

Improving Sanitation and Hygiene for Rural Households in Nepal

Feasibility and Implementation of the GSF program in the Bardiya and Bajura district.



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Sincerely,

Ivo van Haren

Executive summary

The predominantly rural communities of the Bardiya and Bajura district have a heterogeneous population that includes different and distinct values and norms that are related to their culture and ethnicity. The districts furthermore experience differences due to their specific geographic location. The impact of a sanitation program as the GSF program will therefore be dependent of the synchronization, harmonization and unison between the priorities, demands and needs of the local communities, their cultural values and approaches towards sanitation use, and the planned changes from the GSF program connected agencies regarding sanitation and hygiene. Identifying specific local demands, values and differences between communities and between sanitation development approaches will provide a framework for a more successful project implementation and sustainable sanitary future. This regional framework has been established through performing a livelihood analysis survey and observations in the respective districts and through interviews with stakeholders in the sanitation and hygiene sector.

Through the performed research has been established that the GSF program, in coherence with the National Sanitation and Hygiene Program, is potentially a good basis to increase sanitation and hygiene coverage and awareness. Several significant obstacles and threats need to be improved to ensure the success of the GSF projects. It can be concluded that several assumptions and approaches for Nepal as a whole do not apply to (these) local areas. Defences are present in one VDC or District that are not an issue in other regions. Applying general and preconceived approaches to different populations will lead to several problems. Recognizing and understanding local differences, for example through a needs and demands assessment is crucial for the successful implementation. By involving local user groups and stakeholders in the planning and decision making process support from the community can be realized. This knowledge is currently not being implemented. And therefore are national plans paralyzed due to unrecognized local specific needs. Difficult communication and lines of feedback result in insufficient improvements being made. Also do policy makers rely for a large part on the advice from local stakeholders, civil servants or NGO officers, which might have good intentions and local experience but often do not have the needed skills and knowledge to substitute thorough local assessment and research. Personal visits from the executing agency UN-Habitat to the districts that are subject to the GSF program are planned for. This results in a lack of bottom-up feedback and blue-print planning without considering local differences. Secondly, local sanitation and hygiene projects are not being implemented at their full potential due to lack of knowledge and useful guidelines. Bajura suffers from incomplete approaches that do not include educational programmes. Therefore no knowledge on benefits or the linkages between poor sanitation and hygiene is transferred to the local population. Furthermore, no provision of hard-

technology and support when building sanitary facilities in Bardiya is observed. This has as result that sanitation and hygiene is not high on the priority list of people's concern. The unawareness in Kathmandu of the number of challenges that the population of both districts daily faces, food shortages and high poverty rates being the most common, in combination with the difficult geographical situation result in general guidelines while area specific assessment and advice is needed to support local needs and demands.

The assessment of the livelihoods in the Bardiya and Bajura district confirms that the large variation of livelihoods within and between districts require different project approaches to realize sustainable sanitation and hygiene improvements. Different priorities and needs and demands, for example providing the household with three meals a day, having savings for the low season and a general monthly income are considered a greater priority with a larger demand than sanitation and hygiene. Several results have been processed to conclude that the households in both districts live in difficult and challenging environments and therefore face problems that have a higher priority than sanitation and hygiene.

To boost sanitation and hygiene development local differences have to be indentified and used to a maximum. For example in the Mohamadpur VDC, in which the majority is Muslim, the research has indicated that the influence of the local Muslim leaders could be used to advocate higher standards of sanitation of hygiene both through adults and children. Mosque Led Total Sanitation (MLTS) could be a new and unique local approach to realize community commitment and realize change. The importance of education has become extremely clear in the Bajura district. A significant large number of toilets has been constructed and remain unused due to lack of knowledge and other more important technologies. Therefore, a combination of both approached can be advocated; only education leads to knowledge and no toilets due to lack of financial resources. Only construction and no education leads to unused facilities. Combining soft and hard technologies could improve positive change. From the preformed household livelihood research can be concluded that three variables are critical to identify and improve at local when implementing a successful sanitation and hygiene program: local priorities, needs and demands, knowledge regarding sanitation and hygiene and the local ability to invest in sanitation and technologies. These three variables are different in both districts and therefore require different approaches in both districts with unique socio-economic and geographic features. A thorough understanding is required to draft and implement appropriate methods to understand for local differences and improve sanitation and hygiene. Adjusting the GSF program and SHMP to suit local livelihood differences can only improve current efforts and as a result improve sanitation and hygiene coverage and use in Nepal. Local commitment and ownership can only be established through local knowledge and experience.

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Acronyms and abbreviations

AIDS	Acquired Immunodeficiency Syndrome
ANOVA	Analysis of Variance
CBO	Community Based Organisation
CLTS	Community Led Total Sanitation
DEO	District Educational Office
DoE	Department of Education
DoLIDAR	Department of Local Infrastructure Development and Agricultural Roads
DWASCC	District Water Supply Coordination Committee
DWSS	Department of Water Supply and Sewerage
GSF	Global Sanitation Fund
HIV	Human Immunodeficiency Virus
INGO	International Non Governmental Organisation
MDGs	Millennium Development Goals
NEWAH	Nepal for Water and Health
NGO	Non Governmental Organisation
NMIP	National Management Information System
NRS	Nepalese Rupees
OD	Open Defecation
ODF	Open Defecation Free
PhD	Doctor of Philosophy
SHP	Sub Health Post
SLC	School Leaving Certificate
SLTS	School Led Total Sanitation
SPSS	Statistical Package for the Social Sciences
UN-HABITAT	United Nations Human Settlement Programme
UNICEF	United Nations Children's Fund
VDC	Village Development Committee
VWSSC	Village Water Supply Coordination Committee
WASH	Water, Sanitation and Hygiene
WFP	World Food Programme
WSSCC	Water Supply & Sanitation Collaborative Council
WHO	World Health Organisation

1. Introduction

2011 will be the year that the implementation of the Global Sanitation Fund (GSF) in Nepal is started. After realizing positive results in other developing countries Nepal is included in the global efforts made by the Water Supply and Sanitation Collaborative Council (WSSCC) to improve sanitation and hygiene standards. In Nepal the GSF programme is designed by a multi-stakeholder group of governmental and non-governmental agencies together with international agencies. The GSF program will focus on five districts that have a large number of people without basic sanitation and with a high incidence of diseases related to poor water, lack of sanitation and improper hygiene. The program starts in two districts in the Far Western and Mid Western of Nepal, the Bardiya and Bajura district (Appendix 1) (WSSCC, 2011) (UN-HABITAT Nepal, 2010).

The predominantly rural communities of the Bardiya and Bajura district have a heterogeneous population that includes different and distinct values and norms that are related to their culture and ethnicity. The districts furthermore experience differences due to their specific geographic location. The impact of a sanitation program as the GSF program will therefore be dependent of the synchronization, harmonization and unison between the priorities, demands and needs of the local communities, their cultural values and approaches towards sanitation use, and the planned changes from the GSF connected agencies regarding sanitation and hygiene. Identifying specific local demands, values and differences between communities and between sanitation development approaches will provide a framework for a more successful project implementation and sustainable sanitary future. Therefore, a regional framework has been established through performing a livelihood analysis survey in the respective districts and through interviews with stakeholders in the sanitation and hygiene sector.

The main aim of this research thesis is to identify local sanitation and hygiene priorities, needs and demands, the level of unison between the local demands and the sanitation implementations realized through the UN-HABITAT GSF. The sustainable livelihood approach that consist of five assets (human, physical, financial, natural and social) visualized in the conceptual model is used to collect qualitative data through a household survey in the research district. This to create an analytical framework that helps to understand the livelihoods of rural (poor) people and to assist in the identification of effective development policy. Furthermore will qualitative information be collected through interviews with key stakeholders. Involved stakeholders will be approached among policy makers at the (inter)national level and locally in the research districts. The results and conclusions from the quantitative and qualitative data from the livelihood analysis survey are presented, interpreted, evaluated and discussed. The results from the research will be used to answer the central research question and sub questions. This to communicate the results that could potentially

influence future decisions made in the GSF project and have a positive influence on the overall outcome and success of the project implementation in Nepal. The research question and sub questions are composed and formulated to give a clear answer to the current and future of sanitation in Nepal, especially in the Bardiya and Bajura district. The research will confirm or invalidate if the GSF program is suitable to improve the current situation and the obstacles that have to be overcome.

Research question:

- Is the GSF program implementation synchronized with the local priorities that influence the perceived needs and demands regarding sanitation and hygiene?

Sub-questions:

- What are the methods used by the GSF program to adjust to local livelihoods, priorities and needs and demands in the Bardiya and Bajura district?
- What are the local household priorities, needs and demands regarding sanitation in the Bardiya and Bajura district?
- How do different household livelihoods affect sanitation and hygiene priorities, needs and demands?
- How can synchronization between national policy and local livelihoods in the Bardiya and Bajura district be improved?

This thesis consists of several chapters that in total will give a comprehensive overview regarding sanitation and hygiene in Nepal and the implementation of the GSF project in a local context. In the introducing chapter a thematic context of Nepal and the specific research districts will be presented. Subsequently the different approaches and paradigms related to sanitation and hygiene will be discussed in the theoretical framework. Third the research methodology, the conceptual model and the research methods, including the research limitations will be defined and justified. Subsequently the outcomes of the qualitative data, the interviews with stakeholders at all levels and the quantitative data derived from the livelihood survey among households in the research districts will be discussed. In the concluding chapter the research results will be discussed, the respective sub-questions will be resolved and ultimately the central research question will be answered. Recommendations, which are partially answering? the research questions will be included in this concluding chapter. The chapters can be studied individually or integral to gain a more comprehensive overview.

2. Regional Context

Approximately 2.6 billion people, close to 40 percent of the world population, have no access to sanitary facilities. 2 Million people die every year due to waterborne diseases. The majority of these deaths are less than 5 years old. The people most affected are the populations of developing countries, experiencing extreme poverty (WHO, 2011). To reduce the number of people not having access to adequate sanitation and hygiene the topic is included in the millennium development goals (MDGs).

The regional context of Nepal is to create vital understanding of the regional context and the sanitation and hygiene status. This to provide contextual background crucial to understand the setting in which the research of Sanitation in Nepal, and especially the Bardiya and Bajura district has been conducted.

2.1 Nepal

Nepal is located at the north of South Asia (Map 1) and is mostly divided into three broad physiographic regions; this division is based on changes in elevation and ecology. In the north of Nepal lies the mountainous range of the

Himalayas, in the south is the lowland; the Terai located, in between lies the Hill region (Figure 1). The altitude differs from 60 to 8,848 meters on the top of Mount Everest. (Shrestha, 1997) The climate of Nepal varies from subtropical monsoons with dry winters and hot and humid summers in the Terai and hill regions to alpine in the high mountains (Awan, 2010). Nepal is the poorest region in Asia, and the 15th poorest in the world (Tearfund, 2010) with approximately 29 million inhabitants in 2010 (CIA, 2011) living in 75 districts. Dalits, the untouchables in the traditional Caste system, indigenous groups and Muslims are the most marginalized groups. More than a

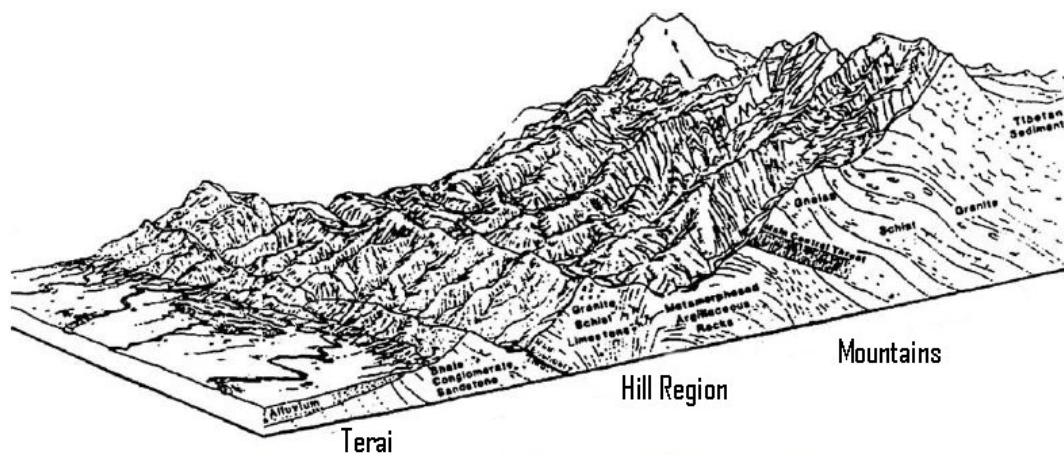
Map 1 South East Asia



Source: southasiarev.wordpress.com (2011)

hundred caste and ethnic groups can be identified and all have different languages, religions and cultural practices and traditions. The constitution of Nepal forbids discrimination based on caste, race, sex or religion. In reality remain minority and low caste groups neglected, especially Dalit women (Tearfund, 2010). The most populated district is Kathmandu. At the moment of the census in 2001 there were more than 1,08 million people living in the Kathmandu district. (CBS, 2009) The Kathmandu district can be seen as the most modern and developed district of Nepal. Nonetheless revealed a survey on water and sanitation in 2005 in the Kathmandu district that 9.4 percent of the people living in the rural areas of the district do not have a toilet, not even a simple toilet without drainage (Adhikari & Shrestha, 2008).

Figure 1 Physical regions Nepal



Source: Pokrel & Viraraghavan (2005)

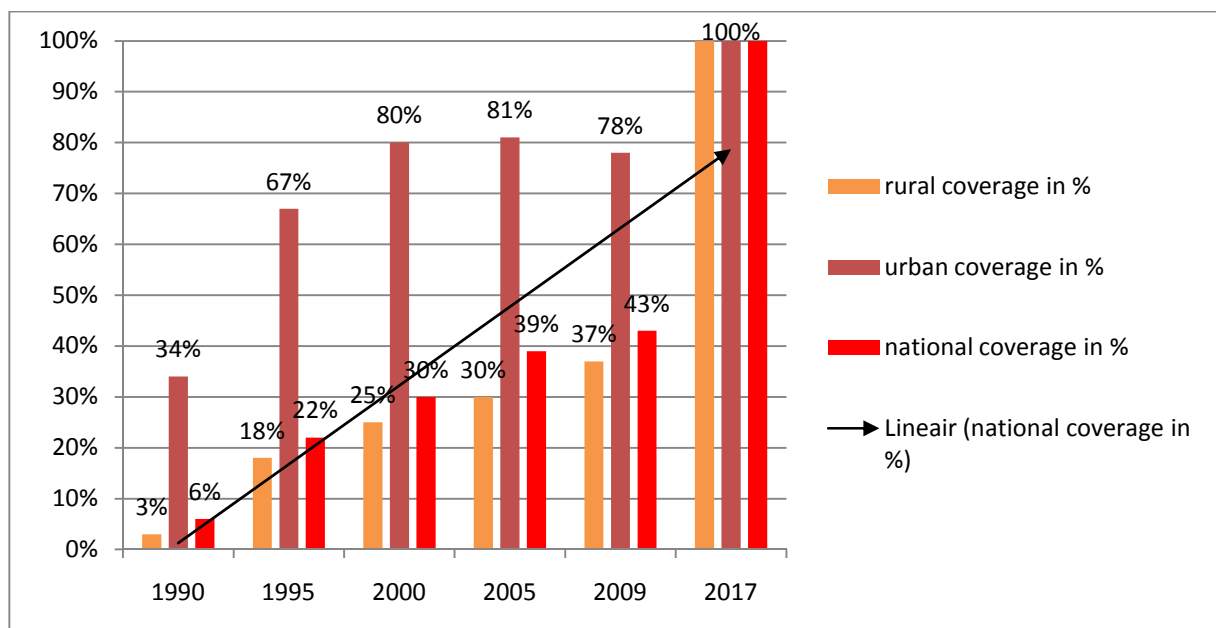
The coverage of sanitation in the Nepal is 46 percent. The differences within Nepal, for example between the urban (78 percent) and rural (37 percent) coverage or the differentiation regarding availability of sanitation services within or between development regions is visualized in figure 2 & 3. Indicated is the significant disparity between urban and rural areas and between central and more peripheral districts (SHMP, 2009). A significant coverage gap exists between rich and poor: 12 percent of the poor have access to improved sanitary facilities, compared to 80 percent coverage in the rich quintile. Only 41 percent of the schools have sanitary facilities. Water is contaminated due to poor waste management with increased waterborne diseases as result (SCNHSA, 2008). According to UNICEF (2008), 13,000 children die annually in Nepal of diarrheal disease. To improve these dramatic figures Nepal has to achieve at least 53 percent toilet coverage in 2015 to meet the sanitation related MDGs. The national goal of Nepal is to achieve universal toilet coverage in 2017. To achieve this goal,

pragmatic vision, operational strategies, strengthened institutional arrangements, adequate resources and stakeholder’s cooperation has to be realized. By introducing the Sanitation and Hygiene Master Plan (SHMP) the Nepali government is expressing its commitment to the international and national goals. The national SHMP is created to overcome existing challenges and barriers to mainstream the efforts made by stakeholders at all levels. The plan has been drafted in cooperation with various community, district, regional and national level stakeholders and consultants to realize broad support for the plan.

The largest occupational sector in Nepal is agriculture, but many villages remain suffering from food shortages. The vulnerability is furthermore increased by poverty, droughts, earthquakes, fires, epidemics, avalanches and windstorms (Tearfund, 2010).

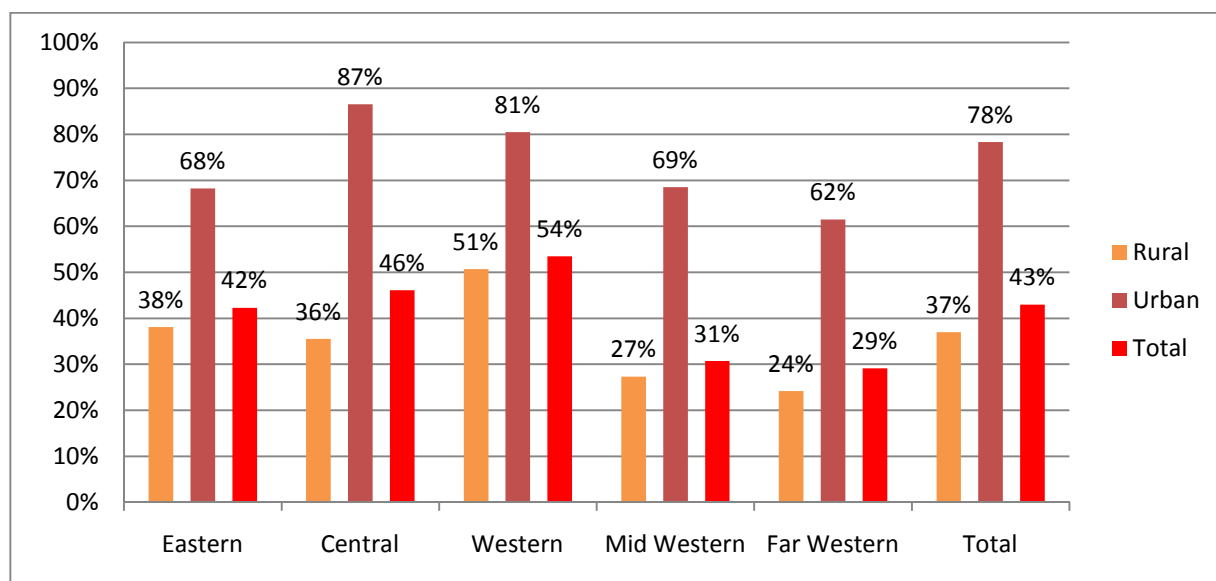
Urban areas do have a higher sanitation coverage but simultaneously suffer from urban specific issues of solid and liquid waste management resulting in poor hygiene conditions. The slight decrease in coverage (Figure 2, 2005 – 2009) can be explained by the increasing urban population. Currently is school led total sanitation (SLTS) the leading approach to improve sanitation and hygiene awareness to increase coverage. According to the Department of Education (DoE) has this resulted in 61.9 percent of schools in Nepal have at least one toilet facility with 35.9 percent having access to a common toilet and 33.9 percent providing a separate toilet for girls and 30.2 percent having a separate facility for teachers. These improvements are made to realize trickle down effects and to decrease the current high level drop-out rate among girls during puberty.

Figure 2 Sanitation coverage in Nepal



Source: SHMP (2010)

Figure 3 Sanitation coverage by development region



Source: SHMP (2010)

The most significant and direct causes of poor sanitation and hygiene in Nepal are listed in Box 1.

Box 1 Results from poor sanitation and hygiene in Nepal

- 12,700 children under five die annually due to poor hygiene and sanitation
- 12 percent of the children under five experience diarrhoea
- 2 percent of the children under five experience bloody diarrhoea during a two week period
- Children under five experience 4 severe episodes of diarrhoea per year
- 700,000 children died due to poor hygiene and sanitary conditions in the last decade
- 90 percent of the people have worms at any given time
- 72 percent of the people have a disease due to unsafe drinking water and poor sanitation
- The estimated cost of the increased morbidity and mortality due to water and sanitation-related diseases per year is Rs. 1.50 billion and Rs. 6.0 billion
- The annual health expenditure on water and sanitation-related diseases is approximately Rs. 2.20 billion and Rs. 3.60 billion
- The economic cost of inadequate sanitation results in productivity loss equivalent to Rs 10 billion per annum.

(SHMP, 2010)

There is no recorded history of programs promoting sanitation and hygiene in Nepal before the 1980s. In 1987, UNICEF partnered with the Nepalese government (Nepal Department of Water Supply and Sewerage) to design and implement a water supply and sanitation programme. From 1994 onwards the government has a policy that should promote sanitation use through the whole country. In 1998, a national level sanitation steering committee was founded to bring the government, donors, NGOs, INGOs and relevant organizations together. In 2000 the National Sanitation Action Week (NSAW) and the School Sanitation and Hygiene Education (SSHE) programmes were introduced (Adhikari & Shrestha, 2008). These and other minor or local policies and approaches eventually evaluated in the national Sanitation and Hygiene Master Plan 2010 that includes all stakeholders related to sanitation and hygiene in Nepal.

The Global Sanitation Fund (GSF) Project of the Water Supply and sanitation Collaborative Council (WSSCC) is introduced and implemented by UN-Habitat Nepal and in line with the guidelines expressed within the SHMP. The GSF is not a separate organization but a fund established to boost expenditure on sanitation and hygiene in support of national policies. Therefore highly suitable to be executed in accordance with the SHMP of the Nepali Government. The GSF is not introducing new methods, approaches or providing funds for construction purposes but advocates and supports the implementation of more sanitation and hygiene projects. The major goals of the GSF are quoted in box 2 (UN-HABITAT, 2010). The overall activities of the GSF Project concentrate on four core areas to support national efforts to support total sanitation, capacitate stakeholders at all levels, and strengthen the sanitation sector through the SHMP. The GSF is solely directed to help achieve the National Goal and the targets of the MDG regarding sanitation and hygiene. UN-habitat is the execution and coordinating organisation of the GSF and selects sub-grantees for the implementation of the GSF programme (UN-HABITAT, 2010).

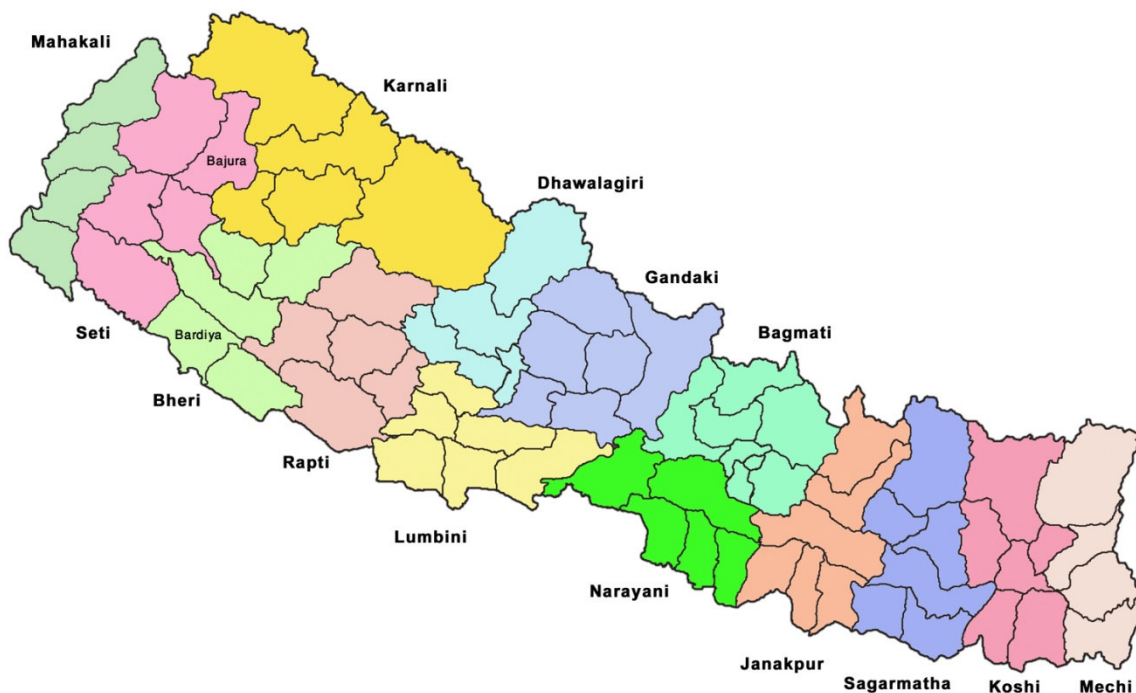
<p>Box 2 GSF Goals</p> <p>The major purpose of Global Sanitation Fund (GSF) is to help large numbers of poor people to attain safe and sustainable sanitation services and adopt good hygiene practices. By doing so, it contributes to progress towards the Millennium Development Goals (MDGs), especially those to reduce child mortality (Goal 4) and to ensure environmental sustainability (Goal 7). Targets to be achieved by 2015 for these goals include reducing by two-thirds the under-five mortality rate and halving the proportion of people without sustainable access to basic sanitation. Improved sanitation and hygiene also contribute towards other MDGs including eradication of extreme poverty and hunger (Goal 1), achievement of universal primary education (Goal 2), and promotion of gender equality and empowerment of women (Goal 3) (UN-HABITAT, 2010).</p>
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Both the research districts of Bardiya and Bajura are, even in Nepali context difficult to travel to. From the nearest large city Nepalgunj it takes 1 hour flying and up to 12 hours of hiking to reach the municipality of Martadi in the Bajura district. The alternative is 3 hours of hiking and approximately 27 hours in a (local) bus. The Municipality of the Bardiya district (Gulariya) can be reached from Nepalgunj in one to two hours by bus. Nepalgunj is 2 hours flying or 14 hours by bus from Kathmandu

2.2 General overview of the Bardiya District

The Bardiya District (Map 5 & 6, appendix) is located in the south-west region of Nepal (Mid-Western Development Region) and adjoins to India. It is part of the Bheri Zone, an administrative division and covers an area of 2,025 square kilometres (Map 2). Halve of the district (968 square kilometres) is covered by the Royal Bardiya National Park. This park is the largest and least disturbed wilderness area in the Terai (Statoids.com, 2005) The Bardiya district consists of 32 Village Development Committee (VDCs) that have access to fertile plain land, covered with agricultural land and forest. The District headquarter is Gulariya Municipality (Wayfarers, 2009). Bardiya District is part of the physiographic region the Terai, as a result the district has a tropical climate with temperatures that can rise up to 42 degrees in summer (Shrestha, 1997) and that the region is mainly covered by lowlands.

Map 2 Adminastrative zones Nepal



Source: Wapedia (2011)

According to Act!onaid (2002) is the majority of the inhabitants (80 percent) of the Bardiya District depending on agriculture and fishery. In the performed household survey 72 percent, based on total number of active people (including educational activities) in the households are depending on agriculture as the main source of income (figure 4) and will be further discussed and analyzed through the household livelihood research in chapter 6. Further demographic information can be found in appendix 5. Bardiya exports approximately 55,000 tons of food grains per year. Most of the potatoes grown are rotten away, or the farmers have to sell them at a very cheap price. This due to the absence of cold storage facilities, Vegetables are also grow in the Baridya district, unfortunately are currently no significant changes realized in the district development and prosperity. Underdevelopment of the market results in low selling price of produced items. The increasing number of people going to other districts of Nepal or abroad to find alternative sources of income can be partially be related to these poor market conditions (Act!onaid, 2002). Beside the traditional religious groups in Nepal (Hinduism and Buddhism) is in Bardiya a Muslim population present, especially in Mohamadpur VDC.

Figure 4 Division of labour

	Bardiya	Bajura	Total
Agriculture	72	39	111
Commercial activities	14	16	30
Labour work	3	9	12
Local Government	4	19	23
Services	0	3	3
Total	93	90	183

2.3 Sanitation status Bardiya District

According to most recent figures collected by the District Water Supply Office (DWSO) of Bardiya 38.1 percent of the households in the Bardiya District have private sanitary. Estimated is that in the fiscal year of 2010-2011 7.5 percent of the total households will install a toilet in Bardiya, this will increase the sanitation coverage towards 45.6 percent. The DWSO furthermore indicates that is expected to reach 50 percent sanitation coverage by the end of 2011. The approach towards meeting the goal set by the Nepalese government to have full sanitation coverage in 2017 is proceeding as planned and will not be delayed according to local officials. The sanitation and water coverage per research VDC can be reviewed in table 3 (appendix).

2.4 General overview Bajura District

The Bajura District is situated in the north-west of Nepal (Map 5 & 7, appendix). It is part of the Seti Zone (Map 3) and is located in the Far-Western Region. The district entitles an area of 2,188 square kilometres and according CBS census of 2001 approximately 109,781 inhabitants (CBS Nepal, 2001). The Bajura District is located in the Hill Region and has a sub-tropical climate, characterized by cold winters and hot summers, the average minimum temperature is 3 degrees Celsius and the average maximum temperature is 25 degrees Celsius (Frisa-Itenco, 2008).

The main occupation of people in the Bajura District is agriculture and livestock, a nomadic population is present that roams the district and beyond for grazing grounds. Apart from this people are active with other activities like employment as labour (e.g. stonebreaker), commercial activities and business, governmental employment as displayed in figure 5. According to the research of Frisa-Itenco (2008) is permanent migration taking place at limited scale towards the Terai and Kathmandu, most common is temporary migration to India or the middle-east. The received remittances from family or friends working abroad or in more affluent regions of Nepal play a significant role in the support of household livelihoods. The influence of these variables on sanitation and hygiene will be further discussed in the analytical chapters.

2.5 Sanitation Status Bajura District

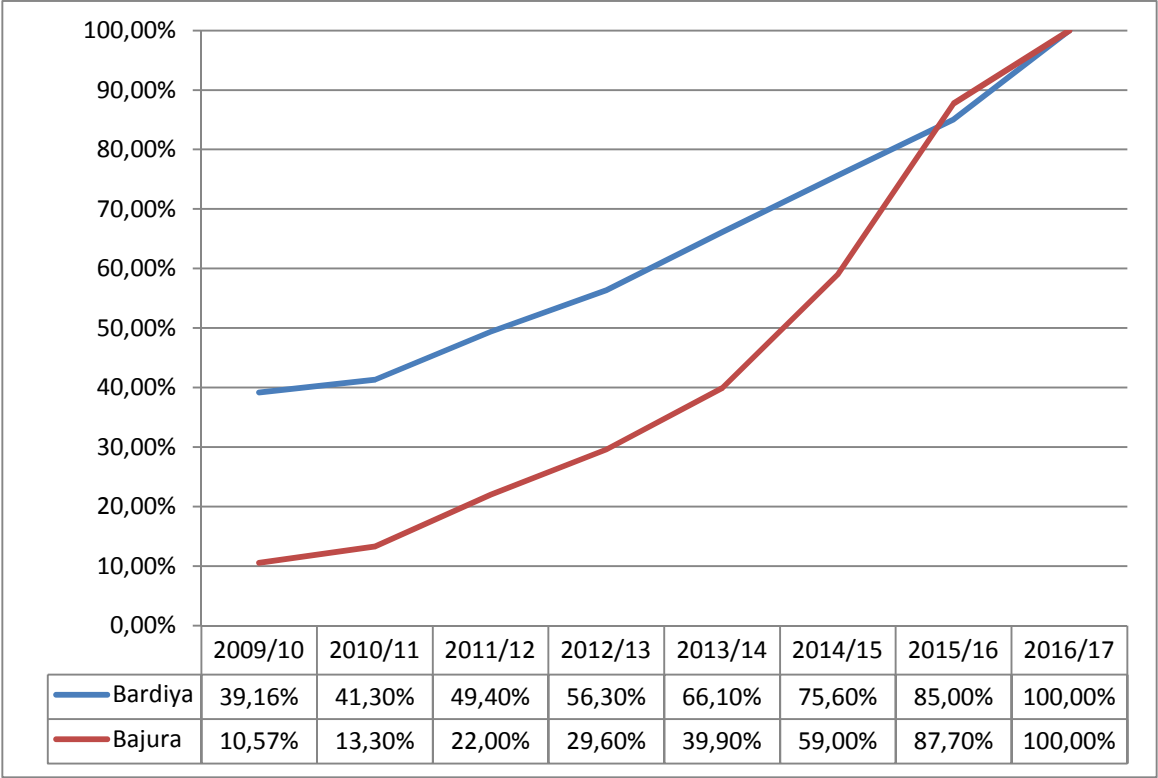
Limited general statistical information and specific statistics related to sanitation in the Bajura district are available. If the mile stones of the Sanitation and Hygiene Master Plan have been realized the present (2010/2011) sanitation coverage is 13.3 percent. The planned perceptual coverage improvements for the district are available in figure 5. No indication of accuracy or verification of the made improvements of this percentage are available. The calculated and expected increments of sanitation coverage are set in the SHMP Local authorities are not able to provide up to date progress reports on the toilet coverage status. Key-informants are unanimous in their opinion that the deadlines as stated in the Sanitation and Hygiene Master Plan are not applicable or feasible for the Bajura district, the district with the poorest sanitation coverage percentage of Nepal.

2.6 Summary regional context

From the introduction to sanitation and hygiene in a local context can be concluded that Nepal has a number of distinct regions that have general similarities and very distinct differences. These differences are identified between urban and rural, and furthermore between different rural regions. For example between districts in the Terai and Hill region. Therefore no single plan can be introduced to solve all issues regarding sanitation and hygiene that have been introduced in Box 1. Blueprint planning in a heterogeneous environment with distinct characteristics will lead to

unsuitable national policies and solutions to unique local problems. From the local context can be derived that both districts have for example have different employment divisions. Furthermore experience both district different characteristics like the nomadic population in Bajura and the Muslim VDCs in Bardiya. Both requiring different approaches to be included for achieving improvements in the sanitation and hygiene sector. According to UN-Habitat is the GSF Program suitable for improving the sanitation and hygiene coverage in different regions and achieving national goals indicated in the SHMP and international goals included in the MDGs. The implementation and feasibility of sanitation and hygiene policies will be discussed in following chapters.

Figure 5 Percentage of toilet coverage in the research districts



Source: SHMP, 2010.

3. Theoretical framework sanitation and hygiene

The objective of this theoretical chapter is to provide the reader with a comprehensive overview of the theories related to sanitation and hygiene in developing countries. Background information on factors influencing sanitation and hygiene project implementation is critical to understand the context of the research in the Bardiya and Bajura district of Nepal. After an introduction to the subject through a thematic preface of sanitation and hygiene in an international and national (Nepal) context a review of leading sanitation and hygiene approaches is presented. Subsequently the livelihood approach is discussed. The livelihood approach has been used as assessment methodology to collect key-indicators of the population to determine the need and demand with regard to sanitation. Variables from the livelihood research that could potentially influence local progress of sanitation and hygiene in Nepal are identified and reviewed.

3.1 Livelihood assessment and priorities

Worldwide people living in developing countries experience a variety of daily problems. Assessing the well being of countries or other clusters has shifted from solely concentrating on per capita GDP (Gross Domestic Product) to the introduction of several other variables of influence (e.g. example health and education). To identify assets and strengths of communities that influence the livelihoods of a community the sustainable livelihood approach (SLA) can be used (Farrington, 2001). The sustainable livelihood approach recognized the context in which people live and the access they have available to reduce limiting factors like for example poverty or limited access to education. This estimate is made through assessing the assets or capitals that influence the pursuit of positive and sustainable livelihoods outcomes (DFID, 2001). Sustainable livelihoods include consumption, income, and ability to handle stress and shocks to continue the pursuit of beneficial livelihoods and provision of basic needs (Chambers & Conway, 1992). Furthermore provides the SLA several practical concepts that can be included in research and project planning and implementation. This includes identifying programme needs and demands, designing and assessing to monitoring and evaluation. The basis of SLA consists of the following key-concepts:

- Empowering activities
- Responsive and participatory planning
- Activities conducted in partnership between the poor and their organisations and the private and public sectors.
- Disaggregated analysis including stakeholders and gender analysis
- Outcome-based monitoring and evaluation
- Long-term flexible programming (Carney, 2002)

The SLA has been proven to be a successful tool in understanding local livelihoods for the implementation of development activities. The five categories are the basis for livelihoods:

1. **Human capital** consists of skills, knowledge, ability to work and good health.
2. **Social capital** are the social resources (networks, memberships, relationships and access to wider institutions of society) that people have access to in achieving their livelihood objectives.
3. **Natural capital** is the natural resources stock from which resources can be used in for example production such as land or trees. Also less tangible assets are included such as biodiversity or pollution.
4. **Physical capital** indicates the basic infrastructure and producer goods needed to enable people to meet their basic needs and function more productively. For example roads, energy and adequate water and sanitation.
5. **Financial capital** indicates the financial resources that are available to people possibly to be used for purchasing or pay for sanitation services (Potter et al. 2008, 485-487). The previously mentioned five indicators for livelihood can all individually be linked to sanitation needs and demands. Analyzing these indicators and synchronizing these with planned changes by locally active agencies will improve the sustainability of sanitation projects.

When evaluating livelihood capitals it is critical to recognize the links between the various capitals. Access, clustering, sequencing, trends in availability and complementary of assets help to identify suitable strategies to improve livelihoods. Improvements of rural livelihoods can be realized through developing (collective) skills and knowledge, improving infrastructure, accessing grass root organizations (Mitlin, 2002). The outcome of the livelihood approach and survey are the goals and priorities that households have. The goal is to strengthen and identify priorities in the lives of the households. When for example the goal is a large yield from agricultural activities introducing the use of human faeces for fertilization and irrigation purposes could be considered. If the priority of communities is the reduction of waterborne diseases or a cleaner environment educational programs regarding the hazards of OD could be the solution. The analytical framework will help understand the livelihoods of rural (poor) people and to assist in the identification of effective development policy. The implementation of this framework in the household survey will be further elaborated on in chapter 5.

To further involve the communities in pursuing their livelihood goals the Rights-Based approach can be applied to: empower poor communities to claim and exercise their rights and enables those responsible to fulfil their duties (CARE, 2004). These rights include social cultural and economic rights like for example shelter, education, livelihood and health (DFID, 2001). Principles that are

implemented by the RBA and are furthermore suitable for the improvement of sanitation and hygiene in communities are:

- Community and stakeholder participation
- Awareness of social differentiation
- People centred development
- Equality
- Capacity building and empowerment
- Accountability and transparency
- Rights and responsibilities of the government, stakeholders and the community
- Priorities for public goods for diverse groups (CARE, 2001).

Raising awareness and knowledge is crucial when empowering communities to recognize their needs, demands and the ability to claim their rights. The poor individuals and communities are citizens with legal rights and responsibilities to fulfil in order to claim their rights. The right to sanitation and hygiene can be realized through the same methods as water supply has been improved. (Inter)National laws have promoted the right to water, in all circumstances regardless of local resources. This approach, in combination with sustainable livelihood could potentially significantly improve sanitation and hygiene coverage.

According to Sen (1992, 2009) a broader perspective to human development should be introduced to this process of identifying development. Although this provides a good general appraisal of the development status, essentially the Human Development Index (HDI) provides not sufficient information to determine local priorities leading to household needs and demands (Muller & Trannoy, 2011). For example because life expectancy at birth and adult literacy rate are not a good indicator for the perceived daily livelihood issues that households experience. Categorizing and prioritizing local problems (box 3) experienced by households will provide insight to locally perceived needs, demands and priorities and influence measures to be taken by development programs. These rankings will include personal perceptions experienced by people that have to deal daily with these issues. This includes the effects of subjective well being, for example social status and satisfaction with life. Several studies performed by the Worldbank have categorized the problems faced by households, including between 11 to 26 variables (box 3). More advantageous groups only having to deal with 1 to 5 of these problematic variables, the very poor have to cope with up to 26 kinds of problems (World Bank, 2010). The priority of these categorized problems will differ distinctly between different regions, urban or rural, socio-economic status,

gender and educational level. From these Worldbank studies have confirmed that access to sanitation is seen as less of a priority compared to access to drinking water, although differences exist between men and women (Allen et al. 2006). Therefore it will have an impact on the implementation of development projects and has the importance to be recognized as a critical factor for successful execution of future plans. If local priorities are not recognized when solving problems the targeted user groups will have limited support for the projects. Recognizing local priorities (of the poor) in problems equals recognizing local needs and demands. This is a valuable asset when implementing changes and a potential key to success. The most common challenges faced by households and communities in developing regions are listed by category in box 3.

Ranking is a proven tool for identifying and clarifying the specific problems experienced in target areas. According to the World Bank (2010) local groups are able to present a large array of strategies to deal with the problems they face. These solutions are not always the tried and tested ideas presented by the developed world; nevertheless they can be described as survival strategies that have been tested repeatedly in previous periods of crisis or difficulty. *“When the present is at stake, the future can be sacrificed”* (World Bank, 2010). As a result, the poor are not succeeding in fully

<p>Box 3 Problems experienced in developing regions</p> <p style="text-align: center;">Financial difficulties</p> <ul style="list-style-type: none"> • Difficulty in obtaining income / job scarcity • Economic difficulties (bankruptcy/laid-off) • Lack of capital • Expensive daily necessities • Difficult to sell harvest • Inadequate amount of affordable food • Poor family diet (malnourished) <p style="text-align: center;">Environmental difficulties</p> <ul style="list-style-type: none"> • Environmental disasters • Inadequate water supply • Pest damage to crops • Bad infrastructure • Lack of equipment <p style="text-align: center;">Social difficulties</p> <ul style="list-style-type: none"> • Inadequate / unaffordable schooling • Crime • Poor Governance • Alcohol abuse • Gambling • No medical services available <p style="text-align: center;">Individual difficulties</p> <ul style="list-style-type: none"> • Forced low price sale of private production • Low agricultural yield • Alcohol abuse • Gambling <p style="text-align: right;">Source: World Bank (2010)</p>

resolving their problems; they are trying to get a grip on continuous issues threatening their present livelihood. World Bank research has shown that lack of latrines is not a number one priority. Instead out of 17 most cited problems, lack of sanitation was only addressed only once (on average) in the

research area (Java, Indonesia) with assistance of external agencies. This indicates the second to lowest priority or interest of the local communities, the highest priorities being: lack of jobs/income, lack of working capital and high prices/lack of food (World Bank, 2010). To create further understanding of the local priorities more understanding has to be created on where these problems originate from and interweave with other pressing issues. The five dimensional conceptual framework of poverty, the deprivation trap (Chambers, 2009) indicates the causes and effects of each variable upon the others. This illustrates how each problem creates further difficulties, entrapping the poor (World Bank, 2010).

According to Sagiv & Schwartz (2000) the subjective sense of a person's well-being is dependent upon that person's profile of value priorities. People with especially important priorities (e.g. ensuring daily meals) may tend to have a more positive sense of well-being than persons guided by a different set of values. Subjective well-being can therefore be associated with particular values compared to other values that are perceived less important. The alternative view indicates that realizing any of a person's values (independent of the personal priorities) increases personal well-being. These two views on satisfying personal needs and priorities are not mutually exclusive (Sagiv & Schwartz, 2000). As a result identifying household priorities is a difficult and challenging task. There are as many definitions of quality of life as there are people. This emphasizes the differences between individuals and what they find important (Liu, 1976). Lacking agreement between those attempting to make a definition of the concept quality of life has led to inconsistent use of the phenomena (Baker & Intagliata, 1982). Many scales have been introduced since the 1970s to characterize the day to day life and after which the quality of life of individuals, households and communities can be identified. The majority of these scales have been developed to measure changes that play a major role in the daily life of people. The changes and movements in implemented policies, for example de-institutionalization, family support, schooling, integration of minority groups and other reforms has led to the pursue of clearly identifiable values to indicate and formulate human behaviour and its well being (Felce & Perry, 1995). The variations in the previously mentioned livelihood priorities has as result that no generalizations can be applied to large areas or groups for constructing or implementing development projects

To conceptualize values and priorities, Schwartz (1992) introduced the theory of universals in the content and structure of basic values. Values are desirable goals, varying in importance, that serve as guiding principles in the life of people. They are verbal representations of socially approved basic motivations. Examples of these values are power, ability to achieve, personal growth and tradition (Schwartz, 1992; Williams, 1968). These value priorities can be related to the survival strategies of rural households in developing countries. In most low income countries an enabling and facilitating

environment to support values and achievements hardly exists. This is understandable in a livelihood environment that is suffering from for example insufficient returns from farming (Ellis, 1999). Personal growth like power and personal achievement are a priority for people with a more secure livelihood. The study furthermore revealed that personal value priorities contribute significantly to the subjective well-being beyond the direct effects of a single value. Indicated is that the relation between people's values and their environment promotes well being regardless of the personal priority values. People living in a positive environment experience a positive sense of well-being in their livelihood. People experiencing a negative environment are less likely to realize their values (Sagiv & Schwartz, 2000).

A need and demand assessment is vital to identify the assets of a community and to determine needs, demands, priorities, potential problems and concerns that it faces. The community opinions and priorities can be used to establish a comprehensive agenda that has as its goal to address community needs and demands through, for example development projects. The local diversities that characterize communities require the assessment of local needs instead of national action plans (Sharma et al. 2000). To further optimize (sanitation and hygiene) project implementation other local factors that have influence (e.g. environment) on the outcome on the project need to be identified. This to positively identifying how existing services can be better or more efficiently co-ordinated, or the subjects that new projects should be concentrating on to ensure community support and successful implementation (Robbins, 2010). These factors will be discussed in subsequent paragraphs.

3.2 Factors influencing sanitation and hygiene development

An ongoing concern in the sanitation and hygiene sectors is that governments, at all levels, are not committed and sufficiently devoted to direct attention and resources to sanitation and hygiene services. Especially compared to expenditure on water supply: the coverage gap. The Water and Sanitation Program (WSP) indicates that the institutional complexity of the sanitation sector, due to the large amount of stakeholders is an obstacle to large investments in sanitation. Research findings (WSP, 2011) indicate that decentralization is a key determinant in the pattern and impact of sanitation implementation. Decentralized, local authorities can mobilize and empower local stakeholders to discuss and adjust sanitation and hygiene investments according to the local needs, creating local demand. Decentralized authority could further encourage regional government, civil society and citizens to create pressure and support for sanitation investments. Decentralization will help politicians and others involved with the grassroots elements, creating political and financial support for the planned changes in sanitation and hygiene. Therefore decentralization is a positive influence on sanitation investment, local awareness and strength of demand among stakeholders,

investors, entrepreneurs and citizens. Exceptions have to be made for countries (e.g. Indonesia) with unclear institutional authority at national and local level. This will potentially be magnified due to decentralization (WSP, 2011). Budget allocations and project implementation can further create problems if the technical and governmental capabilities of the local representatives are not sufficiently developed to execute demands (UNFAO, 1997). Failure to successfully initiated and complete sustainable (sanitation) projects can also result from political structures not providing financial and technical assistance or by creating bureaucratic barriers for obtaining funding and approval from government programs (Ratner 2004; Pena and Cordova 2001; Pineda 2006; Tortajada, 2003). If government, non governmental institutions and other stakeholders overcome these issues nationally coordinated sanitation programs, like the SHMP can provide an adequate framework for increased and successful sanitation and hygiene demand and implementation.

Increased local budgets for sanitation and hygiene, especially at local level, are vulnerable to corrupt practices and rent-seeking behaviour. Although corruption and rent seeking were identified in all cases of the WSP research, it was not identified as significant distortion factor for the sanitation and hygiene implementation and investments. Decreased popularity for sanitation was observed among civil servants due to the fewer opportunities for corruption compared to larger types of infrastructure projects like roads and buildings. A senior civil servant in Indonesia was quoted saying: *“if you go into sanitation, you are signing up to be poor”*. A successful example of decentralized, nationally coordinated sanitation and hygiene project can be seen in India, due to the government creating a transparent institutional mechanism of authority that ensures that the investments and project plans are transferred into the national Total Sanitation Campaign. Furthermore are sub national government abilities improved to create secure, strong and sustained bureaucratic support for sanitation and hygiene commitments at national and local level (WSP, 2011). According to Bhadari & Grant (2007) the major cause that (sanitation) projects fail is the lack of rewards for good operation and maintenance. Improvements here can furthermore be used to increase the support of civil servants for sanitation and hygiene projects. In Maharashtra, India officials have been motivated to perform on sanitation related investments and projects. Officials that have continuously shown commitment and performance have risen to more senior positions with a higher reward. This approach also included village leaders by giving them access to senior decision makers and raising their public profile if they support sanitary and hygiene development. Further political support and well designed decision making process can be created by establishing a linkage between economic benefits or progress and sanitation and hygiene development. A study on the economic impacts of sanitation in Southeast Asia was repeatedly mentioned by government stakeholders, financiers and among donors as a decisive document in realizing government interest. It puts a figure on economic

loss caused by poor sanitation and creates understanding of the impact of poor sanitation accordingly (WSP, 2011). Further sanitation and hygiene progress can be realized if government stakeholders experience it as a vote winner or career maker. Encouraging results are witnessed in India, Brazil and Indonesia with perceived political and professional returns to sanitation development resulting in a higher profile and visibility given to sanitation and hygiene in policy debates. Important incentives for politically driven decision making are characterized by highly visible, big infrastructure investments. Simultaneously are engineers mainly interested in sewerage based service provision that has few benefits for the poor rural majority of the population. A national sanitation and hygiene master plan, if well defined could decrease the discussion regarding popularity of projects and technical preferences ensuring pro-poor affordability. In India affordability of (rural) sanitation had been ensured through household subsidies for latrines through the national Total Sanitation Campaign. Concluded is that these subsidies resolved affordability problems and created behavioural change, especially in below poverty line households (WSP, 2011). Another approach to trigger and monitor change related to sanitation in development countries is creating clear accountability relations. This is a valued tool for securing and delivering sanitation and hygiene commitment. This can be realized through several approaches, for example with *“the short route of accountability”* by investing directly without using half-way contact persons (World Bank, 2004). A second method is by raising consciousness, providing subsidies and rewards to create demand driven sanitation and therefore accountability can shift from delivery to outcomes, enabling conditionality and enforcement (WSP, 2011). Building a sector coalition between and within governmental and nongovernmental stakeholders. This is vital in realizing and strengthening partnerships between key government actors and creates unison in sanitation and hygiene policies.

Box 4 Types of Latrines

- A simple pit latrine consists of a seat or squatting hole over a pit, in which the human waste collects.
- A ventilated improved pit (VIP) latrine has the addition of a screened vent pipe which extends from the pit to eliminate odours and flies.
- A pour-flush toilet is similar to a cistern toilet but with a shallower U-bend do that the toilet can be flushed manually by pouring a small amount (2-3 litre) of water into the toilet pan. For on-site disposal, the toilet is connected to a pit.

For all these toilets types, the pit is normally designed so that liquids will disperse into the surrounding soil, while the solids accumulate and decompose over time, and can be safely removed after a few years for disposal or re-use on agricultural land (Paterson et al. 2007).

3.3 Implementing Appropriate Technologies

Appropriate technologies are a part of the solution to achieve sustainable sanitation. Beside the social and educational dimensions (soft technology) appropriate (hard) technology can play a crucial role in achieving sustainable change. The different types of latrines are described in box 4. To achieve this criteria technology must be appropriate to meet the consumer's demand (preferably identified by the stakeholders themselves). Using flexible technology that meets local capabilities can be achieved by using locally available materials, therefore reducing the community's dependence on outside sources for materials and knowledge for construction and repairs to a minimum. It furthermore creates, according to the modernization theory discussed in paragraph 3.1, local support and trickle-down development subsequently. An important criteria for identifying appropriate technology is affordability. Technology is not appropriate if the potential user group cannot afford it. This does not mean that the least-cost solution is the best solution. The selected technology should match the willingness and ability to pay by the user group. All to be determined through local participation to achieve environmentally and local sustainability. Locally sustainable means that local user groups will be capable of maintaining and repairing the sanitary technologies after the construction period, without depending on outside expertise for help (Patterson, et al 2007). Essential is to involve the local key stakeholders and encourage their participation. The more the stakeholder and user groups are involved in the selection of the appropriate technology, the more likely it is that they will adopt it. Countless projects have failed because the local community was not encouraged to participate, and without participation it is extremely difficult to identify local needs, demands and appropriate technologies. Significant influences regarding the community commitment and appropriate technology are the social and cultural values that are present within a specific community (Murphy et al. 2009). In box 5 examples of identifying appropriate sanitary technologies are presented.

3.4 Private sector involvement

Institutional effectiveness in the sanitation and hygiene sector can potentially be further improved by the involvement of the private sector. Sanitation marketing has concentrated on promoting demand, not on understanding and facilitating the supply of sanitation and hygiene services. Therefore unaware of constraints faced by entrepreneurs and alternative technologies that could benefit the market development. Further research has to be done on how sanitation and hygiene entrepreneurs can be coached to provide the poorest households. Estimated is that services are available for the richest 60 percent and that the poorest 20 percent are left out. A more universal access and provision of service is needed to reach the least developed quintile (Valfrey-Visser & Schaub-Jones, 2008). Private sector involvement should allow for sufficient flexibility in approaches and project

implementation, and the management of political risks and opportunities to leave possibilities for flexible entry of private sector participation. Secondly, NGO participation should be encouraged to include international technology, knowledge and support. The level of nongovernmental and commercial participation should be decided on locally. Lack of perceived legitimacy of projects not promoted by governmental organizations could result in insufficient support or trust among local populations. Sanitation and hygiene development cases are described in box 5. It could furthermore have insufficient credibility compared to currently trusted partners in generating awareness and demand like community based organizations (WSP, 2011).

Box 5 Determining appropriate sanitary technique

Nepal:
During the construction process construction of public female toilet facilities in Patan, Nepal the designer questioned the design of the sanitary facilities due to user group participation. The new design prohibited the women from talking and seeing each other as they had done for centuries. Walls and doors were removed before project completion and prevented failure to occur (Murphy et al. 2009).

Bangladesh:
To select the appropriate sanitary technique for the slums in Bangladesh, an extensive socioeconomic, cultural, environmental and sanitary condition household survey and analysis has been conducted. Furthermore several different types of low cost try-out sanitary units were constructed in a try out phase. In combination with educational, motivational programs the cooperation of the population was sought to determine the appropriate technology by evaluating several types of toilets during a 12 month try out period. Beside the experience of the user group changes in the environment and sanitation rates were monitored to select the most appropriate sanitary service technology (Ahmed et al. 2010).

Vietnam:
A study among four rural communities of ethnic minority groups in northern Vietnam revealed that the common everyday practice regarding sanitation was not different significantly from other rural populations in Vietnam. A strong sense of marginalization and exclusion caused by the difficult living conditions in the (highland) communities had great impact on their perception and response to government sanitation interventions. The cultural perceptions of the body being permeable and therefore vulnerable to 'dirty air' like the smell from human faeces led to the reluctant view of the government promotion of closed latrines. The need for well ventilated sanitary facilities has not been recognized. Furthermore contributed the government priority of increasing the sanitation service coverage expectations and dependency among the communities who experienced the interventions as an event that "comes from outside the society". Resulting in an absence of community initiated actions.
The disregard for community priorities by the government sanitation policies resulted in non ownership and commitment. Closer matches with community demand and local participation is advised to prevent dependency and fuel initiatives from within the communities. Interventions focus on soft technologies like behaviour change should be preferred over the government focus on construction and supply of sanitation facilities in villages. Subsidy-driven sanitation to increase affordability by offering financial and hardware subsidies does not change community attitudes towards sanitation. Nation government targets regarding number of toilets to be constructed and sanitation coverage are realized, usage in communities remains limited (Paterson et al. 2007).

In 2010 has been estimated that less than 20 percent of human waste generated in development countries is safely collected and treated before being released into the environment. The failure to realize adequate sanitation in developing regions can partially be derived from the expensive approaches available to households and the lack of supply from commercial parties (Murray & Ray,

2010). Secondly, there is a growing understanding that in low and middle income countries, the developing world the state will be unable to meet internationally agreed targets for reducing people with no or limited access to sanitation services (Allen et al. 2006). According to Robbins (2010) the empowerment of entrepreneurs is the key to success for wide spread sanitation improvement in developing countries. The business of sanitation is immature in most developing countries, and could be triggered into a more mature stage by increasing household demand, resulting from an increased (perceived) need. Supporting local entrepreneurs with technical and business skills that are needed to supply the increased demand of sanitary facilities and products that are triggered through for example promotion campaigns. Motivating households to increase demand and to pay and invest in sanitation services is a complicated assignment. Services like water have always been more in demand compared to sanitation services. Whether communities or households are interested in sanitation investment is depended on several variables and can be increased using different affordable (long term) approaches and techniques. This should be combined with rewards (e.g. subsidies) and sanctions, for example local laws that force new building to have sanitary serviced incorporated give further incentives to households to invest in sanitary and hygiene services. Case studies in India have recognized that a balanced combination of incentives and sanctions will increase community investment and willingness to pay for services. This is not a general applicable outcome. Researches in Indonesia and Brazil have indicated that rewards for sanitation did not increase sanitation demand (WSP, 2011).

In contrast to analyses on privatization models and financing issues that advocate limited responsibilities for private operators in the sanitation sector given the often poor state of the sector (Brocklehurst and Janssens 2004). Private operators in sanitary services are currently not palpable to expand their network to low income areas which are regarded as difficult to operate in and less profitable than more wealthier areas (Allen et al. 2006). Governments have doubts regarding the capability of private contractors to fill the gap in providing basic services like sanitation. Recent examples in Buenos Aires, Dar es Salaam and Cochabambo have shown that private projects can collapse and contracts between government and private parties have not been fully executed in order to improve sanitary services (Brocklehurst and Janssens 2004). Furthermore, sanitation is similar to water regarded as in-separately from basic human rights. Subsequently the question can be asked if sanitation services can be regarded as a commodity that can be traded between governments and private companies. If the governments are incapable to give basic access to sanitation why would the profit driven businesses be able to resolve this problem? The definition of sanitation as a human right means that access is a legal entitlement rather than a commodity or service provided on a commercial basis. Debated can therefore be if the population should be

exposed to profit driven providers of such a service, similar to water. Consumers in developing countries already exposed to market forces (for water delivery) pay on average more than it would when depending on regular provision of service (Allen et al. 2006).

Currently the majority of the rural areas of the developing world users not paying for the received water and sanitation services. This results in the expectation from local communities that the government or other agencies will provide the necessary service and funding, creating an aid dependent community. (Carter et al. 1999; Pena and Cordova 2001). Consistent dependency on funding from government and development agencies have resulted in a lack of ownership and responsibility after the funding period provided for by the agencies. Shifting to private financing could result in greater feeling of ownership, responsibility and commitment (Foster 2000; Messenger 2004).

The increasing role of the local private sector in providing adequate and efficient sanitation services is a subject that has been researched in few studies. Limited recommendations are available on how to best harness entrepreneurial activities to develop sanitation more commonly, resulting in better livelihoods for the population. According to Valfrey-Visser & Schaub-Jones (2008) the wide range of commercial activity in the sanitation and hygiene sector is very broad and diverse, nonetheless not sufficiently explored to maximize the benefits in development interventions. Building Partnerships for Development (BPD) in water and sanitation has done studies to demonstrate how to better utilize entrepreneurs to expand (sanitation) services to poor consumers. Especially regarding business approaches and opportunities for Public Private Partnerships (PPP) for example in the involvement in the sanitation system. In the majority of poor communities, human waste is deposited into the environment in a manner that is not hygienic nor in the public interest. For the sanitation system to function (human) waste needs to be hygienically and effectively be stored, removed and treated before appropriately be returned into the environment. This accountable breakdown could benefit from the public sector in what currently is been done by private transactions between households and informal sanitation providers (waste collectors), or non-existent altogether. The complicating factor is the unstructured nature of sanitation sub-markets. The large range of (potential) providers of services is very diverse (e.g. builders of toilet block, managers of public facilities, manual pit emptiers and vacuum truck operators) combined with diverse customers (e.g. pay as you go or housewives making home improvements) mostly run without involvement from authorities. From case studies can be concluded that in more advanced well working systems the providers of services are co-operating. The relationship between the three involved parties in the sanitation market (private, public and providers) is complex and needs balancing to be successful. Extensive research has shown that households prefer affordable access and maintenance (emptying) and that their motivations regarding sanitation and hygiene are not based on the effect of good sanitation and

hygiene on public health but are usually related to comfort, dignity and status (WSP, 2011). The public is mainly interested in the protection of the environment and public health in which disposal and management of waste is crucial. Careless or random disposal of waste does not benefit the environment or the public health status. The provided goods therefore need to be not only financially but also politically and socially viable, especially in diverse developing countries experiencing complicated cultural and social factors is a key factor to be welcomed and accepted in communities. A second complicating factor is that providers need to cover their costs in an environment where households seldom prioritize sanitation, and if willing to contribute are only prepared to cover their personal immediate needs (private good). This complicates the public goods like collection (e.g. sewer) and disposal or treatment of the collected waste. The high cost of transporting and treating waste can be greater than the ability or willingness of communities to pay. Benefits derived from total sanitation are largely public goods like population health improvement (lower disease burden) and a safer environment. Yet the cost of the public benefits have to be supported by private funds leading to higher household prices (Murray & Ray, 2010). This could potentially lead to households alternatively using other sanitation service providers who dump illegally. A third potential risk is that the increase in sanitation demand (over-investment) results in poor quality construction. The use of public money for the public good is to be discussed. Especially what aspect of sanitation is public or what part is private (Valfrey-Visser & Schaub-Jones, 2008).

To create more demand for sanitation through the public market three main steps need to be accomplished. First more sanitation transactions are created by involving more people into the sanitation system. This can be achieved through education and awareness activities that increase public demand. Secondly, existing demand for sanitation needs to be channelled to improve the business model. Currently every sanitation job is an individual case spread across different areas and settlements. In the case of emptiers this means that they not go from house to house to empty pits. A pit latrine takes generally between 6 months and several years to fill, driving up overall and transport costs due to the inefficient sanitation chain. Streamlining, by for example neighbourhood collectives will reduce the overall costs and prevent problems as blockages or conflicting transfers of waste. Finally would support with public funds for education and construction help create further demand and awareness. Preventing and restricting the activity of for example illicit dumping of waste would benefit more sustainable activities. These combined actions can potentially change household – entrepreneur relationships not only bringing personal benefits (dignity, comfort) but also have public gains like health and environmental benefits. Regulatory changes and incentives are essential for realizing change. The above mentioned steps to be taken to improve the sanitation market need to be adjusted to the providers and local circumstances (Valfrey-Visser & Schaub-Jones, 2008).

Another issue is how to improve the sanitary market without destroying the livelihood of small entrepreneurs. For example how to accelerate the change from hand emptying of septic pits into mechanized emptying. Currently marginalized or outcast persons perform this dirty task and cause beside personal health hazard also public health and environmental hazards by dumping waste in any possible spot. The work conditions of these marginalized entrepreneurs have to be improved without destroying the livelihoods of these people due to mechanization. Increasing the sanitation and demand for sanitation products would help to ensure future (more professional) employment for this group of workers. The downstream segment of sanitary and hygiene service (disposal/treatment/reuse) is a complicated segment to deal with. It requires large investments, involvement of authorities for enforcement of regulations and the input of technical skills. Building partnerships between authorities, independent private parties and investors is therefore necessary to realize projects (Valfrey-Visser & Schaub-Jones, 2008). The downstream segment is of further interest for back-end users who could potentially buy and use treated waste for their own benefit as nutrient and fertilizer. Households and communities have been subject of demand driven sanitation for decades, and this is commonly thought to be the way to proceed. Shifting the incentive from the previously mentioned front-end-users to back-end-users creating leverage for the demand for products of sanitation like treated wastewater for irrigation, fertilizer and alternative (bio) fuel. This addition to the sanitation cycle introduces a re-use orientated cycle and increasing the value and demand for all inclusive sanitation services. These private consumers and beneficiaries would support the financial aspects of the waste treatment process relieving the cost for households and public funds creating a more fair cost sharing paradigm between public, private and the public sector. The use of wastewater and sludge is furthermore widely promoted due to the potential to safe water, decrease reliance on non-renewable energy, reduce the use of commercially produced fertilizers, protection of the environment and the most simple form as water for irrigation. (Otterpohl, Albold, and Oldenburg 1999; Esrey 2001; Mara et al. 2007; Gensch 2008; World Water Assessment Program 2009). Considering the often encountered need for the previously mentioned products it is rational to use every possible advantage that can be derived from sanitary waste (Driver, 1998). Unfortunately, most households in the developing world have no or limited access to improved sanitation and have other more urgent priorities than environmental protection. As consequences are long term advantages difficult to introduce and are re-use limited to unplanned use of raw sewerage and not part of a sanitation cycle (Murray & Ray, 2010). Secondly, although the majority of educated people is not aware about using human faeces as fertilizer or for irrigation, 68 percent of the educated people is not interested in using it at home and expects that it will not be accepted in the production of food. Further research revealed that farmers need education and practical demonstrations about the use of human waste for personal benefit. This due to the

relatively new and unknown concept of eco-sanitation and eco toilets. The preconceived opinions and prejudices need to be overcome. Recognizing advantages could encourage even poor farmers to construct eco-toilet type of facilities (Pradhan & Tanski, 2009).

Strategic marketing to generate demand for back-end products is crucial to implementation success. Overcoming social and cultural obstacles related to the use of human waste for food production processes is a significant hurdle and might prove to be more difficult depending on the regional cultural characteristics of the community. Convincing the user groups of the benefits like lower costs, added convenience and higher yields could lead to leverage for change in attitude towards using back-end products transforming faecal sludge and wastewater into marketable commodities. If similar quantities of time and money would be invested into in-depth market analyses of the sanitation market as is common in more mainstream consumer markets, significant results can be expected. Currently re-use projects fail due to no consideration of local institutions, market demands and local supply chains due to the often encountered *“if we build it, it will thrive”* mentality of decision makers and project developers (Murray & Ray, 2010).

3.5 Involving community and civil society

A key factor in accelerating sanitation and hygiene progress is participation of civil society. Investing in civil society investment, like community groups is essential to create a demand driven strategy for sanitation and hygiene project implementation. Collective outcomes are preferred (Open Defecation Free, ODF) instead of individual household results like the construction of private toilets. Attention has to be given to make sure that involvement is not limited to the local elite. Recognized by the majority of stakeholders active in the implementation of sanitation and hygiene policies is that community participation is a necessary strategy in sustainable development. Participation is creating and encouraging a feeling of ownership of the projects that increases the likelihood of the benefits to extend over the long term (Robles-Morua et al., 2007). A typical example of challenges faced when improving sanitation in a community is provided in the case study of a rural community in northwest Mexico described in box 6.

Box 6 Collaborative strategy rural Mexico

The community in Mexico had been unable to implement a suitable and effective to treat the local wastewater. The problems can be derived back to the political organization of water and sanitation decentralization that required communities to meet wastewater standards without the supply of technical and political guidance to meet these standards. A new attempt to a sustainable design through cooperation between local authorities, federal social development agencies and academic institutions has been a success. This accomplishment can be linked back to the use of a collaborative strategy that used the needs, demands and capacity of the local community to draft a suitable plan of action. The community has been given leadership and ownership of the project resulting in a sustainable implementation of waste management improvements (Buenrostro & Bocco 2003).

Many problems are faced by rural communities in the developing world that are potential negative influences on the outcome of development projects. Problems can commence during the beginning stage of the development projects and can continue into the finalizing operation and maintenance stages. Especially when development projects are more complex, community support is essential. Several case studies investigating the reasons for failed (sanitation) projects in rural communities show that the need and demand assessment, conceptual design and construction of facilities often have been implemented without involvement of the community that would benefit from the planned changes. The lack of communication with local user groups has as a consequence that they have to deal with problems that they may not understand and are incapable of to solve themselves (Alvarez-Vigil 1982). This furthermore creates non-involvement of people potentially benefitting by these projects. Discrepancy in priorities between project designers and user groups will lead to unsustainable outcomes. A difference in the projected benefits or priorities other than sanitary facilities will lead to sustainability issues in the future (Carter et al., 1999). Participating service providers and agencies not coordinating and co-operating results in the waste of efforts and resources, political debate or issues within the community. Especially concerning benefits promised during the starting phase, or different degrees benefits between programs or the program not being delivered to the population cause a lack of trust. The outcome of sanitation projects is further affected by the slow changing behaviour and attitudes towards health problems (Mackintosh and Colvin, 2003; Reents, 2003). Identifying the appropriate channels for communicating in the community results in the wide diffusion of information. Understanding of socio-cultural aspects of the community is therefore essential for identifying these channels and ensure sufficient coverage in the area. Good leader characteristics and the use of personal networks are critical in many communities (Alvarez-Vigil, 1982; Pena and Cordova, 2001).

A further addition to the already extensive list of factors complicating the implementation of sanitation and hygiene projects is the extreme poverty some households experience in rural areas in the developing world. The social exclusion within the community linked with poverty and stigma of being short term maximizers and not capable of realizing sustainability keeps them not involved in the decision making process (Ravnborg, 2003; Swinton et al., 2003). The community's concern with higher priority activities like obtaining sufficient and adequate food and shelter for their families can cause low levels of participation in other projects. When for example environmental degradation caused by waste water is recognized as a threat to their livelihood, the cooperation and interest of the community is likely to increase. A logically reaction to a threat to their own existence (Broad 1994; Ravnborg 2003). To address poverty and poor sanitation simultaneously strategies that reduce

poverty and solve other problems (e.g. poor sanitation) at the same time, should be integrated to one project (Rogge and Darkwa 1996). Reducing economic inequities have to be considered when aiming to create public participation and successfully implement projects in impoverished regions (Nakajima 1994).

New approaches have been developed to substitute the top-down organization of sanitation projects (further discussed in chapter 4). For example the privatization of drinking water and sanitation services and decentralization of government. This bottom down policy is implemented to create larger involvement of the population with the needed services. Several leading organizations like the World Bank and United Nations have adjusted their policies and projects and use this bottom-down model before they approve financial assistance (Pena and Cordova 2001).

3.6 Household variables effecting sanitation rates

Several large scale obstacles and constraints that potentially could interfere with the development of sanitation and hygiene coverage have been discussed in the previous chapters and paragraphs. In this paragraph several variables at household level that are expected to have influence on the demand for higher standards of sanitation and hygiene are discussed. According to Bukuluki (1995) possession and use of sanitary facilities in communities is depending on several factors. Firstly, the possession of sanitation is not a guarantee for usage. Poverty, lack of education, cultural habits, and taboo's are examples of factors that can be identified for influencing sanitation usage. A study conducted in rural china (2002 – 2007) revealed that the common increase of community income had a substantially stronger effect on the improvement of sanitation and hygiene rate and standard than the improvement of individual incomes. Furthermore has been revealed that during periods of economic growth in rural china, investments related to health and basic sanitation was significantly lower than the household's expenditure on consumer goods like televisions, mobile phones and motorcycles. Eradicating poverty can contribute to sanitation improvements, hygiene standards and the community's health rates if planned carefully and distributed equally among households (Yang et. al. 2009). Research in Brazil of two regions experiencing decreasing poverty and inflation revealed that especially childhood diarrheal decreases significantly. Observed is that investments in public health infrastructure such as waste management and increased sanitation, improved education and literacy and larger funds for health services contributed to this achievement. The collected data suggest that buying power (inflation) and poverty alleviation played a pivotal role in improving acute diarrheal and general health in the region. Simultaneously was recorded that an increase in poverty or inflation correlated with a marginal increase in hospitalization due to waterborne diseases (Andrade et. al., 2009). The improvement of income and buying power has a significant relation with decreased waterborne diseases, especially infant diarrheal in rural Brazil (Rio Grande do Norte). This

outcome is furthermore supported by other studies that identify economic factors as having a significant effect on health rates in developing communities (Andrade et al., 2009; Thapar & Sanderson, 2004; Jones et al., 2003). This supports the general assumption that increasing household and community welfare, for instance through more employment opportunities or received remittances, contribute to improving sanitation and hygiene standards and subsequently community health. Daily problems related to poverty become less pressing and future planning enters the life of more people, improving current and overall quality of life. Universal access to sanitation is a requirement for community health improvement and is not limited to more developed households to make community changes. Waterborne diseases are not limited to poor households and will affect indiscriminately (Andrade et al., 2009). Different research reports that female-headed households have higher rates of sanitation usage while often perceived to be poorer than male headed households. Reasons for this might be comfort or safety issues due to the absence of a male “protector” (MoWLD, 2002). Research has furthermore identified that the nature of the soils can be linked with the possession of latrines as it influences the frequency of septic tank replacement and the linked increased costs (Nakiboneka, 1998). The environment could be a restricting factor for sanitation development. Rocky ground might make it difficult to dig pits for septic tanks for latrines, or seasonal scarcity of water could be encountered and affect structures or the functioning of technologies. An increase in people affected by poor sanitation and waterborne diseases during the rainy (increases faecal contamination of the water supply) is furthermore commonly encountered (Andrade et. al. 2009).

Several examples have been given regarding social and cultural constraints towards sanitation and hygiene, for example the case study in Vietnam (box 5). Another example of cultural beliefs having a negative influence was recorded on Karamojong and Pokot (Uganda). Beside a strong dislike for the digging of pit latrines, communities believed that faecal matter heaped in one place can be used to bewitch someone. Furthermore the females in the communities expressed the fear for having to share the pit latrine with their in-laws, and the common notion that faeces should not be mixed and the dislike of the repulsive smell of from the latrines. Local cultural habits influencing the progress of sanitation are to be identified, expected is that several socio-economic and cultural factors have their influence. The use of ash and mud for cleaning purposes, households using the same water facilities with their livestock, bathing included, the restriction of females using sanitary facilities during their period and the lack of knowledge. (Jitta, 2005). Into account has also to be taken that the cultural values and priorities of common rural households and those of the district contact persons or staff could differ. Cultural, educational and social gaps can affect the way services are rendered and messages are delivered (Burbank, 1992).

3.7 Conclusion theoretic framework

From the provided theoretic context can be concluded that variables that influence the progress of sanitation and hygiene in development regions is multiple and varies from place to place. A single variable that is generic or of most significant influence is not present. Creating demand, recognizing needs, local priorities and realizing solutions will vary from community to community. Recognizing and understanding local differences, for example through a needs and demands assessment is crucial for the successful implementation. By involving local user groups (if present) and stakeholders in the planning and decision making progress support from the community can realized. Control and evaluation of project process and sustainability needs to be present continuously to prevent un-transparent activities like rent-seeking behaviour or corruption. (Technical) support could prevent errors due to lack of knowledge or experience, a common problem when realizing decentralized, bottom down project. The following factors can be identified as the most encountered factors influencing and affecting the general development of sanitation and hygiene:

- Infrastructure and service delivery factors
- Political factors
- Cultural factors
- Socio-economic factors
- Environmental factors

Special attention should be given toward activities that involve entrepreneurs that potentially could improve the availability of sanitation and hygiene services. Through (local) market analysis engagement strategies can be implemented throughout the sanitation chain to make the sanitation system work effectively. Further development of back end process will require significant financial, educational and technological investments that might not prove to be economically viable in a developing region. Expansion of current trial, demonstration projects and market analysis might therefore be more appropriate than short term large scale investments. The largest obstacle to overcome will be the transformation of traditional sanitation services (e.g. ad hoc household pick-up and unsafe disposal) and the proposed transformation to a regulated sanitation cycle that includes the support from households, public and private parties. Furthermore, special attention has to be given to the inclusion the extreme poor households in the service delivery.

In the following chapter will be presented how these theories and suggestions regarding good and successful sanitation and hygiene implementation are used in current approaches.

4. Review of the leading sanitation and hygiene approaches in Nepal

Since the increasing national and international attention for sanitation and hygiene several different methods, approaches, methodologies and practices to facilitate sanitary changes within communities have been developed. Unfortunately and despite the increased efforts of the global water sector since the 1980s a major part continues to live without safe sanitation. No financial statistics are available concerning regional expenditure on sanitation and hygiene in Nepal. National level figures of the Central Bureau of Statistics Nepal (CBS, 2009) indicate a difference between sanitation expenditure compared to water supply. According to Myles (2003) the negative outcomes of attempts to improve sanitary services can be linked with the shortcoming at the national level: the absence of a sanitation policy or unclear or contradicting existing policies. A coherent national policy is critical for the focus and planning of sanitation programmes. The basis for the multi layered governmental and organizational structures needed to decentralize the responsibility for sanitation to local implementation levels. Without this essential support structure successfully implementing sanitation coverage at a worthwhile scale will be unrealistic. Simultaneously NGOs and other agencies miss the link to scale up worthwhile pilot sanitation projects. A separate sanitation policy with clear lines of responsibilities can prevent overlapping or conflicting interest between government departments and other agencies or institutions (Myles 2010). The government of Nepal is making efforts to overcome the institutional problem by introducing the SHMP aimed at removing barriers between stakeholders and creating unison in approaches between different (governmental) organizations trying to prove that organizational complexity need not to be a barrier (SHMP, 2010). The master plan is expected to help the involved stakeholders in effective planning, budgeting, human resource mobilization, implementation, monitoring and evaluating and follow up of hygiene and sanitation and hygiene programs and projects. The aim is to converge the currently used approaches to create and maintain uniformity and standardization in the hygiene and sanitation sector to scale-up and accelerate the sanitation progress to achieve sanitation MDGs and National Targets (SCNSA, 2010).

The most encountered and dominant dogmas (or discourses) in community sanitation will be defined chronologically in subsequent paragraphs. Concluded will be with a review of the Sanitation and Hygiene Master Plan Nepal.

4.1 Basic Sanitation Package

Nepal did not perceive basic sanitation to be a priority problem until the mid-1990. According to a 1994 survey latrine coverage in Nepal was only 12 percent. To address to problems resulting from

inadequate sanitary services a national sanitation steering committee was founded involving several governmental and non-governmental partners. In the subsequent year a Basic Sanitation Package (BSP) was developed and implemented in the majority of the districts where water supply programmes were being realized. The BSP approach recognized the problems facing the poor citizens in the ability to afford the cost of a toilet. Subsidies for building latrines were provided using revolving loan funds and financial incentives (Adhikari et al. 2008). The main strategy of the BSP entitled five key messages:

- 1) Promotion of toilet use;
- 2) Oral Rehydration Therapy (ORT) to threat effect off poor sanitation;
- 3) hand washing with soap;
- 4) water and food hygiene;
- 5) waste management.

The BSP approach furthermore included the mobilization of user committees and the use of VDC to manage the revolving funds (SCNSA, 2010).

4.2 School Sanitation & Hygiene Education

The School Sanitation and Hygiene Education (SSHE) has been developed in 2000 and focuses on the development of life-skills, a safe and healthy school environment and outreach to families and communities. Through investing in the availability of school sanitation many benefits for future improvements are realized. The advantages are listed below:

1. **Promotes effective learning:** Children perform better when they function in a hygienic and clean environment.
2. **Increases enrolment of girls:** The lack of private sanitary facilities for girls can discourage parents from sending girls to school and contributes to the drop out of girls, particularly at puberty.
3. **Reduces incidences of disease and worm infections:** If school sanitation and hygiene facilities are absent, or are badly maintained and used, schools can become a health hazard.
4. **Promotes environmental cleanliness:** Presence and the proper use of facilities will prevent pollution of the environment and limit health hazards for the community at large.
5. **Implements children's rights:** Children have the right to be as healthy and happy as possible. Being clean, healthy and having clean water and proper sanitation facilities contribute to a happy childhood (Snel, 2003).

Combining adequate facilities and the education on safe behavioural practices is designed to have a positive effect on health and hygiene conditions of the whole community, both now and in the future. It is the combination of hardware, the construction of sanitary facilities at schools and software, the education and knowledge on safe practices. This combination applied in practice leads to a healthier environment (Snel, 2003). Child to child, child to community and child to parents approach will eventually lead to a larger understanding of safe sanitary practices with the school being an example model for learning. Using the SSHE approach improves hygiene and sanitation, unfortunately the community outside the school premises is not further involved beside through the children attending the school. A large scale impact was therefore not reached.

4.3 School Led Total Sanitation

To fulfil MDG seven that contains the sanitation target and the national goal to reach 100 percent sanitation by 2017 further action had to be taken. Previous efforts had to be improved and continued; processes speeded up, the scaling up of initiatives and the incorporation of larger number of disadvantaged groups in the sanitation and hygiene target population.

To scale up the sanitation impact on communities the School Led Total Sanitation (SLTS) was initiated in 2005 by the Government of Nepal and other stakeholders. SLTS recognizes the potential crucial role that children can play as facilitators of change in sanitation and hygiene. The SLTS approach builds on the achievements of the SSHE programme and incorporates the reward and revolving fund aspect of the BSP approach and the participatory tools and techniques used in the Community Led Total Sanitation (CLTS) (Dhikari, S. and Shrestha, N.L. 2008).

SLTS main objective is to build on children's awareness of better sanitation and hygiene practices gained using the SSHE programme. This enables the promotion of better hygiene and sanitation in school catchment areas using community organizations/groups and adults to abandon open defecation through the construction, use and maintenance of latrines. Children are recognized as change agents (Dhikari, S. and Shrestha, N.L. 2008).

4.4 Community Led Total Sanitation

Community Led Total Sanitation (CLTS) is described as the approach that fosters innovation and commitment within the community to achieve better sanitation. Furthermore the CLTS encourages and motivates the community to build their own sanitation infrastructure. This without depending on subsidies from external agencies (Deak, A. 2008).

CLTS originated from the Participatory Rural Appraisal (PRA), the valued method of the participatory movement. The fruit of the PRA assessment of community sanitation in Bangladesh in 1999 is the

CLTS. This approach has been called the “spreading revolution” and is widely adopted throughout Asia, Latin America and Africa and by the stakeholders in sanitary development. Resulting in considerable drops in diarrheal and other water borne diseases, medical expenditures and major improvements in the well-being of women, children and men (Lenton, Wright and Lewes 2005). The traditional sanitation programmes used to concentrate on individual household hardware subsidy and had not been proven successful. Through analysis it became apparent that communities are able to take actions themselves and that this action could result in total sanitation. Not total sanitation in the sense that every household has their own latrine, rather the community being ODF. The pilot projects in Bangladesh led to 200-300 villages becoming ODF. Subsequent agencies became enthusiastic supporters and the approach spread throughout the Asian region and beyond (Deak, 2008; Kar, 2003).

CLTS differentiates from conventional approaches towards sanitation due to focus on people rather than hardware in the complete implementation process. Strong focus is on good facilitation and the use of tactics that trigger the people’s intense emotions. Examples of these emotions are disgust, shame and fear. Simultaneously humour and games are used to promote sanitation and hygiene. Raising awareness concerning the truths about the personal and community’s sanitation such as the spread of diseases through flies is achieved. The ultimate goal is to reach awareness in the community on the link between defecating in the open and poor hygiene and negative impact on the community health (Pasteur, 2005; Deak, 2008). Triggering these emotions and effects is to key enabling CLTS. The changes in attitudes and behaviour regarding sanitation are accompanied with the instalment of basic pit latrines. The local communities are not told what needs to be done. Local solutions and markets emerge. Based on local knowledge innovative and low cost toilet models suitable for the region of usage are developed (Hossain, 2007).

In the CLTS process the primary goal is to establish ODF communities, the broader secondary goal is to develop community participation and to establish entry point for different projects and initiatives aiming at empowerment and improving livelihoods (Kar, 2003; Pasteur, 2005).

4.5 Integrated WATSAN

Integrated water and sanitation services (WATSAN) are a pro-poor water and sanitation approach. Integrating the water and sanitation services in one project, the water catchment area (usually a village or rural community) should be supplied with safe drinking water and the availability of sanitary services. Promotion is done through providing subsidies on constructing household toilets.

The drawback of this approach is that sanitation is dominated by the water component of water and sanitation (SCNSA, 2010). Only the construction of toilets is promoted and the concept of universal

coverage as described in the CLTS and SLTS and other approaches is neglected. Soft technologies are absent in this approach and increased awareness and knowledge improvement are therefore to be expected minimal. Integrated WATSAN will provide a larger quantity of water and sanitation services but will simultaneously face challenges to create ODF areas.

4.6 Sanitation and Hygiene Master Plan Nepal

The sanitation approaches that have been implemented in Nepal have been changed and improved according to lessons learned and requirements changed. The fundamental basis of the policies has been to increase awareness through child to child, child to parent, adult learning, school and community approaches. The Sanitation and Hygiene Master Plan (SHMP) continues the success factors of these methods to complete the main goal of ODF and universal access to toilets in both rural and urban areas. Through commitment and collaborative actions of both government, and stakeholders combined with the provision of adequate resources the current barriers and challenges are to be overcome to meet national and MDG targets. The Master Plan is essential to create unison between all stakeholders at various levels and to proceed forward in sanitation promotion to achieve the set targets. It is furthermore stated in the Master Plan that the coverage gap between water supply and sanitation is closed. This to emphasize that sanitation interventions have the same health benefits as improvements in the safe water supply. The aim of the master plan is to direct and harmonize the dispersed and different efforts of the stakeholders to achieve a common national goal. The total sanitation approach stated below should be adhered by all involved government agencies, local bodies, donors, NGOs and other water and sanitation stakeholders (SCNSA, 2010).

- **ODF is the basic and minimum criteria for all activities.** Access to improved and sustainable sanitation (box 1) for every household. Activities to ensure sustainable post-ODF should be calculated in the budget. For example water management to sustain a sanitized condition.
- **Universal access to sanitation in water supply and sanitation projects.** To close the gap between water supply and sanitation all stakeholders have to allocate 20 percent of the available budget to promote hygiene and sanitation in the water supply scheme areas.
- **Technology choices for household toilets.** Communities will be given informed choices of the various types of toilet available that are at low cost, hygienic, user friendly and sustainable.
- **Leadership of local governments.** Sanitary implementations have to be synchronized with the District Development Commission (DDC), the municipality and VDC. The local bodies have to be responsible for planning, implementation, follow up and monitoring and evaluation in coordination with the involved stakeholders. Resource pooling and cost-sharing

arrangements at program implementation level to ensure effectiveness and enabling scaling up of the initiative.

- **VDC or municipality is the minimum program area for program intervention.** A gradual progress of ODF from a settlement, ward or school catchment area to VDC or municipality district through total sanitation approaches.
- **Locally Managed Financial Support Mechanism.** To promote hygiene and sanitation and to stimulate ODF initiatives a community fund can be established. A locally appropriate fund could be created in the form of reward-recognition, revolving fund or other incentive. This enables the community to make their own decisions and generate local resources as additional support. It furthermore creates a demand driven and sustainable support controlled by the SCNSA.
- **Sanitation facilities in institutions.** All institutions within the designated community must have hygienic toilets. This includes schools, health post, VDC, municipality building, community buildings and other public offices and places. These toilets should be user friendly and have child, gender and differently-abled friendly facilities.
- **Mandatory provision of toilet in new built up buildings.** Construction of sanitary facilities must be made mandatory in all new to be constructed buildings. On site sanitation with septic-tank is encouraged to decrease the load on the sewer system.
- **Hand washing with soap and other behaviour build up.** Promoting hand washing with soap has to be an integral part of water supply projects and sanitation and hygiene promotion programs. This to stimulate all households and institutions to provide facilities for hand washing. Partnership of public and private investors will be enhanced for further promotion of hand washing with soap (SCNSA, 2010).

To successfully implement the guidelines stated above a number of strategies are developed partially on existing approaches like the SCLTS and CLTS. The majority of these strategies are to create local ownership and responsibility to ensure demand and sustainability of the sanitary improvements. An overview of the most significant operationalization strategies is presented in Box 7. A comprehensive insight in all the operational strategies can be found in the Master Plan.

4.7 Conclusion sanitation and hygiene approaches in Nepal

From this presentation of sanitation and hygiene approaches being used in Nepal can be concluded methods are currently experiencing change and improvements. Different insights from theory or experiences from other places are being used and included to create more success when attempts are made to positively change regions. The SHMP and the GSF has recognized the different

approaches and the success different organizations are making when using these methods. Therefore the GSF is not advocating the use of a single approach but stimulating the use of previously field proven methods those stakeholders can continue working with. This to reach the goals of ODF and universal access to toilets in both rural and urban areas. Through commitment and collaborative actions of both government, and stakeholders combined with the provision of adequate resources the current barriers and challenges are to be overcome to meet national and MDG targets. The Master Plan is essential to create unison between all stakeholders at various levels and to proceed forward in sanitation promotion to achieve the set targets. Taken into account have to be the Local cultural habits and unique variables influencing the progress of sanitation in Nepal, and especially the Bardiya and Bajura district. Cultural, educational and social gaps can affect the way services are rendered and messages are delivered. The measurement, recognition and inclusion of these variables will be discussed in chapters 6 and 7.

Box 7 Operatinalization strategies SHMP

- Local Bodies to lead for participatory planning and implementation of Hygiene and Sanitation Programme;
- participatory approach crucial for effective, inclusive, accelerated and sustainable hygiene and sanitation development;
- memorandum of understanding among local bodies and support agencies;
- demand driven implementation of hygiene and sanitation programmes;
- coordination of the programme at the national level;
- making Hygiene and sanitation a free-standing subject for foreign aid;
- establishment of a district sanitation desk in DDC;
- reward and recognition;
- identification and mobilization of financial resources;
- communication, coordination and cooperation;
- redefining institutional set-up;
- strengthening partnership with multiple sectors;
- capacity building of stakeholders at various levels;
- advocacy, education and social mobilization;
- gender mainstreaming and social inclusion;
- monitoring and evaluation (SCNSA, 2010).

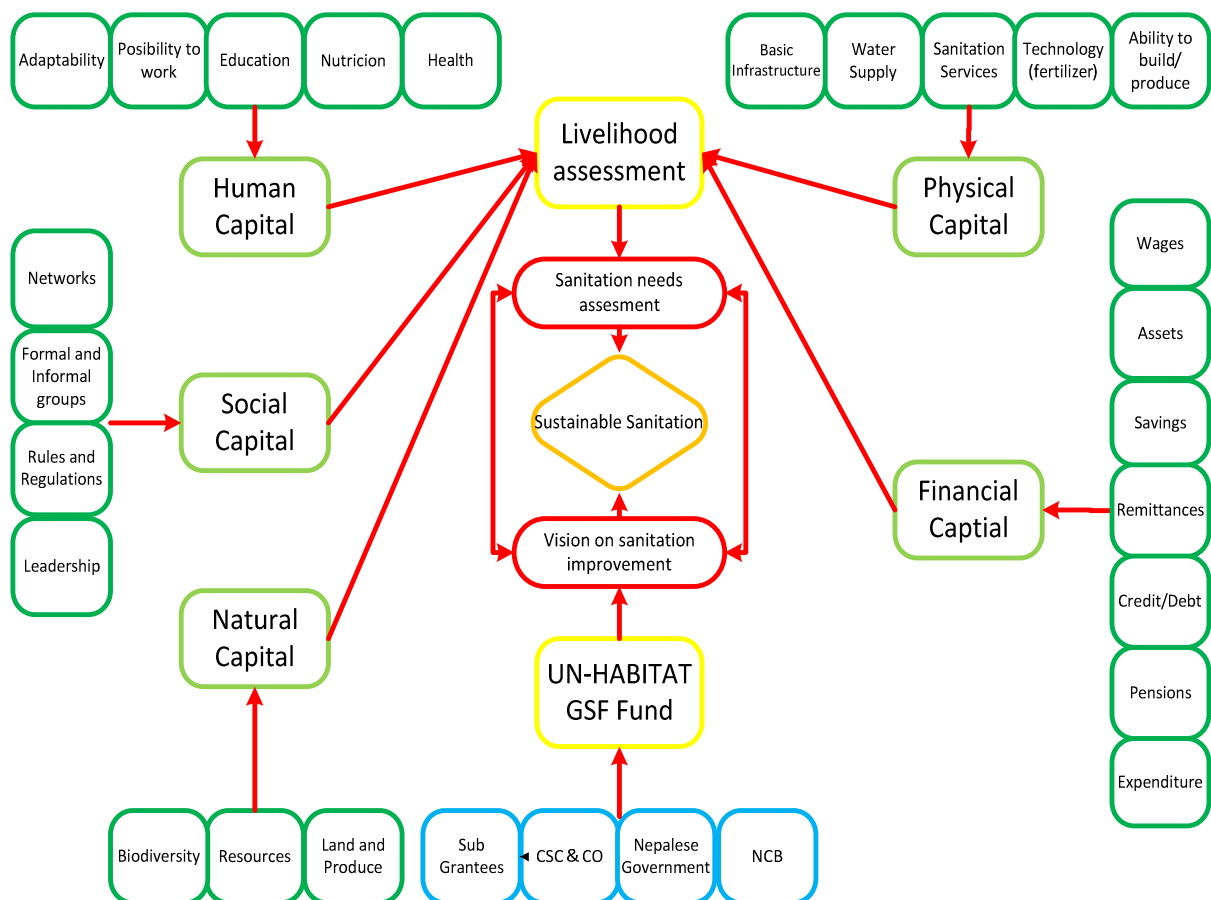
5. Methodology

To collect the necessary qualitative (interviews and observations) and quantitative (statistical data) information to answer the research questions stated in the introduction, multiple sources of information are used. This to be able to answer the research questions through the channels described in the conceptual model. In the next three paragraphs the used methods and approaches will be presented.

5.1 Conceptual Model

The research is implemented as a household livelihood study. The main aim of this study is to identify local sanitation needs, demands and priorities and the level of synchronization between the local demands and the sanitation implementations realized through the UN-HABITAT GSF. The sustainable livelihood approach that consists of five assets (human, physical, financial, natural and social) is visualized in the conceptual model (figure 6).

Figure 6 Conceptual model livelihood research



This is an analytical framework to help understand the livelihoods of rural (poor) people and to assist in the identification of effective development policy. An analysis of the data gathered through a qualitative and quantitative livelihood survey of the Bardiya and Bajura communities will provide a livelihood assessment and subsequent sanitation needs, demands and priorities assessment. Enabling a critical review of the synchronization between community demands and the implementation of developing agencies working on behalf of UN-HABITAT. The indicators which define the capitals of the livelihoods are mentioned in dark green at the edges of the conceptual model and have been discussed in the theoretical paragraph 3.1. These indicators are identified in a survey examining the research areas. Resulting from the livelihood survey and local observations a needs, demands and priority assessment can be made. Mentioned in blue on the bottom of the model are the agencies which all influence the implementation of the GSF and the view of UN-HABITAT on the sanitation program. However, they are not executive agencies. No user committees of sanitation and hygiene services or water services have been encountered during the research. Remarkable because in other research the presence and usage of user groups has been promoted (Rajendra & Shrestha, 2002). Both ends of the conceptual model, the community and agency vision on sanitation have to be synchronized, harmonized and brought into unison to realize the ultimate goal: improving sanitation and hygiene in Nepal.

5.2 Methodology stakeholders

The methods of selecting the seven stakeholders involved in the (inter)national sanitation and hygiene sector are twofold. The stakeholders to be interviewed in Kathmandu are selected and advised by Mr. Kamal Adhikari and Mr. Dinesh Raj Manandhar of UN-Habitat Nepal, in consultation with the research interests. All interviews were open interviews with the lead of a topic list. The most important information attempted to collect in the interviews was how organizations and departments thought about sanitation in Nepal, their approaches in sanitation policies, their stake in the Sanitation and Hygiene masterplan and their (personal) opinions about for example the methods uses and goals set by the Nepalese government to achieve overall ODF in 2017.

In the districts interviews have been collected from officers of local government bodies, schools, health institutions and other institutions that have a stake in sanitation and hygiene in the district. This to create a broad overview of the sanitation and hygiene status in the districts, its implications on health and the (progress of) policies that the stakeholders in Kathmandu claimed to be in place. For the selection of the stakeholders the knowledge of our research assistants and suggestions from UN-HABITAT Nepal has been used. All stakeholders are interviewed with an open interview that was based on a topic list. Most of the stakeholders understood and spoke English but in some cases it was

necessary to clarify some questions and answers though the use of the research assistant and translator. The attempt has been made to collect the same information in both districts, this has not been possible for every type of data. More information on the limitations of the performed research is available in the dedicated chapter.

5.3 Methodology households

A statistical survey has been performed among selected households in the Bardiya and Bajura district. The approached households have answered the household identification table and a questionnaire with open and closed questions (appendix 7). This survey has been performed with the aid of research assistants/translators and with continuous close personal supervision.

In the Bardiya district four VDCs have been selected which are representative for the complete district regarding caste, ethnicity, sanitary status and socio-economic variables. No statistical data are available to assist in making this selection, therefore the local knowledge of the research assistant has been used. The district water supply office (DWSO) has provided a document with the sanitation status of the district and individual VDCs. This has been combined with local knowledge regarding the representativeness of the VDCs. A random sample strategy has been applied to selected respondents in the communities that have been approached within the VDCs. A geographic overview of the selected VDCs is available in the appendix (Map 5).

The same approach of selecting four representative VDCs was planned to be implemented in the Bajura district. The unavailability of information regarding the selection variables, combined with the inaccessibility of other VDCs than Martadi VDC and Kolti VDC made it not able to implement the planned research approach. Alternatively, four VDCs that are a representation for the whole district have been selected. In the visited communities (the VDCs Martadi and Kolti) a random sample has been used when requesting households to participate with the livelihood research. The other two VDCs (Gotree and Dahakot) have not been visited. Regularly people from the Bajura district visit Martadi for shopping and business activities, therefore travellers from Gotree and Dahakot have been targeted at hotels, restaurants and resting points on trails leading to Martadi from the VDCs. Personal visits to the research VDCs would have been preferred, nonetheless a suitable solution has been implemented.

5.4 Representation of the household survey in the Bardiya district

Four VDCs have been selected to represent the household livelihoods in the Bardiya district. The VDCs have been selected on the presence of several variables. Into account have been taken the different caste and ethnicities, the socio-economic and sanitary status of the VDCs. The selection has

been made to ensure a good representation of the Bardiya district. No detailed statistical information is available regarding the demographics of the Bardiya VDCs, therefore the local knowledge of our research assistant has been used to select the population sample for the household survey. Basic statistical information from the DWSO regarding sanitation status of Bardiya VDCs has been used to make a preliminary selection. The four VDCs that have been selected to represent the Bardiya district are Mohamadpur, Mainapokhar, Sanashree and Dhodhari. In these VDCs the most diverse and commonly encountered mix of caste and ethnical groups of the Bardiya District are present: Tharus, Sudras, Muslims, and mixed communities. This selection is necessary to analyses a typical selection of the research population and not get skewed results. The overall sanitation coverage of the VDCs is approximately 34 percent, which comes close to the reported 38 percent sanitation coverage of Bardiya District (table 3, appendix). Within these four VDCs people have been approached randomly if they were willing to participate in the research.

Due to the lack of available statistical data of the Bardiya district it is not possible to calculate if the livelihood household survey is representative. Trust in the knowledge and experience of our research assistant is therefore required. A calculation of the representation of the survey sample can be made on the basis of the sanitation coverage statistics provided by the DWSO. According to the data of the DWSO the sanitation coverage in Bardiya is 38.1 percent. In the survey 40 percent of the respondents have a toilet facility. No significant (chi-square, sig = 0.782) difference between the survey and the population of Bardiya can be identified regarding people who have a toilet facility. Therefore is the survey representative for the population of Bardiya regarding the sanitation status.

To ensure the survey sample at VDC level is representative further chi-square tests are performed with VDC level data to control. The results indicate that only in Mainpokara people with a toilet are overrepresented in the performed household survey. There is a difference between the sample in the survey and the population of Mainapokhar VDC regarding the sanitation status. In the other three VDCs the chi-square test is not significant indicating no difference between the sample and the population. Reviewing the representation of the samples concluded can be that for Mahamadpur, Sanashree and Dhodhari the sample taken is representative. For Mainapokhar VDC there is an overrepresentation of people with a toilet. The overall representation of the survey towards the population in Bardiya regarding sanitation status is representative.

5.5 Representation of the household survey in the Bajura district

The initial plan to collect a representative sample of the Bajura district was identical to the previously discussed method in the Bardiya district: selecting four VDCs which are representative for the Bajura district regarding caste, ethnicity, socio-economic and sanitation status. Due to the absence of statistical VDC information the VDC selection has again been made by using the local knowledge of

our research assistant. The four VDCs that are chosen for our research and are representative for the Bajura population are: the Municipality VDC Martadi, Kolti, Dahakot and Gotree (map 7, appendix 3). As indicated in paragraph 5.3 have personal visits to every research VDC have been prohibited due to the geographical characteristics and low development of the district. The absence of (motorized) transport, roads and hotels made travelling to the Dahakot and Gotree district not possible. Kolti VDC has been visited on arrival in Bajura by plane before continuing by foot to Martadi, the municipality of Bajura. Instead of personally visiting all target VDCs, inhabitants of the Dahakot and Gotree VDCs have been targeted on different strategic positions near the Municipality of Martadi. Inhabitants of the Dahakot and Gotree VDC gave been approached at local hotels, restaurants, resting points on trails leading to and from Martadi and through relatives living in Martadi. Detailed statistical data concerning these VDCs in the Bajura District, especially addressing sanitary status are not available. Overall district data has been used when more detailed information was not available. The lack of statistical data furthermore prohibited the calculation of the sample representation using control variables. No statistical calculation that indicates the level of representation of the survey can be presented. The experience and knowledge of our research assistant has been critical in ensuring a representative sample of the population.

5.6 Limitations of the research

Executing a livelihood research among households in an unfamiliar environment, with different social and cultural settings, has the potential to encounter several problems that could imperil the outcome of the research. Especially the validity and reliability of found result are easily influenced. Several precautions have to be taken to minimize the influence of research outcomes due to ignorance or inexperience.

Local translators and research assistants have been valuable in preventing cultural mishaps during the research period. Simultaneously strict control had to be performed on the method of interviewing implemented by the translator. Previous experiences of assistants, especially with sanitation and hygiene projects could lead to prejudice. Preconceived opinions have the potential to bias results originating from the personal experience or the opinion of the translator. Further personal reservations that prevent the accurate statement and translation of sensitive or tabooed questions included in the survey. Through the daily processing and evaluation of the completed questionnaire a representative and realistic outcome is created through guiding and improving the translators. Nonetheless, the lack of the Nepali language could have led to not recognizing problems like leading questions or the recording of assumptions by the translators.

The geographic characteristics of the Bajura district caused physical limitation and have prevented the personal visits of every research VDC. A personal impression of the Dahakot VDC and Gotree VDC (Appendix 3) would have been preferred. The absence of transport and accommodation in this region made an alternative research approach necessary. This to not get stuck in a place with no accommodation possibilities and an eight hour hike back to Martadi municipality. The expected health problems related to the absence of bottled and filtered water proved to be a hindrance but not a threat to the research.

The lack of documentation, statistical material and the absence of project documents drafted by (local) organisations made it difficult to understand and conceive the goals and achievements from the active organisations. Added to this problem were the several governmental and non-governmental officers absent from their position (for unclear periods of time) limiting the access to documents and information gathering through interviews. This has been further discussed in the chapters discussing project implementation in the districts.

The answers provided by key-figures, both in the research districts and in Kathmandu could have been influenced by their knowledge of the link between our research and a large international donor organization. Every precaution has been implemented to prevent authorities or inhabitants of districts creating the idea that the research was intended to facilitate a future program with community or personal benefits. In several cases the answerers provided had the feeling to be more the appropriate pleasing answer than actually was the case. The situational analysis provided could therefore in some cases be a misrepresentation of the actual situation. Furthermore has the premature status of the GSF program and the National Sanitation and Hygiene Mater plan have led to restrictions on the knowledge of key-figures regarding the subject of our questions

Several questions in the Household survey, especially those addressing private issues like hygiene, female status or financial status, have been answered in a matter that is socially accepted. There is no indication that this is a limitation to the results. Nonetheless can it not be completely excluded to have influenced the results.

Finally, there have been statistical limitations to the research. It has not always been possible to run appropriate statistical tests to gather significant results that can be generalized to the population of the districts. Some variables were not suitable for statistical test; with a number of 50 interviews per district the power of the variables was not always strong enough for significant results and the

logistic regressions did not always work correctly in SPSS due to several errors. Further details regarding statistical analysis and limitations can be found in chapter 7.

Overall can be concluded that several obstacles have been encountered during the research period in Nepal. Both in the remote and under developed regions of Bajura and Bardiya as well as in the administrative climate of Kathmandu. The threats to the validity of the research have mostly been identified in an early stage of the research or have been solved ad hoc through addressing the issues with flexibility and adaptability. Several research outcomes have not been analyzed as thoroughly as (in hindsight) would have been preferred. This due to lack of knowledge when the research started, the limited sized of the population sample due to time and resource constraints and restriction regarding statistical limitations. Future research, for example regarding detailed population and household priorities, could give more information and understanding.

The results from the presented research methodology will be presented and discussed in the subsequent chapters and be concluded with answering the research questions as introduced in the first chapter.

6. Sanitation and hygiene approaches implemented by stakeholders in Nepal

To acquire in depth information regarding the status and approaches used to implement sanitation and hygiene improvements key stakeholders have been approached to share their view and information. Information collected from stakeholders, both at (inter) national and local level, has been used to create a broad understanding and get familiar with valuable insights in the leading views on sanitation, current and past projects, local difficulties and challenges, the effect of (poor) sanitation and hygiene on the local population and the implemented methods and approaches to improve sanitation and hygiene in Nepal. This to answer the sub-question (1) that has been presented in the introduction chapter, and to make inventory on je improvements needed between national policy and local livelihoods (sub-question 4). The collected information will be linked with the relevant literature, personal experiences and be evaluated, discussed and ultimately combined to answer the sub-question regarding methods and approaches used by stakeholders to implement the GSF program. In this chapter start with Sanitation and hygiene approaches implemented by (inter) national stakeholders and continue to evaluate progress made and planned by local stakeholders in the Bardiya and Bajura district.

6.1 Sanitation and hygiene approaches implemented by (inter) national stakeholders

The (inter) national stakeholders interviewed in Kathmandu are major participants in the water and sanitation sector of Nepal, and participate in the National Sanitation and Hygiene Master Plan. During the interview, that had as main goal to record the personal opinion of stakeholders and the official policy statement which is generally similar and adjusted to the leading political view stated in the SHMP. Furthermore have the interviews been a source of secondary sources like project proposals and progress reports. This has resulted in interesting information that otherwise would have been unknown.

6.1.1 Coverage gap sanitation and hygiene

A problem in the sanitation and hygiene sector in Nepal is the coverage gap between water supply and sanitation. Currently, water supply has a coverage of approximately 80 percent, compared to the average total sanitation coverage of only 43 percent. Several districts, among which the Bajura district, have a coverage of around 10 percent. *“That is really poor”* according to the independent consultant involved with the SHMP. The sanitation coverage in rural areas (percentages) is increasing, but in contrast the urban areas are experiencing decreasing sanitation coverage. This is according to NEWAH a result from expanding urban areas and local governments not understanding

the importance and required priority of sanitation. Furthermore could be concluded that the increasing coverage percentages on rural areas are not the result from an increase in sanitary facilities, but a perceived improvement due to decreasing inhabitants resulting from out-migration. Both towards urban areas in Nepal and abroad.

The indicated difference in coverage between water and sanitation is a globally encountered phenomenon. Several reasons for this are indicated in the theoretical framework. Discussed are the lack of decentralization, unmotivated politicians and civil servants due to limited personal benefits or public attention. According to DoLIDAR is working in the Nepalese water supply sector more attractive compared to the sanitation and hygiene sector: *“Water is something you can install and people see the use of it directly”*. Furthermore is indicated by DoLIAR that to make improvements in the sanitation sector, behavioural changes are required and that the process of establishing changes takes time. To close the existing coverage gap several organisations have developed specific policies. Decreasing the coverage gap has been national policy since 1994, and different organizations have since then attempted to make improvements, none with significant results. NEWAH for example has prioritized sanitation and hygiene when implementing WASH projects. The stakeholders that were interviewed are unanimous in their expectation that the Sanitation and Hygiene Master Plan (SHMP) will help close the coverage gap. Therefore effective planning, budgeting, human resource mobilization, implementation, monitoring and evaluation as well as the follow up of hygiene and sanitation programs and projects are needed. According to the independent consultant involved in the draft of the SHMP is the key approach of the plan is to align the ideas of different stakeholders to meet the total coverage goal of the government in 2017 and the sanitation goals of the MDGs in 2015.

6.1.2 Sanitation and hygiene policies

Different approaches have been developed and are advocated for by different organizations to improve sanitation and hygiene and to close the previously discussed coverage gap. The SHMP does not prescribe one approach to be the one way forward but instead encourages organizations to continue using the approaches that have proven to be successful in the past. The SHMP prefers the implementation of projects that focus on soft technology. All major stakeholders have their own approach to implement sanitation projects but they all agree on the fact that software and social commitment is an essential part of the sanitation policy. There is also a shared opinion that the SHMP will bring unity in the policies regarding sanitation, which will lead to the achievement of overall ODF in Nepal in 2017 and the MDGs in 2015. Remarkable was the confession of the independent consultant of the SHMP that he was also contracted for evaluation of the same project he had helped plan and draft. Therefore he indicated himself that he was not an independent

evaluator and that he has to balance a tight rope between a good evaluation of partially his own project with business benefits attached, and objectively evaluating plans and progress made.

The sanitation and hygiene specialist and director of UNICEF, one of the largest international organizations involved with the SHMP, recognizes the guiding principle as the important part of the SHMP. He indicates that in Nepal every region is different and therefore are the approaches for implementation different in every area. It is crucial to acknowledge the fact that people living in Kathmandu think different (e.g. regarding sanitation) than people living in the different rural areas of Nepal. As a result, UNICEF indicates that different regions need different approaches. According to UNICEF, the School Led Total Sanitation (SLTS) approach is the most effective and sustainable method of improving sanitation and hygiene awareness in Nepal resulting in improved coverage rates of sanitary facilities. Critical to the success of SLTS is the long term commitment, training and monitoring of key institutional stakeholders. Increasing levels of interaction between facilitators, schools and community members improves program outcome (Bell, 2010). SLTS is based on the use of institutions (especially schools) combined with triggering social commitment of communities as mentioned in the discussion of the different approaches (Dhikari, S. and Shrestha, N.L. 2008). The executing agencies of UNICEF involved in the sanitation and hygiene sector have booked good results using this approach. A sustainable approach requires the involvement of public institutions, like schools, to change future generations and improve the current. Indicated is that UNICEF is positive regarding improved outcomes of the collective effort to improve sanitation and hygiene in Nepal due to the SHMP. The 2015 MDGs and 2017 National deadlines are regarded a big challenges but potentially possible if organisations will work intensively and drastically together.

Nepal for Water and Health (NEWAH) is a second major participant in the SHMP. Its focus within WASH projects has shifted due to implementation of the SHMP. This has been implemented by NEWAH for example through providing project communities with a sanitation and hygiene program if they previously only received water supply projects. When the project includes newly addressed communities both water, sanitation and hygiene are equally combined in a WASH project. The WASH programs follow a Community Led Total Sanitation approach (CLTS) in Nepalese context. NEWAH is positive that the goal of establishing overall ODF in Nepal in 2017 is achievable if the new work strategy is implemented as indicated in the SHMP. Achieving the set goals is therefore possible but remains a challenge. The Department of Water Supply and Sewerage (DWSS) agrees with NEWAH that community commitment, especially the commitment of local bodies and stakeholders is crucial to achieve sustainable project implementation. Furthermore should the active participation of local bodies lead to these participants taking ownership of the sanitation and hygiene programs. Local bodies and user groups committed and working together is according to the DWSS the key factor in sustainable sanitation and hygiene in rural Nepal. The use of community mobilisation is imbedded in

the sanitation and hygiene policies of the DWSS and is the primary step to take before the start of community projects. The goal is to achieve a community that wants to have and own the proposed DWSS project. Achieving the goal set by the government of overall ODF in 2017 is not a problem according to DWSS, *“we can achieve that (overall ODF, red.) within 3 years from now”* (March 2011). The Department of Education (DoE) implements two types of sanitation and hygiene projects. Beside projects directed at improving and creating soft technologies there are several projects concentrating in the realization of hard technology: the construction of toilet facilities at schools. The soft technology programs, in cooperation with UNICEF includes the education and the awareness raising of school teachers to enable the education regarding sanitation and hygiene practices to be an integrated part of the school’s curriculum. The second approach is to put sanitation and hygiene education on the same level of importance as reading, writing and math. This is in accordance with the SHMP that advocates the introduction of sanitation and hygiene to be an important part of teaching curriculums. According to DoE are the MDG and National deadlines set in the SHMP not realistic. The demand for toilets in Nepal is increasing every year and the construction is not keeping pace. With the current budgets allocated for water and sanitation it is not considered possible to compensate the backward result before 2015 or 2017. The Department of Local Infrastructure Development and Agricultural Roads (DoLIDAR) acknowledges the problem of consecutively running contradictive sanitation programs. The differences in operations are caused by influences from different national and international stakeholders. These different approaches, methods and expected outcomes within the same community can lead to confusion for stakeholders and potential user groups (Mackintosh and Colvin, 2003; Reents, 2003). The introduction of the SHMP created guidelines and unity in the direction of the projects. To be in accordance with the SHMP a new WASH approach is drafted in cooperation with UNICEF based on SLTS principles. Behavioural change through SLTS is according to DoLIDAR crucial when implementing community sanitation and hygiene projects, focussing primarily on the construction of sanitary facilities will not be sufficient. He also believes that the SHMP will harmonise the sanitation sector and make the ODF in Nepal possible. The 2017 national deadline is regarded too optimistic by DoLIDAR. Regardless of the new harmonized and cooperative actions in the sanitation and hygiene sector triggered by the SHMP, the behavioural change that is necessary takes more time and budgets are insufficient. According the WSSCC are the above indicated changes a key part of the Sanitation and Hygiene Masterplan but other steps are crucial to generate more progress in the sector. According to the WSSCC is the most important step to make in Nepal to combine the demand, supply in the sanitation sector of Nepal. The projects working on demand are all well established in Nepal. Nonetheless, Jones (2011) states that the supply sector should be more established in Nepal, the sanitation marketing is still lacking behind. Indicated by the WSSCC is that sanitation and hygiene are equally important as creating demand.

This view is supported by the discussed literature in chapter 3, stating that the supply of sanitation services is crucial to generate demand and that this is currently not utilised sufficiently. Supporting entrepreneurs and alternative technologies could benefit market development, private sector involvement and subsequently the marketing of sanitation and hygiene (Valfrey-Vissser & Schaub-Jones, 2008).

6.2 Sanitation and hygiene status and approaches implemented in the Bardiya district

The information in the Bardiya district has been collected through key stakeholders, personal observations and experiences and the livelihood survey among households. Key stakeholders and informants interviewed in the Bardiya district to acquire information regarding the current livelihood and sanitation and hygiene status all made the impression to be well aware of the present situation concerning the status of their area of responsibility to present a representative image of the district.

6.2.1 Current sanitation and hygiene status Bardiya

The provided statistical information from the four VDC offices was limited but of satisfying quality to produce a population profile that includes the number of inhabitants, male-female ratio, literacy rate and migration patterns. This basic demographic information (table 1) combined with the health profiles acquired from the sub-health posts gives an impression of the region and is a reference tool for the information collected with the household survey research.

Table 1 Demographics Bardiya

	Number of Households	Female	Male	Total population	Total Literacy	In migration	Out migration
Mainapokhar VDC	1592	4326	4401	8727	6420	34	67
Mahmedpur VDC	2057	7500	7500	15000	5925	24	50
Sanoshree VDC	3725	8924	9433	18357	14078	245	347
Dhodari VDC	1622	10365	10850	21215	16523	49	91

Source: DWSS (2011)

All four researched VDCs and district offices are making efforts through various methods to increase hygiene and sanitation standards for its inhabitants. For example are several VDC wards declared ODF or making commitments to declare ODF in the (near) future.

6.2.2 Approaches and projects implemented in the Bardiya district

Most attempts to change and improve sanitation and hygiene practices are done through awareness programs. This approach is focusing on the involvement and the spread of knowledge through children and young educated adults. Furthermore are similar awareness programmes being launched by different NGOs and CBOs to change the behaviour of people through education and other influences like for example health workers, television, radio and other mass media. The trickle down-effect of these efforts through imitation, child to child and child to parent are (expected) subsequent outcomes of the initial behavioural change through information. These programs are based on the different approaches described in the theoretic framework, but during the research (March 2011) not based or adjusted to be in accordance with the SHMP.

Public commitment and ownership is increased by using local resources like timber, sand, stones and concrete when constructing (public) sanitary facilities (e.g. school toilets). Besides improved sanitary and hygiene status and coverage is the construction process creating employment opportunities and overall poverty alleviation due to increased local activity. The local governments support several cases of public toilet construction, mainly within school, government or community premises. Subsidies for programs that support the construction of private facilities have limited availability and do not include direct financial assistance.

The District Educational Office (DEO) has made the implementation of SLTS on all district schools (407) mandatory. The education curriculum includes education on hygiene and sanitation on every Friday. Ten inspectors are employed to monitor the individual performance of schools. According to the District Education Office, the inspectors are responsible for examining the commitment of schools to provide sanitation and hygiene education and the possibility for students to use sanitary facilities at school. For example the indiscriminate access to toilets and the availability of soap. Schools currently not having adequate sanitary and hygiene facilities are being upgraded. When confronted with observations and results from the field research that on several visits to district schools even the higher grade students (level 6, 7 and 8) had not received education on sanitation and hygiene (regardless of the claims made by headmasters) the DOE officer explained that there is insufficient manpower to implement a district covering monitoring system *“Current monitoring is poor but will be improved next year”*. When discussing the encountered examples of accusations made by several students that they are not allowed to use the schools sanitary facilities because they are only to be used by teachers and that soap is not provided regardless of several request, the explanation is given that those practices reflect the *“old days”* and that these practices are banned. According to the DOE, it stands for hygiene, sanitation access and education for all, from playgroup to the high grades. The several encounters during the field research are to be seen as single incidents

or outdated information. In the previous 3 weeks of research, 5 individual accusations regarding limited access to sanitation and hygiene facilities, or inadequate education were recorded. These could have been partially at private schools that are not under the supervision of the District Educational Office and are not obliged to introduce SLTS. Improved monitoring and legislative services that obliges schools to obey district regulation regarding sanitation and hygiene, as indicated by the WSP (2011) could prevent lack of sanitation and hygiene education on schools.

The existing coverage gap between water supply and sanitation is, according to the District Waters Supply Office (DWSO), one of the most significant problems the Bardiya district is currently facing. 85.1 Percent of the households has a private source of water, compared to only 38.1 percent of the households having access to sanitation. In prior projects the supply of water was the major objective, currently attempts are being made to close the coverage gap and improve access to sanitation and hygiene simultaneously. The DWSS has furthermore identified the main reasons why they suspect people are not investing privately in sanitation; lack of financial resources and insufficient space for toilet construction. The Village Water Supply Coordinating Committee (VWSSCC) is presently drafting plans to encourage the construction of more facilities. This plan consists of key information to identify the needs at local VDC level. The DWSSCC collects and combines this data to develop a district work plan.

Two of these VDC specific work plans are currently being implemented by DWSO:

- The first project is focussing on 5 VDCs (Parabhar, Baganaha, Magaragadi, Taratal and Manau). This project has two phases: the first phase is to implement SLTS with the VDC. The second phase is the installation of sanitary and hygiene facilities. The schools indicate which households are too poor to install a toilet and these households get a completion reward of 1000 NRS when they have installed a sanitary facility
- The second project is focussing on the villages which do not have a water supply system. For every water supply system (one access point per household) the District Water Supply Office asks the community to contribute 20 percent of the costs. Households subsequently have the option between paying 20 percent of the costs or constructing their own toilet. In case of the latter, they do not have to pay the 20 percent contribution to the water supply system. Households receive a free water supply system if they choose to construct sanitary facilities. According to the DWSO this project is working well, community pressure and the high interest for a private water supply system has as results that almost everybody is installing a toilet instead of paying 20 percent of the costs.

Consecutive with these work plans special efforts are made, together with the VDC offices and the locally active Red Cross to improve awareness and conditions in hard to reach communities like for example Mahamadpur, a Muslim community. Through bottom-up lines of communication, the Water Supply Office is able to realize suitable approaches to local obstacles. The advice and opinions from leading development, sanitation and hygiene specialists regarding the need for decentralization and bottom-up communication is appearing to be incorporated in new projects and livelihoods are assessed to determine their needs, demands and priorities to require attention (Muller & Traboy, 2010; SCNSA, 2010). The DWSO is positive regarding the approaching deadlines and the local ability to establish total ODF in the Bardiya district. The goal for 2011 is to establish sanitation coverage of 45 percent. This percentage is possible to be upgraded to 50 percent due to cooperation with multiple organisations. The ultimate goal is to bring forward the total ODF deadline to 2016. The positive attitude towards this goal is increasing due to the awareness of the upcoming introduction of the GSF program which is expected to give a renewed boost to current programs. To further encourage private construction of sanitary facilities is the DWSO providing materials that are locally not available (e.g. polyester pipe) instead of financial support. The delivery of these final-phase materials is timed at the final phase of the construction to prevent misuse of materials or construction not being completed. On district level is the Municipality Office of Gulariya (Administrative capital Bardiya district. Appendix 2) implementing several programs to indicate that sanitation and hygiene is the office number one priority:

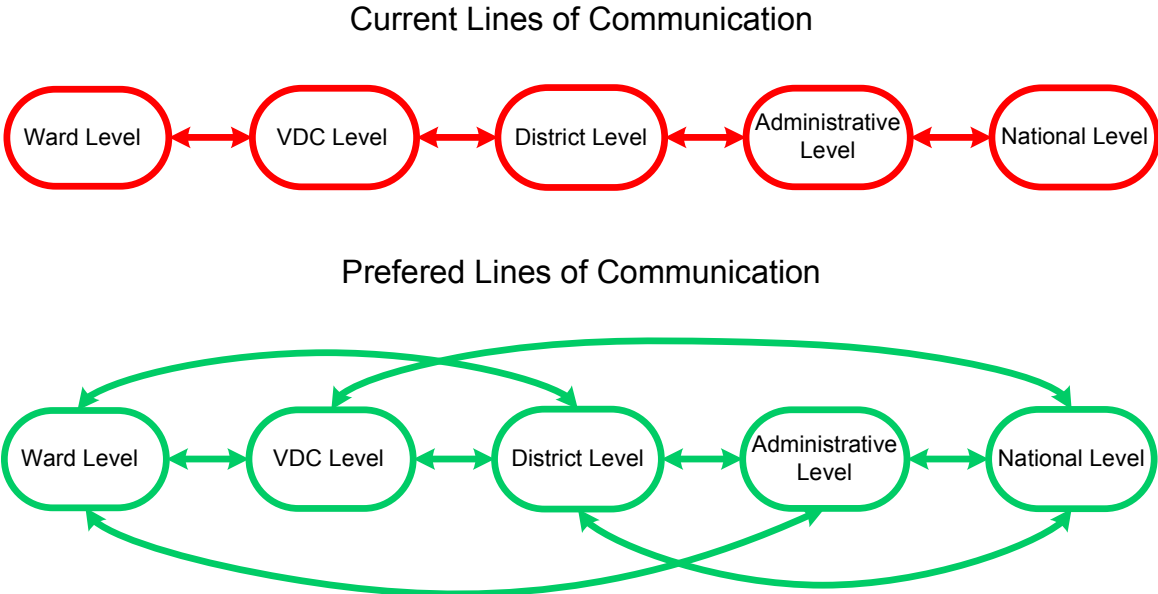
- Achieve ODF in the municipality;
- through public private people partnership solid waste management is being established;
- together with the Red Cross drinking water programs are operated executed;
- the construction of 1500 toilets in the municipality by the municipality office.

Through the involvement of schools (48) and CBOs (235) the community is educated on sanitation and hygiene. This is expected to increase the toilet coverage in the municipality (Appendix 6). Furthermore are people, especially those without livestock, encouraged to use human faeces as fertilizer. This currently provokes large resistance but is expected to become a more accepted mode of conduct in the future. Through using the *“triangle approach”* the municipality involves private parties, the government and community groups in committing to the goals of the sanitation Masterplan. Similar to the suggestions made in chapter 3hh by the WSP (2010) and Valfrey-Visser & Schaub – Jones (2008). This Public Private Partnership (PPP) is resulting in a gradually developing sanitary market in the Bardiya district. During the research two centrally located hardware stores have been identified. Both of these entrepreneurs sell 60 toilet pans per month in the dry season and 30 per month in the wet season. The total cost for constructing a toilet that includes septic tank will

be approximately 340 Euros (35.000 NRS), a large amount for Nepali standards. Although the market for sanitation and hygiene is limited, especially for large investments like the previously mentioned complete toilet, an increase can be identified. From a previously nonexistent market and consumers being forced to construct toilet pans themselves and be satisfied with a concrete slab with a hole are currently Indian made ceramic toilet pans available. Development originating without specific market aid or assistance could be explained from the applied decentralized approaches and grass root elements (WSP, 2011). The relative high cost for construction might simultaneously be a threat to the market development as previously mentioned by Allen et al. (2006).

In contrast with the previously discussed actions of several district and VDC offices is the regional district development office not specifically involved in sanitation and hygiene development programs. Financial resources are provided for the District Water Supply Office and the VDC councils. They choose projects to support and the district council makes the final approval. No evaluation tools are used to control spending and progress. Sanitation is considered part of the water supply programs and not considered a separate issue. As a result sanitation and hygiene are not given the priority the need or are any guidelines like suggested in the SHMP implemented to decrease the sanitation coverage gap.

Figure 7 Lines of communication



6.2.3 Communication and feedback with the Bardiya district

Another often encountered discrepancy caused by multiple variables is the failing feedback process. Commenting on plans drafted at the national level is thought of as difficult and of poor quality. Direct

Picture 1 OD Bardiya district

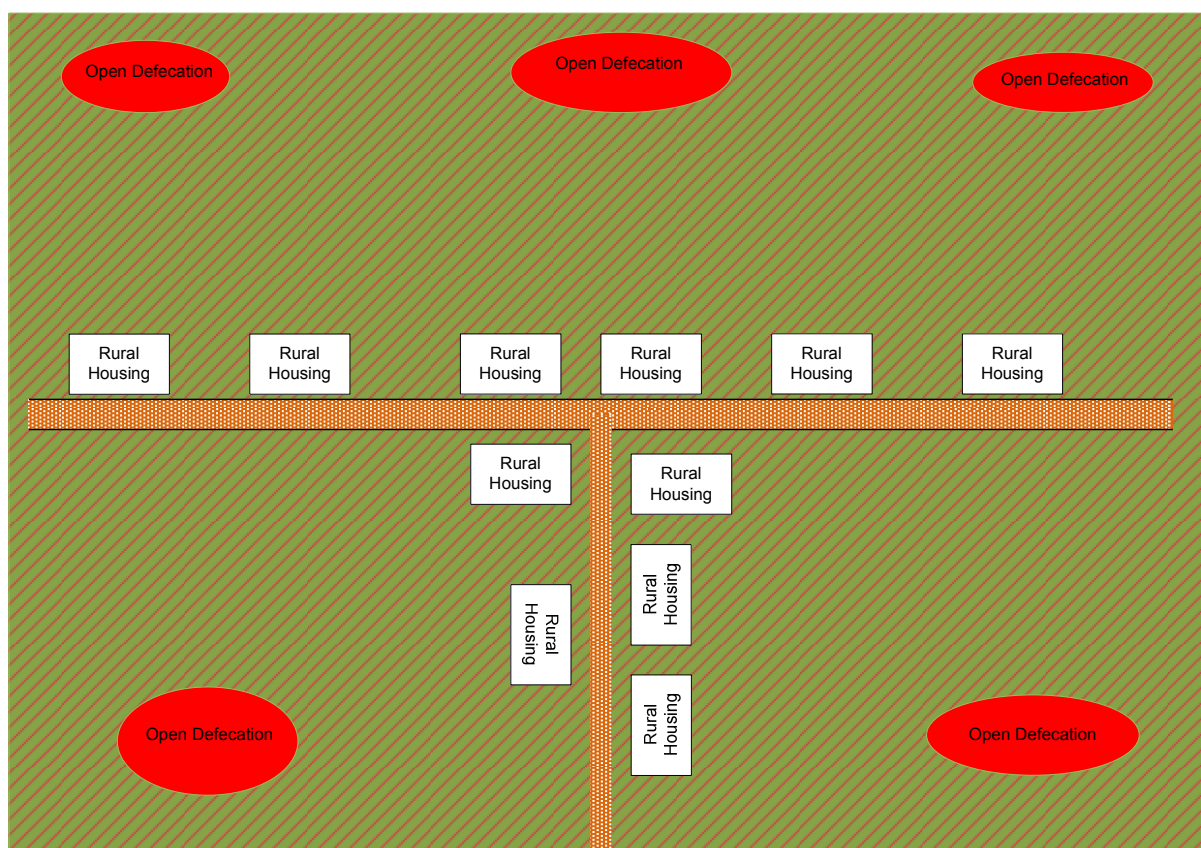


communication does not exist and feedback originated at ward level has to be processed through many bureaucratic levels (Figure 7) that fail to provide direct linkage between national policy makers and the people that are ultimately facing obstacles at the local VDC or ward level. Valuable local information and skills are claimed to be lost due to non-communication and non-coordination.

The most significant obstacle to overcome is creating community commitment and to change

the community mindset related to sanitation and hygiene. Despite the efforts of concerned groups, some people with facilities still choose open defecation (OD). This is explained as a culturally and socially rooted problem. People are generally aware of how to practice good hygiene and of the benefits of not defecating outside, nonetheless they prefer to ignore the advice given. Their grandfathers practiced OD, their father practises OD and their lives were good. Practising good sanitation and hygiene is not the number one priority, although people are constantly reminded on the link between hygiene, sanitation and the resulting water borne diseases. The frequently encountered remark that people lack the time to wash their hands with soap on a regular basis is a good example of the difficulties encountered when changing local habits. Another cause for the lack of understanding and priority for introducing improved sanitation are the local environmental circumstances. The Bardiya district is a flat and wide open landscape (picture 1), if people walk a short distance from the main road and housing area they are able to defecate in a the open or forest area without disturbing their personal direct habitat of the habitat of others. No continuous confrontation exist between daily life and ODF, it is not encountered during other activities. A schematic overview of ODF in a typical village in the Bardiya District is presented in Map 2. This map displays that OD takes places considerable distance from roads (orange) and housing area, therefore causing only limited hindrance.

Map 3 Open defecation in the Bardiya District



6.2.4 Health and sanitation in Bardiya

Sub Health Post officers indicate that they organize programs to keep further informing the population of their catchment area on the health benefits of practicing sanitation and hygiene but lack the means to definitely change the habits of people. Most households have sufficient funds for simple toilets, often it is claimed that no space is available, this is related to the fact that people do not regard sanitation to be their highest priority. Efforts of SHP to increase awareness and practicing of sanitation and hygiene among poor and low caste people are not proving to be successful and large-scale practice is not accomplished. The Sub Health Posts (SHP) located in the researched VDCs are experiencing a significant burden from water borne diseases. None of the visited SHPs had statistical records on the number of reported illnesses but a large number of diseases that are (partly) sanitation and hygiene related are being recognized. Diseases that are suffered from are common water borne disease (Box 9, appendix) like diarrheal, vomiting, ringworm, infected and itching skin, intestinal worm, dysentery, cholera and typhoid. The medicines for these type of diseases are provided free. A large difference in number of reported water borne diseases between the wet and dry season

is recorded. The number of people reporting to SHP is in cases more than triple the amount in the wet season compared to the dry period (Figure 8). It is estimated that in the dry period 30 to 50 percent of these cases are water borne diseases. In the wet season this figure increases to 60 to 70 percent (figure 9).

Figure 8 Sub Health Post visits Bardiya district

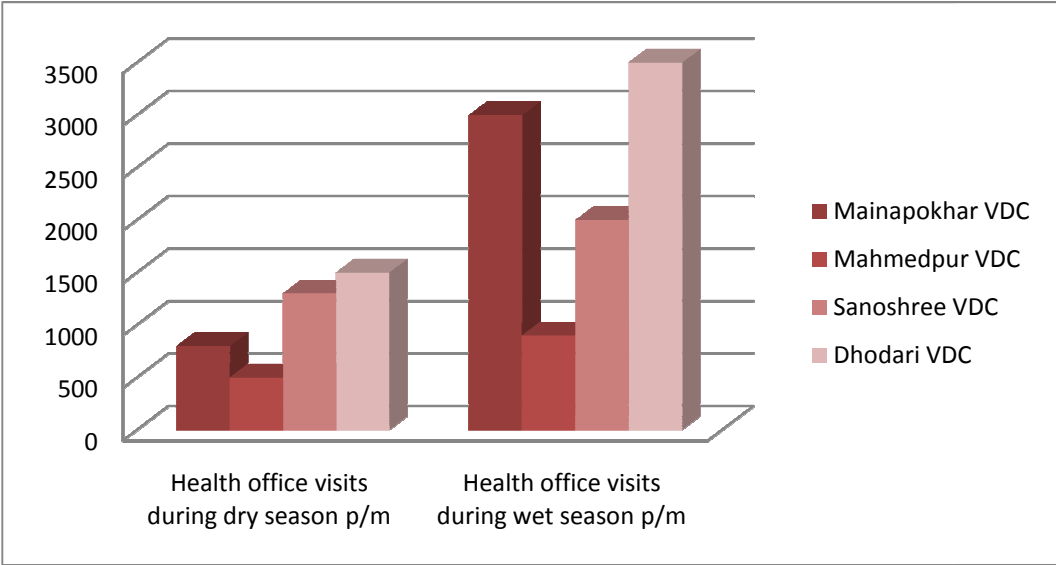
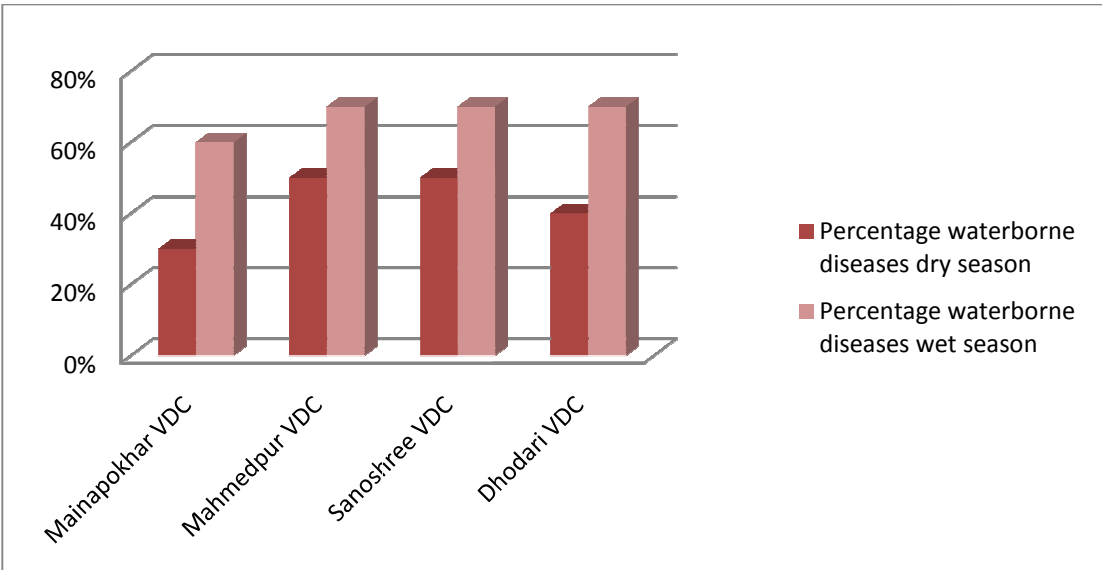


Figure 9 Percentage waterborne diseases Bardiya district



6.3 Sanitation and hygiene status and approaches implemented in the Bajura District

Collecting data from local stakeholders in the Bajura District has been more difficult than the similar process in the Bardiya District described in the previous paragraph, as result only limited statistical is available compared to the Bardiya district (Table 2) Lack of local infrastructure (e.g. roads, transport and hotels) and geographical limitations prohibited visits to local VDC offices and Sub Health Posts.

Table 2 Demographic Characteristics Bajura District

	Population	Number of HH	Literacy Rate	Female education %	Male education %	Toilet coverage %
Dahakot	3957	569	N/A	N/A	N/A	N/A
Koltri	5868	850	N/A	N/A	N/A	N/A
Martadi	5339	942	N/A	N/A	N/A	N/A
Gotree	3258	584	N/A	N/A	N/A	N/A
Bajura District	109781	30378	45,20%	16.7%	45,20%	10.57%

Source: Nepal census data 2001

These restrictions on mobility limited the amount of VDC information and data that has been collected directly. To compensate, more information (compared to the Bardiya district) has been gathered from NGOs active in the district and governmental organizations at district level. In addition to the obstacles indicated in paragraph 5.4 difficulties had to be overcome. Several district level offices were paralyzed in their operations by the absence of personnel. Employees leaving the office (in some cases for several weeks or months) have the habit of leaving “their work” behind lock and key during their leave to prevent colleagues from using “their work”. The ultimate worry is that people benefit from their efforts during the absence. This treatment of their job as private kingdom resulted in several helpful office employees apologizing that they could not access the requested documents or data and suggesting to try again in several weeks when the assigned person returned from his or her absence and the activities assigned to this employee would continue.

6.3.1 Approaches and projects implemented in the Bajura district

A remarkable outcome from the request for sanitation and hygiene data was the lack of current knowledge and progress being made. In the previous fiscal ('09-'10) year plans have been implemented for the construction of toilets in the Bajura District (100 by the local red-cross and 91

by the Finnish Development Aid Organization). A year later (2011) no status updates on the project progress or completion is available. Details on how project progress is measured, monitored or evaluated could not be provided by the Red Cross district officer and due to further questioning can be assumed that none of these tools are being used. This lack of control can be identified as a major failure in the project planning. As displayed in the theoretic framework, transparency should always be part of project plans to prevent unclear outcomes, miscommunication or even the misuse of project assets. During the interview with the district program officer of the Nepalese Red Cross requested information on previous, current and future projects was answered with *guesstimates* and the non-availability of project plans or other details. The evaluation of received digital documents (from a different employee) revealed a contradicting image. The district project officer declared that, beside the construction projects, no sanitation and hygiene projects are being implemented in the district. The received documents describe a widely implemented diarrheal control program only completed recently (Feb. 2011) and several other current and future projects are planned for (Nepalese Red Cross, 2011):

Picture 2
Wood storage in sanitary facility



- Install 175 family toilets
- Construct drains for sanitation improvement
- Conduct 14 community led total sanitation (CLTS) orientations
- Reduce water borne diseases
- Exhibit nine street dramas (Health and Sanitation, HIV and AIDS)
- Celebrate 3 national days/events related to health and hygiene promotion.

Six different actions directly related to sanitation and hygiene are described in the Bajura Action Plan (Red Cross, 2011). Secondly, a large disease control program is completed that the project officer did not recall. An example of lack of interest and motivation from civil servant and development employees as indicated by the WSP (2011).

The final and maybe most remarkable outcome is that the leading activity to improve the sanitation and hygiene status and coverage is the construction of facilities (hard technology) and the absence of

soft technology (the education on the use and benefits of sanitary facilities). The lack of important education (Dhikari & Shrestha, 2008) has been confirmed by all the government offices but also by individual (head) teachers encountered during the research period and by the offices of the large international NGOs. This lack of education resulted in the population not using the constructed facilities for the intended purpose and therefore creating ODF zones. The most encountered new purpose of sanitary facilities was using it as storage room for food. During the research period only storage of wood for fuel was witnessed (Picture 1), this due to the lack of food in the pre-harvest period. This simultaneously indicates the priority the local population gives to sanitation: other issues are considered more important (e.g. food and cooking). Similar to the projects implemented by the locally active NGOs, the Martadi VDC office constructed a number of toilets. Detailed numbers were not known or available but estimated was that 1 public and 82 private toilets were constructed in the previous fiscal year ('09-'10) with the financial help of the VDC, the Nepalese government and a small contribution of the community. These now mainly serve the purpose as storage room for wheat, rice and firewood due to limited knowledge of the population regarding the benefits related to sanitation and hygiene combined with the priority of households to provide sufficient meals.

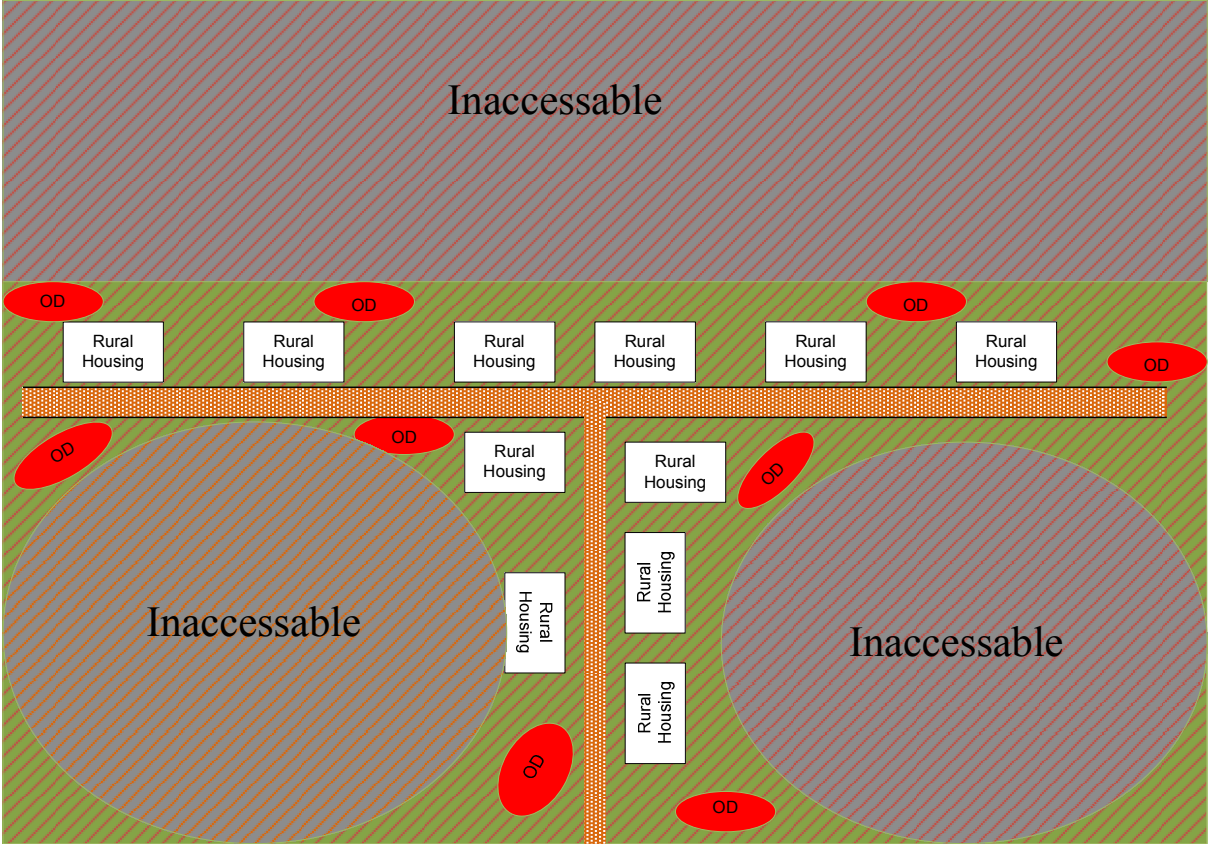
6.3.2 Communication and feedback in and with the Bajura district

At district level there is no sanitation and hygiene coordination or Masterplan. The national Masterplan (SHMP) is known, but deemed not very suitable for the specific local needs and demands as can be concluded from several quotes in box 8. This lack of suitable coordination becomes clear with the local development officers not being aware of the projects being implemented. Furthermore, the deadlines stated in the SHMP are not considered feasible by local stakeholders. Currently no VDCs are declared ODF but the VDCs of Gudukhati and Chhatara are going to be ODF before 2012.

<p style="text-align: center;">Box 8 Quotes regarding problems facing the Bajura District:</p> <ul style="list-style-type: none">• <i>“We are a backward district”</i>• <i>“The program makers in Kathmandu do not know the price of a bag of cement in Bajura”</i>• <i>‘It is hard to go from place to place in this district -I have been here now for 6 months but I still did not visit other VDCs than Martadi- this causes high transportation costs, at least 60 percent of the project costs are involved in transportation”</i>• <i>“Bajura has a low Public Private Partnership”</i>• <i>“We have only few land for cultivation, this causes poverty and food insecurity. There is also no money for taxes because people do not have the money”</i>
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The large majority of the Bajura Population has no access to sanitary facilities. OD is practiced near stream or beside roads located a short distance from housing areas. The community fails to recognize the need for toilets and good hygiene. The daily confrontation with poverty and food insecurity have higher priorities than the construction and use of toilets and the practice of good hygiene. Especially during the nine month period that the population is depending on the World Food Programme, or on the work for food programme to provide the household with a meal. The local agricultural production has only sufficient yield for three months a year. The overwhelming presence of variables that have a higher priority than sanitation and hygiene and the combination of possible social and cultural acceptance is that daily confrontation with OD is not perceived to be a significant problem. As is displayed in map 3, the population of the Bajura district is constantly confronted with human faeces. Due to the lack of accessible land OD is practised (at night) in populated areas en next to roads (picture 3). More remote and private areas are difficult to access and therefore not used.

Map 4 Open defecation in the Bajura district



Picture 3 OD in the Bajura District



Picture 4 Damaged toilet materials



The large nomadic population of Bajura, migrating from Bichhaiyan in the north to more favourable pastures in the south do not have permanent residences. All their belongings are carried on their packing animal. Living in different often remote and harsh regions does not provide the access or the need for sanitary facilities. Furthermore are local entrepreneurs active in the sanitation business facing difficulties with the transport of fragile toilet bowls over the rugged terrain by tractor drawn carts or on the back of mules (Picture 4). The limited demand of the population for sanitation limits the interest of local businesses to invest more. Public Private Partnership (PPPs) or government support to develop market forces are not encountered or reported by involved stakeholders, either public or private.

6.3.3 Health and sanitation in Bajura

The District hospital and health post collects detailed data on the number patients and their type of illness. Derived from this statistical data is that waterborne diseases (Box 9, appendix) are the most commonly reported sickness that is treated, and that the number of reports increase during the wet season (Figure 10). This is similar to the reports from the Bardiya district. A large increase of diarrheal reports took place in the year 2006-2007 and following (Figure 11). According to the statistical analyst of hospital this was due to the increasing number of people migrating to the municipality of Martadi. An epidemic was feared but currently numbers are decreasing. It has to be noted that all these diseases reported are both water and sanitation related. The source of infection is not traceable and as indicated in the survey data access to safe and clean drinking water is not available to the large majority and will be the (partial) cause of these illness as well as open defecation and poor hygiene is. There is no single cause of disease to be dealt with. Due to unavailability of staff with knowledge concerning sanitation and hygiene related to health only limited information could be collected.

Figure 10 Average report of waterborne diseases per month

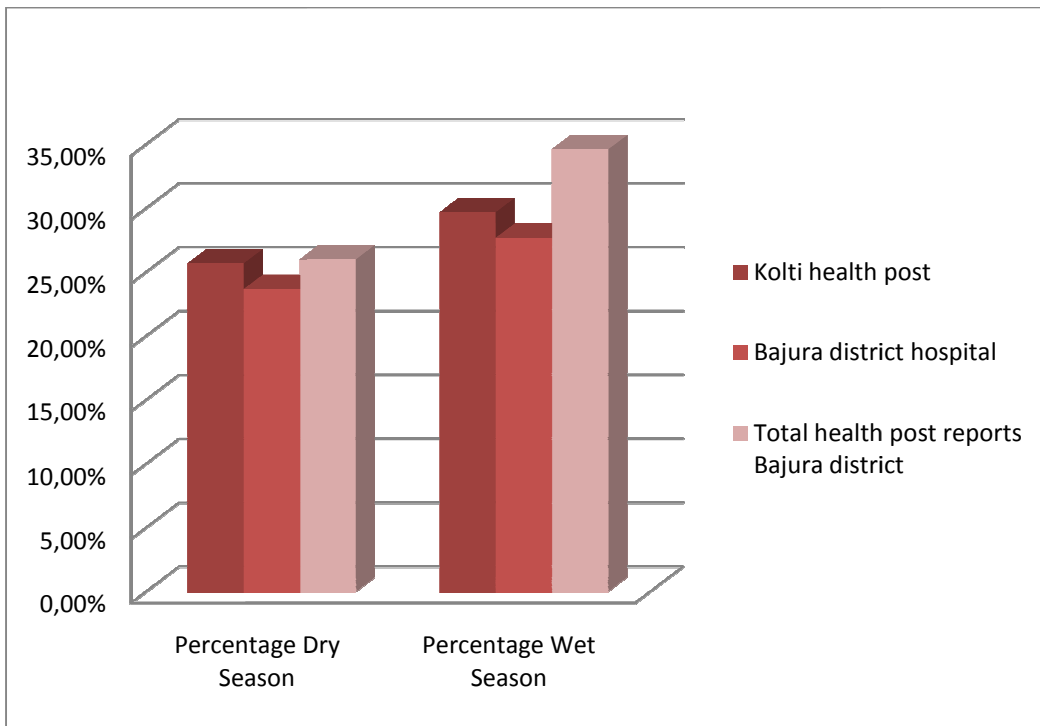
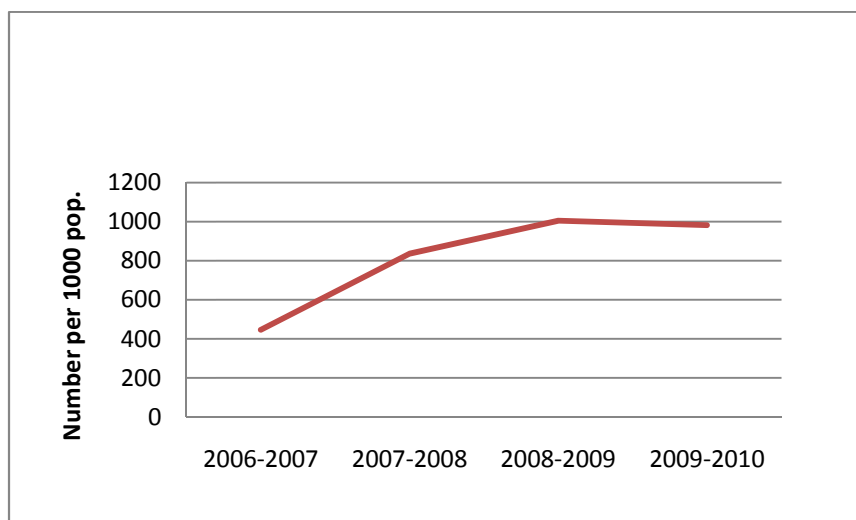


Figure 11 Cases of diarrheal Bajura hospital



6.4 Conclusion implemented sanitation and hygiene approaches in Nepal

The status of sanitation and hygiene, and projects implemented in both districts can generally be described as insufficient. The projects and local organizations are ambitious and have a clear goal of establishing ODF (by 2017) and completing MDG (2015 in the VDCs of Bardiya and Bajura. Their progress and plans made are paralyzed by a number of difficulties and obstacles. The argument used by local (development) officers is that the national plans (e.g. the SHMP) are not tailored to the specific needs, especially in Bajura with its often unique socio-economic and geographical features. For example: the transport of basic materials to construct toilets can prove to be a difficult venture and therefore leads to high damage rates and high prices and/or shortage of materials (Picture 4). The claim that the plans are implemented top-down without local knowledge seems valid. Feedback mechanisms from district to national level are not existent and even communication within the district, especially the Bajura district, proves to be difficult. Stakeholders (and contact persons) are difficult to reach and impossible to contact if they are not located in the municipality Martadi due to lack of communication coverage. The district development officer in Bajura revealed that he had never been outside Martadi and contact with contact persons in the remote villages is difficult and in the wet season not possible. In addition are policy makers in Kathmandu not eager or interested to personally visit remote, uncomfortable regions like the Bajura district. Policy makers therefore rely for a large part on general assumptions of a region and on the advice from local stakeholders, civil servants or NGO officers, which might have good intentions and local experience but often not have the needed skills and knowledge to substitute thorough local assessment and research.

As noted in the regional context are both district and especially the Bajura district remote and difficult to access and are local circumstances not particularly comfortable. As a result national policy makers in Kathmandu are not eager to visit the region resulting in projects being implemented without firsthand experience with the region. From personal experience can be concluded that even internationally active and experienced offices as UN-HABITAT implements the GSF program without a single visit to the Bardiya and Bajura district. National level policy makers are therefore not able to establish direct and clear lines of communication. This results in a lack of bottom-up feedback and blue-print planning without considering local differences. Secondly local sanitation and hygiene projects are not being implemented at their full potential due to lack of knowledge and useful guidelines. Result of these two most significant implementation errors are to be found in both districts. Bajura suffers from incomplete approaches that do not include educational programmes. Therefore no knowledge on benefits or the linkages between poor sanitation and hygiene is transferred to the local population. Furthermore, no provision of hard-technology and support when

building sanitary facilities in Bardiya is observed. This has as result that sanitation and hygiene is not high on the priority list of people's concern. The unawareness in Kathmandu of the number of challenges that the population of both districts daily faces, food shortages and high poverty rates being the most common, in combination with the difficult geographical situation result in general guidelines when area specific assessment and advice is needed to support local needs and demands. A further lack of awareness and knowledge on the risks involved with open defecation, human waste management and poor hygiene has as outcome that the people are not linking high disease rates with these practices. The demand for ODF, quality sanitation and good hygiene are therefore not recognized, no need is perceived, and no demand is created. Leaving entrepreneurs with a limited market to promote and sell sanitary products in, results in limited interest. As can be concluded several methods and approaches are used and implemented to improve the sanitation and hygiene status in Nepal and the respective districts. The synchronization and compatibility with local livelihoods, priorities and needs and demands will be further asses in subsequent chapter.

7. Priorities, needs and demands in the Bardiya and Bajura district

In the following analysis and interpretation of the collected and observed livelihood data the most important and appropriate findings regarding the research goals are discussed. The significant outcomes of concern of the five research capitals (human, physical, social, natural and financial) will be discussed for both districts, concentrating on the variables that indicate the perceived needs and demands or could identify households priority are evaluated and discussed. First the representation of the household survey will be discussed. This to answer the sub-research questions concerning local household priorities needs and demands regarding sanitation and hygiene and the differentiation between different households. Furthermore will the effect of different livelihoods and the households variables be discussed.

7.1 Quantitative analysis tools implemented from the household survey

To analyse the data collected through the household survey several statistical steps and calculations have to be made. This to create the research outcomes needed to answer the raised questions regarding sanitation and hygiene. Especially variables and correlations between variables from the household survey that indicate household priorities, needs and demands, approaches used to improve sanitary and hygiene status has been derived from the interviews with local stakeholders.

The independent variables are divided per capital (human, physical, social, natural and financial) and Univariate analysis (the description of variables) is used to indicate the representation of the variables. T-tests are executed to check whether there are significant differences between the answers given by respondents in the two districts. When the t-test outcome is significant there is difference between the answers given in both districts. This can indicate that there is a difference between the livelihoods in the districts or that there is a difference between the people interviewed in both districts. Variation in outcomes per district can indicate different needs, demands or priorities in different districts requiring different approaches. Different local requirements can indicate the need for different methods of program planning and implementing instead of blueprint planning at national level. The second form of analysis is bivariate analysis used to check if a relationship between two variables is present (bivariate correlation). Different forms of bivariate analysis can be used, depending on the method of measurement. In figure 14 and box 11 (appendix) different methods of bivariate analysis are described.

Multivariate analysis has been calculated through regression tables between the dependent variables and the variables representing the livelihood capitals (human, physical, social, natural and financial)

The control variables (sex; age of the head of the household; amount of household members; amount of children; caste; familiarity with WASH projects; amount of household members active in civil society and; objection when defecating outside) have been included in the statistical calculations resulting in a higher quality and more comprehensive overview of the effects of the dependent variables on the variables that represent the capitals. The degree and direction of relations can be indicated with this analysis. For example: households with a higher income are willing to invest more in sanitation and hygiene services than households with a lower income. Therefore is the multivariate analysis most appropriate for the research and appropriate outcomes will be discussed thoroughly and be clarified using other types of analysis.

There are no regression tables of the variables: reason why latrine is necessary; reason why sewerage is necessary; when the hands are washed and; how the hands are washed. These variables are categorical variables and a regression is therefore not appropriate. The results would present no information about the linear relation between the independent variables and the categorical dependent variables. The variables: familiar with latrines; familiar with sewerage; awareness harmful open defecation and; interested in using human faeces are dichotomous, which has as result that the multivariate analysis is a logistic regression analysis. The output of the logistic regression analysis is a logit, this logit is not the same as the chance that an answer is given. The logit provides the direction (positive or negative) of the chance an event will occur. When the chance on two events to occur is simultaneously equal (chance is 0.5) the logit is 0. The logit is always situated between the range of $-\infty$ and $+\infty$. The second calculated output is the Wald statistic. The Wald statistic is an indicator that shows the relative importance of the independent variables in the prediction of the logit of the dependent variable. The variable: the amount people want to invest in sanitation and hygiene services is a ratio variable. A multiple linear regression analysis is performed to identify the relation with the independent variables. The output of multiple linear regression analysis is the partial regression coefficient b representing the change of the dependent variable when the independent variable changes with one unit under the condition of *ceteris paribus*.

7.2 Significant household differences between the Bardiya and Bajura districts

The univariate analysis reveals several significant differences between the Bajura and Bardiya, a summary is displayed in Figure 12. Concluded is that in the Bajura district the highest attained *educational level of the head of the household* and the *highest educational level of the household* is significantly higher compared to the Bardiya district (table 4, appendix). From chapter 3 can be concluded that higher levels of education have the potential to lead to higher levels of sanitation and hygiene knowledge if included in the educational curriculum. There is also a difference in the

nutrition variable *consuming at least three meals a day* (table 4, appendix): in Bajura people eat more often at least three meals a day than in Bardiya, indicating more welfare but highly influenced by the interference of the world food program. Without this aid Bajura could only feed itself for 3 months a year.

A contradicting outcome is observed regarding the *history of waterborne diseases in the family*. The reported diseases rate in families was higher in the Bardiya district while simultaneously is reported that the waterborne diseases in the last year is significant higher in Bajura than in Bardiya (table 4, appendix). This is further evaluated in the multivariate analysis.

Figure 12 Household survey differences between Bardiya and Bajura district

Bardiya	Bajura
<ul style="list-style-type: none"> • Higher frequency history of waterborne diseases • Fewer waterborne diseases in the previous year • More households use safe drinking water • More regular contact outside the community • More often an active member of a formal group or organization • Savings for the low season 	<ul style="list-style-type: none"> • Higher educational level head of the household • Higher household educational level • More often consuming three meal a day • Greater interest in using human faeces for agricultural purposes • Higher mean income and higher cost of living

More households use *safe drinking water* in Bardiya than in the Bajura district. In Bardiya 39 out of 50 households use *safe drinking water* in comparison to the 12 out of 50 households in Bajura (table 5, appendix). Household prioritizing access to safe water above sanitary facilities can be expected. Providing both services (water and sanitation) in a combined package could improve community demand and commitment.

The evaluation of *regular contact outside the village* revealed, not surprisingly, a higher frequency in Bardiya (table 6, appendix), a district where travelling is more easy, people have more contact outside their own village than in Bajura, where travelling is more complicated. In Bardiya people are also more often an *active member of a group or organisation* than in Bajura. In Bardiya 38 out of 50 respondents said to be an *active member of a formal group or organisation* while in contrast in Bajura only 11 out of 50 respondents gave that answer (table 6, appendix). Expected was the

opposite: persons living in remote and difficult environment could be expected to combine efforts and have a more common group feeling.

There is also a difference in the *interest of using of human faeces for agricultural use*: while in Bardiya 33 out of 50 respondents are interested this is 13 out of 50 in Bajura (Table 7, appendix).

Furthermore, a difference in the *mean income of the households* interviewed in Bardiya and Bajura is identified. In Bardiya the mean is 7.525 Nepalese Rupees (74 Euro) while in Bajura the mean is 18.792 Nepalese Rupees (129 Euro) (table 8, appendix). This difference is explained by the higher cost of living in Bajura as a result of the remote location. Both incomes make the cost for purchasing a sanitary facility enormous.

The variable that states if people have *enough savings for the low season* reports that in Bardiya 41 out of 50 respondents have enough savings for the low season while in Bajura people mostly do not save enough in the high season to compensate the low season (21/50). There is also a significant difference between the monthly expenditures (table 8, appendix).

7.3 Priorities, demands and needs in Bardiya derived from the household survey

Several statistical outcomes can be interpreted to indicate priorities in the Bardiya district. The majority is derived from the multivariate analysis explained previously, further information is provided from the bivariate analysis when appropriate. Several variables could not be included in the multivariate analysis due to statistical limitations that have been discussed in the methodology.

No logistical regression could be calculated for the familiarity of Bardiya households with latrines. This is due to the high level of *familiarity with latrines* (100 percent). People (in the survey) are always *acquainted with the existence of sanitary facilities*, the values of other variables have no influence on this outcome. A similar outcome is observed regarding *familiarity with sewerage*. No significant conclusion can be drawn from the logistic regression between the responses households gave regarding the familiarity with sewerage related to independent variables (table 19, appendix). Several other interesting outcomes can be discussed. It is notable that all Wald statistics are 0.004 or less, indicating that the independent variables are of little importance to predict the *familiarity with sewerage* in the Bardiya district. Of interest is that all educational level indicators (*educational level head of the household; mean educational level of the household; highest educational level of the household*) have a positive logit. If educational level indicators have a high score there is a greater chance that people are familiar with sewerage than when they have a low score on the educational level variables. This outcome reveals that education of the population, that includes sanitation and hygiene in the curriculum as is (partially) the cases indicated by the DEO, created greater knowledge. That the same conclusion can be made regarding the knowledge of toilets although no statistical support can be presented due to the high level of familiarity.

A contradiction is observed when reviewing the results of the survey related to: *history of waterborne diseases* and the *amount of waterborne diseases in the last year* (table 19, appendix). The history of waterborne diseases has a positive logit, when people have a *history with waterborne diseases* they are more likely to be familiar with sewerage than people without a *history of waterborne diseases*. The opposite can be concluded from the variable *the amount of waterborne diseases in the last year*, this variable has a negative logit (table 19, appendix). People with more waterborne diseases in the previous year are less familiar with sewerage than people experiencing fewer waterborne diseases. Differences in the education of awareness in households could be the explaining variable. Households suffering from waterborne diseases potentially receive more information from sub-health posts or link the previously received information with their current illness and are therefore more aware (sewerage and sanitary facilities). People suffering from high numbers of waterborne disease do not recognize the linkage, possibly due to little education and therefore remain viable for waterborne disease, explaining the high rate of illness in the household.

Concluded from the data analysis is that the respondents in the Bardiya district who *use safe drinking water* have a larger knowledge of sewerage compared to those who use unsafe water for consumption (table 19, appendix). Greater access to aid organizations and the information provided through these organizations could be a valid explanation. The majority of drinking water pumps in the Bardiya district are constructed by the Red Cross. A second explanation could be that household recognizing the benefits of safe water also recognize benefits of sewerage, sanitation and hygiene. Calculations further indicate that households having regular *contact outside their personal habitat* are more inclined to be familiar with waste management than those having fewer contacts. Derived from the bivariate analysis is that people who have *more contact outside the village* gave other reasons why sewerage is necessary than people with less contact. People who have more regular contact outside their village are *willing to invest* more in sanitation and hygiene services than people who have less frequent contact outside their village. A strong coherence can also be reported with *the awareness regarding open defecation* (table 19, appendix). Knowledge from more developed regions, or regions more aware of sanitation and hygiene issues transfer the knowledge and demand to other regions. The natural phenomena of humans; attracted and interested in what others have and we don't, in this case a supposedly cleaner environment.

In the survey on the Bardiya district one respondent was not aware of the fact that open defecation can do harm, as a result no significant result can be drawn from the correlation between OD and independent variables. The logistic regression (table 21, appendix) would display no reliable outcomes because the results only represent the different answers of that single respondent against the mean of the answers of the other 49 respondents. A significant outcome can be reported concerning the correlation between *investments in sanitation and hygiene* and the independent

variables (table 22, appendix). The partial regression coefficients indicates that people that have a *paid occupation or are enrolled in an educational institute* are more willing to invest in sanitation and hygiene services than people with no daily activity. The estimated amount they are willing to invest more is 25.700 NRS (255 Euro). Individuals or households in possession of a *paid job or educational opportunities* can be assumed to have a great knowledge regarding sanitation and hygiene and/or a larger expendable income and are therefore able to invest in other than the most basic direct necessities like food.

The variable *eating at least three meals a day* is significant with the willingness to invest in sanitation services (table 22, appendix). People in the Bardiya district consuming a minimum of three meals a day are likely to invest 22.109 NRS (219 euro) more than people who don't consume three meals a day. This can have a logical explanation: having three or more meals a day is a luxury. Households in Nepal often only eat two meals a day. People who have enough financial resources to have an extra meal a day are likely to also have more financial resources that enables investments in sanitation and hygiene services compared to the population not having the financial liberty to feed themselves three times a day.

Analyzing the responses given linked with the *amount of land owned* (table 22, appendix) reveals that households owning more land are likely to invest more in sanitation and hygiene services than people possessing less land or no land at all. The *amount of land owned* can be regarded as an income variable, people can earn money with the products of the land and more land means also more income in kind, goods and products for the owning household. Resulting in households being more likely to have more financial resources left to invest in sanitation and hygiene services. Furthermore can be concluded from the bivariate analysis that households with larger financial resources are often higher educated with knowledge of higher standards and the possibilities to practice these higher standards. People with a *higher income* are willing to invest more in sanitation and hygiene services (table 15, appendix). When people have *more properties* (e.g. second house or enterprise) they are more *willing to invest in sanitation and hygiene services* than when people have less properties (table 16, appendix). Having more properties is an income variable that equals having more welfare. Those people probably have more money available to invest in sanitation and hygiene services than people with fewer assets. The same assumption can be applied to the use of technologies. A significant bivariate relation exists between the *amount of technologies used* and the *awareness of sanitation and hygiene* (table 13, appendix). No significant relation is indicated between the *amount of technologies used* and the *willingness to invest in sanitation and hygiene services*. The amount of used or owned technologies, like for example the purchase of a mobile phone or personal computer could have been a good indication of current priorities (in both districts) but no significant outcomes or conclusion can be drawn from the livelihood survey. Observations in

both districts do indicate that large parts of the population do prefer other possessions instead of sanitary facilities. Furthermore can be derived from the household survey in the Bardiya district that those households having *sufficient savings for the low season* are also more willing to invest more money in sanitation and hygiene services (table 17, appendix).

The educational level variables are contradictory. While the *educational level of the head of the household* has negative effect, the *mean educational level of the household* and the *highest educational level of the household* have a positive effect (table 22, appendix). This means that when the respondent (head of the household) experienced a higher educational level they are likely to invest less in sanitation and hygiene services. When the *mean educational level of the household* is higher and the *highest educational level of the household* is higher the respondent is willing to invest more in sanitation and hygiene services. An explanation for this phenomenon is that the education of the head of the household often has been completed several decades ago, in times when sanitation and hygiene were not part of the curriculum. General education is not contributing to sanitary and hygiene awareness. Specified programs received by younger members of the household more often included this information, therefore are these of positive influence. Not every household has younger educated members, for example when no (educated) children are present in the household, or when the opinion from children, according to the SLTS is neglected by the older household members.

The logistic regression that evaluates the correlation between the *household interest in using human faeces* and the independent variables present several interesting results (table 24, appendix) The variables of financial capital are not suitable to be used for the logistic regression linked with the variable *being interested in using human faeces* (SPSS gives an error on perfect fit, not able to display the covariance matrix). Furthermore is indicated (Wald statistics) that no independent variables are of a great importance to predict the *interest in using human faeces for agricultural purposes* in the Bardiya district. All educational level variables have a negative logit. Indicating that when the educational level in the survey is higher, people are less interested in the use of human faeces for agricultural purposes. This can be explained several different ways. First could it be possible that educated people are less active in agriculture, although is this less likely in the mainly agricultural communities visited in Bardiya. Secondly, it could be that educated persons experience a more developed livelihood and are therefore not considering a frowned upon method to improve their livelihood through larger agricultural revenues.

A moderately strong relation is present between relating *interest in using human faeces* and the variable *owned equipment* (table 24, appendix). Households with more equipment have another interest when it comes to using human faeces than people with less equipment. According to the multivariate index respondents using more technologies, (e.g. fertilizer and pesticide) are more

interested in the use of human faeces than when people use fewer technologies. Perhaps larger knowledge of fertilizing and irrigation benefits, costs and revenues leads to this willingness to use cost effective and available method. When respondents have more regular contact outside their own village they are also more interested in the use of human faeces. Respondents who own more land are less interested in the use of human faeces than respondents who have less land.

Concluded from the above analysis is that there is no single key – variable to improve sanitation and hygiene in the region. A combination of several key variables that are all inter linked and specific for the Bardiya district need to be improved in order to make the attempt to improve sanitation and hygiene a success. As can be derived from the educational variables is knowledge of sanitation and hygiene key to establish the perceived need and to include sanitation in the priorities of the households and create the resulting demand. Subsequently concluded is that financial resources are necessary to implement the households priorities and perceived need to actual investment and use of sanitary and hygiene facilities. That is the key obstacle for sanitation and hygiene development in the district, several previous programs using the SLTS and CLTS have created significant knowledge of sanitation and hygiene. Unfortunately the financial strength that people need to make the initial investment, or the livelihood improvement to include sanitation and hygiene services on their list of priorities is absent. The knowledge can be continued to be improved and include larger groups of people and households, when there are other priorities due to poor livelihoods the learned lessons will not be practised.

7.4 Priorities, demands and needs in Bajura derived from the livelihood survey

Several interesting and sometimes contradicting outcomes can be identified in the Bajura district. The variable *mean educational level of the households* has a negative logit on the variable identifying *familiarity with toilets*: households in the survey with a higher mean educational level are less familiar with toilets than toilets with a lower mean educational level (table 18, appendix). Contrasting is the outcome regarding the *educational level of the head of the household* and the *highest educational level of the household* have a positive correlation between *familiarity with sanitary and hygiene services*. Indicating that higher education leads to a larger awareness of sanitary and hygiene services (table 18, appendix). The first deviation can be explained by the relative small household sample, a few small households with no (educated) children result in a low educational mean, or a relative high level of education that has not included education concerning sanitation and hygiene. Similar to the results of the educational results of the Bardiya district, education that not includes sanitation and hygiene in the curriculum does not influence the awareness levels. This explains the large number of donated and constructed sanitary facilities in the district that do not get

used but are converted to fancy storage rooms for food or fuel. Households lack the knowledge and have other priorities.

The results are, as indicated in the representation paragraph 5.5 based on the differentiation of 3 respondents: the share of people who are not familiar with toilets is only 3 out of 50. Therefore the effects are not significant because they are not reliable enough.

A same type of outcome can be observed from the outcomes related to the variable *knowledge of sewerage* (table 20, appendix). The *educational level of the head of the household* and the *mean educational level of the household* have a positive logit, indicating that when there is a higher educational level there is a higher chance that respondents are familiar with sewerage. The variable: *highest educational level of the household* has a negative logit indicating the opposite. A higher educational level means a lower chance of being familiar with sewerage. The last outcome can be explained similar to the outcome of the familiarity with toilets. If a household has no or young children and the father or mother is in possession of the highest education lack of sanitary knowledge could explain the outcome. Being educated in different times with no inclusion of for example SLTS can lead to a higher educational level and no knowledge of sanitation and hygiene.

From the household survey results concluded can furthermore be that families who have *frequent contact outside their own village* have a higher chance of being *familiar with sewerage* than people with less contact outside their own village (table 20, appendix). Respondents in Bajura with a *higher household income* (subincome and remittances) have a lower chance to be familiar with sewerage compared to people with a lower household income. A difficult discrepancy that would be interesting for future research to clarify. The amount of debt has no influence on the chance that respondents in Bajura are familiar with sewerage. The effect of variables could not be included in the logistic regression of the *awareness of harmful open defecation* due to an error indicating perfect fit; therefore no covariance matrix could be calculated. The multiple linear regression of the influence of variables on *household investments in sanitation and hygiene services* does not reveal significant outcomes among (surveyed) households in the Bajura district. Several interesting and contradicting outcomes can be presented and evaluated. The bivariate analysis indicates no significant correlation between the *highest educational level* and *willingness to invest in sanitation and hygiene*. The variables: *the educational level of the head of the household* and *the highest educational level* both have a negative partial regression coefficient in the multivariate analysis (table 9, 10, appendix). This means that within the survey households with a higher educational level invest less in sanitation and hygiene services. The educational variable which represents *the mean educational level of the household* is positive. When the average educational level of the household is higher respondents in

Bajura are likely to invest more in sanitation and hygiene services. A similar outcome has been presented for the Bardiya district (table 20, appendix).

Furthermore, in Bajura is a moderate strong bivariate correlation indicated between the variables *having an own household latrine* and *when hands are washed*. People with toilets wash their hands on different times than people without a toilet (table 12, appendix). This could be a result from the earlier conclusion that people using facilities have more knowledge regarding sanitation and hygiene services or have easier access than the households practicing open defecation. According to the bivariate analysis that indicates a significant relation between the *history of waterborne diseases* and the *households awareness of risks related with open defecation* and *the willingness to invest in sanitation and hygiene* (table 11, appendix). The multivariate analysis reports that respondents who have a history of waterborne diseases, and when the households experience more waterborne diseases in the last year they are likely to invest less in sanitation and hygiene services (table 23, appendix). This could be explained twofold. First are households experiencing more periods of not being productive resulting in a lower disposable income, resulting in less or no financial resources to invest in sanitation and hygiene services. Secondly, it is possible that households with a higher frequency of falling ill are less educated on the risks of poor hygiene and are subsequently less willing to invest in sanitation. The obvious outcome that might be expected more illness and as a result willing to invest in sanitation and hygiene to prevent future illness is therefore in this context not true. The links and causes of illness are often not recognized, this has also been indicated by the Sub-Health Post officers. No significant bivariate relations is recorded when considering reasons for using latrines or sewerage and the households awareness considering harmful effects of open defecation. When respondents have *more regular contact outside their own village* they are simultaneously *willing to invest more in hygiene and sanitation services* (table 23, appendix). Recognizing different environments with higher sanitation standards or acquiring different sources of information from family or friends in more developed regions has a positive influence on the perceived benefits of sanitation and hygiene.

An antonymic relation has been revealed in the Bajura survey between the *investments in sanitation and hygiene services* towards *the amount of land owned* compared to the Bardiya district (table 23, appendix). In Bardiya this was a (significant) positive effect, while in Bajura this is a negative effect. Respondents in Bajura with more land wanted to invest less in sanitation and hygiene services. When evaluating the bivariate relations between *the amount of technologies used by households* and *the familiarity with latrines* or the reasons given *why latrines are necessary* no significant coherences can be reported (table 13, appendix). The Bajura district households do have a significant relation between *the awareness of the negative effects of open defecation* and *the amount of technologies*

used. A significant relation is furthermore reported between *the willingness to invest in sanitation and hygiene services* and *the amount of technologies used*. The correlation (Pearson's r) is 0.329, this positive number states that when people in Bajura use more technologies they are willing to invest more and vice versa (table 13, appendix).

Furthermore is in the Bajura sample a positive effect of *the amount of properties owned*: when respondents have more properties they are willing to invest more in sanitation and hygiene services than households possessing less property (table 16, appendix) The variable: *having enough savings for the low season* is positive. When respondents have enough savings to compensate the low season they are more willing to invest money into sanitation and hygiene services in comparison with respondents who do not have enough savings for the low season. Secondly can be concluded that *households having enough savings for the low season* have other methods for washing their hands. For example soap, an expensive product instead of mud or ashes. Methods that are also related to a lack of education and possibly explained by the larger financial resources available to large land owners or households able to save.

In Bajura the variables *when and how people wash their hands* have both a medium strength significant relationship with *being a member of a group or organisation*. People participating in community groups or organizations generally used the same frequency and method for washing their hands, this can be good methods and frequencies or poor (table 14, appendix) Nevertheless is this example of coherence good to use for program planning. People communicating with each other copy lifestyles and habits and therefore enable change. Utilizing these possibilities could therefore enable positive changes regarding different subjects.

The regression model of the interest in using human waste reports no significant logits regarding the independent variables (table 25, appendix). The variables of financial capital are not suitable to be used for the logistic regression linked with the variable being interested in using human faeces (SPSS gives an error on perfect fit, not able to display the covariance matrix). In the survey there is a contradiction in the educational level variables. *The educational level of the head of the household* and *the mean educational level of the household* both have a positive logit. *The highest educational level of the household* has a negative logit. Meaning that when the educational level of the head of the household and the mean educational level are higher the respondent was likely to be more *interested in the use of human faeces* than when the educational levels were lower. In contrast, when the highest educational level of the household is higher there is a larger chance that the respondent gave the answer that he or she was not interested in the use of human faeces than when the educational level was lower. This can again be explained by the reason that the education only is of influence on sanitation and hygiene when appropriate lessons have been included in the curriculum.

When respondents in Bajura use more technologies they are more likely to be interested in the use of human faeces compared to households using fewer technologies. A medium strong relationship exists between households having frequent contact outside their village or community and the expressed interest for using human faeces for fertilization or irrigation purposes when practicing agriculture (table 25, appendix). Respondents who have more regular contact outside the village are more interested in the use of human faeces compare to those who have less regular contact outside the village. In the Bajura district respondents with more land are less interested in the use of human faeces than people with less land. This could be a resulting from the larger yield large landowners obtain, smaller farmers need to be more efficient and are therefore possibly more interested in using new technologies like using human faeces as fertilizer or irrigation. It requires few effort or investments and does deliver a return as described in the theoretical framework. Concentrating on small land owners, which are practicing subsistent or small commercial farming could therefore be used to introduce this technology that gets very distinct reactions in the Bajura district.

Concluded is that there are several similarities and differences in the outcome for the Bajura district compared to the Bardiya district. A lack of education is the major outcome from the survey. If the knowledge regarding sanitation and hygiene is not provided then the perceived need and demand resulting from prioritization will never be realized. In contrast to the Bardiya district sanitary facilities have been provided for by several agencies. These remain largely unused due to lack of knowledge and different priorities, as also has been indicated by key stakeholders. These variations in perceived needs and priorities result from the difficult circumstances in the district. When other crucial livelihood factors, like for example food or housing are not available the construction and use of toilets and related services will not be the priority of households.

7.5 Summary livelihood survey in the Bardiya and Bajura district

From the assessment of the livelihoods in the Bardiya and Bajura district can be concluded that the large variation of livelihoods within and between district require different project approaches to realize sustainable sanitation and hygiene improvements. The different livelihood variables recorded through the household livelihood research and observations result in different priorities and (perceived) needs and lead to different demands for households or regions with different livelihoods. As a result from different priorities, needs and demands vary and alternative methods and approaches need to be implemented to properly realize positive change. The above discussed results have indicated that a number of issues has higher priority. For example providing the household with three meals a day, having savings for the low season and a general monthly income. More significant indicators like for example households rather having mobile phones or private transportation could

not been provided. Enough results can be processed to conclude that the households in both districts live in difficult and challenging environments and therefore face problems that have a higher priority than sanitation and hygiene. Including these challenges when implementing, the GSF program would improve local development and future improvement of the sanitation coverage. Further detailed research that indicate more specific details regarding the ranking of priorities could provide further insight. The research has revealed that education has a significant influence on the need, demand and prioritization of sanitation and hygiene. In the Bardiya district in which more educational and training programs have been implemented a correlation between more education, especially of current generations and the willingness to use and invest in toilets. The same conclusion can be made between households having more financial resources, like for example land and income and the willingness to invest in sanitation and hygiene services. This indicates the discrepancy between sanitation and hygiene project approaches and the reality of living in difficult environments. Derived from literature and (inter)national policy makers is that education will lead to increased need and demand. This is true but unfortunately, need and demand are not always leading changes in real life. If the resources are not available to households (the majority) changes will not be realized. Assessment of the livelihoods of the majority of households (no financial resources) is not included in the approaches.

Furthermore indicated is that education, for example through SLTS, will increase knowledge and causes a trickledown effect towards other members of the household. Practice learns that change through these channels is only partial and takes up to several generations to create maximum effect. In real life, parents following different education several decades ago are not going to implement every lesson children learn at school nowadays. During the 90s the use and development of computers and the internet was one of many new technologies stimulated at school to also use at home. Very few fathers ran to the nearest store to purchase an expensive personal computer. These changes can take more than a decade to be fully developed, similar to the investment and use of sanitary services. To boost development local differences have to be indentified and used to a maximum. For example in the Mohamadpur VDC, in which the majority is Muslim the research has indicated that the influence of the local Muslim leaders could be used to advocate higher standards of sanitation of hygiene both through adults and children. Mosque Led Total Sanitation (MLTS) could be a unique local approach to realize community commitment and realize change.

The importance of education has become extremely clear in the Bajura district. A significant large number of toilets has been constructed and remain unused due to lack of knowledge and other more important technologies. Therefore, a combination of both approaches can be advocated; only education lead to knowledge and no toilets due to lack of financial resources. Only construction and no education leads to unused facilities. Combining soft and hard technologies could improve positive

change. Providing partial subsidies or rewards when construction projects are completed makes it only available for the more advanced population and therefore excludes the difficult to reach groups. Implementing region specific projects that includes and appeals to the local population creates community commitment and ownership. This requires a thorough assessment of the region. Unfortunately, UN-Habitat has no local knowledge regarding the Bardiya and especially the Bajura district. Trusting on local partners and executing agencies which are currently (May 2011) still unknown raises question marks regarding the degree of adjustment to local characteristics. Furthermore are no clear evaluation and control measurements included in the GSF. No baseline study is planned to be executed and therefore is tracking of (claimed) progress difficult. In the theoretic chapter, and confirmed in the previous chapter is that trusting on local partners can be difficult due to a number of causes discussed previously.

8. Conclusion and discussion

From this research thesis can be concluded an outcome that was supposedly widely known and implemented. Regions are different, even within districts or VDCs variations in livelihoods can be observed and identified for example through the sustainable livelihood approach as discussed in paragraph 3.1 (Farrington, 2001) (Chambers & Conway, 1992). Nonetheless are projects (including the GSF) to improve sanitation and hygiene awareness and coverage insufficiently using this knowledge. The key concepts of the SLA are known and widely mentioned in the GSF program and the SHMP. Unfortunately is the reality different and are knowledge proposed activities not sufficiently realized. The leading executing agency UN-Habitat does not have sufficient local knowledge regarding the Bardiya and Bajura district and is as an organization not actively acquiring information. None of the staff involved implementing the GSF project has personally visited the districts. To include local knowledge UN-Habitat plans to select executing organizations to implement the GSF program. These organizations will include and involve locally active and situated stakeholders to access local information. Therefore the GSF program will rely for a large part on general assumptions of a region and on the advice from local stakeholders, civil servants or NGO officers, who might have good intentions and local experience but often do not have the needed skills and knowledge to substitute thorough local assessment, research and potentially could encourage the prioritization of personal benefits and malpractice as one of the indicated risks with decentralized influences (Paragraph 3.2, WSP 2011).

From the performed household livelihood research it can be concluded that three variables are critical to identify and improve at local level when implementing a successful sanitation and hygiene program:

1. Local priorities, needs and demands
2. Knowledge regarding sanitation and hygiene
3. Local ability to invest in sanitation and technologies

These three variables are different in both districts. Therefore both districts with their unique socio-economic and geographic features require different approaches. A thorough understanding is required to draft and implemented appropriate methods to improve sanitation and hygiene. From the research it can be concluded that households have more urgent priorities, for example providing food for the family or sufficient savings for the low season. This has been indicated in the World bank (2010) analysis of problems experienced in developing regions. They are unlikely to have interest or

to make investments in sanitary facilities. This results in lower demand and perceived need. These priorities are crucial for a successful program. Urging people to commit to and be involved in improving sanitation and hygiene when the next meal is unsure is not realistic. The second step is to improve knowledge and awareness of the benefits and dangers regarding open defecation and sanitation and hygiene. If the population is unaware of how to use sanitary facilities and of the linked benefits, situations observed in the Bajura district in which toilets are being used as storage room will remain a common sight. Creating knowledge will increase the perceived need and the demand for sanitation improving the priority households give to sanitation. Recognizing the potential crucial role that children can play as facilitators of change in sanitation and hygiene (Dhikari, S. and Shrestha, N.L. 2008). The long term commitment to implement planned changes through the SLTS should be recognized as a slow moving process (Bell, 2010). Alternatives to traditional education (SLTS) should also be considered. As mention in chapter 4, out of the box methods like Mosque Led Total Sanitation (MLTS) or excursions with willing people to more developed regions could create a feeling of how to change the environment. Different educational approaches are necessary to speed up the slow current pace of change through children with little influence.

From the observations and information gathered in the districts it is concluded that soft technology combined with hard technology support is key to improve sanitation coverage. The minimal (financial) support available is not sufficient to close the gap between the willingness of households and the current financial ability to realize their needs and demands to make sanitation and hygiene a priority. Assisting households financially has been (partially) realized on limited scale by stakeholders in the Bardiya district and has been suggested by the WSP (2010) and by the SHMP (2011). Regretfully, this has currently not been recognized by the GSF program. All the knowledge and awareness regarding sanitation and hygiene is not changing the lack of financial resources that enables sanitation investment, private sector involvement and the decrease of the coverage gap. In developed countries households know about the benefits of electric cars, solar energy, led lightning, and double glazing but only few change because not all things people want and need can be afforded and the current situation is not influencing our livelihoods directly or constantly. Indicated by the Sub-Health post officer: *“grandfathers practiced OD, their fathers practises OD and their lives were good, why should we change now”*.

These three key - variables need to be combined to make project implantation a success. No hard technology leads to an increased demand combined with the inability to realize the demand due to lack of financial resources. Installation of sanitary facilities without providing an educational framework leads to incomprehension and the misuse of well intended facilities as has been observed in the Bajura district.

The research also shows that the GSF program implementation is not optimally synchronized with the local priorities that influence the needs and demands regarding sanitation and hygiene. Current approaches are in a to large degree based on generalization concerning Nepal as a homogenous land instead of the large quantity of local differences that give Nepal its unique character. Selecting stakeholders to implement the GSF program according to local requirements will not be sufficient if the executing agency (UN-Habitat) that makes the selection has no local experience or knowledge. This approach forms a basis for mismanagement and miscommunication. The freedom towards approaches and methods used to make improvements as stated in the GSF program should not be ad-hoc or Kathmandu based. Neither should it result in sub grantees and stakeholders to have all responsibility and freedom to do everything regarded suitable. From the answering of the sub questions can furthermore be derived that methods used do not align with the local livelihoods, priorities and needs and demands. The priorities, needs and demands as previously described are largely unknown or neglected in the GSF program. Improvement in the lines of communication (figure 7) could prevent future misunderstandings and allow changes and adjustments that are identified by local stakeholders to reach Kathmandu based program and policy makers. This to prevent accusations and annoyances like: *“The program makers in Kathmandu do not know the price of a bag of cement in Bajura”*

The results from chapter 7 indicate that a large variation of livelihood variables influences the priorities and needs and demands within a household. To improve synchronization and program adjustment to local variations, the basics of the GSF program and the SHMP can be used. The principle of the GSF program of not introducing new methods and approaches but to support existing stakeholders is a useful valid but should be more locally bound and controlled (independently) to prevent mishaps and improve communication. Stationing UN-Habitat officers in Bardiya and Bajura would be a good start, unfortunately no enthusiasm to personally visit the districts was observed during the research project. Identifying the biggest potential threat to any development project: lack of affinity and knowledge of local circumstance. Blue-print planning in air conditioned offices in Kathmandu is a critical failure according to the SL approach. Displayed by the suggested possibilities of implementing private sector involvement through entrepreneurial activity, visiting the region would have made the difficulties regarding that plan clear. Indicated has been by Allen et al. (2006) that private parties are not eager to operate in difficult environments that are less profitable. Furthermore have previous attempts to involve public private partnerships in the sanitation and hygiene sector resulted in failure in collapse (Brockelhurst and Janssens, 2004). Visits to households in both districts which live in difficult and challenging environments create understanding of the problems and challenges faced every day that have a higher priority than sanitation and hygiene. Entrepreneurs are not keen to invest in these types of hostile and non profitable regions.

Improving sanitation and hygiene in both districts would improve general livelihoods of the households. The lack of sanitation and hygiene is to different extensions related with other characteristics of underdeveloped regions. For example high rates of illness, low income, lack of technologies, poor housing, low levels of education and insufficient access to food. All can be linked as cause and result from poor hygiene and should therefore be approached as a unity. Currently a single failure (poor sanitation and hygiene) is singled out in a populations habitat, improvement of the total habitat should be the goal, not only sanitation and hygiene. Hence UN-Habitat not UN Sanitation and Hygiene office. It is important that efforts are continued to be made and possible improvements that become clear from the implemented research can improve results. From the SWOT analysis (Figure 13) all the internal and external influences regarding implementing the GSF program in rural Nepal can be derived. Aspects that influence the sustainable realization of sanitation and hygiene trough the GSF program.

Adjusting the GSF program and SHMP to suit local livelihood differences can only improve current efforts and as a result improve sanitation and hygiene coverage and use in Nepal. Local commitment and ownership can only be established through local knowledge and experience.

Figure 13 SWOT analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> • (Inter) National Support and Knowledge • Large network of stakeholders • Flexible use of approaches 	<ul style="list-style-type: none"> • Insufficient use of local knowledge • Generalizations • No financial support for construction projects • No (bottom-up) communication • No control program
Opportunities	Threats
<ul style="list-style-type: none"> • Improving Sanitation and Hygiene in Rural areas • Closing the coverage gap • Improving knowledge regarding Sanitation and Hygiene • Positively influencing and improving rural livelihoods 	<ul style="list-style-type: none"> • No local commitment • Lack of transparency • Misuse of funds • Insufficient local and household budgets for construction purposes • Blue print planning

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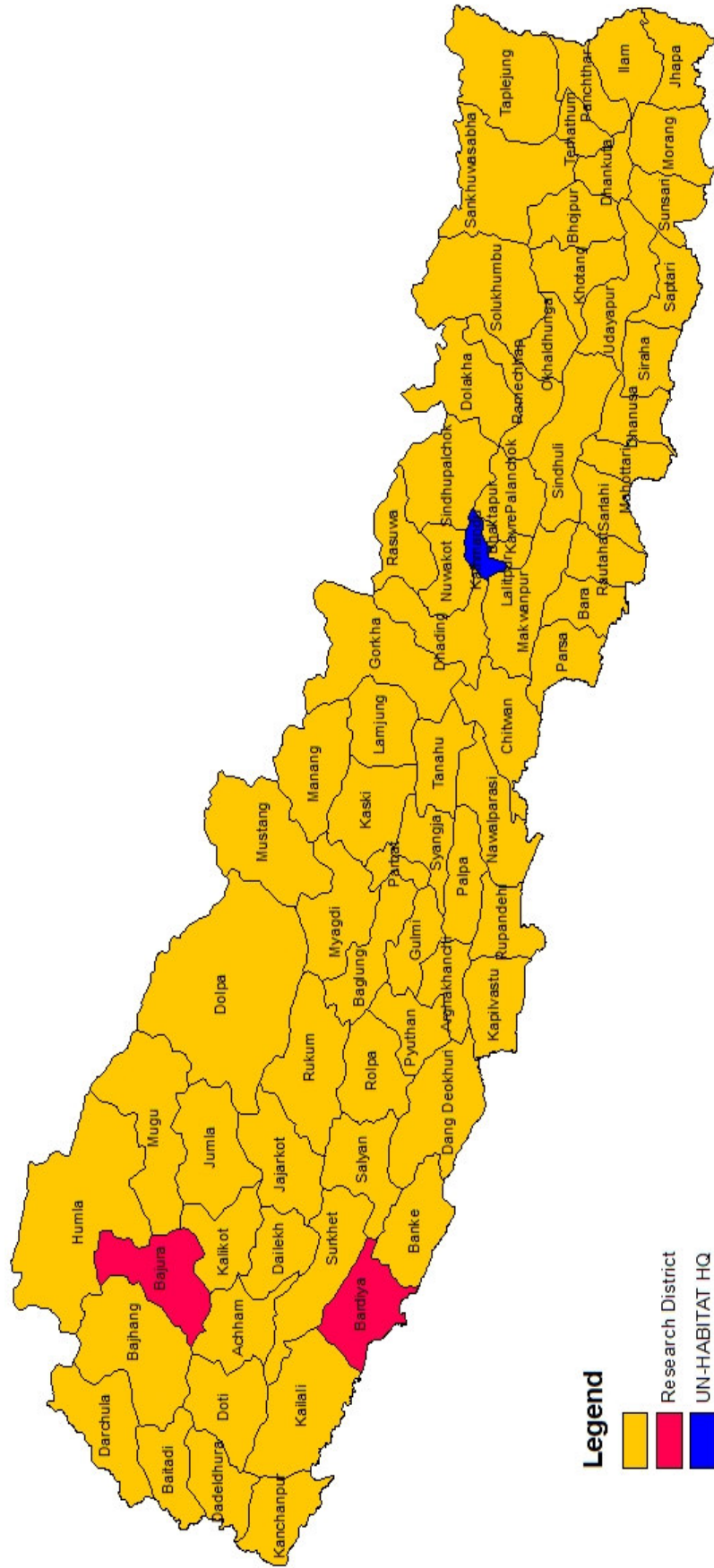
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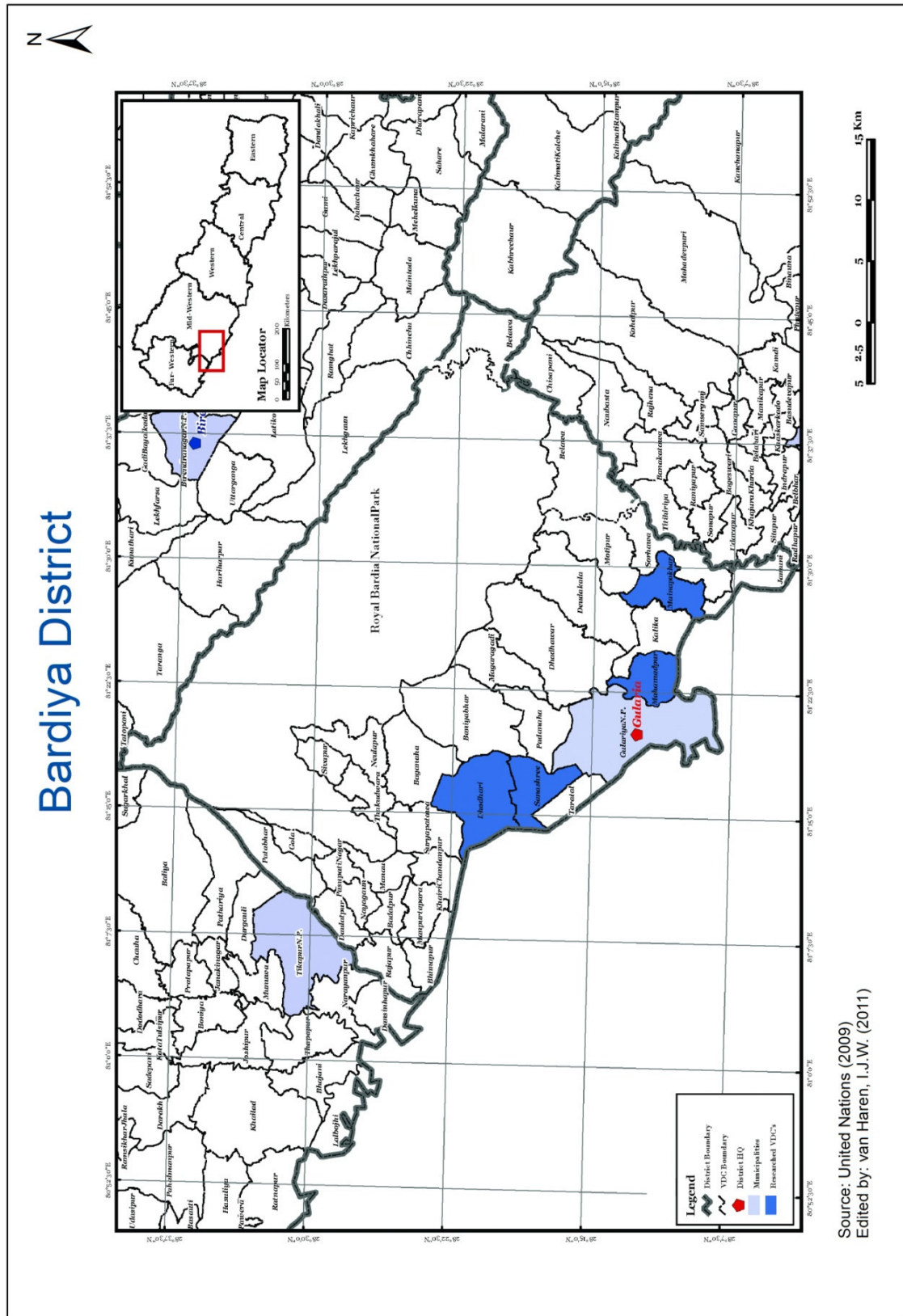
10. Appendix

Map 5 Research districts
Research Districts



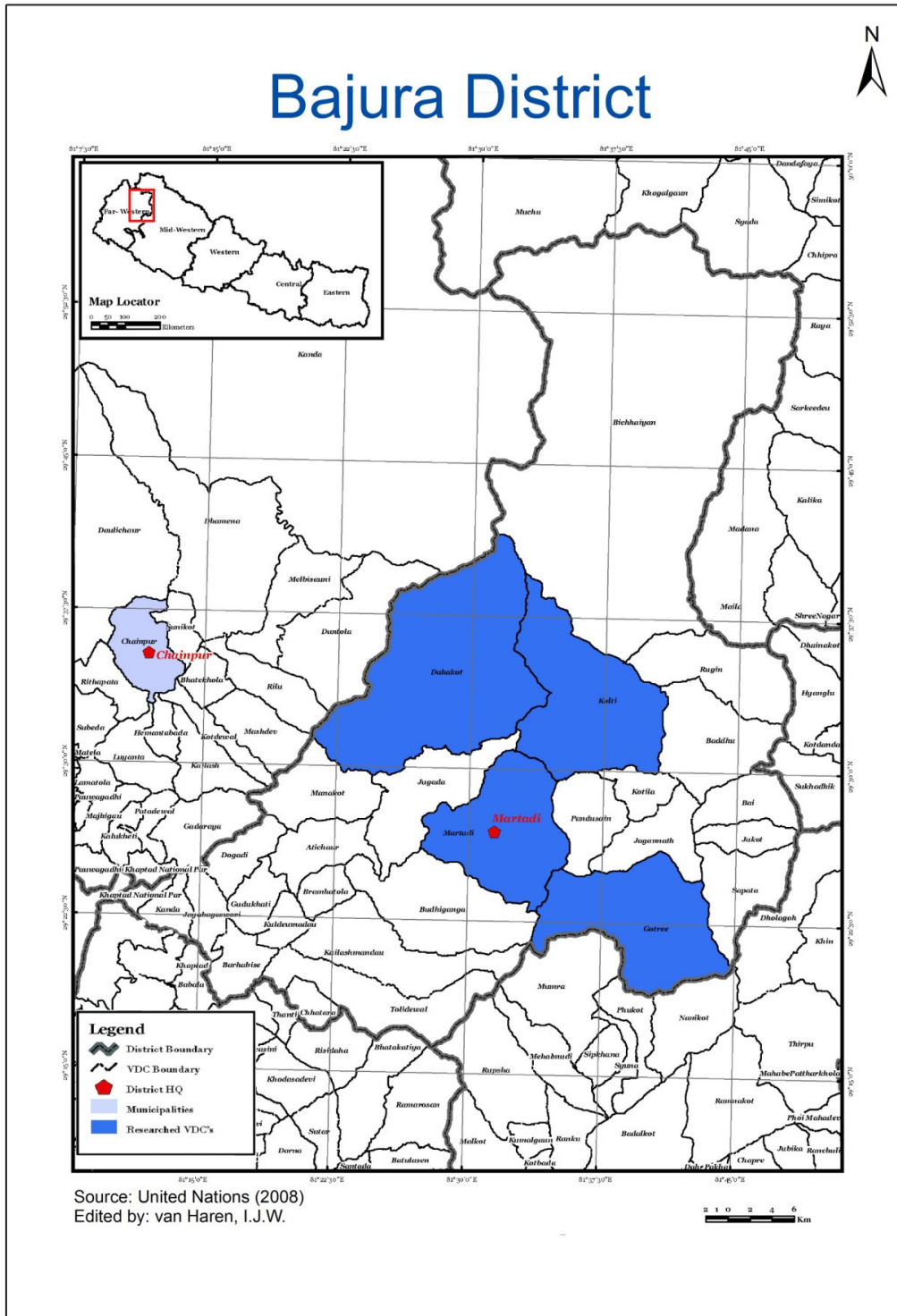
Map 6 The Bardiya district

Bardiya District



Source: United Nations (2009)
 Edited by: van Haren, J.J.W. (2011)

Map 7 The Bajura district



Box 9 Water and sanitation related diseases

- Anaemia
- Arsenicosis
- Ascariasis
- Campylobacteriosis
- Cholera
- Cyanobacterial Toxins
- Dengue and Dengue Haemorrhagic Fever
- Diarrhea
- Drowning
- Fluorosis
- Guinea-Worm Disease (Dracunculiasis)
- Hepatitis
- Japanese Encephalitis
- Lead Poisoning
- Leptospirosis
- Malaria
- Malnutrition
- Methaemoglobinemia
- Onchocerciasis (River Blindness)
- Ringworm (Tinea)
- Scabies
- Schistosomiasis
- Spinal Injury
- Trachoma
- Typhoid and Paratyphoid Enteric Fevers (WHO, 2011)

Table 3 Water supply and sanitation in Bardiya

VDC/Municipality	Total HHs	HHs having access to water supply	HHs having access to toilet					Estimated number of HHs constructing water supply by the end of fiscal year 2010-2011	Estimated number of HHs constructing toilet by the end of fiscal year 2010-2011	Estimated number of HHs having access to water supply by the end of fiscal year 2010-2011
			Permanent (Pakki)	Temporary (Kachchi)	Total number HHs having access to toilet	Percentage of HHs having access to toilet	HHs having no toilet			
Mainapokhar	1592	1475	154	190	344	21,60%	1248	50	394	1475
Mohammadpur	2057	1870	296	48	344	16,70%	1713	180	524	1870
Sanoshree	3725	2965	623	1403	2026	54,40%	1699	100	2126	2965
Dhodhari	1622	1348	132	238	370	22,80%	1252	100	470	1348

Appendix 1 Household survey

Namasté

On behalf of Ivo van Haren & Susan Hoeflaken, Master students at the Utrecht University in the Netherlands I would like to ask you several questions regarding the livelihood of your household. The questionnaire collects information regarding your life and the life of your household in the *Bajura / Bardiya* district.

The collected data will be exclusively used for academic research purposes to gain insight in the communities in rural *Bajura / Bardiya*. The final goal is to successfully write a Master Thesis.

Your participation with this survey is of great contribution to our research and will add significantly to the available knowledge of your region. To acquire a detailed insight in the livelihood of your household and that of the community as a whole several questions are put forward and requires approximately 45 minutes of your time.

If you feel uncomfortable with questions you can refrain from answering or end the interview at any time.

Are you willing to participate with this research?

If Yes, Thank you for your time. Start the questionnaire with the household identification factsheet.

If No, Thank you for your time. Enquire the possibility to conduct the questionnaire another time.

Introductory questions

1 District:

2 Village:

3 Sex

Male

Female

1

2

code

4 What is your last name?

5 With how many people do you share the kitchen?

 people

6 How many children do you have?

 children

On the end of the interview:

Thank you very much for the time you made available, also on behalf of the researchers, Ivo van Haren en Susan Hoeflaken.

If there are any questions regarding the research please ask them now.

Thank you.

Household Identification Table

Name	Sex (M/F)	Age	Highest education attainment level	Daily occupation (e.g. work / school)	Experiencing illness in the last 6 months (Y/N)	Willingness to use sanitary facilities (Y/N)	consuming three full meals a day (Y/N)	Able to read and write (Y/N)	Active in civil society (Y/N)	Regular contact outside the community (Y/N)	Monthly income (NRS.) Final question after survey.	Is this income stable? (Y/N)
												Sub-Total:
												Remittances:
												Grand Total:
												+

1: Human Capital

1 Did you or anyone in your household suffer from an illness during the past month?
 No (go to question 4) 1 code
 Yes 2

2 What was the symptom of this illness?
 Diarrheal 1 Code
 Nausea/vomiting 2
 Fever 3
 Chills 4
 Cough 5
 Headache 6
 Shortness of breath 7
 Other (specify below) 8

3 Was this illness due to the use of affected water or the lack of sanitation?
 No 1 code
 Yes 2

4 Do you or your family have a history of waterborne diseases (diarrheal/vomiting)?
 No (go to question 6) 1 code
 Yes 2

5 How many times were you or your family members ill due to waterborne diseases (diarrheal/vomiting) for more than three days in the last 12 months?
 times

6 How many times a day do you have a complete meal in the [wet/dry] season?
 Wet season times
 Dry season times

7 What are the main differences in eating between the wet and dry season?
 Products 1 code
 Nutrition of meals 2
 None 3
 Do not know 4
 Other (specify below) 5

8 Was it easy to find this job?
 No 1 code
 Yes 2

9 How did you find this job?

10 Are there many jobs available in the surroundings?
 No 1 code
 Yes 2

11 Which technologies do you currently use?
 Multiple codes possible

Electricity	1	codes <input type="text"/>
Internet	2	
Mobile Phone	3	
Irrigation	4	
Pesticides	5	
Fertilizer	6	
Improved sanitary facilities	7	
Other (specify below)	8	

12 Do you and / or members of your household interact with people outside your village?
 No (go to question 15) 1 code
 Yes 2

13 How often do you or your household communicate with people outside your village?
 Daily 1 code
 Weekly 2
 Monthly 3
 Less than monthly 4

14 With who do you communicate outside your village?

15 Are you or a member of your household a member of a formal group/organisation in your locality?
 No (go to question 18) 1 code
 Yes 2

16 To which kind of groups/organisations do you belong?

17 Do you consider yourself an active member of these groups?
 No 1 code
 Yes 2

18 Are you or your household familiar with, or a member of organizations supporting hygiene and sanitation?
 No 1 code
 Yes 2

19 What do you perceive to be the benefits of current water, sanitation and hygiene (WASH) projects for your livelihood and health?

20 What is the religion of you and your household?

- 1 Hinduism
- 2 Buddhism
- 3 Hinduism/Buddhism
- 4 Muslim
- 5 Christianity
- 6 Other (specify below)

code

21 To which Caste do you belong?

22 Do you feel committed (explain) to your Caste?

- 1 No
- 2 Yes

code

23 What is the ethnicity of you and your household?

24 Do you feel committed to your ethnicity?

- 1 No
- 2 Yes

code

110

25 Do you or/and a household member help others with their work in the high season, without getting paid?

- 1 No (go to question 27)
- 2 Yes

code

26 How many people do you or/and a household member help in the high season with their work?

people

27 With what kind of work do you and/or a household member help others with in the high season?

28 Do others help you with your work in the high season, without getting paid?

- 1 No (go to the next module)
- 2 Yes

code

29 How many people help you in the high season?

people

30 With what kind of work do others help you in the high season?

2: Physical Capital

1 Do you have your own water source?

- No
- Yes (go to question 3)

1

2

code

2 Where do you usually get your water for the household?

- 1 River
- 2 Lake
- 3 Public tap
- 4 Public well
- 5 Other (specify below)

code

3 What is your own water source?

- 1 Private river/lake
- 2 Well
- 3 Private tap
- 4 Other (specify below)

code

4 How many minutes do you walk to your water source?

Minutes

5 How do you know that the water that you use is safe?

- 1 It is a official tap
- 2 I disinfect the water by boiling
- 3 I disinfect the water with chemicals
- 4 Solar Disinfection
- 5 It looks safe
- 6 I never got sick of it
- 7 Other (specify below)

code

6 Do you and your household have your own latrine?

- No
- Yes

1

2

code

7 Is this latrine connected to the sewerage or treatment facility? (e.g. septic tank)

- No
- Yes

1

2

code

8 Where do you and your household defecate?
(multiple codes possible)

1 Own latrine code

2 Others latrine

3 Public latrine

4 School Latrine

Outside (go to question 10) (specify why)

Other (please specify)

9 What type of latrine is being used?

1 Pit toilet with slab or lid code

2 Ventilated Improved Pit (VIP) Latrin

3 Flush or pour - flush

4 Composting Toilet (eco-san)

5 Other (specify below)

10 How many people use your place of defecation? people

11 How far is your place of defecation to the nearest building? meter

12 Do you experience any objection of neighbours/landowners when defecating outside?

1 No code

2 Yes code

Asset 3: Natural capital

1 Do you or your household use the timber from the woods?
No (go to question 4) code

Yes code

2 Do you or your household earn money with the timber from the woods?

1 No code

2 Yes code

3 Where do or your household use the timber for?
Multiple codes possible

Fuel (fire) code

Building

Furniture

Selling

Other (specify below)

4 What do you and the household members use from the surrounding area?

Asset 4: Financial Capital

5 How much income does your household generate with these resources?
 NRS.

1 Can you indicate the financial gain made for your labour on an average per month?
 NRS.

2 Can you indicate the financial reward received for your labour on an average per month in the wet season?
 NRS.

3 Can you indicate the financial reward for your labour on an average per month in the dry season?
 NRS.

4 What kind of goods do you receive from labour?

5 Do you own land? (indicate in acres) Acres

6 Do you own any other properties?

No (go to the question 8) 1 code

Yes 2 code

7 What other properties do you own?

2nd House 1 code

Enterprise 2 code

Vehicle, (car, motorbike) 3 code

Other (specify below) 4 code

8 Do you own livestock?

No (go to question 10) 1 code

Yes 2 code

9 What kind of livestock and how many do you own?

Cows

Buffaloes

Chickens

Pigs

Sheep

Other:

Other:

10 What kind of equipment do you own?

Multiple codes possible

codes

- 1 Tractor
- 2 plough
- 3 Cart
- 4 Pump (irrigation)
- 5 None
- 6 Other (specify below)

11 Do you use irrigation?

- 1 No
- 2 Yes (go to question 13)

12 Why do you not use irrigation?

- 1 Do not know the techniques
- 2 It is not necessary
- 3 Do not have the money
- 4 Other (specify below)

13 Are you interested in using human faeces for irrigation / fertilization / fuel?

- 1 No
- 2 Yes

11

14 Why are you not interested in using human faeces for irrigation / fertilization / fuel?

15 Do you currently have savings?

- 1 No (go to question 17)
- 2 Yes

16 What is the amount you have saved?

17 How much do you save in the high season to compensate for the low season?

18 Are these savings generally enough to compensate the low season?

- 1 No
- 2 Yes

19 Do you currently have other savings (e.g. livestock) ?

- 1 No
- 2 Yes

20 Do you have friends or family that live somewhere else to work? (Indicate where they work)

21 Does any of these persons send your household remittances?

No (go to question 26)

Yes

1

2

code

22 Who is sending you remittances?

23 How much remittances do you receive on an average per month?

24 Can you indicate the maximum amount of remittances you receive per month?

25 Can you indicate the minimum amount of remittances you receive per month?

26 How much debt do you have at the moment? (total amount)

27 How much do you spend on average per month on the following items and activities?

- 1 Food
- 2 Water services
- 3 Schooling
- 4 Transportation
- 5 Electricity
- 6 Interest
- 7 Other:
- 8 Other:

Values on sanitation

1 Are you familiar with latrines?

- No
- Yes

1

2

code

2 Do you think that latrines are necessary?

- No
- Yes

1

2

code

3 Why do you think that?

4 Are you familiar with sewerage?

No
Yes

1
2

code

5 Do you think that sewerage is necessary?

No
Yes

1
2

code

6 Why do you think that sewerage is / is not necessary?

7 Are you aware that open defecation can be a harmful for people's health and the environment?

No
Yes

1
2

code

8 Do you think that if you would have a latrine that you will use it?

No
Yes

1
2

code

9 Why / why not?

113

10 When you have a latrine, will the complete household use it?

No
Yes (go to question 12)

1
2

code

11 What will be the reason that not everyone will use the latrine?

12 Can women in their menstruation use the same latrine as men?

No
Yes (go to question 14)

1
2

code

13 Why can women in their menstruation not use the same latrine as men?

14 When the whole family uses the same toilet, who will clean it?

15 How often do you wash your hands on a daily basis?

Less than once a day
Once a day
2 times
3 times
More than 3 times

1
2
3
4
5

code

16 Please specify when you wash your hands

17 Please specify how you wash your hands (e.g. type of soap or other method)

18 Are you willing to invest in sanitation and hygien services? (specify amount)

NRS.

Box 10 List of Approached stakeholders

The stakeholders that have been approached after consulting with Mr. Kamal Adhikari and Mr. Dinesh Raj Manandhar from UN-HABITAT are listed below. Furthermore, local contacts and advice of the research assistants have been used to contact local stakeholders in the research districts.

(Inter) National stakeholders located in Kathmandu:

- Mr. Oliver Jones, Program officer GSF, WSSCC
- Mr. Guna Raj Shrestha, Consultant in writing the Sanitation and Hygiene Masterplan
- Mr. Himalaya Pandit, Nepal Water for Health (NEWAH)
- Mr. Namaste Lal Shrestha, UNICEF
- Ms. Nirmala Mainali, Department of Education (DoE)
- Mr. Kamal Jaishi, Department of Local Infrastructure Development and Agricultural Roads (DoLIDAR)
- Mr. Thakur Pandit, Department of Water Supply and Sewerage, (DWSS)

Local stakeholders located in the Bardiya district:

- Mahmedpur VDC office & Sub-Health post
- Mainapokhar VDC office & Sub-Health post
- Sanoshree VDC office & Sub-Health post
- Dhodari VDC office & Sub-Health post
- Primary and secondary schools in the four VDCs
- District Educational Office (DEO)
- District Water Supply and Sanitation Office (DWSSO)
- Municipality office of Gularia
- Regional District Development Office

Local stakeholders located in the Bajura district:

- District Development Committee
- Municipality Office of Bajura
- Water Supply and Sewerage Office (WSSO)
- District Educational Office (DEO)
- Primary and secondary schools in Kolti VDC and Martadi VDC
- District Hospital Bajura & Sub-Health post Kolti
- Red-Cross & Finnish Development Aid

Figure 14 Bivariate analyses for the different levels of measurement

	Nominal	Ordinal	Interval/Ratio	Dichotomous
Nominal	Chi-square, Cramer's V	Chi-square, Cramer's V	Compare means (ANOVA), Eta	Chi-square, Cramer's V
Ordinal		Chi-square, Kendall's tau	Compare means (ANOVA), Eta	Chi-square, Cramer's V
Interval/Ratio			Pearson's <i>r</i>	Compare means (ANOVA), Eta
Dichotomous				Chi-square, Phi

Source: Course Methods and Techniques for Development Studies, Utrecht University, 2010

Box 11 Measurements of bivariate analysis

The Chi-square test is used to identify a statistical coherence between two categorical variables. There is coherence between the two variables if the test is significant ($\alpha \leq 0,05$). No strength of the coherence can be concluded from this test. To get an indication of the strength a measurement of association is used. Measurements of association coherent to the Chi-square test are Cramer's V, Phi and Kendall's tau. The coefficients of Cramer's V and Phi are interpretable in the following way: 1, perfect coherence; 0,75, strong coherence; 0,50, moderate strong coherence; 0,25, weak coherence; 0, no coherence. The coefficient Kendall's tau is situated between -1 and 1, but these values are only reached when the cross table is a perfect square. When Kendall's tau is 0, there is no coherence between the two variables.

The ANOVA (ANalysis Of VAriance) test is used to verify if the means of the interval/ratio variable are the same for the different groups of the categorical variable. When the ANOVA test is significant, there is a difference in the means of the groups of the categorical variable. There are different coefficients in the output of the ANOVA test. The Sum of Squares Between (SSB), this coefficient gives information concerning the variance between the different groups of the categorical variable, which is the result of the grouping. SSB gives information about the variance of the means of the groups in comparison to the total means. Secondly is the F-Test to tests if the difference between the means of the groups is significant. When the F is 1 the means of the different groups is the same. Eta is a measurement of association, and gives the strength of the coherence. The value of the coefficient of Eta and the strength of the coherence it represents is comparable with Cramer's V and Phi. 0 means no coherence and 1 perfect coherence. The Eta-square coefficient gives information regarding the explanatory variance of the variables.

Pearson's *r* is a coefficient that has a range between -1 and 1. Pearson's *r* indicates the correlation between two interval/ratio variables. Pearson's *r* gives information whether the correlation is positive or negative as well as the strength of the correlation. The value of the coefficient and the strength it represents is comparable with Cramer's V and Phi (Course Methods and Techniques for Development Studies, 2010).

Table 4 Descriptions of the variables of human capital

	Bardiya		Bajura	
Educational level head of the household	min	0	min	0
	max	13	max	14
	mean	4,06	mean	6,62
	st. dev.	4,373	st. dev.	5,767
T-test	<i>T</i>	-2,501		
	<i>df</i>	91,342		
	<i>sig</i>	0,014		
Highest educational level of the household	min	0	min	0
	max	13	max	15
	mean	8,14	mean	10,52
	st. dev.	3,136	st. dev.	3,57
T-test	<i>T</i>	-3,541		
	<i>df</i>	98		
	<i>sig</i>	0,001		
Eating at least three meals a day	no	39	no	27
	yes	11	yes	23
T-test	<i>T</i>	-2,592		
	<i>df</i>	94,823		
	<i>sig</i>	0,011		
History of waterborne diseases	yes	14	yes	6
	no	36	no	44
T-test	<i>T</i>	-2,021		
	<i>df</i>	89,281		
	<i>sig</i>	0,046		
Amount waterborne diseases last year	min	0	min	0
	max	6	max	100
	mean	0,52	mean	21,6
	st. dev.	1,297	st. dev.	20,273
T-test	<i>T</i>	-7,338		
	<i>df</i>	49,401		
	<i>sig</i>	0,000		

N=50

N=50

Table 5 Descriptions of the variables of physical capital

	Bardiya		Bajura	
Safe water used	no	11	no	38
	yes	39	yes	12
T-test	<i>T</i>	6,353		
	<i>df</i>	98		
	<i>sig</i>	0,000		
Amount of technologies used	min	0	min	0
	max	7	max	6
	mean	4,34	mean	2,62
	st. dev.	1,71	st. dev.	1,455
T-test	<i>T</i>	5,417		
	<i>df</i>	98		
	<i>sig</i>	0,000		
	N=50		N=50	

Table 6 Descriptions of the variables of social capital

	Bardiya		Bajura		
Regular contact outside the village	no	0	no	33	
	< monthly	2	< monthly	0	
	monthly	13	monthly	0	
	weekly	18	weekly	9	
	daily	17	daily	8	
T-test	<i>T</i>	6,764			
	<i>df</i>	73,87			
	<i>sig</i>	0,000			
<hr/>					
	Member of a formal group or organisation	no	11	no	39
		inactive	1	inactive	0
	active	38	active	11	
T-test	<i>T</i>	6,567			
	<i>df</i>	98			
	<i>sig</i>	0,000			
<hr/>					
	Common labour without payment	no	11	no	40
		getting help	4	getting help	1
	giving help	1	giving help	9	
	yes	34	yes	0	
T-test	<i>T</i>	8,382			
	<i>df</i>	80,824			
	<i>sig</i>	0,000			
	<i>N=50</i>		<i>N=50</i>		

Table 7 Descriptions of the variables of natural capital

	Bardiya		Bajura	
Amount of resources used	min	1	min	2
	max	4	max	5
	mean	2,22	mean	3,68
	st. dev.	1,093	st. dev.	0,653
T-test	<i>T</i>	-8,107		
	<i>df</i>	79,993		
	<i>sig</i>	0,000		
Amount of land owned (Biggha)	min	0	min	0
	max	15	max	5
	mean	1,7	mean	0,349
	st. dev.	2,583	st. dev.	0,773
T-test	<i>T</i>	3,543		
	<i>df</i>	57,711		
	<i>sig</i>	0,001		
Interested in using human faeces	no	17	no	37
	yes	33	yes	13
T-test	<i>T</i>	4,337		
	<i>df</i>	98		
	<i>sig</i>	0,000		
	<i>N=50</i>		<i>N=50</i>	

Table 8 Descriptions of the variables of financial

	Bardiya		Bajura	
Subincome	min	0	min	400
	max	32 000	max	150 000
	mean	7 525	mean	18 792
	st. dev.	8 210,174	st. dev.	27 136,55
T-test	<i>T</i>	-2,81		
	<i>df</i>	57,896		
	<i>sig</i>	0,007		
Amount of equipment owned	min	0	min	0
	max	4	max	3
	mean	1,3	mean	0,1
	st. dev.	1,182	st. dev.	0,463
T-test	<i>T</i>	6,683		
	<i>df</i>	63,677		
	<i>sig</i>	0,000		
Enough savings for low season	no	9	no	29
	yes	41	yes	21
T-test	<i>T</i>	4,477		
	<i>df</i>	92,434		
	<i>sig</i>	0,000		
Expenditures	min	300	min	1 300
	max	31 400	max	111 340
	mean	7 322,26	mean	13 132,5
	st. dev.	7 724,096	st. dev.	17 852,076
T-test	<i>T</i>	-2,112		
	<i>df</i>	66,725		
	<i>sig</i>	0,038		
	<i>N</i> =50		<i>N</i> =50	

Table 9 Bivariate analysis educational level of the head of the household

<i>Dependent variable</i>		<i>Bardiya</i>		<i>Bajura</i>	
Familiar with latrines		χ^2	18,479	sig	0,047
		<i>Cramers V</i>	0,608	sig	0,047
Reason why latrine necessary	χ^2	97,201	sig	0,026	
	<i>Cramers V</i>	0,493	sig	0,026	

Table 10 Bivariate analysis highest educational level of the household

<i>Dependent variable</i>		<i>Bardiya</i>		<i>Bajura</i>	
Awareness harmful open defecation	χ^2	50	sig	0,000	χ^2 29,63 sig 0,003
	<i>Cramers V</i>	1	sig	0,000	<i>Cramers V</i> 0,77 sig 0,003
When the hands are washed	χ^2	92,084	sig	0,005	
	<i>Cramers V</i>	0,607	sig	0,005	
How the hands are washed	χ^2	110,884	sig	0,002	χ^2 79,2 sig 0,049
	<i>Cramers V</i>	0,606	sig	0,002	<i>Cramers V</i> 0,563 sig 0,049

Table 11 Bivariate analysis of the history of waterborne diseases

<i>Dependent variable</i>	<i>Bardiya</i>	<i>Bajura</i>			
		<i>history of waterborne diseases</i>			
Awareness harmful open defecation		No	2	3	5
		Yes	4	41	45
			6	44	50
		$\chi^2=4,125$	<i>sig=0,042</i>		
		<i>Phi=0,287</i>	<i>sig=0,042</i>		
Invest in sanitation and hygiene services	<i>SSB</i>	12300000	<i>df</i>	1	
	<i>F</i>	4,069	<i>sig</i>	0,049	
	<i>eta</i>	0,28	<i>eta²</i>	0,078	

Table 12 Bivariate analysis of having an own latrine

<i>Dependent variable</i>	<i>Bardiya</i>	<i>Bajura</i>									
Familiar with sewerage			<i>having own latrine</i>								
			<i>No</i>	<i>Yes</i>							
	<i>No</i>		11	3							
	<i>Yes</i>		15	21							
			26	24							
			14	36	50						
		$\chi^2= 5,500$	$sig=0,019$								
		$\Phi=0,332$	$sig=0,019$								
When the hands are washed			<i>having own latrine</i>								
			<i>No</i>	<i>Yes</i>							
	1		13	3							
	2		0	0							
	3		5	4							
	4		3	15							
	5		0	1							
	6		5	1							
			26	24							
				16	0	9	18	1	6	50	
		$\chi^2= 17,977$	$sig=0,001$								
		$CV=0,600$	$sig=0,001$								
How the hands are washed			<i>having own latrine</i>								
			<i>No</i>	<i>Yes</i>							
	1		19	13							
	2		0	0							
	3		1	0							
	4		0	8							
	5		3	0							
	6		0	0							
	7		2	3							
	8		1	0							
		26	24								
			32	0	1	8	3	0	5	1	50
		$\chi^2= 14,268$	$sig=0,014$								
		$CV=0,534$	$sig=0,014$								
Invest in sanitation and hygiene services	<i>SSB</i>		13500000	<i>df</i>	1						
	<i>F</i>		4,505	<i>sig</i>	0,039						
	<i>eta</i>		0,293	<i>eta</i> ²	0,086						
Interested in using human faeces			<i>having own latrine</i>								
			<i>No</i>	<i>Yes</i>							
	<i>No</i>		23	14							
				37							

Yes	3	10	13
	26	24	50

$\chi^2=5,888$ sig=0,015

Phi=0,343 sig=0,015

Table 13 Bivariate analysis amount of technologies used

Dependent variable		Bardiya				Bajura			
Familiar with sewerage	SSB	3,265	df	7					
	F	4,138	sig	0,002					
	eta	0,639	eta ²	0,408					
Reason why sewerage necessary	SSB	43,319	df	7					
	F	2,608	sig	0,025					
	eta	0,55	eta ²	0,303					
Awareness defecation	harmful open	SSB	0,48	df	7	SSB	1,171	df	6
		F	5,76	sig	0,000	F	2,522	sig	0,035
		eta	0,7	eta ²	0,49	eta	0,51	eta ²	0,26
Invest in sanitation and hygiene services					Pearson				
					r	0,329			
						sig	0,020		

Table 14 Bivariate analysis being a member of a group or organization

Dependent variable		Bardiya		Bajura	
Reason why latrine necessary	χ^2	28,316	sig	0,029	
	Cramers V	0,532	sig	0,029	
When the hands are washed	χ^2	10,543	sig	0,032	
	Cramers V	0,459	sig	0,032	
How the hands are washed	χ^2	16,2	sig	0,006	
	Cramers V	0,569	sig	0,006	
Interested in using human faeces	χ^2	5,973	sig	0,015	
	Cramers V	0,345	sig	0,015	

Table 15 Bivariate analysis sub-income of the household

<i>Dependent variable</i>	<i>Bardiya</i>				<i>Bajura</i>				
How the hands are washed	<i>SSB</i>	71,82	<i>df</i>	28					
	<i>F</i>	2,394	<i>sig</i>	0,021					
	<i>eta</i>	0,873	<i>eta</i> ²	0,761					
Invest in sanitation and hygiene services					<i>Pearson r</i>	0,423			
					<i>sig</i>	0,002			

Table 16 Bivariate analysis amount of properties owned

<i>Dependent variable</i>	<i>Bardiya</i>				<i>Bajura</i>				
When the hands are washed	<i>SSB</i>	29,76	<i>df</i>	2					
	<i>F</i>	6,386	<i>sig</i>	0,004					
	<i>eta</i>	0,462	<i>eta</i> ²	0,214					
Invest in sanitation and hygiene services					<i>Pearson r</i>	0,499			
					<i>sig</i>	0,000			

Table 17 Bivariate analysis enough savings for the low season

<i>Dependent variable</i>	<i>Bardiya</i>				<i>Bajura</i>			
Familiar with sewerage	<i>enough savings</i>							
	<i>No</i>							
	<i>No</i>	4	6	10				
	<i>Yes</i>	5	35	40				
	9	41	50					
	$\chi^2=4,099$				<i>sig</i> =0,043			
	<i>Phi</i> =0,286				<i>sig</i> =0,043			
When the hands are washed	<i>enough savings</i>							
	<i>No</i>							
					<i>1</i>	13	3	16
					<i>2</i>	0	0	0

3	6	3	9
4	4	14	18
5	0	1	1
6	6	0	6
	29	21	50

$\chi^2= 19,012$ sig=0,001
CV=0,617 sig=0,001

How the hands are washed

enough savings

	No	Yes	
1	22	10	32
2	0	0	0
3	1	0	1
4	1	7	8
5	3	0	3
6	0	0	0
7	1	4	5
8	1	0	1
	29	21	50

$\chi^2= 14,901$ sig=0,011
CV=0,546 sig=0,011

Invest in sanitation and hygiene services	SSB	1,28E+09	df	1	SSB	1,3E+07	df	1
	F	4,676	sig	0,036	F	4,489	sig	0,039
	eta	0,298	eta ²	0,089	eta	0,292	eta ²	0,086

Interested in using human faeces

enough savings

	No	Yes	
No	26	11	37
Yes	3	10	13
	29	21	50

$\chi^2= 8,795$ sig=0,003
Phi=0,419 sig=0,003

Table 18 Logistic regression of being familiar with a latrine for the Bajura district

	model (1)		model (2)		model (3)		model (4)	
	logit	s.e.	wald	logit	s.e.	wald	logit	s.e.
<i>Human</i>								
Paid occupation/school (0=No, 1=Yes)	-64,760	32515,795	0,000	-25,860	87846,122	0,000	-14,646	62640,355
Educational level head of the household (1-15)	10,911	2400,503	0,000	4,744	4279,537	0,000	2,263	7521,590
Mean educational level of the household (1-15)	27,137	16949,946	0,000	2,794	14624,679	0,000	-0,987	28137,198
Highest educational level of the household (1-15)	-17,798	6704,964	0,000	-2,596	6689,844	0,000	-0,903	13713,171
Eating 3 meals a day (0=No, 1=Yes)	30,169	16775,137	0,000	43,702	70339,451	0,000	21,620	91444,970
Sick in the last month (0=No, 1=Yes)	-6,617	16474,591	0,000	21,614	61799,587	0,000	7,347	63456,061
History waterborne diseases (0=No, 1=Yes)	38,374	36701,882	0,000	55,696	28942,008	0,000	50,208	31825,423
Amount of waterborne diseases last year (0-100)	-1,314	1240,571	0,000	-0,931	1066,106	0,000	-0,991	1377,682
<i>Physical</i>								
Using safe water (0=No, 1=Yes)				0,229	33793,430	0,000	-23,976	73848,713
Having an own latrine (0=No, 1=Yes)				44,044	30860,409	0,000	26,846	68078,732
Amount of technologies used (0-7)				-25,357	16447,305	0,000	-14,920	27534,967
<i>Social</i>								
Contact outside village (0-4)							22,490	42774,434
Member of organisation (0-2)							-23,571	37325,114
Common labour without payment (0-2)							5,145	17559,176
<i>Natural</i>								
Amount of resources used (1-5)							-13,561	23396,995
Amount of land owned (Biggha) (0-15)							-3,904	15214,390
Interested in the use of human faeces (0=No, 1=Yes)							48,592	57126,090
<i>Financial</i>								
The subincome of the household (0-150 000)								
Amount of properties (0-3)								
Amount of livestock (0-73)								
Amount of equipment (0-4)								

Amount of savings	(0-200 000)																			
Enough savings for the low season	(0=No, 1=Yes)																			
Remittances received	(0-170 000)																			
Amount of debt	(0-4 000 000)																			
Total expenditures of the household (300-111 340)																				
<i>Control</i>																				
Sex	(0=Male, 1=Female)	-19,620	42651,716	0,000	-14,160	55538,153	0,000	-13,279	49615,985	0,000	-2,918	23147,638	0,000							
Age of the head of the household	(16-86)	1,775	1605,657	0,000	0,726	1210,914	0,000	0,028	2148,566	0,000	-0,583	980,810	0,000							
Amount of householdmembers	(1-15)	14,361	8146,718	0,000	5,175	9777,702	0,000	5,974	13595,543	0,000	6,180	7268,869	0,000							
Amount of children	(0-11)	1,776	19173,048	0,000	-0,095	14804,353	0,000	-3,026	12897,092	0,000	-3,966	5691,398	0,000							
Caste	(1=Brahmin, 2=Chhetri, 3=Baishya, 4=Sudra, 5=No)	4,121	16499,453	0,000	-1,915	16634,935	0,000	5,020	29445,214	0,000	2,880	9108,651	0,000							
Familiar with WASH projects	(0=No, 1=Yes)	0,188	40825,101	0,000	-15,929	63436,546	0,000	1,058	82550,011	0,000	3,931	21780,447	0,000							
Amount of householdmembers in civil society	(0-7)	-23,330	22301,809	0,000	-4,615	20479,636	0,000	-6,241	46314,500	0,000	3,848	17429,136	0,000							
Objection when defecating outside	(0=No, 1=Yes)	-59,034	27357,500	0,000	21,053	88169,031	0,000	5,323	101898,166	0,000	7,468	47552,017	0,000							
Intercept																				
		35,023	185055,963	0,000	-1,339	178298,482	0,000	3,895	134115,145	0,000	56,434	183283,484	0,000							

Table 19 Logistic regression of being familiar with sewerage for the Bardiya district

		model (1)		model (2)		model (3)	
		logit	s.e.	wald	logit	s.e.	wald
					logit	s.e.	wald
<i>Human</i>							
Paid occupation/school	(0=No, 1=Yes)	775,689	12551,023	0,004	51,655	26953,198	0,000
Educational level head of the household (1-15)		-65,088	1243,335	0,003	1,090	4195,617	0,000
Mean educational level of the household (1-15)		266,138	4237,708	0,004	-5,563	12120,267	0,000
Highest educational level of the household (1-15)		-11,352	1188,047	0,000	15,192	8807,545	0,000
Eating 3 meals a day	(0=No, 1=Yes)	-165,811	24361,420	0,000	-26,544	18762,046	0,000
Sick in the last month	(0=No, 1=Yes)	-886,080	15927,155	0,003	-	24415,257	0,000
History waterborne diseases	(0=No, 1=Yes)	1045,149	17876,713	0,003	101,013	17286,205	0,000
Amount of waterborne diseases last year (0-100)		-6,306	535,269	0,000	-4,828	12384,496	0,000
<i>Physical</i>							
Using safe water	(0=No, 1=Yes)				56,345	22583,458	0,000
Having an own latrine	(0=No, 1=Yes)				-12,722	25001,335	0,000
Amount of technologies used (0-7)					23,531	14034,375	0,000
<i>Social</i>							
Contact outside village	(0-4)				17,950	22319,740	0,000
Member of organisation	(0-2)				-16,408	10128,217	0,000
Common labour without payment (0-2)					9,453	11156,263	0,000
<i>Natural</i>							
Amount of resources used	(1-5)						
Amount of land owned (Biggha) (0-15)							
Interested in the use of human faeces (0=No, 1=Yes)							
<i>Financial</i>							
The subincome of the household (0-150 000)							
Amount of properties	(0-3)						
Amount of livestock	(0-73)						
Amount of equipment	(0-4)						

Amount of savings	(0-200 000)																				
Enough savings for the low season	(0=No, 1=Yes)																				
Remittances received	(0-170 000)																				
Amount of debt	(0-4 000 000)																				
Total expenditures of the household (300-111 340)																					
<i>Control</i>																					
Sex	(0=Male, 1=Female)	-784,862	13948,592	0,003	17,355	16435,767	0,000	34,684	20558,098	0,000											
Age of the head of the household	(16-86)	-4,848	83,504	0,003	-0,736	966,951	0,000	-1,769	863,810	0,000											
Amount of householdmembers	(1-15)	225,219	3771,383	0,004	0,324	7847,417	0,000	6,603	4128,640	0,000											
Amount of children	(0-11)	-191,432	3170,394	0,004	0,786	15024,300	0,000	3,973	6411,938	0,000											
Caste	(1=Brahmin, 2=Chhetri, 3=Baishya, 4=Sudra, 5=No)	334,274	5284,039	0,004	48,288	15127,978	0,000	22,274	14967,349	0,000											
Familiar with WASH projects	(0=No, 1=Yes)	-174,646	3477,253	0,003	-10,445	14191,614	0,000	39,198	16206,218	0,000											
Amount of householdmembers in civil society	(0-7)	-73,235	1847,239	0,002	-14,022	6710,854	0,000	-15,303	21234,160	0,000											
Objection when defecating outside	(0=No, 1=Yes)	-277,695	4598,878	0,004	-9,048	25177,902	0,000	-2,731	44383,881	0,000											
Intercept		-1619,721	25497,587	0,004	-	67211,955	0,000	-	88584,607	0,000											
					371,134			281,425													

Table 20 Logistic regression of being familiar with sewerage for the Bajura district

	model (1)		model (2)		model (3)		model (4)		model (5)						
	logit	s.e.	logit	s.e.	logit	s.e.	logit	s.e.	logit	s.e.					
<i>Human</i>															
Paid occupation/school (0=No, 1=Yes)	-0,009	2,147	0,000	-1,327	2,627	0,255	140,404	6567,774	0,000	-44,597	145612,359	0,000	48,000	77013,801	0,000
Educational level head of the household (1-15)	0,160	0,161	0,987	0,107	0,193	0,310	10,782	480,118	0,001	10,989	8398,505	0,000	5,075	3905,230	0,000
Mean educational level of the household (1-15)	0,299	0,404	0,548	0,302	0,498	0,369	-70,831	2266,052	0,001	9,299	80652,094	0,000	30,944	20503,912	0,000
Highest educational level of the household (1-15)	-0,267	0,281	0,901	-0,223	0,307	0,526	10,793	707,509	0,000	-27,251	28020,802	0,000	-16,399	12494,066	0,000
Eating 3 meals a day (0=No, 1=Yes)	-1,236	1,249	0,979	-2,372	1,663	2,034	-596,026	17311,839	0,001	-	55603,316	0,000	-	130060,646	0,000
Sick in the last month (0=No, 1=Yes)	0,083	1,008	0,007	1,411	1,359	1,079	-2,316	2888,829	0,000	131,865	103369,158	0,000	41,432	29759,848	0,000
History waterborne diseases (0=No, 1=Yes)	1,313	1,343	0,955	2,097	1,552	1,827	349,470	9476,281	0,001	67,831	194877,222	0,000	17,376	43295,202	0,000
Amount of waterborne diseases last year (0-100)	-0,043	0,033	1,713	-0,044	0,038	1,354	-1,775	70,420	0,001	-5,420	3841,456	0,000	-2,069	1032,521	0,000
<i>Physical</i>															
Using safe water (0=No, 1=Yes)				0,810	1,856	0,191	-202,944	6106,283	0,001	136,018	261638,118	0,000	-18,353	72237,404	0,000
Having an own latrine (0=No, 1=Yes)				3,152	1,699	3,442	398,813	10737,207	0,001	255,428	148771,391	0,000	61,949	38802,956	0,000
Amount of technologies used (0-7)				-0,372	0,652	0,325	-83,353	2279,449	0,001	-38,903	50938,965	0,000	8,023	17249,033	0,000
<i>Social</i>															
Contact outside village (0-4)				260,468	7341,495	0,001				49,945	74363,258	0,000	7,326	17764,872	0,000
Member of organisation (0-2)				192,432	7757,818	0,001				-67,520	61197,979	0,000	-25,871	27378,705	0,000
Common labour without payment (0-2)				3,166	6250,108	0,000				14,706	34433,820	0,000	-51,521	29222,011	0,000
<i>Natural</i>															
Amount of resources used (1-5)				-58,836	66784,904	0,000						0,000	-48,972	28411,742	0,000
Amount of land owned (Biggha) (0-15)				79,272	62356,784	0,000						0,000	11,600	33534,435	0,000
Interested in the use of human faeces (0=No, 1=Yes)				-18,945	72477,717	0,000						0,000	-3,092	75136,323	0,000
<i>Financial</i>															
The subincome of the household (0-150 000)													-0,006	2,607	0,000
Amount of properties (0-3)													-31,324	46008,086	0,000
Amount of livestock (0-73)													1,300	2899,882	0,000
Amount of equipment (0-4)													43,059	103222,502	0,000

Amount of savings (0-200 000)	0,003	3,382	0,000
Enough savings for the low season (0=No, 1=Yes)	185,265	118531,541	0,000
Remittances received (0-170 000)	-0,002	5,071	0,000
Amount of debt (0-4 000 000)	0,000	0,107	0,000
Total expenditures of the household (300-111 340)	0,002	1,361	0,000
<i>Control</i>			
Sex (0=Male, 1=Female)	1,320	1,539	0,736
Age of the head of the household (16-86)	0,017	0,037	0,229
Amount of householdmembers (1-15)	0,194	0,303	0,411
Amount of children (0-11)	-0,264	0,335	0,618
Caste (1=Brahmin, 2=Chhetri, 3=Baishya, 4=Sudra, 5=No)	0,308	0,473	0,424
Familiar with WASH projects (0=No, 1=Yes)	1,551	1,293	1,438
Amount of householdmembers in civil society (0-7)	0,857	0,578	2,201
Objection when defecating outside (0=No, 1=Yes)	4,968	2,792	3,165
Intercept	-8,396	5,746	2,135
		-5,030	5,870
		0,734	1873,710
		-	47776,607
		182,697	961679,266
		0,000	0,000
		34,226	277149,958
		0,000	0,000
		25,632	59652,447
		-0,321	1296,274
		19,884	12776,587
		-7,111	7449,258
		3,537	17990,986
		1,245	78523,933
		7,462	19489,295
		25,915	126011,698

Table 21 Logistic regression awareness open defecation in the Bardiya district

		<i>model (1)</i>		
		<i>logit</i>	<i>s.e.</i>	<i>Wald</i>
<i>Human</i>				
<i>Paid occupation/school</i>	<i>(0=No, 1=Yes)</i>	-2,183	43081,094	0,000
<i>Educational level head of the household (1-15)</i>		0,214	6261,560	0,000
<i>Mean educational level of the household (1-15)</i>		-0,810	13624,558	0,000
<i>Highest educational level of the household (1-15)</i>		1,653	8187,088	0,000
<i>Eating 3 meals a day</i>	<i>(0=No, 1=Yes)</i>	-7,910	22514,888	0,000
<i>Sick in the last month</i>	<i>(0=No, 1=Yes)</i>	-6,598	36535,520	0,000
<i>History waterborne diseases</i>	<i>(0=No, 1=Yes)</i>	1,605	26941,763	0,000
<i>Amount of waterborne diseases last year (0-100)</i>		2,049	9505,953	0,000
<i>Physical</i>				
<i>Using safe water</i>	<i>(0=No, 1=Yes)</i>			
<i>Having an own latrine</i>	<i>(0=No, 1=Yes)</i>			
<i>Amount of technologies used (0-7)</i>				
<i>Social</i>				
<i>Contact outside village</i>	<i>(0-4)</i>			
<i>Member of organisation</i>	<i>(0-2)</i>			
<i>Common labour without payment (0-2)</i>				
<i>Natural</i>				
<i>Amount of resources used</i>	<i>(1-5)</i>			
<i>Amount of land owned (Biggha) (0-15)</i>				
<i>Interested in the use of human faeces (0=No, 1=Yes)</i>				
<i>Financial</i>				
<i>The subincome of the household (0-150 000)</i>				
<i>Amount of properties</i>	<i>(0-3)</i>			
<i>Amount of livestock</i>	<i>(0-73)</i>			
<i>Amount of equipment</i>	<i>(0-4)</i>			
<i>Amount of savings</i>	<i>(0-200 000)</i>			
<i>Enough savings for the low season (0=No, 1=Yes)</i>				
<i>Remittances received</i>	<i>(0-170 000)</i>			
<i>Amount of debt</i>	<i>(0-4 000 000)</i>			
<i>Total expenditures of the household (300-111 340)</i>				
<i>Control</i>				
<i>Sex</i>	<i>(0=Male, 1=Female)</i>	-3,408	40687,698	0,000
<i>Age of the head of the household (16-86)</i>		-0,405	2087,250	0,000
<i>Amount of householdmembers (1-15)</i>		-0,845	4677,481	0,000
<i>Amount of children</i>	<i>(0-11)</i>	0,769	5913,126	0,000
<i>Caste (1=Brahmin, 2=Chhetri, 3=Baishya, 4=Sudra, 5=No)</i>		4,988	16299,613	0,000
<i>Familiar with WASH projects</i>	<i>(0=No, 1=Yes)</i>	4,995	29977,837	0,000
<i>Amount of householdmembers in civil society (0-7)</i>		-2,086	9334,770	0,000
<i>Objection when defecating outside (0=No, 1=Yes)</i>		-6,935	22134,463	0,000
<i>Intercept</i>		27,585	170406,860	0,000

Table 22 Linear regression amount to invest in the Bardiya district

	model (1)		model (2)		model (3)		model (4)		model (5)	
	b	s.e.	b	s.e.	b	s.e.	b	s.e.	b	s.e.
<i>Human</i>										
Paid occupation/school (0=No, 1=Yes)	11864,340	10849,976	14844,275	12132,032	18407,030	11350,609	21837,975	11921,746	25700,025*	10522,626
Educational level head of the household (1-15)	-1575,154	1038,474	-1730,080	1162,936	-1341,734	1109,260	-1533,771	1103,593	-1697,135	1055,120
Mean educational level of the household (1-15)	45,149	2823,708	1389,715	3357,127	-575,124	3243,647	-1643,861	3241,467	2090,486	3084,753
Highest educational level of the household (1-15)	1937,974	1823,928	1200,305	2129,246	1836,873	1997,096	2367,566	2037,614	374,001	1769,474
Eating 3 meals a day (0=No, 1=Yes)	14413,049	7264,626	13961,542	7538,625	17257,563*	7114,883	18652,790*	7097,911	22108,983*	8057,211
Sick in the last month (0=No, 1=Yes)	-9103,225	6648,262	-8932,647	7553,621	-7055,926	7695,645	-7081,471	7722,507	-2822,601	10283,308
History waterborne diseases (0=No, 1=Yes)	14719,534*	6546,217	15609,787*	7175,086	12763,147	7055,294	16798,699*	7890,562	13933,431	8733,677
Amount of waterborne diseases last year (0-100)	3305,776	2333,298	3483,079	2459,397	1756,875	2393,923	1783,311	2442,179	883,899	2368,091
<i>Physical</i>										
Using safe water (0=No, 1=Yes)			-1917,973	9246,759	2590,465	9270,517	5455,812	9820,718	11333,667	9514,244
Having an own latrine (0=No, 1=Yes)			1661,022	7107,116	-4103,450	7219,669	-7710,041	8012,831	-3542,453	7240,352
Amount of technologies used (0-7)			-2291,038	2550,268	-304,840	2574,887	66,680	2942,584	1226,659	3269,965
<i>Social</i>										
Contact outside village (0-4)					6960,912	3738,565	7826,043	4237,416	13571,243*	4272,596
Member of organisation (0-2)					166,668	4014,443	1352,775	4127,203	3930,485	4645,943
Common labour without payment (0-2)					-4629,569	2339,100	-3078,240	2482,285	-2932,702	2248,003
<i>Natural</i>										
Amount of resources used (1-5)							-709,439	2955,498	-899,556	3059,431
Amount of land owned (Biggha) (0-15)							2201,495	1338,922	3226,369*	1299,139
Interested in the use of human faeces (0=No, 1=Yes)							-8910,748	9055,457	-13150,327	8662,780
<i>Financial</i>										
The subincome of the household (0-150 000)									-0,632	0,527

Amount of properties (0-3)	20614,753*	8321,683
Amount of livestock (0-73)	516,258	573,677
Amount of equipment (0-4)	-4550,758	4714,481
Amount of savings (0-200 000)	-0,231	0,149
Enough savings for the low season (0=No, 1=Yes)	21778,120*	7506,610
Remittances received (0-170 000)	0,227	0,679
Amount of debt (0-4 000 000)	0,005	0,008
Total expenditures of the household (300-111 340)	-1,132	0,591
<i>Control</i>		
Sex (0=Male, 1=Female)	-10868,004	7888,495
Age of the head of the household (16-86)	-291,694	288,452
Amount of householdmembers (1-15)	616,413	1379,922
Amount of children (0-11)	259,403	1931,945
Caste (1=Brahmin, 2=Chhetri, 3=Baishya, 4=Sudra, 5=No)	-2406,885	2935,519
Familiar with WASH projects (0=No, 1=Yes)	5063,663	5764,564
Amount of householdmembers in civil society (0-7)	-1065,684	2759,943
Objection when defecating outside (0=No, 1=Yes)	2943,352	6897,593
Intercept	8273,365	19184,588
r ²	0,406	0,422
	-23292,827	0,614
	-77410,247	0,839

Table 23 Linear regression amount to invest in the Bajura district

	model (1)		model (2)		model (3)		model (4)		model (5)	
	b	s.e.	b	s.e.	b	s.e.	b	s.e.	b	s.e.
<i>Human</i>										
Paid occupation/school	1047,534	1128,342	1486,016	1213,523	2108,773	1283,961	1619,262	1357,220	527,467	1529,959
	81,749	87,244	29,954	92,841	22,289	92,804	-4,868	97,538	-38,349	115,617
Educational level head of the household (1-15)	629,803*	204,394	637,480*	210,134	591,009*	213,376	647,214*	246,549	537,087	366,516
	-199,113	144,697	-231,284	146,261	-200,042	148,452	-167,270	161,189	-104,371	200,980
Mean educational level of the household (1-15)	-504,265	679,410	-593,248	743,956	-863,768	825,272	#####	864,867	-	2035,299
Eating 3 meals a day	200,611	534,260	-149,719	639,087	-280,868	663,075	-193,991	798,207	2263,262	904,350
Sick in the last month	-1383,360	825,287	-1674,364	840,618	-1258,331	916,606	-1445,612	972,154	-	1041,197
History waterborne diseases	-36,642*	16,675	-29,638	17,047	-32,963	17,235	-27,590	19,269	1120,749	24,049
Amount of waterborne diseases last year (0-100)										
<i>Physical</i>										
Using safe water			-113,238	807,932	-43,151	896,363	469,251	1058,718	189,073	1198,734
			-553,554	794,793	-403,299	876,851	-403,698	957,427	-	955,466
Having an own latrine			496,377	270,159	419,441	273,739	485,139	297,869	1325,877	332,512
Amount of technologies used (0-7)									543,266	
<i>Social</i>										
Contact outside village			461,777	262,575	469,251	1058,718	469,251	1058,718	369,988	315,457
			-616,558	576,468	-403,698	957,427	-403,698	957,427	-250,705	674,940
Member of organisation			-78,634	375,437	485,139	297,869	485,139	297,869	-247,064	619,031
Common labour without payment (0-2)										
<i>Natural</i>										
Amount of resources used			-649,005	496,334	-532,523	515,053	-649,005	496,334	-532,523	515,053
Amount of land owned (Biggha) (0-15)			25,356	405,424	-159,874	516,596	25,356	405,424	-159,874	516,596
Interested in the use of human faeces (0=No, 1=Yes)			-359,534	1048,343	-900,090	1346,599	-359,534	1048,343	-900,090	1346,599
<i>Financial</i>										
The subincome of the household (0-150 000)									0,026	0,043

Amount of properties (0-3)	917,211	678,379
Amount of livestock (0-73)	-55,886	37,899
Amount of equipment (0-4)	-	1518,306
Amount of savings (0-200 000)	1383,110 0,044	0,043
Enough savings for the low season (0=No, 1=Yes)	1966,229	2216,788
Remittances received (0-170 000)	-0,097	0,082
Amount of debt (0-4 000 000)	-0,003	0,002
Total expenditures of the household (300-111 340)	0,004	0,039
<i>Control</i>		
Sex (0=Male, 1=Female)	1186,163	707,997
Age of the head of the household (16-86)	25,657	20,011
Amount of householdmembers (1-15)	227,904	141,131
Amount of children (0-11)	-188,040	142,880
Caste (1=Brahmin, 2=Chhetri, 3=Baishya, 4=Sudra, 5=No)	-87,849	235,281
Familiar with WASH projects (0=No, 1=Yes)	558,483	724,948
Amount of householdmembers in civil society (0-7)	-324,938	237,503
Objection when defecating outside (0=No, 1=Yes)	79,387	1163,827
Intercept	-2763,175	-3411,563
r ²	0,466	0,521
	-5166,527	-1257,169
	0,573	0,610
	3369,048	0,798
	1718,009	1775,695
	-614,818	1054,436
	964,054	30,111
	24,885	216,174
	148,936	213,638
	156,741	213,638
	316,759	350,010
	878,164	1084,289
	314,235	398,401
	1302,863	1775,695

Table 24 Logistic regression interested in the use of human faeces in the Bardiya district

	model (1)			model (2)			model (3)			model (4)		
	logit	s.e.	wald	logit	s.e.	wald	logit	s.e.	wald	logit	s.e.	wald
<i>Human</i>												
Paid occupation/school	27,609	16052,162	0,000	151,346	145812,344	0,000	47,637	80660,548	0,000	-11,552	69283,410	0,000
Educational level head of the household (1-15)	-0,252	0,288	0,763	4,218	4543,015	0,000	-2,072	12217,205	0,000	-1,192	2722,130	0,000
Mean educational level of the household (1-15)	0,597	0,832	0,514	-19,268	24502,250	0,000	-28,718	21000,152	0,000	-6,670	37031,891	0,000
Highest educational level of the household (1-15)	-1,611*	0,805	4,007	-21,823	12268,263	0,000	-5,048	10403,826	0,000	-8,661	12652,193	0,000
Eating 3 meals a day	1,553	2,139	0,527	11,009	81402,056	0,000	15,790	53396,311	0,000	-23,941	46448,950	0,000
Sick in the last month	1,806	2,061	0,768	32,505	115615,755	0,000	60,204	107980,900	0,000	64,042	25701,553	0,000
History waterborne diseases	-0,500	1,772	0,080	36,730	73027,522	0,000	-20,593	35567,974	0,000	-45,385	25985,192	0,000
Amount of waterborne diseases last year (0-100)	0,414	0,624	0,440	-12,182	7150,862	0,000	-0,352	15565,996	0,000	6,076	26358,114	0,000
<i>Physical</i>												
Using safe water				1,830	41664,400	0,000	-48,639	43316,951	0,000	-47,122	35836,644	0,000
Having an own latrine				#####	60889,317	0,000	-6,863	42129,973	0,000	-7,457	25340,737	0,000
Amount of technologies used (0-7)				37,977	8674,832	0,000	21,229	22554,638	0,000	27,110	10155,295	0,000
<i>Social</i>												
Contact outside village							5,492	33891,846	0,000	20,096	15177,405	0,000
Member of organisation							12,875	13360,748	0,000	5,079	19773,019	0,000
Common labour without payment (0-2)							14,980	8780,314	0,000	10,073	14481,006	0,000
<i>Natural</i>												
Amount of resources used										19,614	13297,003	0,000
Amount of land owned (Biggha) (0-15)										-4,763	5580,470	0,000
Interested in the use of human faeces (0=No, 1=Yes)										-	-	-
<i>Financial</i>												
The subincome of the household (0-150 000)												
Amount of properties												
Amount of livestock												
Amount of equipment												

Table 25 Logistic regression interested in the use of human faeces in the Bardiya district

	model (1)			model (2)			model (3)			model (4)		
	logit	s.e.	wald	logit	s.e.	wald	logit	s.e.	wald	logit	s.e.	wald
<i>Human</i>												
Paid occupation/school	26,570	13776,429	0,000	-43,940	68572,270	0,000	-34,765	38287,473	0,000	-17,635	47240,917	0,000
Educational level head of the household (1-15)	-14,961	569,045	0,001	0,764	3097,846	0,000	1,450	2261,460	0,000	0,600	3580,142	0,000
Mean educational level of the household (1-15)	93,448	4238,801	0,000	14,521	7829,714	0,000	9,825	4494,218	0,000	9,003	6485,621	0,000
Highest educational level of the household (1-15)	-18,721	7797,441	0,000	-7,790	2569,979	0,000	-6,723	3044,157	0,000	-6,620	4398,024	0,000
Eating 3 meals a day	516,016	26708,076	0,000	23,986	15404,439	0,000	-2,601	22986,262	0,000	4,857	40205,056	0,000
Sick in the last month	-35,652	6916,552	0,000	-49,942	19768,764	0,000	-48,302	14332,798	0,000	-40,370	22442,386	0,000
History waterborne diseases	-145,491	30305,166	0,000	-25,858	36976,210	0,000	-30,377	17509,344	0,000	-17,608	30163,780	0,000
Amount of waterborne diseases last year (0-100)	5,771	652,880	0,000	0,860	636,905	0,000	0,738	358,157	0,000	0,487	441,199	0,000
<i>Physical</i>												
Using safe water				74,151	38492,852	0,000	36,082	23530,347	0,000	27,360	24212,145	0,000
Having an own latrine				-11,526	34549,683	0,000	-14,076	28159,882	0,000	-15,539	33847,707	0,000
Amount of technologies used (0-7)				12,089	8895,350	0,000	12,750	19869,620	0,000	11,023	10958,950	0,000
<i>Social</i>												
Contact outside village							8,721	8143,356	0,000	10,384	7911,354	0,000
Member of organisation							0,353	15633,479	0,000	-5,061	20427,226	0,000
Common labour without payment (0-2)							-6,554	10907,791	0,000	6,444	17926,455	0,000
<i>Natural</i>												
Amount of resources used										14,701	22942,332	0,000
Amount of land owned (Biggha) (0-15)										-3,676	22959,809	0,000
Interested in the use of human faeces (0=No, 1=Yes)										-	-	-
<i>Financial</i>												
The subincome of the household (0-150 000)												
Amount of properties												
Amount of livestock												
Amount of equipment												

Amount of savings	(0-200 000)																				
Enough savings for the low season	(0=No, 1=Yes)																				
Remittances received	(0-170 000)																				
Amount of debt	(0-4 000 000)																				
Total expenditures of the household (300-111 340)																					
<i>Control</i>																					
Sex	(0=Male, 1=Female)		-65,171	10179,661	0,000	-67,527	55156,045	0,000	-52,715	37136,202	0,000	-32,375	46600,359	0,000							
Age of the head of the household	(16-86)		3,854	445,720	0,000	0,460	553,129	0,000	0,215	671,244	0,000	0,513	732,410	0,000							
Amount of household members	(1-15)		10,513	6418,064	0,000	2,432	2133,363	0,000	0,681	3111,658	0,000	1,778	4614,104	0,000							
Amount of children	(0-11)		-3,707	1874,420	0,000	0,247	7254,582	0,000	2,728	4060,339	0,000	1,997	4905,692	0,000							
Caste (1=Brahmin, 2=Chhetri, 3=Baishya, 4=Sudra, 5=No)			21,711	12125,730	0,000	9,533	4477,284	0,000	8,382	6118,143	0,000	10,525	9178,015	0,000							
Familiar with WASH projects	(0=No, 1=Yes)		547,041	22594,488	0,001	33,400	21079,200	0,000	18,582	21516,512	0,000	41,341	33468,175	0,000							
Amount of household members in civil society	(0-7)		-225,927	7075,992	0,001	-28,355	7759,067	0,000	-14,229	9824,890	0,000	-16,526	13313,566	0,000							
Objection when defecating outside	(0=No, 1=Yes)		-164,440	35574,535	0,000	-24,992	19472,305	0,000	9,278	30937,833	0,000	9,267	34460,064	0,000							
<i>Intercept</i>																					
			-775,152	47932,583	0,000	46,418	112418,631	0,000	30,446	99542,983	0,000	-	205990,077	0,000							
												100,155									