought to be due to snow melting into the river.

Due to the long stretches of exposed pipe between source and outlet, pipes were found to be susceptible to freezing and blocking.

***"In the winter, pipes freeze and we get no water in the morning, up to about 10 in the morning, because of the cold*" (C10-M).**

Fluctuations in the number of animals to and from the village were not reported to have an impact on queues and demand for water. Numbers of people did however shift dramatically when the school was in season, thus increasing demand for water during the school year. Some reported that there had been instances when school was cancelled due to a lack of water for some days.

As can be seen in Table 6-10 some problems in accessing the source were similar to Kermi, with slippery ground from rain and from snow stated many times as an issue for transport of water – particularly if the main taps are broken and the journey to the Karnali river is being undertaken.

While productive use of water was not a focus of this research, it is worthy of note that the production of crops in Chaggaunphaya was severely limited due to the lack of availability of irrigation water.

***"There is no irrigation. If it rains, they are watered and if not they are not*" (C2-F).**

This situation leaves the population very vulnerable in times of drought.

Water quality for animals from the drainage ponds at the taps was found to vary with time depending on if people had been washing clothes and/or themselves (leading to soap water in the ponds – this would peak at festival times due to increased washing), or seasonally – due to growth of algal blooms in warmer seasons.

6.7.1.3 Bathing – seasonal assessment

In Chaggaunphaya, a lack of water from village taps resulted in people washing face, hands and feet at the home and intermittently travelling 1 hour to fully bathe in the river. A summary of seasonal access to water for bathing and challenges experienced is shown in Table 6-12.

"For bathing we must go to the rivers, the water in the taps is not enough" **(C2-F).**

This journey from the village to the river became more difficult when the ground is slippery due to the steep route to the river. A section of this slope is shown in Figure 6-28.

Figure 6-28 A section of the slope on the way down to the river in Chaggaunphaya (Author, 2012)

As a result, access to the area for bathing was reported to be a struggle at all times but with added complication in summer and winter seasons. Regularity of bathing was variable depending on the individual. Women who travelled to the river to wash clothes were likely to bathe at the same time. Men reported themselves that they travelled to the river to wash but were rarely observed to do so. Some men would bring small amounts of water from the tap to the roof to wash.

Safety and privacy concerns were expressed year round due to the speed of the water flow and lack of private washing areas. Water available is always cold in Chaggaunphaya, and to heat it requires fuel (usually wood). The need for wood to be collected to heat water added to the inconvenience of bathing. Bathing was reported to be an uncomfortable experience outside of the summer season due to the cold weather at other times of year.

6.7.1.4 Clothes Washing – seasonal assessment

Data on seasonal clothes washing is shown in Table 6-11. Clothes washing could generally only take place at the river in Chaggaunphaya. Community members were noted to light fires by the river to heat water for washing clothes. Again, access to fuel and to the river itself were the primary inhibiting factors – with particular problems resulting from the need to carry heavy wet clothes one hour back to the village in deep snow and thick mud. Many interviewees reported washing themselves and clothes, infrequently.

Table 6-11 Summary of data on seasonal clothes washing in Chaggaunphaya

Clothes Washing Chaggaunphaya												
Months	**F**	**C**	**B**	**J**	**A**	**S**	**B**	**A**	**K**	**M**	**P**	**M**
Seasons	**Spring**			**Summer/Rainy**			**Autumn**			**Winter**		
Location	River (10)											
	Tap if it has water (2)											
Logistics							Too busy (3)					
	Treacherous walk to river with wet heavy clothes - particularly hard to get back up hill (3)											

Table 6-12 A summary of data describing access to bathing water in Chaggaunphaya

Bathing Chaggaunphaya												
Months	**F**	**C**	**B**	**J**	**A**	**S**	**B**	**A**	**K**	**M**	**P**	**M**
Seasons	**Spring**			**Summer/Rainy**			**Autumn**			**Winter**		
Location*	River (9)			River (9)			River (9)			River (8)		
	Tap - if it has water (5)			Tap if it has water (5)			Tap if it has water (5)			No washing (1)		
	Bring water to roof (1)			Bring water to roof (1)			Bring water to roof (1)					
Logistics				Much more easy (1)			No time (1)			Very difficult with the cold water (3)		
	Very rarely enough water in the tap so have to walk far (6)											
	May have a fight for tap water if there is limited supply - should not be bathing there (1)											
	You may not use soap at the tap because animals drink from the collected puddles (2)											
Safety	Very fast river speed (3)											
Queue	Never a queue at the river but can be at tap (2)											
Access										Very difficult to get to river and back in snow (2)		
Privacy	Typically overcome by washing in home or latrine - no privacy at tap or river											
Temperature effect	Warm so quite comfortable (1)			Hotter so much easier (2)						Too cold (4)		
Bathing regularity	Some			Most			Some			Less/none		
	Some wait many weeks, others 3/4 days (1)											
	Depends on the motivation of the individual (1)											
	Hand, face and feet regularly - others much less often (5)											
	Once a week/every 2 weeks									Once a month		

6.7.2 Seasonal Access to Sanitation in Chaggaunphaya

6.7.2.1 Sanitation infrastructure

Unlike Kermi, Chaggaunphaya had an abundance of visible latrine superstructures, many of them over raised latrines. However, large proportions of these systems appeared to be in disrepair, an example of which is shown in Figure 6-29.

Of the 26 interviewees asked if they had a latrine (this includes 10 individuals from 2 focus groups), 4 had a latrine, 8 had broken latrines, 1 had a latrine under construction and 13 had no latrine.

Figure 6-29 One of many latrines in disrepair in Chaggaunphaya (Author, 2012)

Of the 12 constructed latrines (including the 8 broken latrines) – 9 of these had NGO or government support. The broken latrines were primarily blamed on a programme that delivered pans but failed to follow up on construction and deliver tin roofs as promised.

When asked why households had no latrine, reasons given were: poor access to materials (5), no space (1), no interest (1), no time (1) and also one household who based their decision on not having a latrine on advice from a Dhami (traditional healer).

"*We were thinking we would build one here but God said not to do so through the Dhami. We went to consult with him. Now we will just spend the rest of our life facing difficulties*" (C2-F).

All latrines in Chaggaunphaya were built during an NGO project in approximately 2008 A.D. Community members stated that since that date, no staff from the responsible organisation had visited again to enquire about the state of the latrines constructed with their support.

Again even those who had latrines were reported not to use them:

"*Lots of people don't use their own latrines*" (C8-M).

One community member suggested the primary use of the latrines was for the sick and infirm, whereas those who were able to walk easily would go far from the village for defecation.

***"My mother uses it all the time as she is old and cannot go far. We are fit and healthy; we can go anywhere to defecate"* (C7-F).**

The main open defecation site in Chaggaunphaya is in an area beside the school on a slope down toward the neighbouring, village Darapori. When asked about defecating at night, community members unanimously reported going at a distance from the home. One woman disagreed and explained that she tries to just not go at night but would be tempted to go close to the home.

"*We try not to go at night, and if you do, don't go far*" (C2-F).

Pits are dug close to the home for the ill, elderly and young children in homes without latrines.

The school in the village had 2 operational latrines at the time of visitation but both were locked. Other latrines were under construction. Thus school children used open defecation areas regularly and had no hand washing facilities.

6.7.2.2 Sanitation – seasonal assessment

A summary of data collected with regard to seasonality of latrine use in Chaggaunphaya is presented in Table 6-13.

Very few people reported use of latrines. There were no complaints of freezing water in latrines as actually accessing water in the first place was a far greater challenge. Not having enough water for flushing was a common complaint among interviewees. As can be seen in Table 6-13 there was only one mention of bad smell when using latrines, and 2 about insects – these low numbers were due to the lack of people actually experienced in using the latrine.

One community member admitted that her family only used the latrine if the weather was bad and they could not go far.

"We only use the latrine when we are sick or it is raining or snowing outside. At other times, we go far away to a cliff on the periphery of the village" **(C7-F)**

For open defecation, community members uniformly stated that they continued to use areas on the periphery of village. Ease of open defecation varied seasonally as the number of people present in the village affected the ease with which an individual could find privacy. The seasonal presence of thick crops was noted as something which aided privacy, although it was also reported to be grossly offensive to defecate in another community members' field while crops are visibly growing.

The rains and winter were noted as particularly uncomfortable times to go outside for defecation – as can be seen in Table 6-13 this was noted as a particular problem for children and the elderly.

"In winter there is no option but to go far. Even if it rains hard we go to the same place" **(C2-F).**

One respondent summed up the situation that the researcher observed:

"*We urinate around here but for defecation we go far. Even in winter we go up there*" (C4-F).

Levels of environmental sanitation deteriorate when school children are present, due to the lack of latrines in use at the school.

***"It's extremely important to have latrines in the school with 400 kids; but they aren't operational, they go outside and dirty this village"* (C8-M).**

Table 6-13 Summary of data on latrine use and open defecation in Chaggaunphaya

Basic sanitation – Chaggaunphaya												
Months	**F**	**C**	**B**	**J**	**A**	**S**	**B**	**A**	**K**	**M**	**P**	**M**
Seasons	**Spring**			**Summer/Rainy**			**Autumn**			**Winter**		
LATRINE USE												
Comfort				Smell (1)								
				Insects (2)								
Ease of use										Flushing water frozen (1)		
	Do not have enough water for flushing if they did have a latrine (7)											
	Latrines are all dark and small - particularly intimidating for old people (1)											
OPEN DEFECATION												
Location	Cliff on lower edge of village (8)											
	Far from home in fields (5)											
										More nearby in winter (2)		
	Dig a hole for children and elderly (8)											
	Some elderly and sick may use a container in the home (1)											
	Anywhere close with space (1)											
	Urination close to home - wherever space can be found (3)											
			Many are away and go where is convenient (2)									
Comfort				Get very wet (1)						Very difficult in snow (2)		
Ease			Particularly difficult for children in rains (2)							Particularly difficult for children in winter (2)		
	Can be embarrassing to carry water with you (2)											
	Difficult to find privacy - especially in times when leaves are gone (3) - particularly a problem for children an elderly (2)											

6.7.3 Menstruation – seasonal assessment

During menstruation in Chaggaunphaya, women spent 3-4 days in a separate “Khullo”. A khullo in Chaggaunphaya was found to be a small door less room at a distance from the home. During this time women would bathe at least once and maybe twice.

***“Some who want to bathe daily but others bathe on the day they can enter the house”* (C2-F).**

The Khullo could be uncomfortable in winter time but actually the time spent in there was reported to be a good social time for women.

“*The floor is colder in the “Khullo”. The beddings aren’t as good as home. The cold is the main problem*” (C1-F).

“*It is nicer when there is someone else. You have someone give company and you can go to wash together. It’s not uncomfortable having more than one person in the “Khullo””* (C1-F).

Younger women exhibited more reluctance to use the Khullo then their elders.

“*It’s obviously really difficult! It’s cold, dark and smoky in there”* (C4-F).

During the summer graze, women were still required to stay outside during menstruation periods – this could at times mean literally sleeping outside

“*During grazing we stay outside the tents during menstruation periods under the open skies”* (C2-F).

Women in some households were forbidden from using the tap during menstruation.

***“No (we can’t touch the tap when menstruating). We have to go to the river for water, even in the winter”* (C7-F).**

As a result there were non-climatic times of year during which women could not use the infrastructure in the community.

6.8 Chaggaunphaya Summary

In Chaggaunphaya a crippling shortage of water in the community year round (particularly since a recent ‘upgrade’ in the system) outweighs any issues which are experienced seasonally. While quality and quantity of water at the village taps is reported to vary seasonally, it is the constant threat of absence of water at the taps which dominates conversations about water in the area.

Tap water quality appeared to change due to the physical environment (silt, sand) and weather conditions (snow melt) at the source. Interestingly, quality was also seen to fluctuate due to the seasonal movements of people and animals from other communities to the area surrounding the source and its pipeline to the taps in Chaggaunphaya. Demand in the community is seasonal in the village due to the influx of school children and seasonal comings and goings of animals and community members.

Bathing and washing of clothes both take place in the river Karnali year round. While travelling to the river was not ideal at any point of the year, the difficulty associated with completion of these tasks was worsened in times of snow and rain due to the slippery ground.

Latrine use was not found to be common in Chaggaunphaya, despite a relative abundance of latrine superstructures in the community. As a result, a small amount of data was collected on seasonal latrine use with some mention of smell, flies and frozen flushing water as seasonal issues. However, these issues were minimal when compared with the gross overall shortage of water to use for flushing and anal cleansing in the latrine at any time of year.

Open defecation was found to be particularly uncomfortable in the rainy season, winter, and at night time. Seasonal presence of people, and of crops, was found to affect privacy in openly defecating. An increase in the number of people present was reported to make it more difficult to find privacy, whereas thicker crops (e.g. in times coming up to harvest) were reported to increase the chances of finding privacy. Open defecation location was found to shift seasonally due to crop cycles also. While defecating in another community member’s field with crops is acceptable in winter when the fields are bare, it is not acceptable when crops are visibly growing.

6.9 Simkot-W1

Simkot is the capital of the District of Humla. Research was conducted in Ward 1 only. Details of the research conducted are shown in Table 6-14 and Table 6-15.

Table 6-14 Research details for Simkot

Case Study No.	3
Population	260
Households	60
Visited	Dec '11, Feb '12, Mar '12, May' 12, June '12
Research Assistant	3, 4

Table 6-15 Interviews and focus group discussions in Simkot-W1

Interviews		**Focus Group Discussions**	
Total	13	Total	3
Male	6	All Male	1
Female	7	All Female	1
Mixed group	0	Mixed group	1

Simkot Ward 1 is in the Maathi-lo gaun or Upper village of Simkot, at an altitude of approximately 2970m.a.s.l. It comprises exclusively of the low caste Dalit[1] population of Simkot. Figure 6-30 shows a photo of Simkot taken from a hill behind the town. The Dalits inhabit the area at the back of Figure 6-30 to the front of the dashed line.

Figure 6-30 A view of Simkot. All Dalits live to the North (foreground of the picture) of the dashed white line (Author, 2012)

Figure 6-31 A close up of the homes of Ward 1 (Author, 2012)

Simkot is comparatively amenity rich; it has an airport, 2 hospitals, a health post and a market centre filled with shops. The land used for the airport was previously the farming land of the Dalits which was purchased at a high rate by the local government. Thus while the last generation of Dalits to live here benefitted from this sale, the next generation are struggling due to the lack of land.

[1] The term Dalit is a designation for a person who belongs to a low caste in India or Nepal, otherwise known as an 'untouchable'.

There is an obvious disparity in resource access, land ownership, material wealth and living conditions between the Dalits and communities in the other case studies and other areas in Simkot. Barefoot children play outside very small densely packed mud homes with smoke billowing from the balconies due to a lack of improved stoves. A row of typical Dalit homes are shown in Figure 6-31.

There are far fewer animals by the homes of the Dalits. Some donkeys, cows, goats and chickens were observed.

The ward 1 area of Simkot is filled with visibly darker, smaller and older homes than the rest of the village. Smoke can be seen to billow from these homes and their balconies early in the morning and in the evening. Children, in many instances, are obviously less clean than in neighbouring areas. Members of the community are aware of their environmental sanitation issues.

"Yes, I think it's dirty. Open defecation, lack of awareness, negligently throwing trash everywhere has led to this problem" **(S21-M)**

There is not a significant amount of solid waste; however the area as a whole has a more untidy appearance than other wards in Simkot. The main taps in the community are the primary area where solid waste is visible as they are used by much of the community for clothes washing and are surrounded by detergent wrappers.

There are clear areas of open defecation toward the rear of the community. The cleanliness of the area has, however, been improving:

"*Compared to earlier years, it's (Simkot) much cleaner. Then, the paths had human faeces around so much*" (FGD11-S)

6.9.1 Seasonal Access to Water in Simkot W1

6.9.1.1 Water infrastructure

The main water supply for Ward 1 is Simkot is 'the three taps' as shown in Figure 6-32. The 'three taps' is the common term used by all inhabitants of Simkot for this water outlet despite the fact that there are no actual taps present. In fact the 'three taps' refer to three open-ended outlets, with water constantly flowing from plastic pipes mounted in a stone wall. Figure 6-33 shows a close up of one of these outlets. This was the only outlet of this style seen by the researcher in the district. The 'three taps' lie approximately 100 meters away from the nearest point of Ward 1and 400 metres from the furthest. These 'taps' serve as the main supply of water for bathing and clothes washing for much of the surrounding area of Simkot.

The plastic outlet pipes currently in ‘the three taps’ are said to have replaced bronze fittings which were in these fixtures up to approximately 2000 AD. The old (reportedly) bronze fittings are blamed for the yellowing of the teeth of many of Ward 1s inhabitants; a problem that still occurs today. No information was gathered to verify or dismiss this claim, although the problem of severely stained teeth was observed to be true in many of Ward 1’s residents.

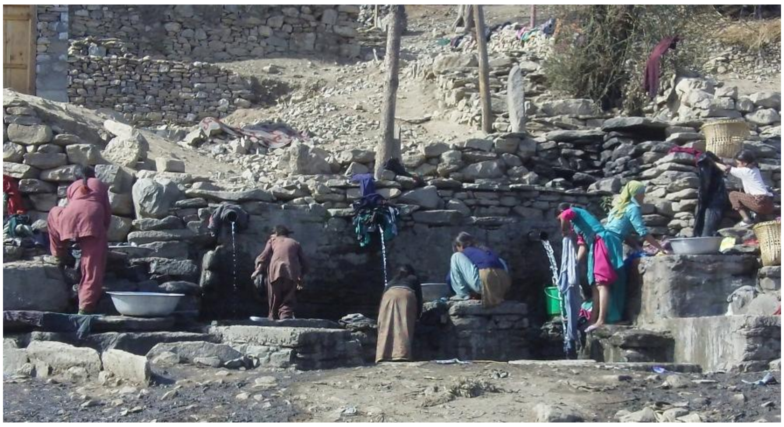

Figure 6-32 The 'three taps' - a primary water supply for all in Simkot (Author, 2012)

Figure 6-33 A close up of a 'tap' (Author, 2012)

There is no doubt that there is a much higher prevalence of extreme yellowing (almost like a deep yellow plaque) on the teeth of those in Ward 1. No other village seems to have this same problem. It is blamed on the bronze taps that existed years ago but I’m not how logical this reason is as it is also present on young children’s teeth

(Field notes, 28-03-12).

The source of the ‘three taps’ was unknown by any individual questioned. This lack of information was blamed on the age of the supply.

The flow from each of the pipes was seen to vary – with the left most pipe having a low flow compared with the pipes to the centre and right. This effect can be seen in Figure 6-32. The left pipe was reported to be traditionally allocated for Dalits and menstruating women; but in recent years this restriction was lifted so that Dalits and women with their periods could now use any of the outlets. Dalits were still noted to primarily use the pipe on the left.

Within Ward 1 three alternative individual taps were constructed in recent years with the support of an NGO. These taps were reported to have worked on the day of their opening ceremony, but ceased to work completely in as little as one day after this. One example of these dry taps is in Figure 6-34. The failure was blamed on poor construction – including failure to bury the pipes leading form the source to the tap, thus leaving them exposed to damage from animals and children. The pipes are now permanently out of use.

These taps had been a great advance in water supply for Ward 1. While 'the three taps' are relatively close in distance to the nearest home (~100-400m from all homes), the vertical climb back from the taps is steep and thus fetching water is a struggle.

In times when the functional "three taps" are dry, the default option is a trickling spring in Ward 2 (Figure 6-35). Dalits were previously banned from accessing this site, but are now permitted to use this tap when in need.

Figure 6-34 One of the broken taps in Ward 1 – these taps delivered water for one day only (Author, 2012)

Figure 6-35 A small spring source in Ward 2 (Author, 2012)

The drainage in Simkot is poor with all water from the 'three taps' flowing down the main paths of the town (see Figure 6-36). Repairing drainage from Simkot's 'three taps' is a project that has been completed '3 or 4 times' (FGD11-S). Typically a bad job has been carried out and the money embezzled.

This poor drainage does not affect those in Ward 1, as all homes are uphill from water access points. Access to irrigation water for the land of the inhabitants of Ward 1 is a struggle, as the land is uphill from their homes. There are no water sources to irrigate these fields. Demand for irrigation is high due to an influx of new crops to suit the higher temperatures in the district e.g. green vegetables, potatoes, barley, and maize.

Figure 6-36 Water from 'the three taps' flowing down the paths of Simkot (Author, 2012)

"Years ago, it didn't matter if it rained as we used to cultivate crops that didn't require much water (millet, buckwheat, 'chino'). I am not sure this is true but it is said that our forefathers prayed for it to not rain as the rain would have been harmful to the crops we cultivated then"
(FGD11-S).

6.9.1.2 Household water – seasonal assessment

Details for water access in Simkot are in Table 6-16. For the course of the year, household water for those in Simkot W1 is primarily sourced from the three taps. The stone tap in ward 2 serves as a back-up if the three taps are out of use.

There were many complaints about the difficulty in accessing water during times when the ground was slippery underfoot – particularly during winter and the rainy season. As can be seen in the 'collection' section of Table 6-16, this was regularly mentioned to be an issue.

An example of a path between the homes in Simkot during winter is shown in Figure 6-37. Figure 6-38 shows the extent of snow coverage over a section of the 'three taps' during the winter. One of the hazards the author noted, as did one interviewee, was the fact that in winter time, the large drainage apron of the taps would fill and become particularly slippery, making it very difficult for anyone to stand close to the taps. Figure 6-39 shows the 'three taps' in the depth of winter. Soap residue in the apron caused a similar slipping hazard.

"*There is so much snow. Recently, one woman broke her arm while getting water*" (S2-F).

At times the ground is slippery to the point where children cannot collect water.

"In the monsoons and winter, when it's extremely slippery, we don't send children to get water. The older ones must go to fill up the containers" **(S12-M).**

Children were also found to have trouble accessing taps due to large crowds gathered there. Taps were reported to be most busy:

"*…during festivals and on Saturdays. On Saturdays people don't even let you take a quick drink of water*" (S2-F)

Queues were an issue year round as much of the population of Simkot use the 'three taps' supply. This was attributed to the fact that the water at the outlets is slightly warm and as a result it is easier to wash oneself or one's clothes at this supply.

Figure 6-37 A slippery route in Simkot in Winter season (Author, 2012)

Figure 6-38 A completely frozen alternative water source and bucket abandoned while filling in Simkot (Author, 2012)

In field notes, the taps were observed to be very busy on sunny days during cold periods as everyone rushed to wash themselves and their clothes. The main supply to homes in Simkot was susceptible to freezing in winter, this lead to very high demand in winter at times. A comparison of busy-ness is shown in the contrast between Figure 6-39 and Figure 6-40.

One respondent noted that storing water in the home post collection was difficult in winter as containers' contents might freeze, particularly if they only contained a small amount of water.

Figure 6-39 The 'three taps' on a cold winters day (Author, 2012)

Figure 6-40 The 'three taps' on a warm winters day (Author, 2012)

Water quantity at the taps was reported adequate or high for all times of year except spring, but quantity of water at the tap was reported to be decreasing year on year, reducing the smaller of the 'three taps' plastic outlets to the left down to a trickle at times.

Table 6-16 Summary of data describing seasonal household water access in Simkot Ward 1

	Household water – Ward 1 Simkot											
	Spring			**Summer/Rainy**			**Autumn**			**Winter**		
	F	**C**	**B**	**J**	**A**	**S**	**B**	**A**	**K**	**M**	**P**	**M**
Source	The three taps (7)											
Back up:	Stone tap, ward 2 (3)											
Collection				Down/Uphill slippy (5)						Down/Uphill slippy (5)		
	Need to push in to taps - children find it difficult to collect water due to big crowds (2)											
Quantity	Low, increase as snow melts (1)			High (2)			Acceptable (2)			Acceptable (2)		
	Decreasing dramatically year to year (2)											
	Sufficient (3)			A lot (3)			Low (2)			Low (3)		
Demand	Need water for animals (3)			Need to bring water up to graze sites (1)						Very high - all people and animals present (2)		
	Need to collect water for animals - if they drink from puddles near tap they will drink dirt and soap (2)											
Queue	Always busy -all of Simkot come to use this resource (6)											
	Animals in village - contribute to queue (4)							Animals in village, contribute to queue (4)				
									Very busy on sunny days (3)			
									Very busy when main town supply breaks (1)			
	Busy during festivals, Saturdays (2)											
Quality				Muddy (7)						A little dirty (1)		
	Stains teeth bronze (3)											
Treatment	None (4)											
				Settling/boiling (2)								
				Use alternative source (2)								
Infrastructure functionality				Peak functionality (1)						Base of tap frozen (1)		
	Left tap almost completely dry (2)											
	No drainage or attempt to use water from tap whilst fields nearby remain lack irrigation (2)											

A need was highlighted for animals to have a separate water source particularly during spring and winter seasons. The 'three taps' lie directly on the main exit/entrance route from Simkot; thus anyone departing or arriving at Simkot was likely to bring their animals to this water supply for a drink upon departure or arrival. This was seen as the only option for animals in the village but was recognised to be unsuitable due to the high amounts of soap from bathing and clothes washing in the basin from which the animals drank. As can be seen from the 'queue' section of Table 6-16, this was mentioned regularly by interviewees.

Quality of the water was reported to become quite muddy during the rainy season at the 'three taps'. As the source of the water could not be located, the reasons for this are unknown by the author.

6.9.1.3 Bathing- seasonal assessment

A summary of information on bathing is reported in Table 6-17. The 'three taps' were reported by respondents to have slightly warm water compared to other sources in Simkot – as a result they are typically a popular bathing spot for the entire town.

All female respondents confirmed use of this water supply year round for bathing. Bathing was on average reported to occur about once or twice a week.

We would bathe all the time in summer if we had the time. In summer, we don't have time to bathe, and in winter we have plenty of time but it's too cold to bathe. Even in the summer we only bathe every 4 to 5 days **(S2-F).**

Men reported issues of accessing the 'three taps' due to the female dominance.

The men wash their hands and face and try to bathe at the home. There are many women at the taps so we don't get an opportunity to do so **(S12-M).**

As can be seen form the 'queue' section of Table 6-17 – a major obstacle to bathing was the permanent queue at the 'three taps'.

Bathing regularity was reported to decrease dramatically in the winter time. One male respondent also noted that during the time he spent away trading it was almost impossible for him to bathe due to the lack of facilities along the trading route.

Young children were observed being washed on the first floor balcony of their homes, with a very clear peak on Sunday mornings before the beginning of the school week.

Table 6-17 Summary of data describing seasonal bathing practices in Simkot Ward 1

<table>
<tr><th colspan="13">Bathing Simkot W1</th></tr>
<tr><th>Months</th><th>F</th><th>C</th><th>B</th><th>J</th><th>A</th><th>S</th><th>B</th><th>A</th><th>K</th><th>M</th><th>P</th><th>M</th></tr>
<tr><th>Seasons</th><th>Spring</th><th colspan="5">Summer/Rainy</th><th colspan="3">Autumn</th><th colspan="3">Winter</th></tr>
<tr><td rowspan="3">Location</td><td colspan="12">The three taps (6)</td></tr>
<tr><td colspan="12">In home (1)</td></tr>
<tr><td colspan="9"></td><td colspan="3">Heat water at home (2)</td></tr>
<tr><td rowspan="4">Logistics</td><td colspan="3"></td><td colspan="3">Rainy - hard to keep clean (1)</td><td colspan="3">Dusty – hard to keep clean (1)</td><td colspan="3"></td></tr>
<tr><td colspan="12">Very difficult for men to bathe there - imposing on women (3)</td></tr>
<tr><td colspan="3"></td><td colspan="6">Away trading – go anywhere that’s available (1)</td><td colspan="3"></td></tr>
<tr><td colspan="2"></td><td colspan="7">No time (1)</td><td colspan="3"></td></tr>
<tr><td>Queue</td><td colspan="12">Very large queue at all times (3)</td></tr>
<tr><td>Privacy</td><td colspan="12">Crowded at tap - no privacy possible (3)</td></tr>
<tr><td>Temperature effect</td><td colspan="9"></td><td colspan="3">Too cold (4)</td></tr>
<tr><td rowspan="4">Bathing regularity</td><td colspan="3">1 or 2 times week</td><td colspan="3">1 or 2 times/week</td><td colspan="3">1or 2 times/week</td><td colspan="3">Warm days (3)</td></tr>
<tr><td colspan="12">At least twice during menstruation (2)</td></tr>
<tr><td colspan="9"></td><td colspan="3">Elderly don’t bathe (1)</td></tr>
<tr><td colspan="9"></td><td colspan="3">Much less - feel dirty (4)</td></tr>
</table>

6.9.1.4 Clothes Washing – seasonal assessment

A low amount of data was collected on clothes washing in Simkot W1. The responses that were received are summarised in Table 6-18.

Table 6-18 Summary of data on seasonal clothes washing in Simkot W1

Clothes Washing Simkot W1												
Months	**F**	**C**	**B**	**J**	**A**	**S**	**B**	**A**	**K**	**M**	**P**	**M**
Seasons	**Spring**			**Summer/Rainy**			**Autumn**			**Winter**		
Location	The three taps (4)											
Logistics					Difficult to dry clothes in rain (1)					Difficult to get clothes to dry in cold (1)		
	Extremely busy - difficult to get space (1)											

According to the interview content, clothes washing in Simkot always takes place at the 'three taps' unless the area is busy to the point where the 'three taps' cannot be accessed.

***"On Fridays and Saturdays it is hard to find a spot to wash clothes. We end up going to a stream far from our village"* (S25-M).**

Alternatively water would be collected and brought to the home for clothes washing.

The year round busy-ness of the tap was the main obstacle reported to getting clothes washed. There was a reported difficulty in drying clothes in the winter and rainy season, with spring proving the most conducive time of year for clothes washing.

6.9.2 Seasonal Access to Sanitation in Simkot W1

6.9.2.1 Sanitation Infrastructure

Of the 13 interviews conducted in Simkot W1, 1 person reported having a latrine (the only member of the Chhetri caste in the ward) and 1 more had a latrine under construction. The latrine under construction was government-supported after the individual went to the government to request support. The remaining 11 interviewees had no facilities and went for open defecation on a nearby hill.

Lack of space was the main reason provided for a lack of facilities (4), followed by poor access to materials (3), a lack of time (2) and no interest (1). Again, respondents reported that those with latrines within the village did not use them (FGD11-S).

Research Assistant, Ranju Sharma made the following observation about the function of the latrines:

<u>An interviewee told me "We have dug a pit, the stool goes into the pit and disappears underneath the surface of the pit. We don't know where it goes". I thought this was something to be alarmed</u>

about. There is a possibility that the latrine waste is not contained in these pits but is sucked in by the loose soil underneath. As far as I know, that is not good for the underground water sources in the area. In one other interview I remember a person telling me that the latrine pits never get filled in Simkot as the soil is so loose and it absorbs everything. Definitely something to think about…

(Field notes, 04-06-12).

This field note was made toward the end of the study and thus the concern regarding suitability of soil in Simkot for pit latrines could not be considered further.

The majority of the population of Ward 1 openly defecated on a hill to the west of their homes. To gain privacy on the hill, one must dodge scrub and scramble up rocky ground; thus this site was a struggle for the elderly, and was not typically visited by children. Children were more likely to defecate in pits close to the homes.

Most respondents brought nothing to open defecation sites with them for anal cleansing and chose to use the available rocks and leaves. Others claimed to bring water with them, but this was not observed by the research team.

"We have a bottle that we carry water in, when we go" **(S12-M).**

6.9.2.2 Sanitation – seasonal assessment

No data were collected with regard to use of latrines in Simkot Ward 1 as there was only one latrine present. Seasonal data on open defecation are presented in Table 6-19. As can be seen from the table, the majority of respondents reported defecating up a hill beside Simkot.

Problems with open defecation were reported as

1. Privacy
2. Comfort defecating during wet or cold seasons.

A hill by the side of Simkot W1 is used for open defecation. Some respondents alluded to going to defecating a little closer to the village in winter. Others were defiant about going far.

If we have to go at night or early in the morning when it's snowing, it is troublesome. No matter what, we have to go far, as we don't want to be seen by the other villagers while defecating or urinating. It is really inconvenient **(S9-F).**

On the approach to the agricultural planting season, community members reported having to clear faeces from the land they would sometimes use for defecation during the winter, due to the fact that the land used belonged to Chhetris from another Ward of Simkot as it would upset them to find human waste on their land.

"When it is time to farm, we have to pick all of it up and throw it far away. The land belongs to the Chhetris, so we have to clean it up when they come to farm" **(S7-F).**

Seasonal slipperiness on the way up the defecation hill is shown in Table 6-19 to be a source of inconvenience in rainy and winter seasons, with discomfort overall noted to be worse during this time.

6.9.3 Menstruation – seasonal assessment

Most menstruating women in Simkot said they wore underwear with folded up cloths in them during menstrual periods. As part of Chhaupadi practice in the area, menstruating women were said to be restricted to using the left tap of the 'three taps' (the tap originally assigned to the Dalits) during their period. Reports did suggest that this practice was diminishing.

"We have suggested segregating a tap for such cases but women don't listen and they wash clothes and dishes in the same tap. If Dhami or Dangri go to the taps, they listen but sometimes the women don't tell us they're menstruating" **(S12-M).**

No Khullos exist in Ward 1 in Simkot, thus many women sleep outside or in a room in the ground floor of the home with the animals when menstruating. Varying levels of strictness were reported about women staying in or outside the house. Some reported that they could stay within the house unless a Dhami or Dangri (healer) was present:

***"We have a room on the ground floor of that house to stay during periods. We don't stay outside after or while giving birth to a baby anymore. They only follow the practice strictly in houses of Dhamis and Dangris*"** **(S11-F)**

Other women reported remaining outside. For those individuals outside, snakes and insects were a worry during the rainy season. Overall this practice was said to be unpleasant, but was treated as a rule which should not be questioned.

Table 6-19 Summary of data on open defecation in Simkot Ward 1

Basic sanitation - Simkot Ward 1												
Months	**F**	**C**	**B**	**J**	**A**	**S**	**B**	**A**	**K**	**M**	**P**	**M**
Seasons	**Spring**			**Summer/Rainy**			**Autumn**			**Winter**		
LATRINE USE												
Comfort	No data											
Ease of use	No data											
OPEN DEFECATION												
Location	Uphill beside village (4)											
	Young children and elderly close to home in pits (1)											
										Closer to home in winter (1)		
	Sometimes on people farms - source of anger - need to pick waste off before summer (2)											
Comfort	Annoying to go outside and far in bad weather (2)											
Ease	Difficult for elderly to get privacy (2)											
				Hill for open defecation is slippery in rain (2)						Hill for open defecation is slippery in snow (1)		
	Afraid to go far in the middle of the night (1)											
	Children play in the open defecation areas (1)											

6.10 Simkot W1 Summary

Investigation in Simkot has shown that the entire community in Ward 1 are dependent on a single water supply, locally known as the ‘three taps’. While the three water outlets at the ‘taps’ rarely appear to be dry, there are times of year when quantity is insufficient to meet demand and long queues form. Queues predominately occur in the spring, before festivals and on intermittent warm days throughout the winter season.

Bathing and washing of clothes are carried out at the ‘three taps’ – with water being removed to the homes for use in particularly busy times.

While the horizontal distance to the ‘three taps’ from Simkot Ward 1 is less than the Sphere standard of 500m, the vertical distance descended in travelling toward the ‘three taps’ from the Ward, and ascended on the way back, has an impact on the convenience for individuals collecting water.

Use of latrines was not documented in Ward 1 due to the presence of just one latrine for the estimated population of 260. A hill behind the village is the typical site for open defecation. Slippery surfaces in the rainy and winter season impacted the ease of travelling up this hill, while prevailing weather conditions also impacted on the comfort of defecation.

Menstruating women often sleep outside the home in Simkot – many of them in poor canopies tented canopies on the first floor balcony. While discomfort was alluded to, the practice was not questioned.

6.11 Chapter Summary

This chapter has provided data on seasonal access to water and sanitation in all case studies. The chapter began with an overview of the basic forms of infrastructure observed in each case.

Water infrastructure has been found to almost uniformly consist of gravity fed taps to cater for all water uses, domestic and productive. Latrines have been shown to be either basic pit latrines, raised pits and/or offset pour flush latrines. This information on water and sanitation infrastructure will feed into research question 1(c) which asks 'does the functionality of the community water and sanitation infrastructure vary intra-annually?'

This chapter has presented the data obtained from the interviews, focus group discussions, observations and field notes for each of the three case studies conducted in this research. Each case study has been reported individually, with descriptions of seasonal household water access, bathing practices, clothes washing, sanitation and menstruation presented and provisionally discussed.

Chapter 7 will seek to analyse the commonalities and differences between the cases, while drawing out key points of consideration for this areas of Humla in relation to the aims and objectives of the research.

7 Discussion of Case Studies

7.1 Chapter Outline

In this chapter, the three case studies from this research are compared and contrasted to find similarities and differences between them. This will allow for an assessment to be made of the 'uniqueness' of the observations and results in each case, and give clearer view of the lessons that can be learned for Humla as a whole.

The chapter draws on the research questions presented at the beginning of this work, the literature presented in Chapters 2 and 3, reports on the 'Study Area' from Chapters 4 and 6, and results presented in Chapter 7 to explain what this research has contributed to address Aim 1 of this work: **To investigate intra-annual patterns in access to water and sanitation for low income communities in Humla, Nepal**.

Results and discussion with regard to Aim 2, 'to determine intra-annual patterns of challenges and opportunities for improving standards of water and sanitation in Humla District, Nepal', are presented in Chapter 9.

45 interviews, 9 focus group discussions, unstructured observations and field diaries have been used to address these questions. A summary of data collected through interaction with community members is presented in Table 7-1.

Table 7-1 Summary of interviews and focus group discussions addressing Aim 1

	Kermi	Chaggaunphaya	Simkot-W1	Total
Total Interviews	16	16	13	45
Interviews Male	6	8	6	20
Interviews Female	10	8	7	25
FGDs	3	3	3	9
FGD male	-	1	1	2
FGD female	-	2	1	3
FGD mixed	3	-	1	4

7.2 Baseline Information Summary

Population

Chaggaunphaya has the largest day to day population of the case studies due to the presence of students attending the secondary school. While Simkot as a whole has a large population, no one other than the residents frequented or stayed in Ward 1.

The population of Kermi was found to vary significantly seasonally due to the large amount of people and large animals that travel to grazing sites and trading. The popularity of the hot springs with outsiders also led to seasonal shifts in the population of the area.

The population of Chaggaunphaya was not as significantly influenced by those leaving for trading or grazing as fewer members of the community owned animals that needed to be moved to higher ground. The lack of large animals in Chaggaunphaya also restricted the amount of trading and transport of goods that was carried out.

In Simkot W1, ownership of animals was observed to be lesser still, and seasonal departures of the members of the community were uncommon. The town as a whole did become significantly busier due to the tendency of outsiders to visit the area in late spring, early summer.

Water Supply

In all case studies, water was found to be distributed via central water points. No home interviewed or observed had water supplies directly to the home. A summary of primary household water supplies is shown in Table 7-2. Main taps were cast in concrete in all cases apart from Simkot, where plastic pipes were embedded in a stone wall. While Kermi and Simkot had infrastructure that worked comparatively well, recent 'upgrades' to the system in Chaggaunphaya had left the system in disrepair.

Table 7-2 Summary of household water supplies in case studies

Case study	Kermi	Chaggaunphaya	Simkot – W1
Main water supply	Taps (x5)	Taps (x6)	'Three taps' (in one structure)
Source of water	Not visited – dangerous and long journey	Visited – abundance of exposed pipe and open breaker tanks	Unknown
Storage in community	None	Small reservoir at school	None
Back up source	Hot springs	-Small spring -River Karnali	Small spring in Ward 2
Broken Infrastructure	All functioning	Entire system in disrepair	Broken taps within ward (functioned 1 day only)
Drainage from main supply	None	None	Concrete channel under construction

Only in the case of Chaggaunphaya was the source visited. In Simkot the source was unknown, and in Kermi it was advised that the journey to the source was too treacherous for an 'outsider' to undertake as it would require camping along the way.

Chaggaunphaya had some water storage available in the form of a small reservoir at the school.

Environmental Sanitation

The largest amount of solid waste was seen in Chaggaunphaya, where a number of tea shops thrive thanks to the hundreds of school children that stay in the village. Both Kermi and Simkot W1 were observed to have solid waste primarily in the form of empty soap and washing powder packets around their water supplies.

Simkot W1 had a more unsanitary appearance than Kermi or Chaggaunphaya due to the thick black smoke billowing from its houses makeshift chimneys, and the state of disrepair of the homes in comparison with the other cases. Children appeared less clean and many were barefoot.

Sanitation

In terms of sanitation infrastructure, Kermi is the most advanced case study with 6 out of 15 people asked having a functional latrine (see Table 7-3). In Chaggaunphaya, latrine structures stood but were in disrepair. In Simkot W1 latrines were yet to be constructed. If the number of people with a functional latrine is converted to a percentage for each case study based on how many people were asked, the range is found to be 40% (Kermi) to 7% (Simkot W1). Due to the very low numbers of people interviewed, these percentages cannot reliably be taken as representative of the districts they are in. However it is worthy of note that all figures calculated are lower than the 2012/13 estimate of access to sanitation in Humla which stands at 43% (Government of Nepal, 2010).

Table 7-3 Summary of sanitation infrastructure

Category	Kermi	Chaggaunphaya	Simkot W1
Asked if has latrine	15	26*	13
Has latrine	6	4	1
% of people with functional latrine	~40%	~15%	~7%
Broken/out of use latrine	2	8	0
Latrine under construction	1	1	1
No latrine	6	13	11

*10 individuals in an FGD included

There was high incidence of government and NGO support across the case studies for the construction of latrines with very few systems having been constructed independently by community members. Table 7-4 shows how this differed across the communities.

Table 7-4 Summary of sources of support for latrine construction

Support	Kermi	Chaggaunphaya	Simkot W1
GO/NGO supported	7	9	1
Independent	1	1	1
No Data	0	2	0

In interviews, very few people were reported to be using the latrines even if they owned them – this was triangulated and confirmed via observation. Despite this, open defecation or evidence of human waste outside of designated open defecation areas was rarely observed. All case studies had one or two areas unofficially designated for open defecation. In these areas human waste was found to be abundant. The elderly and young children were not found to use latrines regularly in any case. Reasons provided for lack of latrine use included fear of falling into the pit, unfamiliarity with technology and overall difficulty (Section 6.6.2.1.).

7.3 Seasonal Access to Household Water

In all case studies, communities were found to have one main water supply[23] year-round and a backup supply for times when the primary source was not functioning (as was shown in Table 7-2). Unlike studies completed by Dessalegn et al (2013) and Coulter (2008) in Ethiopia, and the World Toilet Organization (2010) in Cambodia, a significant shift towards an alternative water source in the dry season was not observed. This study aligns more with Bostoen (2007) in Lao where just 12% of people were found to vary their primary water access point seasonally. While no attempt was made to quantify regularity of use of an alternative source in this study, it was noted through observation that alternative sources were used at times when queues were significant or main supplies were dry (in no case was this reported to happen for more than a few days).

7.3.1 Collection

Table 7-5 presents a summary of data on collection of water for household use. In all cases ground conditions in the rainy and winter seasons was found to cause difficulties in accessing water sources.

Table 7-5 A comparison of issues in collecting water across the case studies

Month	**F**	**C**	**B**	**J**	**A**	**S**	**B**	**A**	**K**	**M**	**P**	**M**
Season	**Spring**			**Summer/Rainy**			**Autumn**			**Winter**		
Kermi					Slippery (rain)					Slippery (snow)		
							Too busy with work					
Chaggaunphaya				Slippery (rain)						Slippery (snow)		
							Too busy with work					
Simkot W1				Slippery (rain)						Slippery (snow)		

Depending on household location in Kermi and Chaggaunphaya, householders had to travel varying distances horizontally and vertically to access a water point. All homes in Simkot had to undertake a similar trip down a steep slope to the 'three taps'. These journeys were reported to be particularly difficult when carrying heavy water containers back to the home. Slips or falls on the way to and from water points often resulted in spilled water, and on rare occasions, injuries or broken bones. Vertical distance was found to have a greater impact on the difficulty of collecting water when compared with the horizontal distance.

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[23] When travelling further north in the district towards the end of the stay in Humla the researcher did stay in one area which had completely separate sources for summer and winter time.

In Kermi in particular, the main paths through the community were shaded by larger households and as a result, the 'sloppiness' of the paths post rain and post snow could last for many weeks before these unpaved and saturated areas would dry.

The households in these communities were typically found to lie within Sphere standard requirements of a maximum of 500m horizontally between a household and a water supply. However the severe slopes on the way to many water points and the seasonal increase in difficulty walking on them was found to impact on the relevance of the indicator for the area generally, and seasonally. This suggests that consideration should be taken of the relevance of these standards to a mountainous community.

The guidance notes for the Human Right to Water specify that water must be physically accessible (United Nations, 2010a). The results of this research show that in the communities under analysis, the degree of physical accessibility varied seasonally and thus a shift occurred in relation to attainment of the Human Right to Water[24].

In autumn, the main problem in collecting water from the community supply was finding the time to do it. In Kermi and Chaggaunphaya in particular, busy harvest seasons resulted in it being difficult for women (the primary collectors of water) to physically find time to get to the taps. In Simkot W1, land ownership is lower, thus farming and demanding schedules in autumn were not highlighted as a barrier to water collection.

Studies by Coulter (2008), Dessalegn et al (2013) and the World Toilet Organization (2010) showed that time taken for collection of water significantly increased in the dry season[25] (as journeys to alternative supplies had to be undertaken). However, in this study there was not a substantial shift in time taken to collect water. While slippiness, queues, and intermittently frozen outlets caused some issues, the increase in time taken was not seen to be close to the same magnitudes reported in Cambodia and Ethiopia.

The most dramatic increase in collection time was observed to occur in Chaggaunphaya, where community members would, at times, be forced to walk to the River Karnali for water. This alternative trip increased collection time from approximately 15 minutes when using the primary source, to two hours.

[24] Though levels of water access are so poor in Humla that the Human Right cannot be considered to have been met at any time of the year

[25] In some cases up to a fourfold increase in time

7.3.2 Quantity at Source

In all cases under analysis the same pattern of water quantity can be seen. The pattern consists of shortages in spring, followed by an abundance of water in the summer/rainy season, followed by acceptable quantity of water in autumn, decreasing into low availability in winter. The alignment of these fluctuations is shown in Table 7-6.

At the time of data collection the quantity of water at taps in Chaggaunphaya was completely unpredictable due to their poor functionality following a landslide at the source.

Table 7-6 A comparison of water availability at primary source

Month	**F**	**C**	**B**	**J**	**A**	**S**	**B**	**A**	**K**	**M**	**P**	**M**
Season	**Spring**			**Summer/Rainy**			**Autumn**			**Winter**		
Kermi	Very low			Very high			Acceptable			Low		
Chaggaunphaya	Very low			Very high			Low			Low		
Simkot W1	Low			High			Acceptable			Acceptable		

As was discussed in Section 2.2, time series data can be split into trend, seasonal, cyclical and irregular components. From this analysis it can be determined that in Kermi and Simkot W1, seasonal components to water quantity exist. In Chaggaunphaya, the same seasonality was visible, but at the timings of the research visits (December 2011 – July 2012), an 'irregular' component, in the form of the recent landslide at the newly developed source caused a greater impact on the trend than seasonality.

In the other studies reviewed (Anand & Jenkins, 2010; Coulter, 2008; Dessalegn et al., 2013; Illian & Cikhartova, 2010; World Toilet Organization, 2010), only two seasons were compared: wet and dry. This study includes four seasons and is thus difficult to draw comparison with these studies. In common with these studies water was found to me more abundant in the rainy season and scarce in the dry season (which was found to equate to spring). Analysis of autumn and winter seasons show that this peak in availability gradually decreases through the year, until sources replenished again by the next rainy season. One respondent in Chaggaunphaya did suggest that melting snow also provided a small boost to water availability (more on this in section 8.5.1.)

7.3.3 Water Demand

Water demand was found to follow a similar pattern in all case studies with high demands in spring and winter and lower demand in summer through autumn. A comparison of results from each case study is shown in Table 7-7. These fluctuations in water demand were primarily found to be a function of the number of animals and people in the village, and the need for water for irrigation.

Table 7-7 A comparison of water demand for all case studies

Month	F	C	B	J	A	S	B	A	K	M	P	M
Season	**Spring**			**Summer/Rainy**			**Autumn**			**Winter**		
Kermi	High		Low					High				
Chaggaunphaya	High			Low				High		Very high		
Simkot W1	High									Very high		

Lama communities were found to be a more mobile population, with Kermi having the most significant fluctuations in the number of people and animals in the village. In many cases the author found homes empty in the summer due to children being away at boarding school, family members away with animals at high altitude grazing sites and men away trading in Simkot or China. The number of inhabitants present was found to increase as people returned for the harvest and increased again when animals and people who had travelled to grazing sites returned to the village from early winter through to the end of spring. As shown in Figure 7-1, animals were found to drink from the drainage basin of taps in some cases and in other cases would drink directly from the tap. A similarly shaped pattern of population fluctuation was seen in Chaggaunphaya but to a lesser extent.

Figure 7-1 Animals contribute to demand at a tap in Kermi (Author, 2012)

Simkot W1 did not have this same variation in people within Ward 1 as few people go to summer grazing sites (which lie a few hours behind the village) and few go trading. While the community population of Ward 1 was not found to have the same extent of population variation as the other case studies, the population of Simkot as a whole did vary significantly due to the influx of traders and tourists in the months before and after the rains. These incomers would place significant demands on ‘the three taps’, particularly as they passed them while entering or exiting the town with large packs of animals.

Overall it was Kermi that was observed to have the greatest seasonal fluctuation in population of the village, and thus the greatest seasonal demand for water. While the population of Simkot W1 did not change, the position of their water supply at a point where seasonal traders pass meant that it also experienced great seasonal demand. Seasonal demand in water in Chaggaunphaya was caused by the presence of the school children. This increase in demand is significant, but more long lasting and predictable.

In her 2012 paper at the Seasonality Revisited Conference, Coulter (2012) discusses the importance of linking water availability with livelihood calendars. This relationship was found to be vital in determining access to water in the communities under analysis in this work. It would appear that peaks in water demand (spring and winter) coincide with decreased water availability. It is difficult to discern in this study whether this decreased water availability is a perceived one due to the increased demand, or is literally a commentary on decreased quantities of water available at the primary supply points. An analysis of the functionality of the water infrastructure with volumetric measurements of quantity available would have been meaningless in this area without an assessment of the demands for water at that point in time. Whether the shortage of water is literal, or perceived, the fact is that in all cases there was not sufficient water to meet demand in the spring. In general the duality of supply and demand must be understood and satisfied to implement an effective solution.

Livelihoods also affected access to water in terms of people's access to water while away from their home community. This is discussed further in Section 7.6.6.

7.3.4 Queue

The reasons for queues for water were primarily a function of availability and demand. At the time of the visit, the water source in Chaggaunphaya was in such disrepair that queues were almost constant. Scenes such as those in Figure 7-2 were common, where community members (in this case, children) queued with containers in anticipation of the arrival of water at the tap.

Figure 7-2 Children queue for water at an out of use tap in Chaggaunphaya (Author, 2012)

In Kermi and Simkot W1, queues were observed to be a function of demand and availability. As a result queues in both cases were high in spring, a time of year when water shortages are prevalent and demand for water is high. A summary of information on the presence and length of queues is presented in Table 7-8.

Table 7-8 A comparison of queuing times across the case studies

Month	**F**	**C**	**B**	**J**	**A**	**S**	**B**	**A**	**K**	**M**	**P**	**M**
Season	**Spring**			**Summer/ Rainy**			**Autumn**			**Winter**		
Kermi	Highest			Acceptable						High		
Chaggaunphaya	Function of when tap is actually working											
Simkot W1	High								High			
	Almost constant crowd at tap - must queue a lot of the time											

The seasonality of supply and demand led to what appeared to be a seasonally predictable queue. In the winter time in all cases, queues were also noted to vary significantly from day to day, or even within a day, with times of sunlight and increased temperature leading to a dramatic increase in use (particularly for bathing and clothes washing).

7.3.5 Water Quality

In interviews, the water quality was reported to be acceptable with no time of year highlighted as a being particularly vulnerable to water contamination. A summary of information on reported water quality is shown in Table 7-9.

Table 7-9 A comparison of water quality at primary supply in each case study

Month	**F**	**C**	**B**	**J**	**A**	**S**	**B**	**A**	**K**	**M**	**P**	**M**
Season	**Spring**			**Summer/Rainy**			**Autumn**			**Winter**		
Overall	OK											
Kermi	White soapy colour											
Chaggaunphaya	Soapy			Sandy and murky								
Simkot W1				Muddy								

Unlike the work completed by Pritchard, Mkandawure et al., (2007) in Malawi, where shifts in total and faecal coliforms were analysed on a seasonal cycle, the data in this work relates to visible changes in water quality only. Data on presence of coliforms would have added significant and important information in terms of tracking shifts in quality expected to have an impact on health, but equipment was not available that would have allowed for this testing.

Respondents in Kermi and Chaggaunphaya noted a slightly soapy appearance to water in spring. This was attributed by respondents to snow melt. Certainly the Chaggaunphaya source (which was visited) was at a high altitude with a large surrounding water basin, reported to be filled with snow for much of the year. From these observations it is probable that snow melts into the stream containing the intake for Chaggaunphaya. As the Kermi source was not visited, the same claim for this area cannot be verified.

Murkiness and muddiness was highlighted by communities from Chaggaunphaya and Simkot with regard to the water received at their taps in the rainy season. Again, the investigator can only relate experiences from the Chaggaunphaya source; but certainly it was immediately apparent that sandiness and murkiness was present in the water due to the location of the capture pipe in the middle of a river surrounded by very steep and unstable ground. The sides of the river banks are visibly susceptible to erosion, thus filling the source with stones, silt and sand. The source of Simkot's "three taps" was not visited.

7.3.6 Water Treatment

In the majority of cases, water was not treated. A summary of information on water treatment can be seen in Table 7-10. Water was reported as being boiled regularly, but primarily for the purposes of taste, or for consumption of warm drinks in the winter. Treatment was not the reason specified for boiling water in households.

At times, the murkiness of the water in Simkot and Chaggaunphaya would lead to people leaving water to settle for some hours until suspended solids sank to the bottom.

Table 7-10 A comparison of water treatment across the case studies

Month	F	C	B	J	A	S	B	A	K	M	P	M
Season	Spring			Summer/Rainy			Autumn			Winter		
Overall	None											
Kermi												
Chaggaunphaya				Let sand sink to the bottom								
Simkot W1				Settling/boiling								

7.3.7 Infrastructure functionality

Infrastructure functionality was found to be a combination of permanent problems and seasonal problems. A summary of permanent problems is presented in Table 7-11.

Table 7-11 Permanent issues with water infrastructure in all case studies

Case Study	Permanent Water Infrastructure Problems
Kermi	• Taps in village left permanently open with running water[26] • Upper taps fail more often than lower taps • Distance of taps from home
Chaggaunphaya	• Neighbouring village cut/disconnect pipes • Origin is large distance from village so difficult to go there and fix it • Water availability very unreliable since improvement works
Simkot W1	• Left tap of 'three taps' almost completely dry • No drainage from 'three taps' or attempt to use water for irrigation

Seasonal issues affecting infrastructure functionality are shown in Table 7-12.

Table 7-12 Seasonal issues affecting functionality of infrastructure

Month	F	C	B	J	A	S	B	A	K	M	P	M
Season	Spring			Summer/Rainy			Autumn			Winter		
Kermi	Dry					Tank blocked with leaves				Tap/pipe frozen		
Chaggaunphaya				People/animals at graze land damage pipes								
				Sand clogs pipeleine			Leaves clog pipeline					
				High water pressure damages tap								
				Landslides damage intake						Tap/pipe frozen		
Simkot W1										Base of tap frozen		

[26] All water supplies visited were left constantly running but this was only mentioned in Kermi. The only taps observed to stop running were in Chaggaunphaya and this was due to water shortages rather than a conscious effort to stop the water.

In all cases water infrastructure was affected by a number of significant failings year round. Simkot was found to have the most reliable year round supply with two outlets at 'three taps' working well, but with one outlet becoming increasingly dry.

In Kermi, taps were found to be reasonably reliable year round, with taps in the upper section of the community reported to fail most often. While it was only mentioned as an issue in interviews in Kermi, the distance of the taps from the homes in all cases was significant (as discussed in section 7.3.1, these distances appeared further in times of rain and snow). This is a permanent failure of the water infrastructure present. Other issues in Kermi were blockages resulting from clogging of the tank at the intake with leaves in autumn and frozen pipes in winter.

At the time of study (December 2011- July 2012), Chaggaunphaya was suffering from severe unreliability of infrastructure. These problems far outweighed any seasonal issues in the community. In terms of seasonal problems that typically existed before this larger scale failure of the system, there were reports of residents from other communities (specifically a neighbouring Lama community) contaminating and tampering with the water supply along the pipeline form the source to Chaggaunphaya during the peak grazing periods.

In spring, water quantity was described as very low in all cases, but no particular reasons were given for particular infrastructure breakages in that season. In summer, breakages become a problem in Chaggaunphaya where the system in place is susceptible to clogging from sand, landslide damage, or when they system actually functions: the pressure being so high that it damages the outlet.

One respondent in Chaggaunphaya noted that breakages were most prevalent in the summer and explained that this was a time of year when they were the most difficult to fix, due to much of the male population being away at graze sites or trading.

In winter problems are predominantly due to the cold weather across all case studies. Both Kermi and Chaggaunphaya water systems were prone to freeze at the collection point (i.e. the tap itself). As seen in Figure 7-3, communities also experienced issues due to the tap stand apron freezing, making the tap hazardous to use at times.

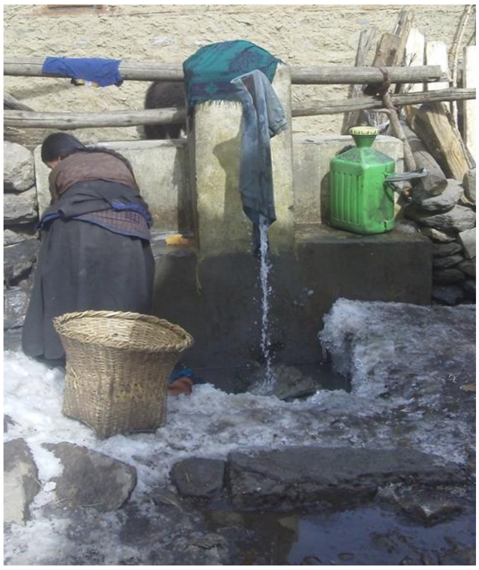


Figure 7-3 A woman uses a tap with poor drainage resulting in water freezing in its apron (Author, 2012)

Overall, the issues seen in Table 7-12 are primarily due to the location of people and the prevailing weather.

7.3.8 Summary of seasonal access to household water

In summary, seasonal access to water for the household was primarily driven by the climate, and its influence on the livelihoods of community members[27] and the physical environment. A representation of the relationship between seasonal dimensions and access to water is shown in Table 7-13. In this table, the source of seasonality (be it climatic or non-climatic) is mapped through to the effect it has on access to water where '✓' indicates a positive effect, and 'x' indicates a negative.

Table 7-13 The influence of seasonality on household access to water

Source of Seasonality				Impact						
Level			Seasonal variable	Household water access						Primary Manifestations
1	2	3		Physical Access	Quantity	Queue	Demand	Quality	Function	
CLIMATIC	Livelihoods	NA	Work schedule	x			x			Time availability, location
			No of people in the community			x	x			Increase in people requiring water
			No of animals in the community			x	x			Increase in animals requiring water
	Weather	Direct	Rainfall	x	✓		x	x	x	Replenish source, wash silt into source, blow off taps
			Snowfall	x	✓		x	x	x	Replenish source, melt into source, freeze pipes
			Extreme cold	x					x	Freeze pipes, slippery ground, slippery tap apron
		Indirect	Ground conditions	x						Slippery ground
			Landslides					x	x	Breaking or damanging source or pipeline
NON - CLIMATIC	NA	NA	Festivals			x	x			Increased interest in cleanliness
			Menstrual Cycle	x						Prevented from using certain taps
			School Year				x			Presence or absence of school children

Seasonally varying features are presented a number of levels. Level 1 describes whether the seasonal variables are climatic or non-climatic, Level 2 breaks these categories down to primary topics under which the variables fit (e.g. livelihoods and weather), and Level 3 breaks these categories down further still – in the case of weather, to variables that are caused directly by the

[27] Livelihoods of people has been listed here as a function of climate as agricultural livelihoods are significantly influenced by climate. It could also be argued that 'livehiloods' are a more cyclical non-climatic process.

weather (rainfall, snowfall, extreme cold) and those which are indirect (landslides and ground conditions). The three non-climatic variables were not categorised.

These seasonal variables are mapped onto a number of components describing ‘access’ to water. These components have been derived from thematic analysis of results presented which applied to each case study. Impact on access to water is assessed via impact on (i) Physical access, (ii) Quantity of water available, (iii) Queue, (iv) Demand, (v) Quality of water available and (vi) Functionality of the infrastructure.

Climatic sources of seasonality dominate, while non-climatic sources include festivals, women’s menstrual cycles and the school year also play a role. In the category ‘livelihoods’ the key factors which seasonally influence access to water are an individual’s work schedule, the number of people in the community and the number of animals in the community. These factors are mapped on to specified areas which influence access to water. The prevailing work schedules of the community are seen to influence the physical accessibility of water (e.g. during harvest time people may not physically have time to collect water), and demand (e.g. particular activities, like irrigation, may demand more water than others).Number of people and animals in the community can be seen to have an impact on the demand for water and resulting queues.

In terms of the seasonal influence of the weather, rainfall and snowfall positively influences the quantity of water available (through their contributions to the source), the demand for water (due to the influence of their yearly magnitude and occurrence on the need for irrigation), quality of water (due to the snow melt and/or rain washing sand and silt into the source) and functionality of infrastructure (through the potential for an abundance of water to overload the system and break the tap, and the potential for snow to bury the tap and make the drainage basin unsafe). Extreme cold weather negatively influences physical accessibility and functionality of the infrastructure due to the potential for water to become frozen in pipes and the tap itself.

Indirectly the weather causes a deterioration of already poor ground conditions. This can lead to difficulties in physical accessibility due to frozen, saturated and/or slippery surfaces. An indirect result of the weather is also the risk of landslides stemming from intense rainfall. Landslides may influence the quality of the water available due to the increase in rock, silt and other particles at the source due to the event. The damage caused by a landslide may damage functionality of a water supply system or in some cases wipe it out completely.

In terms of non-climatic seasonal variation, festivals were found to influence the demand for water and subsequently the queue. This was due to the fact that community members would make a particular effort to be clean at these times. The menstrual cycle influences physical accessibly of water for women only, as in some cases they were discouraged from using the main supply during menstruation.

The school year was also found to have an influence on demand for water. In Kermi this was due to an influx of students returning from boarding school at certain times of year, and in Chaggaunphaya this was due to the influx of students to the village during the school year.

Of course there are many more non-seasonal issues with water access also (e.g. poor sourcing of intake, taps at a distance from the home, too few taps for number of people, lack of skills to repair broken infrastructure, distance between intake and community etc.); however, these will not be dealt with further in this chapter as they are outside of the aims of this research.

7.4 Bathing

The following section summarises data collected on seasonal bathing habits among the three case studies.

7.4.1.1 Location

A summary of data collected on bathing location is shown in Table 7-14. In most cases bathers used the same area to bathe in year round, with some community members opting for a nearby tap in times of warm weather.

Table 7-14 Bathing location in all case study sites

Month		F	C	B	J	A	S	B	A	K	M	P	M
Season	Location	Spring			Summer/Rainy			Autumn			Winter		
Kermi	Main	Hot springs											
	Alternative				Tap								
Chaggaunphaya	Main	Karnali River											
	Alternative	Tap - if it has water									In the home		
Simkot W1	Main	The 'three taps'											
	Alternative	In the home											

Although it didn't appear in the data often, men were very infrequently seen to wash at taps. While women would wrap in a blanket to wash at the taps, men were rarely seen to wash anything beyond their face, hands and feet. Men in Chaggaunphaya and Simkot did say in conversation that women mostly dominate occupation of the taps, and they tend to use some water brought to the home and heated up year round (while some women joked that the men never wash at all – based on observation by the researchers it is possible this applied in some circumstances).

7.4.1.2 Safety

No particular seasonal safety issues were mentioned with great regularity but those that were are summarised in Table 7-15. Risk of landslides and avalanches at Kermi hot springs were of concern, as were risks of bathing in the particularly strong and fast river Karnali in Chaggaunphaya. No safety issues were raised in Simkot.

Table 7-15 Seasonal safety when bathing across all case studies

Month	F	C	B	J	A	S	B	A	K	M	P	M
Season	**Spring**			**Summer/Rainy**			**Autumn**			**Winter**		
Kermi				Risk of landslide						Risk of avalanche		
Chaggaunphaya	Very fast river speed											
Simkot W1	No data											

7.4.1.3 Logistics

The term logistics was used to cover any logistical way in which a person might be reluctant to bathe, or prevented from bathing. The main issues observed and discussed in interviews and focus groups are highlighted in Table 7-16.

Table 7-16 Seasonal logistics of bathing across all case studies

Month	F	C	B	J	A	S	B	A	K	M	P	M
Season	**Spring**			**Summer/Rainy**			**Autumn**			**Winter**		
Kermi			Away from village - no facilities					Too busy to wash				
	Difficult for women to get privacy											
Chaggaunphaya							Too busy to wash			River water freezing		
	Rarely enough water at taps and river is very far											
Simkot W1	Tap very busy - no privacy											

Privacy was an issue highlighted in Chaggaunphaya and Simkot because both of their main washing locations (the hot springs and the “three taps”) were in very public areas dominated by women. As a result they felt they could not go there and it was considered a women-only area.

In contrast, women had issues finding privacy from men in Kermi where the hot springs were filled with men, often from other communities. In Kermi, the large amounts of the population were away in late spring and summer and meant that they were away from their hot springs. During these times on the trading route they had no place to bathe (this is not particularly related to the aim of assessing community level standards of water and sanitation but is a point of importance that will be addressed in section 7.6.6).

In all cases, but particularly in Chaggaunphaya, the temperature of the water in winter was a large inhibitor of bathing in the three winter months and early spring. As can be seen from Table 7-16, distance to the washing location also had an impact on washing in Chaggaunphaya.

7.4.1.4 Regularity

Data on the regularity of bathing is presented in Table 7-17. Particularly worthy of note is the lack of bathing in winter. The data collected on bathing was quite poor with numbers stated in interviews not considered to reflect reality when triangulated with observation data. While average numbers reported suggested that the majority of people were bathing at least once a week, this was not observed to occur. One women in Chaggaunphaya reported that men only ever took a 'passport bath' (one that washes only areas visible areas) and washed fully very intermittently.

Table 7-17 Regularity of bathing across all case studies

Month	F	C	B	J	A	S	B	A	K	M	P	M
Season	Spring			Summer/Rainy			Autumn			Winter		
Kermi	Most							Some - too busy		Less - too cold		
Chaggaunphaya	Some			Most			Some - too busy			Some to none - too cold		
Simkot W1	Some									Less - too cold		

Through observation, it was noted that the majority of people washed at least hands and face every morning with water in the home. This was not accounted for or asked about in the interviews or focus groups. This is a flaw in how the questions about bathing were typically phrased, as the difference between regularity of bathing oneself completely and washing hands, face and feet is predicted to be significant.

Thus the best data that could be compiled shows an almost predictable trend in bathing, whereby in all cases, practice is regular in spring, a little more regular in summer when comfortable, less due to being busy in the autumn, and almost none in winter. To compare actual numbers would require data on age and gender of participants, as the elderly were found to bathe much less than the youth, thus to compile an average would be misrepresentative.

7.4.1.5 Access

Access to bathing sites also varied in a somewhat predictable manner. Slippery paths made the journey to Kermi hot springs quite difficult in summer and winter, with respondents in Chaggaunphaya and Simkot also found that snow inhibited their ability to reach bathing spots. A summary of data is shown in Table 7-18.

Table 7-18 Access to bathing locations across all case studies

Month	F	C	B	J	A	S	B	A	K	M	P	M
Season	Spring			Summer/Rainy			Autumn			Winter		
Kermi				Slippery path						Thick snow		
Chaggaunphaya										Thick snow		
Simkot W1										Thick snow		

Certainly in Chaggaunphaya, the distance to the river for bathing was a far more significant problem than seasonal access. Women were noted to typically bathe when travelling to collect water for household purposes. Thus 'access for bathing' was not considered independently from access for water collection.

7.4.1.6 Queues to bathe

A summary of seasonal queues for bathing spots are shown in Table 7-19. Large seasonal variations in queues were seen primarily in Kermi, where the very popular hot springs would draw large crowds in the colder spring and summer seasons. Since those in Chaggaunphaya were accessing a river with long accessible banks, there was rarely a queue, whereas Simkot has only a small bathing area for its large population, and as a result there was a queue at most times.

Table 7-19 Queues to bathe across all case studies

Month	**F**	**C**	**B**	**J**	**A**	**S**	**B**	**A**	**K**	**M**	**P**	**M**
Season	**Spring**			**Summer/Rainy**			**Autumn**			**Winter**		
Kermi	Very busy on warm days			Much more space						Very busy on warm days		
Chaggaunphaya	None											
Simkot W1	Large at all times											

Size of the area available for bathing thus had an influence on queue more than the seasons. In all cases, queues were noted to be much higher on Saturdays and in festival periods. The shop owners asked also noted a significant increase in the sale of soap close to festivals.

7.4.1.7 Summary

Ease of bathing and, as a result, its regularity, was found to exhibit a seasonal pattern from both climatic (e.g. temperature, environment, livelihoods) and some non-climatic factors (e.g. festivals). These effects are summarised in Table 7-20.

Table 7-20 The influence of seasonality on bathing

Source of Seasonality				**Impact**					
Level			**Seasonal variable**	**Bathing**					**Primary Manifestations**
1	**2**	**3**		Location	Regularity	Safety	Access	Queue	
CLIMATIC	***Weather***	***Direct***	Temperature	x	✓/x			x	Water temperature, comfort being outside
			Precipitation	x	x		x		Water temperature, comfort being outside, access
		Indirect	Ground conditions				x		Slippery ground
			Landslides /Avalanches			x			Slipping rocks, influx of snow
	Livelihoods	***NA***	No. of people in the community	x	x		x	x	Increased demand for space
		NA	Work schedule	x	x				Time available, location
NON - CLIMATIC	NA	***NA***	Festivals		x			x	Increased interest in cleanliness
		NA	School Calendar		x			x	Presence /absence of students impacting demand

As can be seen in Table 7-20, prevailing weather conditions were found to have a significant impact on the location chosen for bathing, the regularity of bathing and the queue at any particular bathing location. Warm days were noted to be particularly busy year round; in contrast bathing was prevented through intense rain and snow fall.

Seasonal livelihoods of community members influenced a number of the criteria used to evaluate bathing behaviour. The number of people in the community was found to influence location of bathing, bathing regularity, accessibility and queuing times to bathe – all of these issues stem from a large number of people trying to access the same bathing areas – particularly on warm days and festivals.

An individual's work schedule also influenced their bathing habits through location (may vary when working outside of the community), and regularly spare time available (with a common issue reported that bathing was very difficult to find time for during the harvest).

The physical environment, primarily ground conditions, influenced accessibility to bathing spots, while landslides and avalanches were at times a safety concern while bathing.

Non-climatic influences on bathing behaviours stemmed from festivals and the school calendar, where certain days of the week, particularly leading up to festivals and the day before the return to school were noted to lead to increased bathing, resulting in increased queues.

Overall the data on bathing is flawed in that the distinction is not made between the 'passport bath' and a complete wash. As a result, respondents may have been addressing different issues in answering their questions. Taking that into account, it is still expected that the overall trends observed and seasonality sources remains the same for both forms of bathing.

Ideally health data would have been collected to see if any relationship could be derived between regularity and ease of bathing and prevailing illnesses – however, this data could not be obtained in the time frame and what results is a seasonal description of the existing bathing situation.

7.5 Clothes Washing

Data collected with regard to clothes washing is summarised in Table 8-21.

Location did not vary between seasons in any case; with those in Kermi washing clothes at the hot springs, those in Chaggaunphaya washing them in the river Karnali and those residing in Simkot W1 washing at the 'three taps'.

Table 7-21 Seasonal logistics of washing clothes across all case studies

Month	F	C	B	J	A	S	B	A	K	M	P	M
Season	Spring			Summer/Rainy			Autumn			Winter		
Kermi				Wet - difficult to dry clothes						Cold - difficult to dry clothes		
				Slippery ground- difficult to carry wet clothes				Too busy		Slippery ground - difficult to carry wet clothes		
Chaggaunphaya	Very difficult at all times to carry wet clothes back from river											
								Too busy				
Simkot W1				Wet - difficult to dry clothes						Cold - difficult to dry clothes		
	Extremely busy - difficult to get space											

Logistics varied slightly, with clothes proving hard to dry in wet and cold seasons. Slipperiness of the ground was further exacerbated when trying to carry bulky wet clothing across it. Women in Simkot had to contend with year round busy-ness at the tap. While accessing water was seasonally busy, getting space at the tap to physically wash clothes was a year round struggle. All washing points were noticeably busier on Fridays and Saturdays or at festival periods.

7.5.1 Summary

Data collected which describes the influences of seasonality on clothes washing are summarised in Table 7-22.Weather conditions, particularly the temperature and prevalence of snow and rain are found to influence regularity of clothes washing, as well as the ability for clothes to be dried post washing.

In terms of livelihoods, again the number of people in the community is seen to have an influence, with times of high settlement in the villages leading to poorer access to water points for washing and an increased queue. In the same way as it influenced bathing, the prevailing work schedule may cut off access to an area to wash clothes (through travelling away from the village) or influence regularity (again through issues in peak labour times).

From Table 7-22 it can be seen that, ground conditions are of particular importance when washing clothes. Slippery ground was reported to be particularly difficult to traverse when carrying wet clothing. Again, festivals were the primary source of non-climatic seasonal variability with peaks in washing taking place before them.

Overall – the impact of seasonality on clothes washing is similar to that for bathing based on the fact that all the communities studied used the same source of water for both, and the fact that both share similar optimum conditions (warmth, comfort, ease of access etc.).

Table 7-22 The influence of seasonality on clothes washing

Source of Seasonality				Impact			
Level			Seasonal variable	Clothes Washing Criteria			Primary Manifestations
1	2	3		Access	Regularity	Queue	
CLIMATIC	Weather	Direct	Temperature		✓/x		More/less comfortable to be outside, ability to dry clothes
			Precipitation		x		More/less comfortable to be outside, ability to dry clothes
		Indirect	Ground conditions	x			Slippery ground
	Livelihoods	NA	No. of people in the community	x		x	Increase in people requiring water
		NA	Work schedule	x	✓/x		Time availability, location
NON - CLIMATIC		NA	Festivals		x	x	Increased interest in cleanliness

7.6 Sanitation

The following section presents a summary of the influence of seasonality on access to sanitation. The previous chapter has unearthed that only residents of Kermi had latrines in regular use. As a result the following section includes some details on the influence of seasonality on use of latrines, but primarily presents data on seasonal practice of open defecation.

7.6.1 Latrine Use

In terms of comfort in a latrine, smell and insects were the main issues highlighted; both peaking in the summer/rainy season (as shown in Table 8-23).

Table 7-23 Comfort of latrine use across case studies

Month	F	C	B	J	A	S	B	A	K	M	P	M
Season	Spring			Summer/Rainy			Autumn			Winter		
Kermi	Smell			Very bad smell			Smell					
	Fly bites during use											
Chaggaunphaya				Smell								
				Insects								
Simkot W1	No data											

Issues highlighted regarding to ease of use are shown in Table 8-24.

Table 7-24 Seasonal ease of latrine use across all case studies

Month	F	C	B	J	A	S	B	A	K	M	P	M
Season	Spring			Summer/Rainy			Autumn			Winter		
Kermi				Diarrhoea - makes it difficult						Flushing water frozen		
Chaggaunphaya										Flushing water frozen		
Simkot W1	No data											

As is shown in Table 8.24, community members in Kermi said that diarrhoea could contribute to difficulty in using the latrine in the summer season. Bouts of diarrhoea were reported to increase the frequency of the need to defecate, and also difficulty in the actual mechanism of squatting to relieve oneself for substantial periods of time in the uncomfortably small and dark latrine.

In both Kermi and Chaggaunphaya there were complaints of flushing water freezing when stored in buckets in the latrine superstructure (though the overwhelming complaint in Chaggaunphaya was still the lack of water for flushing year round). This was something the lead investigator often came across throughout the district. Although it wasn't mentioned as an issue in the interview data, the author also observed very slippery floors upon entering some latrines in the winter season. This effect was also noted in Rwanda by Ekane et.al (2012) during the rainy season and was cited as a reason in focus groups discussion for unease in using the latrines.

7.6.2 Summary

A summary of the interaction between seasonality and latrine use is shown in Table 7-25.

Table 7-25 A summary of the impact of seasonality on latrine use

Source of Seasonality				Impact			
Level			Seasonal variable	Latrine Use Criteria			Primary Manifestations
1	2	3		Comfort	Access	Ease of use	
CLIMATIC	Weather	Direct	Temperature	✓/x		x	Smell, vectors, frozen flush water
		Indirect	Ground conditions		x		Slippery ground
	Liveli-hood	NA	Health			x	Diarrheoa, increased need for toilet use, urgent use
			Work schedule		✓/x		Away from community, too busy

Unlike the cases presented by the U.S Centers for Disease Control and Prevention (2006) in Central America, and Illian and Cikhartiva (2012) in which found that latrines were completely unusable in different seasons, the effect was mostly in variations of comfort, ease of use, and physical accessibility to the toilet itself.

In Cambodia, the World Toilet Organisation (2010) reported that discomforts such as these brought dry season latrine usage down from 79.3% in the wet season to 55.2%. Only in one interview for this study did a respondent state that she only used the latrine in the wet season and not the dry. Therefore it is possible that this trend exists in some instances – but the overall lack of use generally outweighed these incidences.

Comfort of latrine use is impacted by the presence of vectors and smell. Access is impacted by an individual's work schedule (e.g. if they are trading, spending days in the fields etc.) and the prevailing ground conditions; and ease of use is affected by intermittently frozen flushing water and prevailing health conditions, particularly diarrhoea.

Beyond these seasonal aspects, some more permanent issues emerged with regard to latrine use. There is no quantified data for the following but it was observed by the lead researcher upon reflection that (all discussed previously in Section 6.4):

- Elderly people were not observed to use the latrine
- Children were not observed to use the latrine
- There was a general preference for defecating outside unless one needed use the latrine (e.g. if it was dark, or the individual was ill)
- Latrines constructed were small, dark and unpleasant to use
- Latrines in use were often locked and a key would have to be obtained from the home owner to use the latrine (thus for urination it was often quicker to go outside)
- Latrines were typically put in rather inconvenient spaces and access at night or in times of snow was difficult

(Field notes, 07-07-12)

Overall, latrine use is noticed to exhibit some seasonality but these fluctuations typically exist in aspects of latrine use rather than latrine use as a whole. No non-climatic factors appear to influence seasonal use of latrines.

7.6.3 Open defecation

Open defecation sites were present in all case studies. In Kermi, most people defecated near the hot springs and toward the north of the village near an old abandoned tap. In Chaggaunphaya open defecation primarily took place on a cliff at the lower end of the village. In Simkot, a piece of land uphill and to the north of the community is used.

There was some variation in location depending on the individual, the time of day and the seasons. A summary of seasonal issues with open defecation are presented in Table 8-26.

Table 7-26 Seasonal issues associated with open defecation in all case studies

Month	F	C	B	J	A	S	B	A	K	M	P	M
Season	**Spring**			**Summer/Rainy**			**Autumn**			**Winter**		
Kermi				Fear of snakes in grass								
				Get very wet						Thick snow		
				Unsettled stomach - need to go more often			Many people in fields			Very cold		
Chaggaunphaya				Get very wet						Thick snow		
										Very cold		
Simkot W1				Slippery to go up 'defecation hill'						Slippery to go up 'defecation hill'		

In summer, open defecation was typically rated as more convenient as more people were away from the community and privacy was easier to find. Many did however state that some issues that impacted comfort included a fear of snakes in the grass, getting very wet during the rains, an unsettled stomach during the rainy season leading to increased need to defecate and slippery ground adding to difficulties in accessing open defecation sites.

In autumn, individuals in Kermi reported that the long time spent harvesting in the fields led to them defecating there rather than in toilets by the home.

In winter, thick snow was mentioned as an obstacle to open defecation in all communities – with some admitting to defecating closer to home during this period, and others adamant that they were obliged to go far from their homes to relieve themselves.

Despite there being quite well defined open defecation areas, there were found to be some seasonal changes in defecation location. Certainly for urination, particularly at night time, many people were observed to go to urinate close to the home.

7.6.4 Summary

A summary of how seasonality influenced open defecation is shown in Table 7-27.

Table 7-27 A summary of the impact of seasonality on open defecation practices

Source of Seasonality				Impact				
Level			**Seasonal variable**	**Open Defecation**				**Primary Manifestations**
1	**2**	**3**		Location	Comfort	Access	Ease	
CLIMATIC	***Weather***	Direct	Precipitation	x	x		x	Likelihood of getting wet while defecating
			Temperature		x		x	Too cold or hot to be outside without shelter
		indirect	Ground conditions			x		Slippery ground
	Livelihood	NA	Health	x	x		x	Diarrheoa, increased need for toilet use, urgent use
			Number of people in the community	x			x	Harder to find privacy
			Crop thickness	x			x	Thick crops provide privacy cover
			Work schedule	x			x	Working in fields, away from home

Defecation location is a function of livelihoods; weather and the physical environment with the primary aim being to find somewhere private without having to travel too far, particularly in bad weather conditions. There is however on a more constant basis, significant pressure from social norms which oblige people to go far from the community for defecation.

Comfort while defecating is a function of prevailing weather and was noted to be unpleasant if hot or wet. Access to open defecation sites was primarily affected by the existing ground conditions, and ease of open defecation was found to be a combination of the likelihood of getting wet, prevailing health conditions, crop thickness, the number of people in the community, and work schedule. Crop thickness and number of people currently in the community both influenced the difficulty in finding a private space to defecate.

Open defecation was found to be common practice in each case study visited. Location, comfort, access to sites and ease are all found to vary through the year.

7.6.5 Menstruation

In Kermi women may remain in the home while menstruating, however in Chaggaunphaya and Simkot W1 the typical practice was for the woman to spend days in a ‘Khullo’ or outside while menstruating. The practice in itself is controversial, and opinions from women ranged from detesting it, to enjoying time with the other women. In this section, only seasonal aspects of menstruation will be considered.

In Chaggaunphaya, the existence of a Khullo protected women from the elements when menstruating. In Simkot, however, women were at times outside in the cold temperatures. As it is a regular occurrence, women had by and large developed coping elements to protect themselves during rains or heavy snow.

The primary issue for women from Chaggaunphaya was the conditions they had to endure while at high altitude grazing sites and menstruating. Some must stay outside, or in tents of very poor quality.

7.6.6 Reflection on unit of analysis

In this section, the seasonality of community level standards of water and sanitation has been considered. During the research it transpired that Lama people in particular spend only a few months of the year actually physically in their community. Similarly many from Chaggaunphaya go trading and for summer graze, so are also away from their communities.

While community level standards have been assessed, the standards of water and sanitation in locations where much of the population spend months of their year (e.g. on the trading route, summer grazing sites, boarding school) have not. As a result an individual's experience of seasonal access to water and sanitation is not accurately reflected at all times.

Toward the end of the study, the researcher travelled along the main trade route to China from Kermi to the Tibetan border. Along this stretch of path, facilities were found to be particularly poor; in summer graze sites, constructed water and sanitation facilities are reported to be non-existent.

As a result, the community level standards assessed in this work do not accurately reflect the experience of all family members and an improved method of capturing the seasonality of an individual's access may have been to track that individual and include analyses of how access changed when, for example, at the grazing site, trading, or in boarding school. This issue with data collection would also be mirrored in designing suitable infrastructure to provide the necessary services throughout the year.

Through observation only, it is certain from the researchers' perspective that these times of travel lead to even poorer access to water and sanitation, including infrequent bathing and minimal clothes washing.

7.7 Addressing the research questions

In this section, the research questions posed in the first Chapter will be reflected on and addressed. The overarching question to be answered through this research is:

What is the effect of seasonality on access to water and sanitation in Humla District Nepal?

At the community level, this question becomes '**How does seasonality impact on community level access to water and sanitation?**' This question is broken down into sub-questions which look at seasons, infrastructure functionality and community behaviours. These questions are addressed in the following sections.

(i) **What climatic and non-climatic seasons exist in a high altitude community that affect access to water and sanitation?**

To quote Gill,

"Seasonality refers to any regular pattern or variation that is correlated with the seasons. Seasons may derive from nature, or may exist in social and cultural behaviours or business and administrative procedures."

(Gill, 1991)

This research sub-question seeks to address which seasons, be they natural or otherwise, affect access to water and sanitation in Humla.

Calendar Seasons

Four calendar based seasons have been found to exist in this area. These seasons are most commonly known as spring, summer or rainy, autumn and winter. 'Summer' and 'rainy' are interchangeable terms used to describe the three months of Jestha, Asar and Shrawan. Autumn season is also known as the harvest season.

Weather

The weather observed during these seasons exhibits seasonality. The weather in Humla has been found to be dry and cold in the spring, wet and warm in summer/rainy season, cooler and dry in autumn and very cold with periods of snow in Winter. Data from the Nepal Department of Hydrology and Meteorology for the period during which this research was conducted has indicated that the yearly high was $26^{o}C$ in summer and lows in temperature ranged from $0^{o}C$ to $-6^{o}C$ in winter.

Weather has been observed to influence access to water, bathing, clothes washing, sanitation and menstrual hygiene both directly and indirectly. Directly, rainfall, snowfall and cold affect access to water through their impact on quantity and quality of what's available, as well as functionality of the infrastructure itself. Temperatures also play a role in latrine use where hot temperatures bring flies and a bad smell. Cold weather, rain and snow make openly defecating uncomfortable and more difficult.

The weather also affects access to water and sanitation through its impact on the physical environment. The primary means of impact in this category have been found to be: (i) variable ground conditions and (ii) the risk of landslides and avalanches. The impact of the weather on ground conditions and its subsequent impact on access to water and sanitation are significant. Periods of heavy rainfall and snowfall were found to make ground conditions very muddy and slippery. This added a risk factor to each journey made to collect water, bathe, wash clothes or defecate in a latrine or openly. It also slowed journey time due to the added care that needs to be taken.

This added difficulty in access was in some cases significant to the point where open defecation location would be found to vary, particularly at night. It also impacted the amount of water that could be collected or clothes that could be washed.

Landslides and avalanches had a significantly lesser impact, but did cause safety concerns when collecting water from a river or washing in the hot springs of Kermi.

Livelihoods

Chambers et al., (1981), explain that rural and agricultural communities are the most likely to demonstrate seasonal shifts in primary livelihood activities. This is certainly true in Humla, where the climate experienced has had a significant role in shaping the lifestyle and occupation of its inhabitants.

Agriculture and trading, the primary income generating activities of the District are climate dependent[28]. As a result of this, workloads and number of residents and animals in the case study villages were found to fluctuate seasonally.

Spring was found to be a busy month for both men and women as they prepared their fields for crops. In summer, many inhabitants and animals were found to depart the home for summer graze and trading. In autumn, the majority of these community members returned for the challenging harvest season. In winter, many who could afford to leave their villages would do so to migrate south. Those who remained in the villages had a comparatively quiet time with primary tasks involving caring for animals and fetching fire wood.

[28] Before trading can begin, snow must melt from the mountain passes. Significant rains also halt trading, as paths used for travel become unsafe.

These wide ranging fluctuations in population and activity levels had significant impact on the demand for water for household purposes, bathing and washing clothes. Animals were a significant contributor to queues and demand when residing in the community and its surroundings.

Although it was not investigated, livelihoods are also predicted to have a significant influence on an individual's access to water and sanitation as they move between the home, trading , and summer grazing sites. This reason for omission of further analysis in this area was discussed in 7.6.6.

Non-climatic seasons

Non climatic seasons were not found to have a significant influence on standards of water and sanitation. During festivals there was found to be higher interest in cleanliness, and therefore an increased demand for water. The school calendar was also shown to have some influence on access to water and sanitation due to the influx (Chaggaunphaya) or exodus of school students (Kermi) and the subsequent impact on village population.

Summary sub-question (i)

Overall, the key 'seasons' which have been found to exist that affect access to water and sanitation, are the weather (both directly and indirectly), and livelihoods. Non climatic seasons that have an impact include festivals and the school year.

(ii) **Does functionality of community water and sanitation infrastructure vary intra-annually?**

Functionality of water and sanitation infrastructure was found to vary inter-annually in each case study, but rarely to the point where infrastructure would become completely unusable. In Chaggaunphaya an abundance of infrastructure was in disrepair, as were some latrines in Kermi, and some taps in Simkot W1 – however all of these infrastructure failings were due to permanent issues, rather than seasonal variations. Thus the impact of seasonality on physical water and sanitation infrastructure is believed to be less significant than those presented by the World Toilet Organization (2010), Dessalegn et al., (2013), Coulter (2012), Ekane et al., (2012) and the US Centers for Disease Control and Prevention (2006).

In terms of seasonal risks for malfunction of water supplies; spring was dominated by the threat of water shortages; in the summer/rainy season the risk shifted to landslides, and particulates being washed into the water source; in autumn there was a risk of clogged pipelines from falling leaves; and in winter the schemes were found to be susceptible to freezing.

For latrines the primary seasonal cause of failure of the systems was the presence of large amounts of flies and a significant smell in the summer/rainy season and the risk of frozen flushing water in winter. A far greater problem was, however, the disinterest in using latrines by those who owned them. In the rushed construction process to meet government targets, latrines constructed are small, cramped and uncomfortable; while the installation process has lacked the accompaniment of a vital hygiene education programme.

For open defecation, despite there being a lack of physical infrastructure, the ‘system’ in place was still impacted seasonally due to increased discomfort in the rainy and winter seasons and varying levels of privacy availability throughout the year.

If consideration of function is widened beyond the physical infrastructure itself to include criteria for the Human Right for Access to Water and Sanitation, the ‘functionality’ of these systems is impacted further. The Human Right to Water and Sanitation requires that infrastructure be sufficient, safe, acceptable, physically accessible and affordable (United Nations, 2010b)

Acceptability and affordability of systems have not been considered in this research, however sufficiency, safety, and physical acceptability were.

Sufficient

‘Sufficiency’ of water sources for household uses, bathing and clothing has been noted to be particularly weak in the spring when demand peaks due to an influx of people and animals. Insufficient access to water supply is most prone to arise in this season due to the alignment of periods of peak deficiencies and demand. As a result there are insufficiencies in personal sanitation, washing of clothes and personal hygiene.

This is in contrast with the ‘sufficiency’ one might observe if in the area during, or just after the rainy season. In this time water is plentiful and many people are outside of the community, thus the balance between water availability and demand would reflect an abundance of water. An analysis of sufficiency of water supply would reflect far more positively on the area during this time compared with one taken in the spring.

Both demand (related to livelihoods) and water availability (related to weather) interact to affect the degree with which water supply can be considered sufficient year round.

In no case was even the optimum scenario for sanitation sufficient. Insufficiencies of the existing system were however exacerbated by prevailing temperature, rain and snow (weather) and ability to find privacy and prevailing health conditions (livelihoods).

Overall, both the seasonal calendars of weather and livelihoods can be seen to observe sufficiency.

Safe
'Safe' water implies that water must be free from organisms, chemical substances and radiological hazards that constitute a threat to health. In this case water was seen to be affected by suspended solids seasonally but no measure was taken of hazards to health. The tendency for human defecation near a water source only occurred in Kermi – and certainly this was considered to be a seasonal health risk during times of rain or snow melt.

The presence of animals in the community also increased the possibility of health risks due to the abundance of animal waste near water points, a result of animals using the same drinking water source as humans. This waste decreases the overall environmental sanitation of the water point and leaves people susceptible to stepping in waste in the surroundings of the water point.

Both livelihoods and weather interact to affect seasonal safety of water points – though the variations in level of safety year round are not thought to be severe.

The description provided for 'safe' sanitation by the UN specifies that sanitation systems must be situated where physical safety can be safeguarded. Toilets should be available for use at all times of the day or night and must be hygienic (United Nations, 2010b). In the cases in this report the baseline access to sanitation was so poor that very few systems could be considered safe at any time of the year. Certainly for those with latrines or openly defecating, the night time proved a challenge, with latrine users observed to urinate closer to the home or on the first floor roof and open defecators staying closer to the home. This in turn decreased the level of environmental sanitation in the area and increased the risk of water becoming contaminated and unsafe.

Weather was the primary factor which dominated seasonal 'safety' of sanitation in the community. If individuals are considered, livelihoods play a part as the safety of sanitation for those who go trading or to the summer graze is likely to become less safe during these times.

Physically Accessible
For water and sanitation services to be considered physically acceptable, they must be within or in the immediate vicinity of, their households, workplace and educational or health institutions (United Nations, 2010b). Again, the poor levels of infrastructure in the case studies mean that no scenario presented could be considered to be physically accessible year round, though this level of accessibility (poor as it is) did vary throughout the year.

The primary issues to affect physical accessibility were the ground conditions (an indirect result of weather) and work schedule (livelihoods). As has been detailed in sections 7.3 to 7.6, ground conditions altered the levels of accessibility across all aspects of access to water and sanitation considered. While an analysis in the dry times of the year may note the vertical distances individuals are travelling for water, or to open defecation sites as a significant access issue; the extent of poor physical accessibility is truly understood if one observes these vertical inclines when saturated or snow covered, and slippery.

While the cases presented in the literature review showed shifts in sources seasonally and dramatically increased collection time for water (Coulter, 2012; Dessalegn et al., 2013); primary increases in collection time in these case studies could be attributed to changes in ground condition.

Livelihoods impact physical accessibility of water and sanitation also due to the fact that the predominant workplace for the people of Humla is in agricultural fields, where any facilities are typically not available. For those who do not use a latrine anyway (the vast majority of those interviewed), this change in circumstance has little impact on accessibility. For those with a latrine, this may represent a down scaling in accessibility. The same is true for those who spend months out of the home while grazing or trading.

Summary Sub-question (ii)

Overall water and sanitation infrastructure functionality in Upper Humla can be seen to vary seasonally but rarely to the point where it is completely out of use. Peaks and troughs of yearly accessibility have been found to be primarily driven by the weather, both directly (in terms of water availability), and indirectly (landslides, smell, flies, falling leaves, frozen pipes etc.). The poor levels of infrastructure meant that UN criteria for access to water and sanitation were rarely met, even in the best case scenario. However, the analysis shows that the degree with which water and sanitation systems meet the more qualitative Human Right to water and sanitation varies intra-annually, and that different interpretations of levels of 'access' could be observed depending on the time of year in Humla. In order to meet the Human Right to water and sanitation, recommendations from Cruickshank (2004) must be adhered to, whereby the engineers involved in these projects, must move beyond simply provision of physical outputs, to provide more qualitative improvements if improved and sustainable levels of access to are to be achieved (Cruickshank, 2004).

(iii) **Do community member's behaviours change intra- annually in a way that affects standards of water, sanitation and hygiene?**

Sub-question (iii) examines community level behaviour that may impact on access to water and sanitation, and how it changes as a result of the aforementioned seasons and variation in infrastructure function.

In literature presented in section 2.4.1 seasonal behaviour change was seen to decrease dry latrine usage from 79.8% to 55.2% (World Toilet Organization, 2010). No quantitative measurement of shifts in behaviour has been reported in this work, though it is believed by the researcher that variations (particularly in defecation and washing behaviour) are significant in these communities.

People's livelihoods were found to impact behaviour through their current work schedule and the number of people in the community. The weather was also observed to have a significant impact on behaviour.

The community work schedule impacted behaviour related to water and sanitation through location for work, and availability of time. Location for work influenced behaviours due to availability of infrastructure at the current place of work. When working in the fields, access to water and sanitation was reported to be poor and thus behaviours might be downgraded to match the systems available. A hypothetical example might be where an individual anally cleanses with water and washes hands in the home, but uses leaves and does not wash hands when in the field. While the focus of this research was on members of the community while they were in the community, it is worthy of note that behaviours are predicted to decrease in standard when using poorer infrastructure while trading or grazing.

Workload was also found have an important influence on water and sanitation behaviour. The harvest season was noted to cause an issue in collection of water, bathing and clothes washing due to lack of time to complete these activities; whereas in winter, time was abundant but accessibility caused an issue. Coulter (2012) reported that the peaks of water shortages and workload overlapped for communities under analysis in Ethiopia, and that this resulted in decreased amounts of water being used and collected. No attempt was made to quantify such differences in this research but it can be predicted with confidence that this was also the case for these communities.

To a lesser extent, behaviours were modified according to the number of people in the community. This was of particular relevance to open defecation where defecation sites were at times changed due to the inability to find privacy when communities were at peak annual population (particularly in Chaggaunphaya with the arrival of school children).

Weather also influenced open defecation behaviour with cold and wet weather likely to lead to defecation close to the home. Prevailing weather also impacted the regularity with which a community member would wash themselves and/or their clothes due to the prevailing levels of comfort.

Non-climatic seasons were also seen to influence behaviour. Festivals and days of the week were found to lead to an increase in washing of one-self and clothes; the beginning of the school week was found to lead to increased bathing of children.

Summary Sub-question (iii)

Behaviours have been found to be impacted by both climatic and non-climatic seasons. Seasonally optimum behaviours are governed by presence of infrastructure, work schedule and workload; with actual practice being further influenced by varying levels of ease and/or comfort that exist as a result of the weather. These varying behaviours lead to seasonal variation in health risks resulting from defecation closer to the home and lack of washing of selves or clothes.

7.7.1 Addressing the primary research question

The primary research question that the sub-questions contribute to is**: How does seasonality impact on community level access to water and sanitation?**

Seasonality has been found to impact on community level access to water and sanitation. The primary drivers of this seasonality are the weather (directly and indirectly) and the livelihoods of community inhabitants.

Infrastructure faces a seasonal range of threats to functionality; this affects the sufficiency, and at times the safety, of water and sanitation infrastructure and systems. The community experience a further shift in perceived access to water and sanitation due to the shifts in physical accessibility of infrastructure. Physical access is primarily a function of the weather. Precipitation makes it difficult to visit stand-posts and open defecation sites, while hot temperatures increase discomfort while using latrines and lead to queuing at water points due to increased demand for bathing and clothes washing. Indirectly, weather effects ground conditions, further impacting on accessibility.

Community behaviours have been observed to vary seasonally as a result of their access to functioning infrastructure and the prevailing weather. Defecation in particular is noted to be difficult at times of increased high rain or snowfall. This is further enhanced at night.

The livelihoods of the community members have a significant impact on their intra-annual access to water and sanitation. While it has not been analysed in depth in this study periods of absence from the home were noted often to be in areas with little or no water and sanitation systems.

Overall, the effect of seasonality noted in Humla is not as significant as the dramatic cases of seasonality reported by Coulter (2012a), Dessalegn et al (2013), The World Toilet Organization (2011), Illian and Cikhartova (2012), Anand and Jenkins (2010); however, there is still a notable shift in access to water and sanitation seasonally, with the most notable aspects of this shift occurring in the surroundings of the infrastructure, and as a result of the community livelihoods.

7.8 Implications of findings

The two main implications of these findings which will be discussed are: (i) the shifting water related environmental health risks in a Humli Community, and (ii) the applicability of current systems of measurement of water and sanitation access in Humla.

7.8.1 Shift in Water and Sanitation Related Environmental Health Risks

Seasonal shift in functionality of infrastructure and community behaviours leads to shifting water-related environmental health risks. According to Bradley (1977) water related infectious diseases have four means of transmission:

(i) Through water supplies (waterborne);
(ii) Infections spread through lack of water (whether clean or contaminated) for personal hygiene (water-washed);
(iii) Infections spread through an aquatic invertebrate host (water-based); and
(iv) Infections spread by insects that depend on water

Figure 7-4 shows the basic mechanisms of disease transmission from faeces to a new host – the faecal oral route. The five means of disease transmission for faeces are

(i) Fluids (via water or other liquids)
(ii) Fingers (via dirty hands in mouth or on food
(iii) Food (through ingestion)
(iv) Flies (through direct contact with the host or via food)
(v) Fields (through walking in faeces)

This section will explore both water, and sanitation based mechanism of disease transmission and considers how this risk shifts over the course of a year in Humla.

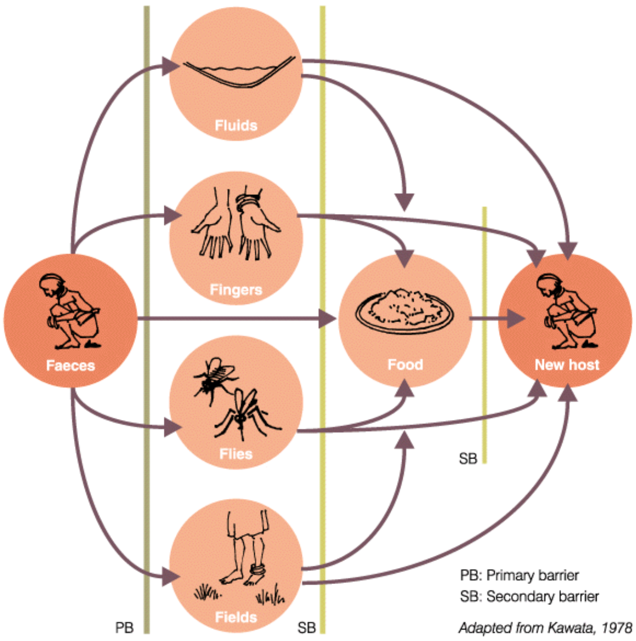


Figure 7-4 The faecal-oral route (Parry-Jones & Kolsky, 2005)

In spring the communities are susceptible to water-washed disease and fingers due to the lack of water which in some cases prevents maintenance of good hygiene practices. There is also a risk of disease transmission via flies and feet; large populations of animals defecate in the village when they are present. The excreta are often very close to busy water points (due to the animals using them) and are a possible source of ill-health via both flies and fields. There is also the risk of water-borne contamination as snow melts into water supplies, and brings excreta surrounding water points with it.

In summer means of disease transmission shift to a combination of water-borne and fluids (which have contamination of water supplies in common, in the case of ‘fluids’ this refers exclusively to faecal contamination). The prominence of these routes is caused by the presence of both animal and human excreta near water sources, which can be washed into the sources at times of heavy rain. The general muckiness of the ground in rainy season also leads to issues with ‘fields’ as excreta becomes less visible and more likely to be stepped in. This is particularly an issue as some interviewees noted a tendency to defecate closer to the home during the rains.

Another issue in the rainy season stems from pools of water around the community, bringing with it the potential for disease caused by insects that depend on water. Flies were also noted to be at their peak numbers during the summer/rainy season and as a result they augment the faecal oral route.

In autumn it is a community’s busy timetable that is the primary issue in terms of health. The lack of time to wash is predicted to boost disease transmission via ‘fingers’. Sporadic defecation in fields during the harvest may also increase the likelihood of transmission of faeces via ‘fields’.

In winter, individuals are reported to defecate nearer the home and thus are more susceptible to disease transmission from ‘fields’. Discomfort due to the weather also leads to decreased bathing and washing of clothes, and as a result disease transmission via fingers may be more prominent. The cold weather at this time eliminates risk from flies.

A summary of seasonal health risks and the times of year they are most prominent is presented in Table 7-28.Poor hygiene practices and standards of sanitation generally are predicted to cause ill-health year round, this table merely serves to highlight seasonal fluctuations in some aspects of water and sanitation based environmental health risks.

Table 7-28 shows that means of disease transmission via water and faeces in Humla are not constant throughout the year. It is predicted to be for this reason that McKay (2002) reported peak diarrhoeal cases in Humla in the rainy season.

Practitioners and educators should incorporate these fluctuating risks in design and construction of appropriate infrastructure, and also in preparation of hygiene guidance and training. Incorporating year round risks is important, so that trainings can address the primary weaknesses in behaviour and transport year round in order to prevent ill health.

Table 7-28 Fluctuations of water and sanitation based disease transmission

Transmission Routes	*Spring*	*Summer*	*Autumn*	*Winter*
Water-borne	X	X		
Water-washed	X			
Water-based				
Insects on water		X		
Fluids	X	X		
Fingers	X		X	X
Food				
Flies	X	X		
Fields	X	X	X	X

7.8.2 Application of standards

In section 1.6.1, the intention for this research to understand whether current means of assessing access to water and sanitation were appropriate for areas with seasonal climates was explained. The Millennium Development Goals track progress in terms of presence or absence of 'improved infrastructure.

This study has found that seasonal community behaviour, accessibility and sufficiency have been found to have a significant impact on 'access' (as defined by The Human Right to Water and Sanitation), as well as presence of the infrastructure itself. Thus while a measure of the physical presence of the infrastructure is useful, it provides no indication of 'usability', the physical access to the infrastructure and the comfort in using it.

As Mehta (2013, p5) explains,

"Presence of 'improved' infrastructure is no guarantee it is used by all. This may be a function of affordability, access, usability or socio-cultural norms and values…

…Proximity to a toilet could be a proxy for access but could disregard affordability, cultural and mental barriers for people. Ignorance of these factors can mean that the surveys become merely a counting exercise, without an effort to ensure long-term sustainability"

(Mehta, 2013).

To complicate matters further in this case, these external factors (access, comfort, ease of use, sufficiency, reliability etc.) and resulting behaviours vary seasonally, annually –and over much smaller timescales. These variations stem from the weather, and from the wider livelihood priorities and pressures which impact decision making. Non climatic sources of seasonality (e.g. festivals) are found to impact behaviours only.

From the perspectives of these communities, access to water and/or sanitation cannot be reduced to a single diagnostic. Presence of an improved water source or sanitation system within a certain distance, volumetric measures of water availability, testing of water quality etc. all fail to adequately capture the way in which individuals and households achieve, or struggle to achieve basic levels of access to water and sanitation at different times of year.

Ignorance of these nuances, or indeed elimination of them through amalgamation of data as it is sent to decision makers, risks that improvements do not meet the needs of the most poor and vulnerable.

In the case of Humla baseline levels of access were so low that seasonality was not measured to actually render any infrastructure out of use (in the case of open defecation, there is no physical infrastructure but the practice was found to be significantly less sufficient). However the communities studied had variable levels of access to water and sanitation throughout the year. If statistics collected on access to water and sanitation were collected via the Joint Monitoring Programme system, access would be seen to be constant year round (no matter when the data was taken) until new infrastructure was built. However, as discussed in 7.7, the criteria used in the Human Right to Water and Sanitation are shown to vary significantly.

The reality is that many people have already criticised the inadequacy of the MDG indicators to summarise an enormously complex reality in a 2 option 'yes' or 'no' response (Satterthwaite, 2004; Bostoen, 2007; Kayser, Moriarty et al., 2013). Particular criticism typically occurs around the definition of 'improved' and its failure to address issues concerning water quality, operation and maintenance of the service, time taken for collection and acceptable distances to water or sanitation facilities (Bostoen, 2007). Seasonality is another dimension to incorporate to this list of inadequacies.

It is important to consider that seasonality may not exist everywhere. In Humla, the variable weather and seasonal livelihoods were key influencers of the variable standards of access to water and sanitation. It is suggested that practitioners examine these aspects first in considering whether seasonality of access to water and sanitation is expected to be of importance.

7.9 Chapter summary

Climatic seasonality in particular has been shown to have an influence on community standards of access to water and sanitation. It manifests in three primary ways; its effect on livelihoods, the physical environment, and in its most basic form – the change in weather.

The changes have been found to exist in access to household water, bathing, clothes washing and in open defecation. The changes seen in latrine use are less pronounced (due to lack of latrine use generally). Impacts have seen to be greatest in areas beyond the physical infrastructure itself e.g. accessibility, safety, etc.

The seasonal variation in access to water and sanitation has been found to cause intra-annual differences in the primary routes of water and faeces related disease transmission. Seasonal variation has also led to the researcher to call into question the adequacy of existing measurements of access to water and sanitation.

The next chapter investigates the impact of seasonality on programme delivery.

8 The Impact of Seasonality on Water and Sanitation Programme Delivery

8.1 Chapter Outline

The information in this chapter is primarily sourced from semi structured interviews with 39 key informants and information from the lead investigators field diary. It seeks to investigate the impact of seasonality on project implementation in Humla District, Nepal. Information is also included from the lead investigator's diary.

The reader should bear in mind that few key informant interviews were taped using the voice recorder, only hand written notes of the conversations exist. Thus the exact phrasing of quotes has been finalised based on notes made by the researcher during and immediately following the interviews.

The questions this chapter will address are:

At programme level: Does seasonality effect water and sanitation programme implementation in Humla District, Nepal?

(iv) What seasonal calendars effect water and sanitation programme implementation?
(v) What are the seasonal barriers and opportunities for effective implementation of water and sanitation programmes?

In investigating the influence of seasonality on project cycles, the following themes arose in the interviews

- The Institutional Environment;
- Community Behaviours;
- The Natural Environment; and
- Technical Issues.

A section of this chapter is dedicated to discussion of each.

In interviews regarding the opportunities and challenges for programme implementation in Humla, many of the responses were based on the challenges presented by the high levels of corruption in the area, and the high level of dependence of the communities – while some information is presented on these issues, the focus of the chapter remains on the seasonal issues observed.

8.2 Programme Delivery in Humla

Humla was described as a particularly challenging environment to work in by those who were involved in provision of sustainable water and sanitation systems in the area. Box 6 presents an introductory story on programme implementation in Humla. This story was relayed to the researcher in conversation with an informant and is based on notes made after the event.

Box 6 The Realities of Latrine Construction in Humla

It is Autumn, the rainy season is coming to an end and Organisation X is attempting to construct latrines for Village Y before the harvest begins. Timing is vital as staff at X have found that during the harvest season, community members are very busy with their own work, and thus are unable to cooperate in project implementation.

Organisation X needs to transport ten 50kg bags of cement to the village to secure latrine pans as part of their new sanitation programme. The cement is transported by plane from Nepalgunj, in the flatter Southern plains of Nepal, to Simkot, perched high in the Himalayas and inaccessible by road. The cost of the transport dwarfs the cost of the cement itself.

By the time an official from Organisation X arrives at the airport, the plane is already being unloaded in the rain and cement bags are being piled in puddles and outside. In these few minutes the contents of the bag are damaged. The official goes for help and the bags are brought one by one to a storage facility in Simkot. The top bag is taken each time and the bags underneath get wet.

Village Y is a 2 day walk from Simkot. Donkeys are arranged to carry the load. The maximum weight a donkey can carry is 80kg, while the bags weigh 50kg. To maximise efficiency the donkey's owner splits the bags and balances the load with 40kg on each side of a donkey. With the bags open, the cement is exposed to the elements and is much more susceptible to damage.

The open bags of cement are transported by donkey for 2 days. Along the way, the owner makes a profit by selling cement as he passes through the villages. The bags are very depleted by the time they reach their destination.

Upon arrival in the village, the cement is again left outside until the arrival of the organisation staff. The intension is to get sand from the nearby Karnali river for the concrete mix. However, this year, the rain has been very heavy and the flow in the Karnali is particularly fast. As a result, it is very difficult and dangerous to obtain sand – this essentially halts construction until the river levels subside. When the sand is obtained the steep climb back to the village must be completed by the women, as the men are away at a religious festival and the older boys are at boarding school, only returning for the harvest.

The concrete mix is made and the latrines are constructed using it, along with locally available stone and a pipe. Tin roofs are to be transported at a later date.

Curing the concrete is difficult as the water must be fetched from the river – a landslide in the heavy rains has damaged the village's water supply. When the staff leave, the village members are left responsible for the curing but do not find the time due to their already packed farming schedule. The organisation begins the same process in the next village

Staff from X return one year later to start a water rehabilitation project. They find disused and dilapidated latrines. The tin roofs, which failed to arrive, are blamed for the latrines being unusable and deteriorating over time. The concrete is cracked and unsafe to stand on over the pits. Despite the reality, community members are listed as having access to sanitation and the statistics for the area increase. Open defecation continues to be the norm.

The story in Box 6 is indicative of the scale of problems faced in programme delivery in Humla. It hints at some of the recurring issues that will be discussed in this chapter: community members' busy timetables, transport of materials, changing physical environment, poor availability of skilled labour and construction techniques, and low levels of education on sanitation issues.

The next section introduces the issues which were found to occur due specifically to the institutional environment.

8.3 Institutional Environment

The following is a description of the main WASH policies currently applicatble to Humla, the Institutions tasked with their delivery and the associated seasonal challenges.

8.3.1 Relevant WASH policy

There are currently two major targets for water and sanitation delivery in Nepal. The Millennium Development Goal (MDG) targets for 2015 to ensure 53% of the population has access to improved sanitation and 73% has access to improved water sources, and the national target of universal access to water and sanitation by 2017 (WaterAid Nepal, 2010, Lindblom, 2006, Government of Nepal, 2010, Rural Village Water Reources Management Project, 2011).

Table 8-1 details a brief history of relevant water and sanitation plans from Nepal. Of particular relevance to this study is the National Sanitation and Hygiene Master Plan.

8.3.1.1 Sanitation and Hygiene Masterplan

The aim of Sanitation and Hygiene Master Plan produced by the Government of Nepal in 2010 is to achieve universal latrine coverage in Nepal by 2017 (Government of Nepal, 2010). There are number of phases to this plan, these are summarised as follows:

1. **Open Defecation Free (ODF) Situation**
    - No open defecation in the designated area at any time
    - All households have access to improved sanitation facilities
    - All schools, institutions and offices have latrine facilities
2. **Total Sanitized Post-ODF**
    - Use of latrines
    - Practice of hand washing with soap or cleaning agent at critical times
    - Safe handling and treatment of drinking water at household level
    - Maintenance of personal hygiene

Table 8-1 A summary of relevant water and sanitation policy in Nepal. Year in the Nepali (B.S.) is on top, year in A.D. is underneath in brackets. Compiled from (Taylor et al., 2005; Government of Nepal, 2010; WaterAid, 2005)

Policy	Year	Main details
Water Resources Act	2048 (1992)	The umbrella Act governing water resource management. • Declares the order of priority of water use. • Vests ownership of water in the State. • Provides for the formation of water user associations and establishes a system of licensing. • Prohibits water pollution
Drinking Water Regulation Act	2055 (1999)	Regulates the use of drinking water. • Provides for the formation of Drinking Water User Associations and sets out registration procedure • Deals with licensing of use drinking water. • Deals with the control of water pollution and maintenance of quality standards for drinking water. • Sets out the conditions of service use by consumers
Water Resources Strategy	2058 (2002)	Improving living conditions of Nepali people in a Sustainable Manner. • 100% national drinking water coverage by 2012 • 100% "good quality water supply" by 2027 • 100% sanitation coverage by 2017
Nepal National Sanitation Policy and Guidelines for Planning and Implementation of Sanitation Programme	2050 (1994)	Aim to reduce incidence of morbidity and mortality due to water borne disease and lack of environmental sanitation and hygiene; through • Bringing about attitudinal and behaviour changes for improved sanitation and hygiene practices; • Increasing knowledge and awareness among all levels of community, particularly in women and children regarding improved sanitation hygiene; • Reducing infant and child mortality rate in population through emphasis on control of diarrhoeal diseases; • Ensuring that all water supply programmes have sanitation programme and vice-versa as integral component.
Rural Water Supply and Sanitation National Policy	2060 (2004)	Provide water supply and sanitation services to 100% of population by 2017 Provides general, non-quantified objectives relating to access to water supply and sanitation facilities, reduction in water-borne disease and increased productive time
Master Plan for Sanitation and Hygiene in Nepal	2066 (2010)	Emphasis on enabling environment shifts necessary for universal sanitation access by 2017 More details in section 8.3.1.1

- Proper fluid and liquid management in and out of home

Plus a number of criteria for strict upkeep of household and institution facilities

3. **Child, Gender and Differently-abled Friendly Features**
    - Range of features to cater for children, different genders and disabled users
4. **Ultra Poor Households**
    - Use Rural Water Supply and Sanitation National Strategy to identify 'ultra-poor' homes
5. **Stakeholders**
    - All involved agencies (see Figure 8-1) to have a role in water and sanitation promotion
6. **Joint Plan**
    - A district, municipality and VDC level plan of action which the central government, local bodies, donors and International/Non-Governmental Organisations follow to promote total sanitation.
7. **Universal Sanitation Coverage**
    - One hundred percent sanitation coverage in a given area
8. **Universal Access to Sanitation** – all users have access to latrine in a given area

The Masterplan has an "enabling environment" emphasis, with an aim to enhance collaboration between relevant stakeholders to provide sanitation. A new set-up sees small projects feeding back through a chain to a National Sanitation and Hygiene Steering Committee; this is shown in detail in Figure 8-1. In this new institutional set up, the VDC, school and community level program will report their progress to the V-WASH-CC (Village Water Sanitation and Hygiene Co-ordination Committee). Similarly, the V-WASH-CC report to the district (D-WASH-CC), who report to the regional level; eventually feeding back to the National Sanitation and Hygiene Steering Committee.

In the 2010 sanitation and hygiene master plan, the Government of Nepal map Humla's progress to 100% sanitation coverage in 2017 as shown in Table 8-2.

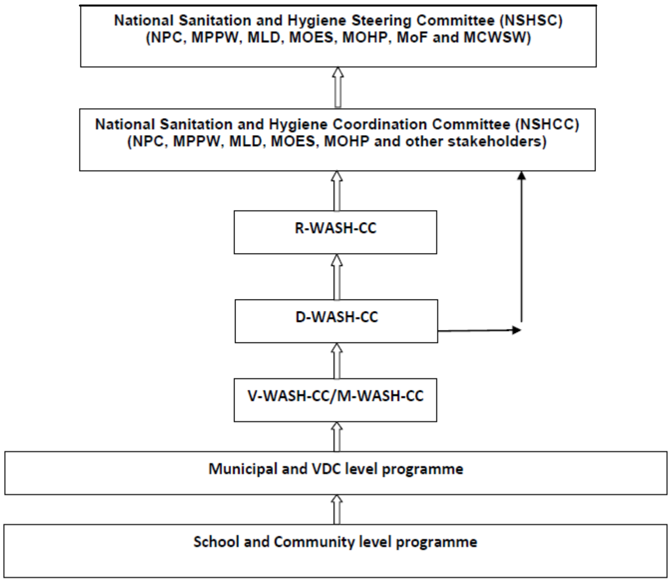


Figure 8-1 The reporting structure under the 2010 Sanitation and Hygiene Master Plan (Government of Nepal, 2010)

Table 8-2 The road map to 100% sanitation coverage in Humla (Government of Nepal, 2010)

Year:	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
% coverage	25.83	28.3	36.6	43.8	53.9	63.7	73.3	100.0

The challenge facing those working toward his goal is significant, with a 10% increase in numbers of people with access to sanitation needed each year from 2012 to 2017 to meet this target. With the current population of 50,858 people and an average of 5 people per household, this equates to approximately 1,000 household latrines per year.

The pace of this improvement was considered by the researcher to be inappropriate for Humla. The following practices were observed:

- ***Building latrines in areas that already had composting latrines as they were not considered 'improved' –*** the researcher observed a community (not used as a case study) in which composting latrines were already being used, but pour flush latrines were being enforced by government officials to reach the target for 100% use of 'improved' latrines
- ***Rushed work leading to poor demand stimulation and behaviour change –*** in many instances it felt as though latrines were being built for the sake of meeting targets and sufficient time was not being taken for educational programmes, behaviour change and demand stimulation activities in the relevant villages
- ***Rushed work leading to poor quality construction –*** the researcher observed very poor quality latrines being constructed due to the small investment by the homeowner and short time frame of work(which was not allowing for import of quality goods)

8.3.2 Institutions for WASH Delivery In Humla

There are an abundance of stakeholders responsible for delivery of water and sanitation in Nepal. A summary of those under consideration is presented in Figure 8-2 with accompanying roles in Table 8-3.

The chain can be seen to feed from the Office of the Prime Minister through to the District Water Supply Office (DWSO) (in the left strand of Figure 8-2 and the Water User and Sanitation Committee (WUSC) (right strand). The left strand represents money directly allocated toward development of water and sanitation on a district level, whereas the right strand represents the scenario when user committees actively request village level improvements via their local development office.

Government Ministries all have offices at regional and district levels. These are linked with local governance via the Chief Development Officer (CDO) and the Local Development Officer (LDO). The CDO belongs to the Ministry of Home and is the chief administrator of the District. He is responsible for maintaining law and order, and co-ordinating the work of field agencies and government ministries. The LDO belongs to the Ministry of Local Development (MLD) and serves as the secretary to the DDC, thus playing a crucial role in planning and development of the district (UNESCAP, 2004).

Under the Local Self Governance Act (LSGA), local bodies are required to encourage, involve and co-ordinate NGOs when formulating, planning and implementing projects. Thus the DDC and VDC are responsible to avoid duplication of programs and activities.

An additional and vital stakeholder in NGO led projects is the user group or community based organisation. Under the LSGA, all local bodies must give first priority to user groups to implement projects. As a result, user groups implement most of the projects of the local bodies. These groups must have 30% women members and can be a useful link between organisation technical offices and the people.

Due to its lack of infrastructure, lack of communications, severe cold mountain climate and difficult walking conditions Humla is a very difficult and unpopular place to work, both for Nepali people and many development workers (whatever their origin). It is considered the most despised ‘punishment post’ for government workers who are being disciplined or demoted for any reason (Saville, 2001)

The key institutions involved in the delivery of water and sanitation programmes in Humla are the local branch of the Department of Water Supply and Sewerage, the District Development Committee, numerous International, National and Local Non-Governmental Organisations and the Community level User Committees (as required under the Local Governance Act – section 0). In accordance with the 2010 Sanitation Master Plan (Government of Nepal, 2010), a D-WASH-CC

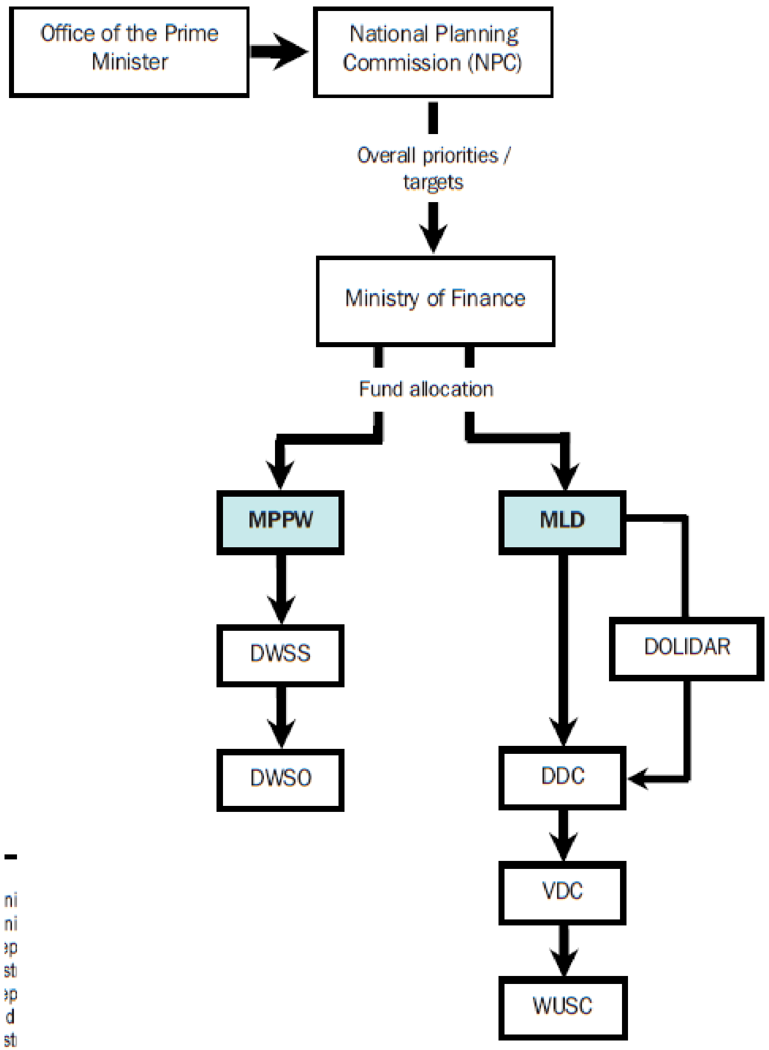


Figure 8-2 Visual representation of stakeholders responsible for delivery of WASH in Nepal

Table 8-3 Stakeholders in delivery of water and sanitation and their roles

Department	Role
National Planning Committee	To incorporate sectoral plans in comprehensive national development process for orientating it towards national development targets and to monitor its progress;
Ministry of Finance	To allocate budget to all ministries involved, release it and monitor its expenditure for achieving national development targets
Ministry of Physical Planning and Works	Work with NPC to formulate sectoral policies, plans and strategies, and to monitor them
Department of Water Supply and Sewerage	Centralised department for national level planning, co-ordination, programming and evaluation that undertakes district and community level activities through its sub-division offices. Provide technical support in the rural water supply and sanitation sector
Ministry of Local Development	Assist in the overall development works of the districts and villages by providing technical skills in line with the process of decentralisation
District Development Committee	Formulate and manage district level plans and to co-ordinate with other sectoral activities
Village Development Committee	Enhance co-ordination at the community level
Water User and Sanitation Committee	Preferred model for managing water supply and sanitation projects in rural areas. Participate in plan formulation, construction, management and operation, repair and maintenance of such facilities
Non-Governmental organisations and Community Based Organisations	Assist the community in the formulation and implementation of projects and to manage funds relating to such programme. Experiment and evaluate the revised implementation processes. Evaluate and also participate in the rural water supply and sanitation policy formulation on the basis of these experiences

(district level water and sanitation co-ordination committee) and V-WASH-CC (village level water and sanitation co-ordination committee) consisting of primary stakeholders for the delivery of water and sanitation programmes in each district were in the early stages of development during the field visit for this research (November 2011 – July 2012).

Upon analysis, interviews with regard to the intuitional environment were often found to be negatively biased. Conversations about these institutions would often remain centred on greed and corruption. There are, of course, success stories in Humla but the following section presents primarily failings of the current institutional environment due to their prevalence in the data.

"The collusion of big-wigs has stagnated development. We need to have the army, the police, all the 4 major parties, monitoring and cross-checking each other for every development projects. This is the only way to develop this area. The political leaders give us empty promises…" **(C8-M)**

An abundance of NGOs and partners existed in these committees with many NGOs present observed to have a water and sanitation arm of their organisations. In the opinion of some:

"..there are too many NGOs trying everything" **(KI37).**

While for some community members this abundance of NGOs was a source of amusement.

"…the Americans[29] must love us" (Quote noted in field notes, 12-01-12).

In accordance with the Local Self Governance Act (1999 A.D), all NGO led projects across Nepal must be implemented with a local user committee. There was a very negative feeling toward user committees from the community members themselves and key informants. Community anger stemmed from the unfair selection of committee members (as was discussed in 8.5.3) and their apparent greed.

"Our intentions aren't noble anymore, how could the status of the village be improved? Our hearts have already been corrupted. People have started misusing the money that comes in for development. If everyone worked together for the overall good for the village, that would be nice. The cunning ones embezzle all the money; innocent people like us are unaware of what goes on. Thus, the innocent people get angry" (**FGD11-S).**

NGO and GO frustration stemmed from the corruption within the committees.

[29] Generic word for any foreign white people in the area

***"User committees are very difficult to work with, culturally homogenous but economically heterogeneous. People are very opportunistic; you have to be so here to survive, therefore they are not thinking of the community, only themselves"* (KI20).**

KI18 described the only reason people chose to be on a user committee as:

***"Political power, access to money and an ability to influence people"* (KI18).**

In some cases, particularly in Lama communities there were far fewer complaints of corruption in User Committees and a much more united front was observed. In one Lama man's opinion:

***"If the user committee is strong, the project will work"* (KI13)**

The main seasonal aspects of the institutional environment of Humla were found to be the operational months of the main actors, budget timing and policies.

8.3.3 Operational Months

The operational months of the institutions of Humla was found to be a significant restriction to programme implementation. One government official stated that

***"Operational months are April to November – outside of these, productivity is reduced by about 50%"* (KI10)**

For the duration of this research (December 2011 – July 2012), almost no government level activity was observed from November 2011 to April 2012. Not only is productivity reduced, but at the government level over half of the staff members were found to leave the district during this 'low season'. In fact offices were by and large locked during this period. Holidays and festivals were found to shut down offices for days, if not weeks – all in all grinding productivity of projects to a halt. Leading staff from government offices were regularly on prolonged training courses outside of the district.

Tillett (2008) reported similar issues during his research in the area:

"…As the field research also coincided with two of Hindu's biggest festival periods (Dashain and Tihar), many government departments, schools and health posts were closed for holidays, and many staff were unavailable for interview. This was mitigated by a return visit to district towns 3 weeks after festivals had finished, although many local government staff were still absent from their post"

(Tillett, 2008)

This is not only government workers in the district capital, but also NGO workers and many of those stationed in health posts. This greatly reduced seasonal access to health care in the District. The District Health Officer did not appear in the District for more than a few days for the entire duration the research team were in Humla[30].

Some key informants observed that while this practice of leaving Humla for 6 months may have been acceptable in the past when Humla was truly a difficult place to live in winter; warming from climate change and increased development in Humla had made living there more comfortable and there was no longer a reason to leave for so long.

The newly formed D-WASH-CC met once per month to discuss progress and plans for water and sanitation in Humla. However, the repeated absence of staff, turnover rate of employees and the slow return of employees to the district was found to be stalling the effectiveness of these meetings as each would need to repeat a lot of information to get people up to date.

Communication among stakeholders

The poor access for personnel and communication with community members due to the physical environment is discussed in 8.5.3. Poor accessibility in the region also lead to weak communication between water and sanitation delivery stakeholders during their time out of Humla. In the 6 month absence from Humla, members of staff from these organisations were often found to go to Kathmandu to continue their planning for the next year. This departure from the district to complete planning often resulted in poor communication between the stakeholders and at times resulted in duplicated work (or at least intentions).

8.3.4 Project Timings

Project and policy timings are cyclical rather than seasonal[31], but they often failed to match the seasonal calendars of operation in Humla. Government and NGO workers complained of having the same time frames as their colleagues in the hill regions and Terai of Nepal in which to complete projects and meet deadlines, despite the fact that (a) Humla is more challenging to operate in, (b) levels of development are lower, (c) operations can only take place 6 months of the year due to the weather and absence of staff, (d) the difficulties in access to materials and access to communities.

The manifestation of this was poor standard projects, rushed to meet a deadline. One of the key aspects driving these timings was the Fiscal Year in Nepal.

[30] It was as a result of this that no health data was obtained for this PhD as all data was kept on paper in his office.
[31] The difference between seasonal and cyclical is detailed in 2.2.2.1.

Fiscal Year in Nepal

The fiscal year for all project cycles in Humla ends in mid-July (in line with the rest of Nepal). This date cuts operational cycles in half, by falling in the middle of the time of year when villages can be accessed, materials transported and cement used. This was found to leave project implementers in a rush to spend money and finish projects on time – despite only being part way through the time they have available for work.

In setting budgets, there seemed to be no consideration for the shortened operational seasons in Humla. Thus many grossly underestimated the time that would be needed to implement a project.

8.3.5 Budget Quantity

There were also regular complaints from government and non-government officials that budgets often did not even come close to representing the true cost of a project due to a failure to take the geographical situation and its constraints into account (KI26). The result was either (i) projects of a poor standard, or (ii) multiple small scale projects:

(i) *Projects of a poor standard* **–** where insufficient allocation of money would lead to a poor job being done when implementing a project.

***"Doing a proper job costs so much money that they end up lying about how much they can do for a budget and then do a shoddy job of it"* (KI20).**

(ii) *Multiple small scale projects* – Where the budget to fund large scale robust infrastructure is typically not available and thus an abundance of small projects are funded.

"*Because they're so expensive, there are far too many tiny projects here*" (KI20).

There was an apparent consensus among those who were asked, that insufficient budget for Humla was leading to construction of infrastructure that was merely a temporary fix with a short design life, rather than something expected to still be operational in 20 years.

8.3.6 Summary of Seasonal Institutional Environment

The primary means by which the institutional environment exhibited seasonality was through the almost complete absence of staff in Humla during the winter months. This was found to have a crippling effect on productivity in the district.

Poor budget allocations, project timings and inconvenient falling of the end of the fiscal year also contributed toward challenges faced by the key stakeholders in water and sanitation provision.

The next section shall consider the impact of the community and their livelihoods on project cycles.

8.4 Community Impact on Project Cycles

The seasonal nature of the local population's livelihoods was found to have an impact on project implementation. The four primary challenges highlighted by key informants were:

1. The population are highly mobile with large amounts of time spent out of the household e.g. trading, on temporary graze sites, in boarding school.
2. Community members are very busy at times of the year due to agriculture, and have no time to assist in programme implementation
3. The financial situation of a household may be very changeable throughout the year
4. Changing behaviours as a function of the weather

These issues will be discussed individually in the next sections.

Dependence on aid was also noted as a significant issue in long term provision of better access to water and sanitation in Humla. It is introduced first to facilitate the understanding of the logistics of working with the communities.

8.4.1 Dependence of Humli Communities

A re-occurring theme in interviews with key informants was the dependence of the Humli people on aid programmes.

***"Humlis are stuck in a relief cycle"* (KI20).**

***"People are 'disabled' due to the interventions here"* (KI24).**

Lack of motivation to work

Many key informants spoke of the laziness of the men of Humla, and their unwillingness to do anything without being paid.

***"Men are increasingly unwilling to work – in contrast, women don't seem to know the meaning of rest"* (KI28).**

In many cases there was little community spirit observed. This was attributed to the high levels of poverty in the area, which led to individuals living in desperation, and adopting an 'every man for himself' approach to life. This effect was most often described in relation to Hindu villages.

***"People are less motivated to build community properly; people are becoming very individualistic and are not willing to contribute to community development"* (KI3).**

In terms of the case studies, it should be noted that in Kermi, members of the community were found to work well together in the construction of new homes, and had greater aspirations for community level development. In contrast, the atmosphere in Chaggaunphaya was one of suspicion and hostility. The Dalits of Ward 1 appeared relatively well unified (possibly due to their collective dismissal by other caste systems) although some were noted to be 'getting ahead' to the detriment of other people. When researching in Kermi, corruption or dependence were not terms that emerged, whereas in Chaggaunphaya they dominated many conversations.

While staying in a village in Humla (not chosen as one of the case studies), time was spent with an NGO official as he tried, to no avail, to recruit men to assist in the rehabilitation of the village water project. Even the water committee manager purported not to be bothered, as they would just be building another system that would break (Field notes, 04-03-12).

Overall this lack of motivation for community development affected programme implementation. Permanent labourers were not available in Humli villages, and so, construction in a community would rely on the men and women in the vicinity of the project. The lack of interest also shows the average community members contempt for more projects they believe to be destined for failure.

Some Humlis spoke of their ability to survive on hand-outs if they wished to:

***"If we work hard we can save money, if not we can take it easy and get sustenance from NGOs"* (K1-M).**

The abundance of aid and hand-outs available in the district was found to be affecting some NGO's attempts to create a sense of ownership in their infrastructure projects. One NGO employee described his struggle to set subsidies and gain contributions towards projects, when other NGOs were just distributing goods in abundance for free and removing all hope of getting people to pay a contribution. As KI5 described:

***"(We) must 'compete' with the other NGOs who give everything for free – giving things for free means people are careless with them and this is a big cause of failure here"* (KI5).**

In FGD9-S when discussing the implementation of a new latrine programme, participants admitted that there was:

" …no point (in doing it), as the community would just build something that lasted the duration of the project and then pocket the money, and go back to the forest when the latrine broke".

One NGO worker described his difficulties in trying to persuade community members not to take on ineffective, inappropriate programmes:

"*When we talk about a project being inappropriate, the people get angry; they want every project so they can get extra money*" (KI12).

Overall the impression of NGO work on the dependence of people was poor, as summed up by KI20:

"NGOs contributed to the breakdown of community structure. They (Humlis) have become a population in waiting and have lost their confidence/drive to do anything for themselves"

This 'dependency' of the population caused issues for longevity of projects. An abundance of infrastructure was said to be constructed but left to break; at times with it literally having been constructed so that community members could have a percentage of the money (as opposed to actually wanting the infrastructure). This was indicative of the 'hardware' heavy approach being taken in Humla in provision of water and sanitation; where the number of programmes to provide infrastructure was noted to far outweigh those stimulating demand for the infrastructure through educational programmes.

During the course of the interviews, people spoke of the extremes in Humla, so while specific data is not available, the researcher anticipated that this was reflective only of the worst case scenarios.

While the impact of seasonality on programme delivery is exclusively considered in this chapter, it is important to remember that other, far greater issues for improved programme delivery were present.

8.4.2 Highly mobile population

In Humla, the population are highly mobile. A review of the seasonal activity calendar, presented in Table 5-9 , shows that men in particular may spend a large proportion of a calendar year trading goods outside of their community. It was also found to be typical that two members of a household[32] would go to temporary grazing sites or trading for 4-5 months of the year.

The mobility of the population led to a number of issues for programme delivery, including the need for investment in temporary settlements, and the absence of decision makers and skilled labour.

Need for investment in temporary settlements

The mobility of the population meant that large periods of the year were often spent outside of the community itself. Often, in the areas travelled to (e.g. grazing sites and trading paths), infrastructure availability was particularly poor, and thus community members would lack reliable access to water and sanitation for the duration of their time in these temporary settlements. An example of a temporary settlement is shown in Figure 8-3.

The difficulty from a programmatic point of view, is that

[32] Average household size from 201 census is 5.8 (Government of Nepal, 2011)

***"…nobody wants to invest in temporary settlements"* (KI39).**

Donors were reported to be reluctant to invest in areas where people only lived temporarily. In discussions about programme implementation in Humla, no organisations disagreed with this sentiment, placing an investment in temporary settlements low on the priority list given the poor levels of access to water and sanitation in the communities themselves.

Figure 8-3 Example of temporary grazing settlement (Author, 2012)

For the summer graze sites this was not seen to be a problem

***'…it's very spread out and the cold weather up there saves them from illness'* (KI20)**

The tea houses en route to China were found to be densely packed, with many people sleeping in the same room and with a high potential for disease transmission.

In conversation with owners and employees of the tea houses (the researcher and team stayed in many), little desire was shown to improve water or sanitation infrastructure as the owners or staff themselves typically only resided in the area for the trading months of the year themselves.

Luring foreign tourists to your tea house was seen as one distinct advantage of having a latrine, however all tourist treks seen by the researcher stayed in tents along the route, would dig a hole for waste, and surround it by a tent for privacy. This would be covered up prior to departure.

Thus the first impact on programme implementation resulting from the mobility of the population is the difficulty in guaranteeing year round access to water and sanitation when some individuals spend such a large proportion of the year outside of the home in areas with very poor facilities.

Absence of Decision Maker

Another key problem in working with the highly mobile population of Upper Humla was the regular absence of the male of the household; who by virtue of his income generating activities, was typically considered to be the decision maker of the household.

***Upper Humlis are particularly mobile, so making plans with them is very difficult* (KI20).**

From the seasonal activity calendar in Table 5-9, one can note that women were found to be responsible for the agricultural activities, with men involved in making money for the family. Thus the decision making typically lay with the man. His absence, be it from trading or being at boarding school[33], proved a difficult challenge for programme implementers seeking financial commitment.

Absence of Skilled Labour

Another issue with the regular absence of males was the subsequent lack of men to assist in construction work. Labour in communities was found to be lacking due to the absence of males through trading, grazing and boarding school.

In general, skilled labour was difficult for organisations to find. The construction calendar in the area was found to be limited due to the climate (see 8.5.4) and as a result, one informant reported:

'You can't be a full time construction worker, therefore no one wants to do it as a job'(KI27).

This lack of potential to work full time in construction meant that labour was at times provided by unskilled construction workers – potentially impacting on the quality of the work.

8.4.2.1 Summary of seasonal population mobility

A summary of prolonged periods of absence from the home (mostly affecting the male population) is shown in Table 8-4. Men are regularly unavailable to fulfil roles as decision makers and labourers due to the reasons shown in the table.

Table 8-4 Summary of prolonged periods of absence from the home in Upper Humla

<table>
<tr><th>Month</th><th>F</th><th>C</th><th>B</th><th>J</th><th>A</th><th>S</th><th>B</th><th>A</th><th>K</th><th>M</th><th>P</th><th>M</th></tr>
<tr><td>Seasons</td><td colspan="3">Spring</td><td colspan="3">Summer/Rainy</td><td colspan="3">Autumn</td><td colspan="3">Winter</td></tr>
<tr><td rowspan="3">Absence from the home</td><td colspan="2"></td><td colspan="5">Trading in China</td><td></td><td></td><td colspan="3">Move south</td></tr>
<tr><td colspan="2"></td><td colspan="5">Summer Graze</td><td colspan="5"></td></tr>
<tr><td colspan="9">Boarding School</td><td colspan="3"></td></tr>
</table>

While more elderly men go to summer graze, it is typically the younger stronger men who are sent to trade or who move south in winter, therefore the latter had more of an impact on programme implementation.

8.4.3 Workload

Another aspect of community impact on project cycles was the prevailing workload of the community. While physical absence of males from the village led to a lack of assistance with labour and availability for decision making, the same effect was noted to occur during busy times for agriculture. During harvest time, community members were found to be too busy to take part in the

[33] In some communities there was a trend for older men to go to school now that it had become more accessible

planning or implementation of projects. This further extended the periods of the year in which programme implementation was difficult.

As Tillett (2008) experienced in his research in Humla:

"The research was conducted during harvest time, and generally during the day; meaning that the community members at this time, particularly the lower castes and women, were often too busy to partake in the research…"

The same effect was noted by Klassen (2011) in Zimbabwe, who found it impossible to find local labour in the harvest season.

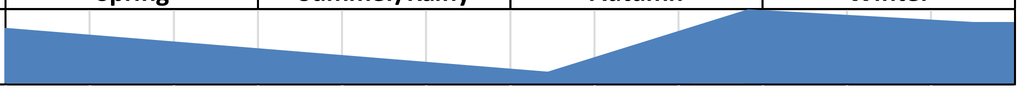
Further to the harvest, other local festivals could also leave people unavailable to assist in research or participate in projects.

8.4.4 Seasonal Finances

An awareness of seasonal income and outgoings has been shown to be important when considering project timings (World Toilet Organization, 2010). While it was not investigated in depth in these cases, householders and key informants reported that the level of income in a household was typically predictable according to the season. A representation of this is seen in Table 8-5.

In this study, peak incomes were uniformly reported to occur after the harvest, and before the winter season. Money available would then decrease through the year before reaching a low during the Summer/Rainy season. This affected programme implementation because, if funds were required for a project, the timing of the requirement for a contribution, needed to align with the time a household was likely to have funds.

Table 8-5 Cash flow in typical Upper Humla household

Month	F	C	B	J	A	S	B	A	K	M	P	M
Seasons	Spring			Summer/Rainy			Autumn			Winter		
Money availability												

This was a technique highlighted by the World Toilet Organization (2010) in their work in Cambodia, which used analysis of seasonal income to determine when to ask for investment in latrine programmes.

Unfortunately in the case of Humla, the time of peak money availability coincides with the beginning of a (at least 3 month) period when construction is not possible due to the poor weather conditions (as discussed further in Section 8.5.4). As a result difficulty is experienced by organisations in convincing individuals to invest in projects for the next year.

8.4.5 Behaviour as a function of the weather

As detailed in the chapter 8, community members of Kermi, Chaggaunphaya and Simkot Ward 1's water and sanitation related behaviour was found to change seasonally. This was attributed to the weather, their livelihoods and non-climatic events. In terms of key informants, only KI20 was noted to consider these seasonal changes in behaviour a significant consideration in delivery of appropriate water and sanitation projects.

"There are 2 behaviours for winter and summer. When seasons change there is a change in behaviour"

(KI20)

The interviewee noted that on the whole, winter behaviours are less hygienic but that people are more or less protected from their poor hygiene by the cold weather. He expressed fear that in the long term, as climate change raises the winter temperatures, that the effect of the cold 'safety blanket' might wear off and lead to increased illness. The same was noted in the researcher diary on 28th January 2012.

At no point in my life have I ever washed so little. Nearly 10 days in the same clothes and no latrine to use. Dipping my hands in the river water makes them crack and ache. Yet I feel in good health. It feels like the cold saves me from my poor hygiene. If I did this in the Terai[34] I'm sure I'd be very ill!

(Field notes, 28-01-12)

The primary issue seen by KI20 with seasonal change of behaviour was the fact that centrally produced training packs for school hygiene classes and NGO or GO hygiene trainings are

'***not relevant for all seasons***' and '***not suitable for Humla'***

Whilst the generic packs contain lessons on hygiene for 'average' conditions in Nepal and show how to wash hands, use a latrine etc. – they were not found to contain information relevant for maintaining these standards in a mountainous area or through the seasons. KI20 thought it important that these manuals be updated to show how behaviours might be modified when it was raining or snowing, in order to maintain good hygiene in all seasons.

This irrelevance of training material may explain why KI24 expressed disappointment that

'People score very well in hygiene exams but they do not practice what they learn'.

[34] The lowlands of Nepal where temperature is considerably higher

8.4.6 Summary of Seasonal Community Impact on Programme Delivery

Timing programme implementation so that it suits the community 'schedule' is very important for project success in terms of availability of decision makers and labour, money availability, and the shifting in needs and behaviour.

The high mobility of the population in Humla has been found to have an effect on availability of labourers and decision makers – thus stunting progress in programme implementation. Peak harvest times have also been found to result in the same effects.

The timings when men are away or particularly busy with the harvest overlap with key programme implementation timings. As will be discussed in Section 8.3.3, GOs and NGOs are most active from late spring to late autumn (with a gap during intense rains) and thus these gaps in community availability can cause significant issues in gaining permissions and physically constructing during what should be the most productive time of the year.

Mobility of the population also causes an issue in determining if access to water and sanitation in the community is sufficient, when large portions of the year are spent outside of the home. This does not affect prioritisation in programmes currently as donors and programmes implementers alike were reported to have little interest in investing in temporary settlements when community level access remains so poor.

Community level behaviour was also considered an issue in providing effective programmes that were suitable year-round. Shifts in behaviour were discussed at length in 7.8.1. In this section one key informant in particular described the need for hygiene promotion materials to be redesigned to address these seasonal behaviours.

The seasonal calendar of the target population's livelihoods is a fundamental system to understand for effective programme delivery.

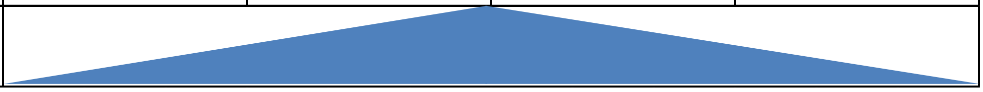
8.5 Physical Environment

Weather is the primary driver of shifts in the harsh mountainous physical environment in Humla. The seasonal shifts observed in the physical environment in Humla were found to affect water and sanitation programmes in terms of water availability and access to the area (for both personnel and materials). These issues will be discussed in the following sections.

8.5.1 Fluctuations in water availability

From the community viewpoint, access to water was found to be highly seasonal, with low flows in winter and spring, higher in late spring as the snow melts, and very high during the rainy season, before decreasing again throughout the autumn (this has been discussed at length in section 7.3.2). Table 8-6 summarises this data.

Table 8-6 Fluctuation in water availability in Upper Humla

Months	F	C	B	J	A	S	B	A	K	M	P	M
Seasons	**Spring**			**Summer/Rainy**			**Autumn**			**Winter**		
Water fluctuation (min to max)												

This seasonality of water availability has an impact on water source capacity testing, and on use of concrete (more on this in section 9.4.4).

The significant shifts in water availability make assessment of a new supply and its ability to support new infrastructure difficult. KI34 and KI21 agreed that flow rates and water quality tests should be carried out during times of low and high flow. Samhain and Boddow (end of the rainy season) and Poush and Marg (end of winter) were considered the best of times to do this testing (KI34). The ratio between the two flow rate readings allows the engineer to calculate how much water a source can supply without becoming dried out. However no standards were reported on timings for this, or for acceptable levels of difference between the two readings.

Local engineers reported that judging the capacity of a water source was becoming increasingly complicated with climate change. Many claimed to know of water sources which had recently dried up, and attributed this directly to climate change.

Overall this fluctuation in water availability made it difficult for engineers to judge the capacity of water sources to supply a fixed amount of water. Designs prepared by outsiders often were cited as not having taken the magnitude of these fluctuations into account, which was attributed to the drying of some community supplies in the spring. Knowledge of the water availability allows engineers to predict peaks and troughs in quantity available, and design appropriately so that water is available in communities year round.

8.5.2 Access for materials

Materials required for project implementation in Humla are exclusively sourced from outside the district, and typically with great difficulty resulting in many agreeing that:

'the biggest issue for this district is transport' **(KI14)**

The following are the primary options for delivery of material to the district

1. **Plane from Nepalgunj** – a quick option for material delivery but costs per kilogram are reported to range from 130 NPR to 220 NPR. In some instances this transport option was reported to cost up to 60% of a project budget (KI26, KI17, KI4). Seasonal climate had a significant impact on deliveries prior to the airport runway in Simkot being tarmacked in 2011. Prior to this heavy snow or rainfall was enough to cancel all journeys to the airport. The tarred surface now enables deliveries in much more challenging weather conditions but cancellations are still regular. A summary of issues with this transport option are shown in Table 8-7.

Table 8-7 Logistics of transport of goods from Nepalgunj

Month	F	C	B	J	A	S	B	A	K	M	P	M
Season	Spring			Summer/Rainy			Autumn			Winter		
Transport of goods by plane from Nepalgunj	Very expensive											
	Can be cancelled due to snow				Can be cancelled due to rain						Can be cancelled due to snow	

2. **Transport on foot from Nepalgunj –** Goods can be brought to Simkot in 10-14 days walking from Nepalgunj (whether on foot or with pack animals). This method of transport is less reliable than air transport and subject to unpredictable delivery times, but comes at a reduced price. This method of delivery is suitable in instances where delivery is being made to areas in the south of the District. This transport method is more challenging in the rainy season and during times of snow. A summary of the seasonal logistics of walking from Nepalgunj with goods is shown in Table 8-8. A motor vehicle-worthy road is being built but

"…the road from the south could be 20 years from completion" **(KI10)**

This substantial construction time is predicted due to the very slow progress on the road to date.

Table 8-8 Logistics of transport of goods on foot from Nepalgunj

Month	F	C	B	J	A	S	B	A	K	M	P	M
Season	Spring			Summer/Rainy			Autumn			Winter		
Transport of goods on foot from Nepalgunj	Very slow and expensive											
				Dangerous and unpredictable								

3. **Transport on foot from Chinese border –**This transport option is a more complicated task for the project manager due to the procurement of materials in another country and currency. The trip to Simkot takes an estimated 4-5 day walk on a route that is completely closed by snow for 4-6 months of the year. A summary of seasonal logistics of use of this transport methods are shown in Table 8-9.

Table 8-9 Logistics of transport of goods to and from China

Month	F	C	B	J	A	S	B	A	K	M	P	M
Season	Spring			Summer/Rainy			Autumn			Winter		
Transport of goods from China	Snow dependent				Dangerous in high rain					Pass closed due to snow- no access		

A motor road is also being constructed from the border to Simkot at a reportedly very slow rate. Over the course of the study this was regularly reported to be the most corrupt project to have ever existed in the District, swallowing any funds which come its way. One digger was noted to be in operation as the author passed along the route in mid May 2012. There are high hopes for this road when it opens, however an interviewee did note that:

"even when the northern road is finished, it will be closed very often with snow. It would be far better to finish the southern route" **(KI10).**

An example of the stretch of path from Simkot to China is shown in Figure 8-4 where donkeys are being used to bring timber to the border.

Figure 8-4 Donkeys transporting goods along the main trade route from Simkot to China

No distribution centres for materials were reported outside of Simkot that served the Northern Belt of Humla. Thus the primary flow of goods in the case studies in this research was from Simkot.

Potential for reliable transport was observed to be significantly reduced in the winter months with few goods seen moving along the main trading routes. To transport in the rainy season was seen as a risk, due to the potential for animals to slip, and for landslides

"Rainy season is hazardous- many landslides occur and loose stones roll down hills. Iron, rock and other bulky items become particularly difficult to transport" **(KI20).**

Whilst the most significant issues with transport of goods were to do with the terrain and lack of motorised transport in the area, seasonality was observed to add an extra dimension of complexity and uncertainty surrounding whether transport of goods would actually be possible at different times of the year; particularly with regard to transport of goods from China.

In discussion with key informants, this uncertainty paled in comparison to complaints of the extreme cost of transport of goods due to lack of a road, and the lack of understanding on the part of donors on how transport expenses contributed to costs (which resulted in projects in the area being much more expensive than those in lower, more accessible areas of Nepal) and project timings (with flexibility needing to be maintained due to uncertainty of access).

In a study completed by the Policy and Evaluation Department of the Netherlands and the German Federal Ministry for Economic Co-operation and Development (2011), rainfall was found to prevent transport of a borehole drilling rig during the rainy season. External organisations had arranged for work to take place during this season but had not taken into account that physically transporting the rig would not be possible.

Material transport in Humla is literally halted for months of the year (particularly in the snow) but even the optimum present situation doesn't allow for transport of such large machinery (due to the lack of vehicles). Instead, large items were transported by helicopter year round.

Seasonal weather issues did leave all case study sites outside of Simkot virtually inaccessible for materials transport in the winter months, thus playing a significant role in the timing of material procurement.

8.5.3 Access for personnel

The difficulty of access both to and within Humla results in very few external people visiting projects there.

***"There is much more failure in the mountains, no one visits"* (KI16).**

However, people need to visit. Due to the lack of skilled staff in the district, decision making is frequently from the top down and made outside of the district. Right across the board, from country programme managers to donors, to designers, to evaluators – 'outsiders' were found to be making the important decisions for Humla's WASH programs.

***"Outsiders come and they don't know the language, they can't cope with the conditions, aren't fit enough to get around, and never allow enough time to visit all project sites – it is physically too challenging"* (KI20).**

Visits of personnel are further restricted by the climate of the region. If and when visits do occur, they were noted to occur in Spring and Autumn, thus avoiding times of heavy rain and snow. The researcher did not encounter another outsider in Humla from arrival in December '11 until March'12 (Field notes 21-03-12). As a result, Humla is typically viewed by these 'outsiders' during times of relative comfort.

Table 8-10 gives a very broad overview of times of the year when officials were stated as being most likely to visit.

Table 8-10Typical timing of visits from those who reside outside the district - visits marked by x

Month	F	C	B	J	A	S	B	A	K	M	P	M
Season	Spring			Summer/Rainy			Autumn			Winter		
Typical visit times by outsiders	Too cold		x	x	Raining		x	x	Too cold			

The problems as a result of these infrequent, time restricted visits were found in every aspect of the project cycle; from the planning phase, right through to monitoring and evaluation. The following sub-sections consider how these irregular visits were found to affect project management, design, logistics, communication with the community, and operation and maintenance.

Project Management

Poor seasonal access to Humla was found to have significant impact on regularity of donor and management visits to the district. KI6, an NGO programme manager, stated that it was very difficult for donors to visit, and therefore NGOs

‘***get away with running bad projects’***.

Poor accessibility to the area was also found to restrict the number of visits from external personnel from NGO or INGOs. In an interview, one country programme manager (whose main project was in Humla), admitted that he only found the time to visit Humla every 2-3 years, and when he did would stay for 1-2 days. He blamed the weather and subsequent unpredictability of the flights as the reason that he could not ‘risk’ coming to Humla more often. In times of bad weather, he feared he could be stuck in the region some 2-3 weeks (KI15).

This manager did stay in Humla for 4 days. He was observed to spend 1.5 days walking to the project site, a few hours visiting the site, 1.5 walking back and then got a few hours of sleep before retuning on an early flight from Simkot. This was a typical schedule observed for a number of organisations visiting the region.

The combination of a lack of visits from both donors and programme managers was found to contribute to great frustration on the part of the field staff, who complained of being given:

1. Unrealistic budgets

***“Donors just can’t understand the unique constraints here”* (KI20).**

2. Short, infeasible time frames

***“We are put under pressure by short year here and trying to get the work done in this time. This tends to lead to rushed projects and reports”* (KI18).**

3. Fundamentally unsuitable proposals

***"Most projects are proposed in Kathmandu, and are just not suitable for here"* (KI20).**

This particularly rang true when one member of NGO field staff detailed how he was currently obliged by funds to supplied to him, to implement pour flush latrines in a community he knew to have very poor access to water, and who already were very successfully using composting latrines to produce fertiliser for their fields.

Lack of visits from external donors and managers was also cited as a reason for corruption in the area. Again this is something that was underlined as a significant issue year round in the district, but one that was further enhanced through seasonal inaccessibility.

***"The only way to improve our lives is for NGOs to work here with close monitoring by their own staff. If there any organizations that work like such, they should come here. Otherwise, there is too much corruption: send their kids to Kathmandu, buy Jhopas, and make themselves rich"* (C9-F).**

Project design

Similar issues of access were found to exist due to infrastructure designers only coming on short investigative visits before returning to Kathmandu to work on a design.

***"A specialist comes in from Kathmandu to do the survey, who then returns and designs it there"* (KI18).**

According to a number of key informants, these specialists often send designs to the area which are unsuitable for use. Key informants blamed this on:

1. Lack of familiarity with the area and its resources

***"These outside consultants do not understand the context – that is the biggest reason for technical failure of projects here"* (KI29).**

2. Physical inability to carry out necessary surveys correctly

"*they don't do surveys properly as the conditions are too tough and it's too difficult for them to visit the water sources"* (KI20)

Seasonality of the climate was found to restrict the time of the year that designers can visit, thus consideration of how a system will function in times of extreme cold or rain is often minimal.

Project Implementation

The handover process between design engineer and those responsible for construction was also affected by poor access for personnel to Humla. Project handover was described as one informant as being '***typically very disjointed'*** (KI20). He followed up to explain that:

'***It is very difficult to link a design and build phase when different people do them'* (KI20).**

Worse still the designers were sometimes found to handover the designs in English, thus making them problematic for local engineers to use (KI39).

Due to access being restricted by the climate, and the short building season (see section 9.4.4) those implementing projects were found to have a great deal of work to complete in a short length of time. As a result, projects were reported to be rushed and typically finished to a poor standard.

Some organisations were noted to just:

'…***give the pan and pipes and the job is done'*** (KI35).

Time available for supervision and project assistance was found to be short. In many cases, organisations would bring materials to the area and leave advice for construction, but not supervise the construction. This frequently resulted in unqualified people undertaking the construction of a design (and as mentioned previously, quite often this design could be presented in a language not understood to the constructor).

This lack of supervision was found to lead to construction problems. One government official blamed the community for poor construction of a water pipeline but failed to take responsibility for their lack of supervision.

'*We told them to dig the pipes down. We told them it would freeze, and it did; thus it required new money to re-lay all the pipes'* (KI17)

The poor facilities in the villages where projects were being undertaken further restricted staff from visiting project areas and staying, thus these external staff would typically have no place to stay long term and would move on.

There were complaints from both the community and local staff members that the volume of work to do in the short working calendar led to unfinished work across the District. It was also observed to result in a lack of hygiene and education programmes to accompany infrastructural improvements. With visits to site, and time limited, getting physical infrastructure build was found to be a priority.

***"The use of latrines is never demonstrated to the user. The only time I've ever seen the latrine pipes being used is to mix tea in!"* (KI34).**

"*It is difficult to engage with distant communities, can only visit 1 or 2 times a year*" (KI3)

Community Communication

Access of personnel also had an impact on community communication. In Kermi and Chaggaunphaya, methods of communication were all but cut off in the winter season. Phone networks failed to work in very snowy conditions, and access for community members on foot was difficult in rainy and snowy season. As a result, if infrastructure did break, there was often no means to report it.

Table 8-11 Means of communicating with community members year round

Month	F	C	B	J	A	S	B	A	K	M	P	M
Season	Spring			Summer/Rainy			Autumn			Winter		
Visit on foot				Road dangerous						Road impassable		
By phone				Unreliable network						Unreliable network		
Radio	Poor signal											

This also resulted in difficulty in planning anything project related with the communities outside of Simkot. Arranging trainings, hiring labourers and assessing needs were tasks (among many others) that were seen to be extremely challenging due to the lack of communication routes. Planning anything for a fixed date with these communities was particularly difficult.

Radio was found to be used as means of assembling user committees and for obtaining user feedback by calling meetings. This left those in more remote villages unaware of activities in the district, and left projects to be implemented in districts far from the capital, with a user committee filled with people residing in Simkot, and at times even Kathmandu.

They (Department of Water Supply and Sewerage) advertised the project (a drainage system) on the radio and told villagers to form a committee and to come to register at the Simkot VDC office. A committee had done this the day previously but today another committee has shown up arguing that the radio method was unfair and that they should be the committee. The desperation to be on the committee is apparent. They get 5% of the project money. One man is particularly stubborn and insists he will be chairman. Is this so they can truly do a good job on the system?

(Field notes, 16-03-12)

From the point of view of the researcher these radio announcements were unfair to those without radio signals, and resulted in imbalanced user committees with the best interests of the community not always as the primary concern.

Lack of Operation and Maintenance

A lack of operation and maintenance of projects was also cited as a result of poor site access. Again this is an issue which was a direct result of the physical environment of the mountain, but one which was further exacerbated by seasonality.

'***Monitoring is where all of these projects fail'*** said a participant of FGD9-S; speaking both in terms of financial monitoring of funds and monitoring of the infrastructure.

Communities expressed frustration that:

"*If an NGO does a project, they do not consider themselves responsible for the maintenance*" (KI25).

However, for NGO staff, to monitor a project would make it financially impossible as they

"*would need to work very slowly to monitor all building work, someone would need to stay there full time*" (KI20)

A Government member of staff said that:

***"…theoretically, the community should monitor any project they want – this is theoretical, not practical"* (KI38).**

Lack of visits from personnel also meant the functionality of infrastructure was rarely considered in the rainy and snow seasons, and as per the Chapter 8, the seasonal fluctuation in water availability and sanitary practices should be considered important.

No monitoring criteria were stated by any key informants with regard to checking functionality of infrastructure on a seasonal basis. Follow up assessments, if carried out, were typically seen to occur in the late spring season. No assessment teams attempt to access sites in the colder weather or rainy season, primarily because "***everywhere is so spread out that it is impossible to keep field staff monitoring things"* (KI20).**

Some organisations did have many more field staff than others, and those who lived in the villages were found to be more concerned for the state of their infrastructure than others.

Even when problems could be reported, to arrange follow up and repair of issues was at times a lengthy process

***"..it is difficult to act immediately if something goes wrong*" (KI3)**

8.5.4 Design and construction of appropriate infrastructure

The seasonal shifts in the physical environment also led to technical challenges for engineers in designing, constructing and maintaining sustainable infrastructure.

KI39, based in Kathmandu said that across the three regions of Nepal, the Terai, the Hills and the Mountains – the reasons for failure typically differed significantly.

***In terms of water supplies, broadly, the main concern in designing a water supply in the Terai is arsenic, in the hills its calcium carbonate, and in the mountains, it is the possibility of freezing* (KI39).**

The same interviewee said that '***geography and availability of local materials'*** were his primary concerns in design of a system. Yet, as discussed in 8.5.3, centralised designs of all systems from Kathmandu were found not to account for this.

The following sections examine the technical aspects of the process of delivery of access to water and sanitation and how these were affected by the physical environment. This includes an examination of measuring access to water and sanitation, construction times, seasonal threats to functionality and project budgets.

Measuring access to water and sanitation

The impact of the weather on the physical environment of Humla was also found to result in questions with regard to the applicability of water and sanitation standards (both local and global) to the area.

The prevalence of steep slopes and the impact of these on physical access to water was detailed in Chapters 7 and 8. As a result it was proposed that horizontal distance should not be used as a measure of access in a mountainous environment due to the significant impact of vertical distances on ease of access.

One key informant advised that in Humla, they considered 'access to water' as the supply being at

***"..up to 15 m horizontal and 15 m vertical distance"* (KI39)**

The same informant considered time to be a better measure of access to facilities in a mountain environment.

One local NGO was seen to be using time as measure, and considered access to a supply to mean

***"150 m horizontal, 50 m vertical or a 15 min round trip"* (KI21).**

Another informant aimed to get the best closest access that they could for facilities but recognised that it is

'…impossible to uphold criteria and standards here" **(KI27).**

Volumes were also an interesting consideration as animals were found to place a large demand on drinking water infrastructure.

If one considers seasonality this becomes even more complicated. Is 150 m in snow the same as 150 m in the more comfortable spring season? When it is raining hard is it acceptable to walk the same distance to the latrine? Even if time is a measure will a distance that takes 15 minutes in the autumn also take 15 minutes in the winter?

The worst case scenario should be considered in applying these standards, yet they are typically based on viewings in comfortable conditions and based on completely different physical environments.

Construction

Construction of large scale infrastructure in Humla was found to be difficult task year round due to the poor access for materials and personnel, the significant slopes, and the rocky ground. Figure 8-5 shows a woman digging a pit for a latrine in Chaggaunphaya. She has unearthed a particularly large rock in the area which she has reserved for latrine construction. Standard practice for dealing with this on a small scale, was to light a fire by the rock and then attempt to break it up with an axe (or similar items).

As well as these baseline difficulties, construction periods of the year were severely limited by climate. There exists a:

'very narrow timeframe for construction and transport' **(KI20)**

In winter, frozen soil and inaccessibility means that not work is possible (K3-M), in rainy season it is hazardous, landslides occur and iron, rock and other bulky items become difficult to transport (KI20).

Cement imposed further restrictions.

Everyone gets the cement wrong (KI34).

A combination of unpredictable weather and transport often lead to cement failing (see story in box 6). Guidance on timings for use of cement from a number of sources was as follows:

-It cannot be used before April as it will not set (KI5)

-May-ish is the suitable time for cement (KI21)

-April to August, cement can be used (KI31)

-Curing cement is often difficult due to the lack of water (KI31)

-During rainy season, even transporting cement within a VDC is enough to ruin it (KI20)

Figure 8-5 A woman digs a latrine pit in very rocky ground

The physical environment thus limits construction and using cement as shown in Table 8-12.

Table 8-12 Summary of some construction issues limiting months in which it is possible

Month	F	C	B	J	A	S	B	A	K	M	P	M
Season	Spring			Summer/Rainy			Autumn			Winter		
Cement Use	No cement		Cement use possible					No cement use				
Construction				Landslides possible						Avalananches possible		
										Frozen soil		

Seasonal threats to water project functionality

The reasons for failure of water projects, as perceived by case study communities, were presented in Chapter 7. Key informants noted key seasonal hazards as landslides, heavy rain and frost.

(i) Landslides

Landslides had severely damaged the 'improved' water project in Chaggaunphaya. But according to engineers in Humla this was not a one-off, and siting water supply intakes in the middle of rivers was one of the more common mistakes made by outsider designers.

"Landslides regularly wipe out NGO water projects. They have wiped out 2 projects recently due to bad placement **"(KI21).**

(ii) Heavy rain

Whilst heavy rain ensures an abundant water supply during the rainy season, it is also known to cause some damage to infrastructure:

"Heavy rain has been known to blow taps off due to the pressure. These are then left off and the taps run 24 hours per day" **(KI34).**

(iii) Frost

Any section of exposed pipe is susceptible to freezing due to cold in the winter. Leaving plastic pipe above ground led to it being cut upstream of the frozen section and damaged further.

"Can lose half a foot a day with people cutting back pipes (when frozen)" **(KI28).**

This issue was particularly problematic due to the difficulty in burying pipes with the prevailing rocky ground in Humla.

One project engineer advised that the current standpost design was also unsuitable for Humla. He advised that constructing a water project in a cold area in which pipes are surrounded by concrete is a poor approach, as the thermal insulation capabilities of concrete do nothing to prevent the water in the internal pipe from freezing.

Instead he suggested that, particularly at tap stands, sections of metal pipe be left exposed so that community members may defrost the pipe with hot water, rather than break the concrete to access it. An example of a standpost with the pipe exposed is shown in Figure 8-6. While the exposed pipe will lead to more frequent freezing, it leads to freezing that is easier to deal with. Hot water can be poured over the exposed pipe to defrost it. In his experience, in some cases where water froze in pipes internally, community members had been found to smash the concrete to gain access.

Figure 8-6 A re-design of a standpost to cope with cold weather (Author, 2012)

The engineer also advised that for larger scale water supply projects HDPE (high density polyethylene) pipe should instead be used whenever available to cope with the cold. The limitation in acquiring more of this pipe for the district was in his opinion, the cost.

Overall, it was reported that to construct a system that functions in all seasons in Humla led to much higher project costs than for the hills or Terai of Nepal.

"Water projects are shockingly expensive here; 12 million npr [35]for a 200 person scheme is not unheard of" (KI20).

A large proportion is of project cost is due to the high cost of access for materials, labourers, and engineers etc., but some expense is a result of the need to build very robust systems in the mountains. All structures must be well built, with high quality pipes buried to a depth of one metre to cope with the climatic extremes.

This increased cost was regarded as a large barrier to the implementation of sustainable water supply systems in Humla. In an effort to attain funding from donors, organisations were found to undercut the realistic cost of implementing a sustainable system in Humla in a bid to construct something. This was repeatedly said to lead to organisations constructing cheaper projects which could not withstand the operational conditions in the district.

To construct a working water supply also requires a greater degree of skill than a system in a less challenging area. However issues also arise in standard of the labour force

"*Many engineers in Humla, but there is quantity, not quality*" (KI34)

Attracting high quality engineers to what many considered to be a 'punishment post' in the challenging circumstances of Humla was difficult and the labour force was generally known to be weak, and to have a high turnover rate. This lead to continuity issues which shall be discussed further in section 8.3.

Seasonal threats to latrine functionality

The reasons for failure of water projects, as perceived by case study communities, were presented in Chapter 7. Key informants noted key seasonal hazards to functionality as cleanliness, water supply, and construction issues with the roof and superstructure.

(i) Cleanliness

Latrines must be easy to clean or they become a "***hazard in themselves***" in the rainy and summer seasons (KI20) as they attract many flies and a bad smell.

(ii) Reliability of water supply

Seasonal unavailability or low availability of water can be enough to render a latrine out of use. Certainly the choice to put pour flush latrines in Chaggaunphaya had been a decision which contributed to the lack of use of the installed latrines due to its current water supply failure.

[35] Approximately £77,000 on 01-10-13

(iii) Roof failure

Many latrines in Chaggaunphaya were unfinished due to lack of a corrugated iron roof. KI14 clarified why the roof was an issue in latrine construction as detailed in the field notes:

We've heard the complaint over and over that they're waiting for the tin and cement to finish the job but can't you build a roof from anything? XXXX has informed me that normal roofs (mud, wood) are fine on homes as the heat from homes keep them dry, but you need tin on a latrine. It's also hard to scrape the snow from the stand alone latrine's roof so it must be sloped.

(Field notes, 23-05-12)

The reliance on an externally sourced material for roofing meant that latrines were not usable in the long term without delivery of this part. The same was found to be an issue for pour flush pans, which if undelivered or broken, were difficult to acquire and could halt the use of latrine.

(iv) Superstructure and pit

Superstructures and pits must be constructed very well to cope with the weather conditions in Humla. The pit must contend with the freeze thaw action of the ground, while the superstructure must endure the extreme weather conditions. To build a latrine superstructure to last in Upper Humla, stones must be used, similar to those used in the construction of homes.

The collection and construction of solid latrines using stones resulted in latrines costing a lot of money, but as one informant pointed out:

"There is no point building a cheap latrine here, it will collapse" (KI15).

Typically a latrine was reported to cost at least three times as much to provide in the mountains as one in the Terai. Informant KI20 estimated the price to be at least 30,000 NPR[36].

Overall the installation of the current design of choice in the area, the pour flush latrine, was questioned by key informants. Composting latrines reportedly used to be 'the heart of the agriculture systems' but the government was said to be reluctant to install these systems as they would not contribute to national statistics for 'improved sanitation'.

"…composting latrines like those up north would be great for here" (KI20).

[36] Approximately £190 on 01-10-13

In all case study communities, animal waste was used as fertiliser. Community members in Kermi expressed a need for fertiliser because Lamas miss out on collecting this waste while their animals area are at summer grazing sites and defecating there.

One engineer in the area was attempting to make compost latrines more elitist to stimulate demand for what he saw to be an improved system for the area. He did however acknowledge the risk of this tradition, primarily stemming from Lama Communities, and the consequential risk of Hindu communities not being open to using human waste as fertiliser.

8.5.5 Summary of Seasonal Physical Environment Shifts on Water and Sanitation Programme Delivery

The physical environment of Humla and seasonal shifts within it are seen to have a profound impact on the delivery of water and sanitation programmes. This effect has impacts from the initial logistics of the programme itself and its planning, to the technical aspects of design choice and implementation, to the post implementation monitoring.

The seasonal fluctuation in access to the district and its communities is the most significant manifestation of the effect of prevailing weather conditions on the physical environment. Heavy rain and snow exacerbate the already challenging mobility situation in Humla. While the baseline situation is poor due to a lack of motor-able roads, the small paths which actually do exist can become impassable in winter and dangerous in the rainy season. At this time transport of materials and access of personnel to the district becomes a challenge. Communication with the communities can also be cut off. This can lead to a halt in progress for programmes in the area.

The impact that this has on access for personnel is significant, and it has been attributed to the lack of donors visiting the area, poor designs carried out by outsiders, and poor access for monitoring projects during construction and upon completion. With the time available to access communities shortened, important hygiene lessons and softer issues of programme delivery have been reported to be dropped in order to complete infrastructural elements on time.

Many technical challenges face an engineer designing, building and maintaining a water or sanitation system for use in Humla. The mountainous environment provides challenges in itself, but the extremes of the seasonal weather also mean that systems need to be robust to cope. Robustness leads to increased cost, and according to the Key Informants of the district, this increased expense is not one that donors are willing to pay for when their money can buy so much more in other districts. As a result, organisations under sell the true cost of infrastructure, and at times build unsuitable systems.

8.6 Addressing the Research Questions

The data collected from key informants aimed to address the following research question and sub-questions.

At programme level: Does seasonality effect water and sanitation programme implementation in Humla District, Nepal?

(i) What seasonal calendars effect water and sanitation programme implementation?

(ii) What are the seasonal barriers and opportunities for effective implementation of water and sanitation programmes?

This section shall discuss seasonality in water and sanitation programme delivery based on the data presented in the preceding sections.

(i) What seasonal calendars effect water and sanitation programme implementation?

The seasonal influences on programmes delivery primarily stem from (i) community livelihoods, (ii) the weather, and (iii) the institutional environment.

A summary of seasonal variables, how they affect specific elements of programme cycles, and the primary ways these impacts manifest is shown in Table 8-13.

The work schedule of the community is seen to influence construction and implementation of projects, through community members' unavailability during peak work times in the year. Location of individuals of the community has a similar effect.

The finances, or cash and asset availability of a household, should also be taken into account for programme timings due to the impact of money availability on the time at which people may or may not be able to pay a contribution toward an intervention.

Behaviour is seen to be a function of the weather and the physical environment. The year round shifts in water and sanitation behaviour and preferences (e.g. using a latrine versus openly defecating) should alter the design of the project. The prevailing weather also impacts the design of water and sanitation infrastructure through its impact on availability of natural resources (primarily water) and the seasonal array of threats to infrastructure functionality as a result of extremes of weather. Design of training materials is also influenced by prevailing weather and behaviour due to the need to make training materials contextually relevant.

Seasonal accessibility to project areas for both personnel and materials has the most far reaching effects and impacts the programme on every level through allowing or preventing the access of staff and goods to the area they need to be in. The weather can also worsen communication networks which again are seen to have a far reaching impact due to difficulty in planning or following up with a community with regard to a project.

Table 8-13 Impact of seasonality on water and sanitation projects

Source of Seasonality				Impact					
Level			Seasonal Variable	Programme Cycle					Primary Manifestation
1	2	3		Design	Costing	Construction/ Implementaiton	Monitoring/ Evaluation	Programme Timings	
Climatic	Livelihoods	NA	Work schedule			✓/x		x	Too busy to assist in project implementation
			Location of individual			✓/x		x	Decision makers &labourers absent
			Finances					x	Greater availabilty of money to pay at different times of year
	Weather	Direct	Behaviour	x					Designs needed that cope with seasonal behviour shifts
			Preavailing weather	x					Varying threats to infrastructure functionality e.g. water shortages, landslides
			Precipitation			x		x	Limited time availabiliy for cement based construction
		Indirect	Condition of access routes	x	x	x	x	x	Periods of the year where people/materials cannot reach communities
			Communication networks	x		x	x		Difficult to reach community to discuss project or follow up
	Insitutional	NA	Operational calendar			x		x	Limited time in which to complete projects, poor communication
Non-climatic / cyclical			Fiscal Year			x		x	Timing leads to rushed and inappropiate spending of money
			Inadequate budget	x		x	x		Low quality infrastructure

In terms of the institutions, the operational calendar (a function of the climate and non-climatic institutional norms), is seen to impact the construction and implementation of projects, and their overall timings. The timing of the fiscal year also impacts how money is spent. The time for which budgets are prescribed, and their amount, has an impact on the design construction and monitoring of projects, typically resulting in low quality infrastructure.

The elements of these calendars and how they vary as a function of the seasons are shown in Table 8-14.

(ii) **What are the seasonal barriers and opportunities for effective implementation of water and sanitation programmes?**

As can be seen from this Table 8-14, some of the barriers and opportunities for water and sanitation programme implementation in Humla vary over the course of the year.

Spring

In the spring, many decision makers are in the home and are not undertaking a heavy work load. This should be a prime time for project implementation. However, the household cash stocks are beginning to deplete as they enter the lean season prior to the harvest, access can be unreliable, and heavy snowfall can prevent use of cement.

If there is low snow coverage, access can be possible and communities can be visited for project work to begin. However, spring is a time of year where GO and NGO officials make assumptions about snow coverage and often remain out of the district for most of its duration. In times of low levels of snowfall, this is a missed opportunity for work.

Spring – Summer/Rainy

In the time between the last of the spring snow falls and rains of the rainy season (Jestha, Asoj with heavier rains during Shrawan); men, and some women, begin to leave the communities. Available cash stock continues to deplete to a very low level, but workload is acceptable and those who remain in the village are intermittently available. This is a key time for water and sanitation interventions, particularly those centred on females. Systems need to be devised that do not involve payments from the communities during this lean time.

Rainy

When the rain does come there is a risk of landslides and transport is more of a risk; but otherwise conditions are good and cement may be used. The fiscal year ends at the end of Asoj and this puts pressure on NGOs and GOs to spend their money. This optimum period for construction overlaps with low money availability and an absence of males.

Table 8-14 Summary of seasonal shifts causing an effect on water and sanitation programme delivery

	Month	F	C	B	J	A	S	B	A	K	M	P	M
	Season	Spring			Summer/Rainy			Autumn			Winter		
Community	Absence from home			Men trading in China							Move South		
				Men/women at Summer graze									
		Boarding school											
	Peak workload							Harvest					
	Behaviour	Shifting water and sanitation behaviours											
	Cash flow												
Physical Environ	Access for materials	Poor Access				Poor Access					Poor Access		
	Access for	Poor Access				Poor Access					Poor Access		
	Cement Use	No cement use		Can Use cement reliably (when not raining)					Intermittent cement use				
	Hazards				Landslides						Avalanches		
Inst Environ	Officials absent from district	Absent									Absent		
	End of fiscal year												

Mechanisms of making decisions before this period of absence from the head of household and flexible finances on projects (allowing payment later in the year) would help to alleviate this mismatch of construction conditions and suitability of timing for the community.

Autumn

In the harvest, many people have returned to the home but all are occupied in the harvesting of crops. Those who have returned bring money from trading activities and disposable income increases. However, while the conditions for project implementation remain good, and access paths remain open, the community are often too busy to participate in labouring, trainings etc. As a result, incentives may be necessary for people to free time from the harvest.

Winter

In winter, community members are available and have a stock of money and goods; however, the snow begins to shut off access again and government and non-governmental organisations begin to leave. As a result, very little work takes place in this season despite it being by far the time of lowest workload for the community members.

Throughout the year there is a mis-match between availability of male community and optimum time for access and construction. This leads to an issue in matching project cycles to community timetables. With ever increasingly warm winters, the period during which access to villages is cut off is lessening. By remaining in the district in the early stages of winter and late spring, officials would increase their operational time in the district.

Approaches need to be taken which consider this mis-match of timetables, in order to bridge the gap and optimise the work that can take place. This may include strategic incentives when cash is low, or delivery of training at times of the year when the community are least occupied.

Data collated in tables such as those in Table 8-14 should assist in highlighting operational strengths and weaknesses year round.

8.6.1 Addressing the primary research question

The primary question under investigation in this chapter is: **Does seasonality effect water and sanitation programme implementation in Humla District, Nepal?**

Overall it can be interpreted that seasonality does effect water and sanitation programme implementation in Humla District, Nepal. The seasonal nature of community livelihoods, the weather, and associated institutional calendars must all be reviewed to optimise the timing of programmes. The reliance of programme implementation on weather is a significant risk in terms of project planning and flexibility in plans and spending must be incorporated to cope with this.

The highly seasonal weather also means that infrastructure must be built in a way that can withstand a range of shifts, most particularly extreme cold, heavy rain and a substantial dry period.

All in all seasonal effects must be taken into account for a project from its inception stages, right through to plans for monitoring and evaluation. The 'seasonal blindness' of professionals outside of Humla can be a barrier to this occurring.

Three things which are apparent from these results are that, in Humla:

(i) Institutions delivering water and sanitation programmes are seasonally blind
(ii) An understanding of the community livelihood is vital in project implementation
(iii) Designing to 'season proof' infrastructure can increase the associated cost.

These issues are discussed in the next section.

8.6.2 Seasonal blindness in Humla

In chapters 2 and 3, the tendencies of water and sanitation professionals to live in ignorance of fluctuations in poverty levels arising from seasonality, and from living in a mountain community were discussed.

The reasons for negligence of professionals in addressing mountain poverty was attributed to (i) lack of understanding, (ii) generalisation of data, and (iii) the holistic nature of the problem.

The reasons for ignorance of seasons, or 'seasonal blindness', as summarised by Chambers (2012) were shown in in Figure 2-5. For reference his diagram representing this phenomenon is repeated in Figure 8-7.

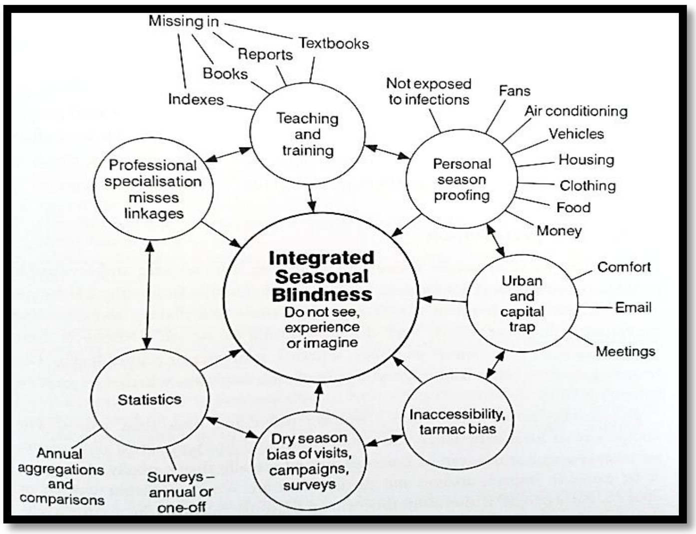


Figure 8-7 Integrated Seasonal Blindness as described by Robert Chambers (2012, p9) in 'Seasonality, Rural Livelihoods and Development ' (Devereux et al., 2012)

It can be seen that both seasonal areas and mountain areas have lack of understanding, generalisation of data and the holistic nature of the problem in common as reasons for the lack of work in this area. It is for this reason that there is such extreme blindness to the poverty in Humla, and such an array of outsider designed, unsuitable projects proposed for Humla.

The characteristics of seasonal blindness of professionals, as presented in Figure 8-7, are highly relevant to Humla. If one works around Chambers' representation of Integrated Seasonal Blindness, starting at the top of with 'Teaching and training'; the engineers who work in Humla appear not to have specialised training in working in a seasonal mountain environment. In fact it seems that many of them do not even visit to understand the differences for which they are designing. Many are 'personal season proofed' through their better conditions of living in Kathmandu, and choose to remain in the 'urban and capital trap' with the associated comforts, emails and meetings.

Humla exhibits inaccessibility to a rather extreme degree, thus it is not surprising to find that a significant inaccessibility and tarmac bias exists in the area. If coming from outside Humla, high levels of fitness are necessary to make it from community to community and from water sources to high altitude grazing sites. As a result, experts do not appear to come to Humla based on the physical preparation that would be necessary, compounded by the length of the journeys and the inevitable long time taken to visit the district and some villages. This lack of visits from donors, policy makers and programme managers results in unachievable targets being set, with inappropriate technologies selected and unrealistic budgets.

If visits from outsiders did occur; they were witnessed to be very short and in the dry season. However, even the permanent staff of Humla displayed a remarkable degree of dry season bias by only remaining in the office for approximately 6 months of the year. This leads to a lack of understanding of the conditions endured by community members through the winter months even by those best placed to observe them.

The presence of staff for certain periods of the year only, resulted in a skew in the collection of all statistics for the area towards measurement at similar times of year. As a result, not only is seasonality lost through amalgamation of statistics at the national level; but it is not even observed by local level staff (particularly those involved in decision making).

It is only the final stage in this lap of Chamber's representation of Integrated Seasonal Blindness that the approach in Humla is not implied. Chambers attributes increasing specialisation as a reason for seasonal blindness; however, in Humla the approach was often cited to be the opposite – too many organisations trying to approach development from every angle. That said, funds received by implementing organisations were still very sector restricted, with budgets and time scales that did not take account of other activities in the district.

Overall, even the staff that work within Humla remain season blind, particularly to the winter seasons, when a distinct lack of professionals remain. This seasonal blindness applies to both community livelihoods and the physical environment and thus is a key driver of poorly planned, designed, implemented and monitored projects in Humla.

Much of the failure of projects in Humla is driven by its remote mountainous location. Seasonality of livelihoods and the physical environment add an extra dimension of complexity In a system similar to that described by Cruickshank and Fenner (2007, p116) when considering the role of engineers in working toward sustainable development of the built environment; the current “linear approach to procurement, design, building operation and decommissioning” can lead to a failure to recognise the wider context in which the engineering is taking place as one that is part of a series of complex systems, with feedback loops involving society and the environment (Cruickshank and Fenner, 2007). To alleviate these issues, designs (both project and technical) must be done by staff with an awareness of the context and its seasonal restrictions that include considerations and exposure to both the community and the environment.

Donors must expose themselves to the conditions of Humla to understand that to implement projects that work year round in this mountainous community is going to be far more expensive and lengthy than those implemented in the lower lands of Nepal. Until this is acknowledged, the infrastructure built in Humla will continue to be rushed and of low quality, with no time available for follow up monitoring.

8.6.3 Community livelihoods and project implementation

Coulter (2010) emphasised the importance of incorporating community livelihoods in understanding access to water and assessing water needs. In Humla, the community level livelihoods calendar has proven of significant importance in terms of programme implementation.

Failure to consider community livelihoods results in ignorance of a community’s peaks and troughs of labour and availability, periods of the year when a family, or member of a family may be absent from a community, and seasonal highs and lows of income.

In accordance with findings by Chiwaula and Wibel (2011) and Gill (1991) the agricultural nature of employment in Humla mean that income in a typical Humli household was found to vary significantly seasonally; peaking during the harvest season and lowest when crop stocks are depleted. In Humla, all money generating activities occur at the same time of the year leading to a distinct peak in money availability post-harvest.

This inconveniences programme implementation in Humla as this time of peak income generation is also the only time of year that building work and visits to the communities can be completed for implementation of water and sanitation programmes (be they infrastructural or educational).

Understanding community availability should lead to better prioritisation and implementation of programmes. An understanding of which gender and age group are likely to be in a certain area at a certain times could lead to better targeting of hygiene lessons or packages of work related to projects. If more than half of the population are guaranteed to be absent or busy during the peak times for work, GOs and NGOs need to consider bringing in external labour. If household decision makers are to be absent all summer, GOs and NGOs need to arrange that decisions are made and projects planned before they depart. If communities are sitting in the home all winter and early spring, project implementers need to devise a way to reach these communities and use this time to implement educational programmes. If half the population are at graze sites, perhaps these sites need to be visited. If summer graze sites and trading areas are where people experience their poorest access to water and sanitation, then some effort needs to be made to improve facilities there.

To best use the already limited resources in Humla, the community calendar must be understood and timings of action optimised. It is due to a lack of understanding of these community issues that outsider planned project timeliness have a reputation for failure in Humla.

8.7 The Impact of Seasonality on the Research

While this chapter focuses on the impact of seasonality on programme delivery in Humla – it is interesting to observe the impact of seasonality on this research as an example of a 'project' being undertaken in Humla. What follows in this section is a personal account from the researcher on the key ways in which seasonality had an impact on her work.

1. **Access to field sites**

The reality is that the researcher was restricted on her arrival in Humla in November 2012 from accessing communities which already had their access routes cut off by heavy snow. While the research was still conducted in communities which had intermittent access in winter – there were many communities further to the north which experienced far greater isolation in winter. With no phones or convenient way to contact these communities – the reality of what research conditions may exist in the communities (e.g. accommodation for researcher and assistants, open-ness of the communities to take part in research etc.) were too uncertain for the researcher to travel in unsafe conditions through deep snow with research assistants for whom she was responsible. Thus the seasonal inaccessibility of these communities had an impact on community selection.

Noki was supposed to arrive today to start some interviews with the females in the community but perhaps it is too cold for her to make it – snow has cut off the phone networks so no way to check .

(Field notes , 12-02-12)

The general issues of inaccessibility also hindered the researcher's ability to study summer graze sites and do an in-depth analysis of the trading route to Hilsa. These were made seasonally more difficult to access during the rains.

In Kermi, it was noted that:

People seem to very confused as to why I am here in Winter

(Field notes, 05-02-12)

Clearly the communities were not used to an outsider visitor in the colder months.

The researcher could understand the issues explained earlier in this chapter of the designers of programmes who fail to visit water source points and do thorough assessments of the physical environment of Humla before project implementation. Site visits and access between villages involved gruelling walks of at least one day on steep terrain. To access water sources in particular, was very difficult, and at times of the year, impossible.

I'm still feeling very unfit and out of breath with minimal amount of steps – a real lack of energy.

(Field notes, 07-02-12)

2. **Living Conditions**

The living conditions in Humla are particularly basic – and are a challenging place for an outsider to stay, in particular over the winter months. The researcher went to great effort to endure these conditions for almost 1 year –however there is no doubt that the exhaustion of living in these conditions, at altitude, especially with the prevailing temperatures, had an impact on the researcher's ability to work effectively. Energy levels at times were particularly low and there is little doubt that these living conditions impacted on the amount of work conducted in the field.

On the 28th January it was noted that:

<u>It is too cold to work in the offices and too difficult to visit the villages after the heavy snow – I am feeling a bit at a loss for what to do</u>

(Field notes, 28-01-12)

The cold weather and precipitation also impacted on the field observations made. While to conduct a few hours of observation was a comfortable task in the warmer months, on days of heavy precipitation or intense cold it was found to be a difficult task.

3. **Reluctance of research assistants to work in challenging environment**

While a researcher is control of the living conditions that they may choose for their own research, it was challenging to find research assistants with the correct training who were prepared and able to live in the conditions in Humla. For this reason there was a bias toward local research assistants in the winter months, a time when the researcher felt it was unfair to bring in outsider assistants who may have found the conditions verging on unbearable.

To work in Humla also required a high level of physical fitness, which for one assistant in particular was a barrier to her completing work in harder to reach villages e.g. Kermi.

4. **Access to key informants**

The reality is that the vast majority of key informant interviews that were conducted in Humla, took place after March 1st. This is purely due to the fact that most key informants were absent from the district in the cold winter months. Certainly the researcher observed the tendancies of those working in Humla to 'work 6 months on, and take 6 months off'. Government offices in particular were found to be dormant over the winter months with key figures unavailable, or reported by their staff to be 'on training' during this time.

5. **Access to community members**

The livelihood calendars presented in section 5.10 ha d an impact on the availability of respondent for interviews and at times meant that observations (and interviews) shifted from community members homes, to the field.

In the winter months, families remain in the home and thus to conduct interviews was at time intrusive as physically calling to an individual's home was necessary. It also meant the interview had to be conducted indoors, which was a struggle due to the lack of electricity and natural light in these homes. As a result – note taking and drawing of seasonal calendars and focus group discussions was impacted.

The weather is terrible so it makes it hard to get people for interviews when groups aren't out and about on the roof.

(Field notes, 15-02-12)

Sunny days in the winter were found to be best for interviews as people had a tendency to gather on the roof of their homes for social activities, thus making them very accessible.

In the summer time, in many cases, family members would leave the home early due to agricultural commitments. During times of summer grazing and harvesting people were irregularly available for research interviews. Kermi in particular was found to be virtually abandoned in the day time during these months.

6. Length of working day

In mid-winter, daylight hours were short and thus safe access around the communities was restricted. This lead to further decreases in productivity during this months. It was also found to impact access as the shorter days restricted time available for walking from one field site to another.

It's so hard to work in the communities in the houses that I stay in. Inside there are very active children running around and its cold and dark; but if you go outside its freezing and so windy. I'm finding it difficult to keep my notes up to date

(Field notes, 05-02-12)

The cold weather makes it so difficult to work here. Its so hard to get up in the morning and then you get stuck in the house from about 6 each evening with very little light.

(Field notes, 15-03-12)

As a result of these factors and more, the impact of seasonality on this research has been found to be significant. Even with the researcher's heightened awareness of seasonality and it's biases, many of the impacts on working in Humla were found to be unavoidable though contingency plans could be put in place for many if the researcher had been more familiar with what to expect prior to departure.

8.8 Chapter Summary

In this chapter the seasonal opportunities and barriers for implementation of projects in Humla have been discussed. The main drivers of these opportunities and barriers have been found to be the seasonal livelihood of the community, the weather, and its impact on the physical environment and the existing institutional calendars. A graphical method has been suggested that prompts designers to take a more holistic approach, considering a fuller range of time-dependent factors. The approach also gives an easily visually interpreted indication of the most suitable times for implementation of projects of various types.

While the focus of this chapter has been to look at the seasonal shifts in opportunities and barriers, it should be noted that the vast abundance of barriers to progress are as a result of the Humla's remote mountainous location.

As it stands there is significant seasonal blindness of professionals in Humla which is leading to ineffective programming, but even more significant is the blindness of professionals to their most remote communities and their needs due to overwhelming accessibility bias.

The next chapter shall conclude this thesis by reflecting on the aims and objectives of this work and recommending further areas of research.

9 Conclusion

9.1 Chapter Outline

This chapter concludes the thesis. It revisits the aims and objectives of the research and reflects on the success with which they were completed, and the limitations which affected their accomplishment. The overall contributions to knowledge are highlighted and recommendations for further research are suggested.

9.2 Introduction

This research has investigated the link between seasonality and standards of water and sanitation in a mountainous context. This link has been considered on both the community and the programmatic level in Humla District, Nepal.

Lack of research exploring the links between seasonality and water and sanitation has, in the past, been attributed to generalisation of data, seasonal blindness of professionals, lack of fixed frameworks for collecting data and the complications caused by the holistic nature of its impact (Chambers, 2012). Similarly there is limited literature which details access to water and sanitation, or programme delivery in a mountainous context. Mountain environments suffer from a number of biases similar to those causing neglect of seasonality; these include a lack of understanding from outsiders, the generalisation of data, and the holistic nature of the problem (ICIMOD, 2010, Kreutzmann, 2001).

The research which has been completed investigating links between water and sanitation typically compares a dry and a wet season. Differences found have included: seasonal changes in water source, increased water quality in the rainy season (World Toilet Organization, 2010), decreased water quality in the rainy season (Action Against Hunger, 2009), increases in collection time for water in the dry season (Dessalegn et al., 2013, Coulter, 2008), flooding of latrines in the wet season (U.S. Centers for Disease Control and Prevention, 2006), and discomfort using latrines in warm temperatures (World Toilet Organization, 2010).

No studies obtained during the literature review were completed in an area with four seasons, one of which was cold. This study has sought to address that gap by understanding, if and how, seasonality impacts access to and provision of, water and sanitation; with particular interest in the winter season. Research in the field was undertaken from November 2011 to July 2012 in a bid to understand these issues.

9.3 Conclusions of the study

At the community level, this study has found that access to water and sanitation does vary in Humla on a seasonal basis. Livelihoods and the weather have been found to be the primary driver for shifts in behaviour, while the weather and its effect on the physical environment have been found to have the greatest impact on infrastructure functionality.

This study has shown that presence of infrastructure gives an insufficient indication of usability. In all case studies, the usability (due primarily to physical access and comfort) varied more than the function of the infrastructure itself. At the time of research, Chaggaunphaya's water supply was in such disrepair that seasonality was eliminated.

The key conclusions on the community level are:

1. Livelihoods, weather and the physical environment are the key reasons which impact on a community's access to water and sanitation
2. Understanding livelihoods is vital, particularly in an agricultural area, when assessing demand and availability of water
3. Understanding the physical environment and how it shifts seasonally is important in understanding threats to infrastructure functionality
4. Population mobility may imply that provision of infrastructure at the household level is not sufficient to ensure access to water and sanitation year round
5. There is a seasonal shift in environmental health risks primarily driven by the climate

There have been found to be gross failings in the institutional environment for provision of water and sanitation in Humla. The key conclusions at the programme level are:

1. The alignment of community livelihoods, weather and institutional calendars must be understood by agency staff for effective programme implementation
2. Mountain areas are susceptible to extreme seasonal blindness due to the existing urban, tarmac and inaccessibility biases which are exacerbated seasonally
3. In areas where climate is seasonal, weather may lead to a need for flexibility in the project timetable
4. Timing of data collection will impact on its effectiveness for monitoring purposes
5. Preparation of water and sanitation policy, programmes, designs and budgets at the central level is a primary cause of ineffective programming
6. Measures of success must move beyond counting of physical outputs to more qualitative improvements

9.4 Contribution to knowledge

This research has contributed to knowledge on a number of levels, which are addressed individually in this sub-section.

Methodologically

This research has taken an exploratory approach to collect of data on access to water and sanitation. Effort has been made to triangulate interviews and focus group qualitative data, with significant periods of observation.

The flexibility and room for continuous adaptation in this methodology allowed for pursuit of the most relevant information to the aims of the research as they were uncovered. This approach is uncommon in studies of access to water and sanitation, based on their tendency to be based around pre-defined indicators.

This study has also contributed to knowledge with regard to capturing seasonality on the community and programme level. Seasonal calendars have been developed which capture community level fluctuations in access to water and sanitation, and a framework has been proposed for professionals for use in their programming cycles.

The data intensive nature of data collection on seasonality has been confirmed, but no fixed methodology has been proposed for capturing the relationship between water, sanitation and seasonality in a wider range of contexts. .

Empirically

Empirical evidence in water and sanitation monitoring often deliberately seeks to ignore the seasonal element. This research has provided an original data set which exclusively seeks to explore seasonality with regard to water and sanitation, and does so in an area with four distinct climatic seasons.

Furthermore this research has captured data on progress toward improved water and sanitation in one of Nepal's most impoverished areas.

Theoretically

This research has contributed to knowledge theoretically through the development of relationships between seasonally fluctuating variables and their impact on distinct elements of access to water and sanitation and programme delivery.

This research also supports the theory that not capturing seasonal data may lead to misleading statistics on progress toward meeting local, national and international water and sanitation goals.

Practically

This research has contributed to knowledge practically by raising awareness of the issues caused by programme design, budget and timeline preparation by individuals that lack knowledge on the context they are working for.

The research has also highlighted the issue of seasonally shifting environmental health risks from water related disease on a seasonal basis in a mountain environment.

This study provides further evidence that access to water or sanitation should not be reduced to a single diagnostic for use in decision making. Measurement of access needs to be context specific to take into account contextual needs and demands.

Policy

In terms of policy, this research highlights the fact that centrally based decision makers and policy makers lack awareness of the contextual nuances which impact on every aspect of water and sanitation programme delivery and monitoring. In Humla, this study has found that lack of contextual appropriateness in policies led to ineffective programme implementation and unsuitably designed infrastructure.

The need for better cohesion of institutional, governmental, non-governmental and regulatory bodies in areas where accessibility bias is an issue has also been shown. Policy makers need to be made seasonally aware in order to prevent a trickle-down effect, whereby inappropriate project specification at the highest level prevents effective project implementation by tying implementers to impossible timescales and budgets. This would also help to reduce an atmosphere of mistrust and dependence on the ground level.

9.5 Achievement of Study Objectives

A review of the attainment of the study objectives is presented in Table 9-1. As was detailed in Section 1.5, two further aims were originally envisaged but were unachievable due to time constraints.

The remaining objectives have been achieved and as a result the aims of the study have been fulfilled.

A review of the limitations to the finding is presented in the next section.

Table 9-1 A review on attainment of research objectives

Objective	Attainment
Aim 1: To investigate intra annual patterns in standards of water and sanitation for low income communities in Humla District, Nepal.	
(a) Examine existing methods for studying the seasonal aspects of members of a mountain community's livelihood	A literature review was conducted which examined data collection on seasonal poverty and livelihoods. Research specific to mountain communities was not attained.
(b) Develop a means of examining and reporting community level fluctuations in standards of water and sanitation over the course of a year	An exploratory method has been used to examine fluctuations in standards of water and sanitation intra-annually. A means of reporting seasonal access at the community level have been developed but further work is necessary before they are replicable elsewhere.
(c) Apply the methods developed in (b) to a set of communities in Humla, Nepal	These methods have been applied in Kermi, Chaggaunphaya and Simkot Ward 1 in Humla District
(d) Provide a case study exploring the existence of intra-annual variation in standards of water and sanitation	Three case studies have been presented which have examined seasonal household access to water, bathing, clothes washing, latrine use, open defecation and menstrual hygiene.
(e) Assess if the intra annual variations of standards of water and sanitation imply that one off snapshot statistics may be misrepresentative	An assessment of the suitability of snapshot statistics has been provided, and a demonstration in the variation of attainment of Human Rights throughout the year has been detailed.
Aim 2: To determine intra-annual patterns of challenges and opportunities for improving standards of water and sanitation in Humla District, Nepal	
(a) Identify the intra-annual challenges and opportunities faced by organisations working to improve standards of water and sanitation in a mountain setting	Intra annual challenges and opportunities faced by organisations have been identified through a review of literature and 39 key informant interviews with regard to opportunities and challenges thematically coded with regard to each season.
(b) Present a case study to demonstrate the seasonal variation of challenges and opportunities faced in provision of water and sanitation in Humla District, Nepal	A case study of the District of Humla has been provided, and details of its seasonal challenges and opportunities have been presented.

9.6 Limitations of this study

The combined ambiguities of seasonality and water and sanitation delivery and monitoring in a mountain environment have proven challenging to this study. Conducting the research in an area with so many unknowns, and with a baseline so unclear has resulted in the information provided being broad and shallow.

Due to the baseline level of access to water and sanitation being so low in Humla, the seasonal variations were at times out weighted by the crippling year round inefficiencies of the infrastructure.

The small sample size means that this information can be said with confidence to relate to those working in Humla District Nepal, but cannot be generalised to other situations.

The reality is that capturing seasonal variation in rural deprivation without spending too much time or incurring too much expense requires considerable ingenuity. This research has not overcome this need for considerable time and expense; instead the time allowed has been used to take a broad holistic view of the picture of seasonality and its causes.

The cases are limited in their choice of the village as the level of analysis. In doing so, no picture is provided of the year round experience of access to water and sanitation for the large proportion of the (particular Lama) population that migrate seasonally to higher altitudes or for trading.

Throughout the study, reports of an event or occurrence have been recorded. However, there was no recorded method used to verify facts with a certain number of other people. As a result, while numbers are attributed to the responses in the seasonal calendars – the data cannot say if other interviewees simply did not mention this point, or whether they actually disagreed with it. Thus there is a danger that some information provided represents the view of one individual only.

The researcher now recognises the great value that added quantitative data would have added to this study. In particular measurements of water quality and quantity on a seasonal basis would have been useful to triangulate data in relation to perceived peaks and troughs of water availability and quality. The researcher strongly advises that anyone who undertakes a study of a similar nature in the future, consider what data that can be measured on a daily/weekly or even monthly basis to track actual changes in access to water and sanitation over time.

The reality is that this research has been designed and conducted by an outsider – an approach which this study recommends against. The potential bias of the ethical viewpoints of the researcher have been somewhat offset due to the extended period of time spent in the field. Nevertheless, the impact of the perceptions and priorities of the researcher and the subsequent interpretation of the data may differ to those who took part in the study.

Another limitation is also a cause for increased focus on seasonality, which is the fact that climate change may impact on typical seasons are their associated impacts on livelihoods, agriculture, water availability etc. The specific influences of seasonality uncovered in this study may be subject to change with increased climate change.

9.7 Recommendations

9.7.1 Policy Makers

For policy makers, it is recommended that an increased attempt is made to understand the contextual information which may impact on the relevance of policy aims, the budget needed to achieve them and the speed with which they can be delivered.

It is recommended that communication with district level administrators is opened up to understand the contextual information of relevance to the policy. A degree of flexibility needs to exist to allow district level actors to adapt goals as they see fit for their administrative region.

Policy makers must seek to overcome the urban, tarmac, inaccessibility and seasonal biases which lead to negligence of the most poor.

The misleading nature of snapshot statistics has been shown; as such great caution should be employed when basing decisions on these figures, despite their convenience.

9.7.2 Practitioners

Data collection and measurement systems need to be reformed to move beyond spatial and temporal averages and aggregation. This has implications for Central Statistics Offices and research design and training.

The way we collect and report data is critical to revealing seasonal processes. We need to move away from averages to seasonally disaggregated data; this is only likely to be achieved through the use of more longitudinal studies as a survey at any one point in time is necessarily biased by the time of year at which it is taken. Practitioners must at least be aware of this, and attempt to incorporate a way of reporting seasonality within their practice.

Shifts in environmental health risks and water security, from the perspective of communities, have also been shown to be heavily influenced by seasonality cannot be reduced to a single diagnostic.

Further, the influence of seasonality on practitioners is not limited to collecting representative statistics. It is absolutely vital that consideration of the predictable elements of seasonality is taken when planning projects. Simple actions, such as completing the transport of materials prior to a known period of poor accessibility could result in significantly more robust projects.

9.7.3 Academics

Following on from this study, a number of topics are recommended for future research.

These include:

- Research on seasonality of access to water and sanitation in a context where there is a clear understanding of the baseline situation
- Research on seasonality of latrine use in an area that has been declared ODF
- Research on data collection methods that allow for local level nuances to be retained in a manner that can be fed back to decision makers
- Research on the development of a 'factor of safety' approach to reporting water and sanitation statistics

9.7.4 Improving Practices in Humla

While the aforementioned recommendations are for those working in seasonal climates generally, the following recommendations are made specifically for those in Humla.

9.7.4.1 Absence of staff for long periods

The absence of government and NGO staff for months of the year is crippling progress in Humla. Climate change has warmed the area in winter months and accessibility and communication is not the challenge it used be 10 years ago. During 6 months of the year (the colder months), little or no progress is made in Humla. This leads to rushed work in the summer months pre rains. Residents of communities have far more spare time in winter months and efforts should be made to conduct some aspects of programming during that time.

9.7.4.2 Contextualising work

There are many failed projects in Humla due to decisions made by outsiders – be they planning decisions, budgeting decisions, policy decisions or designing. Humla is a unique context which demands a specific response. Its climate, physical environment and the livelihoods of its people must be understood before water and sanitation projects can be successfully implemented.

This is particularly visible in (i) the rapid construction of poor quality latrines to meet the Sanitation Master Plan across the district when insufficient time is allowed for demand stimulation and composting latrines might suffice; and (ii) the poor site location of the Chaggaunphaya's re-developed water supply when anyone who understands this context could see the potential for landslides in that location are very clear.

Budgets and workplans must accept that progress in Humla will be slower and should seek to take advantages of seasonal opportunities according to livelihood and accessibility calendars.

9.7.4.3 Improving Infrastructure

Engineers must take note of the climate in Humla when developing water and sanitation solutions. Some of the more evident repetitive design mistakes observed by the researcher included:

- Un-insulated pipes concreted into stand posts which prevented defrosting
- Use of pour flush latrines when buckets of water and U-bends freeze during winter
- Hand washing devices designed to store low quantities of water freezing in winter
- Large portions of exposed pipe from the source cutting off water to communities when frozen
- Unsafe and difficult walkways to and from water points and latrines in rainy and winter seasons
- No reservoirs available for times of high demand e.g. irrigation
- No attempts made to cease water flow between use or drainage to capture the excess
- No separate water points for animals despite their abundance and the pressure put on water points
- No services to seasonal grazing sites and poor facilities on trading routes despite the fact that many people spend months in these locations.
- Failure to measure water availability throughout the year to insure a year round reliable supply

It is recommended that these points on infrastructure be considered by engineers working in Humla and that practitioners in general examine the calendars provided in Chapter 8 and frame their work accordingly.

9.8 Researcher Reflections

This PhD represents the work of an engineer trying to understand the story around infrastructure; the experience of the people providing it, maintaining it, and most importantly, using it. Previously it was unnatural for this researcher to deal in qualitative data – and methods of finding things that could be stated as ‘fact’ from it were unclear.

The quest for 'facts' and certain answers is a product of an engineers training, and it makes the task of processing qualitative data an uncertain and even frightening one! For this engineer, uncovering the 'story' behind the infrastructure has been a lesson in the value of qualitative data. The tables of data presented, are a representation of this engineer to understand the implications of the words she spent years understanding and collecting. In fact it could be argued that this engineer went too far and failed to take enough quantitative measurements along the way.

Setting this balance, and finding a process by which one can balance their typically quantitative numbers with their qualitative words is difficult; yet it is vital if usable, sustainable infrastructure is to be constructed. Engineers must find a way to set their design boundaries by incorporating both qualitative and quantitative information.

9.9 Closing Statement

"You can't manage what you can't measure" – according to the Institute for Sustainable Development (IISD) this was one of the valuable lessons from the failure of the International Drinking Water Supply and Sanitation Decade (1981-90) to reach its objective of universal access to water and sanitation.

Measurement of access to water and sanitation by a single diagnostic is already complex due to issues of gender, regional disparities, social class etc. Seasonality adds another dimension to this complexity. Furthermore, it adds a dimension that itself is inherently complex, data intensive and time consuming to measure.

In the case of Humla, seasonality has been found to have significant influence on access to water and sanitation. This influence primarily occurs at a deeper level than physical presence of infrastructure; it is the secondary levels of access measurement, for example, physical access, safety and adequacy which are affected.

In terms of programme implementation, it has been shown that the overlap of community, weather and institutional seasonal calendars is an important consideration in terms of delivering effective programmes in seasonal areas; including the programme selection, design, construction, budgeting and subsequent monitoring and evaluation. Seasonality has been found to exacerbate the urban, tarmac and accessibility biases of professionals working in Humla, thus contributing to slow progress in improved standards of water and sanitation in the District.

Seasonality should not be mixed up with 'blaming the weather'; the weather is exposing inherent flaws in a system on a predictable and repeated seasonal basis. As Fenner and Cruickshank (2007, p111) describe, "The laws of nature are non-negotiable and everything must operate within them".

However, in Humla, and other areas with a seasonal climate, it appears that these relatively predictable, seasonal aspects of nature are ignored rather than embraced.

In areas with seasonal climate, this effect should not be ignored, as to do so may reduce the value of measurements to such an extent as to render them misrepresentative at best, and counter-productive at worst. With climate change predicted to increase extremes of seasonal variation, it is expected that measurement of seasonality will become an increasingly important consideration in determining access to water and sanitation.

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Appendix A - Professional Development Activities

Date	Type	Activity
Oct 2009	Training	Postgraduate Induction Day
Nov 2009	Meeting	5th Sanitation Community of Practice Meeting: Sanitation for Climate Change and Adaption
Dec 2009	Training	'What is a Literature Review?', Loughborough University, Loughborough, UK
Feb 2010	Training	'Time Management', Loughborough University, Loughborough, UK
Apr 2010	Training	'Introduction to the Design of Surveys and Experiments', Loughborough University, Loughborough, UK
Apr 2010	Meeting	6th Sanitation Community of Practice Meeting : Sanitation in Fragile and Conflict Affected States
May 2010	Training	'Introduction to SPSS', Loughborough University, Loughborough, UK
Jul 2010	Training	'Ethical Thinking in Research', Loughborough University, Loughborough, UK
Oct 2010	Training	'Questionnaire Design', Loughborough University, Loughborough, UK
Nov 2010	Training	'Networking and Attending Conferences', Loughborough University, Loughborough, UK
Nov 2010	Meeting	7th Sanitation Community of Practice Meeting
Apr 2011	Meeting	8th Community of Sanitation Practice Meeting Urban Sanitation Planning: How to Think About Scale from the Start
Jul 2011	Conference	WEDC Conference, Loughborough, UK
Jul 2012	Conference	Scholarship to attend the Massachusetts Institute of Technology lead International Development Design Summit, Sao Paulo, Brazil
Apr 2013	Conference	Engineers Without Borders Research and Learning Conference 'Going Global', London, UK
Sep 2013	Training	'Writing Up Your Thesis', Loughborough University, Loughborough, UK
Sep 2013	Conference	6^{th} International Conference on Engineering Education for Sustainable Development, Cambridge, UK
Mar 2014	Training	RedR Urban WASH course, London, UK

Appendix B - Outputs to Date (May 2014)

Date	Output Type	Conference/Journal Title	Title
Mar 2011	Conference Poster	Engineers Without Borders Research and Education Conference 'Our Global Future', London, UK	Cold Climate Sanitation
Sep 2012	Conference Poster	International Conference on Innovation, Practice and Research in Engineering Education, Coventry, UK	The Global Engineer – Awarded Best Poster
Apr 2013	Conference Presentation	14th IWA UK Young Professionals Conference 2013	Seasonal Access to Water in Kermi – Best International Development Presentation
Apr 2013	Journal Article	Waterlines	Crossfire: Can 'admitting failure' help the WASH sector learn and improve its work?
Apr 2013	Open Source Article	Published online at: http://www.bpdws.org/web/d/DOC_360.pdf?statsHandlerDone=1 (Accessed May 25th 2014)	Learning from failure: lessons for the sanitation sector