# The Federal Democratic Republic of Ethiopia
# Ministry of Water and Energy

# Community Led Accelerated WASH in Ethiopia (COWASH) Project

# Guideline on Social, Environmental and Climate Risk Screening and Management (SECRSM) for COWASH Project

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**Acronyms**

| | |
|---|---|
| BGR | Benishangul Gumuz Region |
| BoA | Bureau of Agriculture |
| CERS | Climate and Environmental Risk Screening |
| CMP | Community Managed Project |
| COWASH | Community Led Accelerated WASH |
| CR-WSP | Climate Resilient Water Safety Plan |
| CRGE | Climate-Resilient Green Economy |
| DA | Development Agent |
| DEM | Digital Elevation Method |
| DW | Deep Well |
| ED | Environmental Degradation |
| EIA | Environmental Impact Assessment |
| ESMP | Environmental and Social Management Plan |
| FHH | Female Headed Household |
| FTAT | Federal Technical Assistant Team |
| FTC | Farmer Training Center |
| HDW | Hand Dug Well |
| HEW | Health Extension Worker |
| KWT | Kebele WASH Team |
| MHH | Male Headed Household |
| MSEs | Micro and Small Enterprises |
| MoWE | Ministry of Water and Energy |
| NRM | Natural Resources Management |
| O&M | Operation and Maintenance |
| ODI | Oversea development Institute |
| PAPs | Project Affected Peoples |
| ROWs | Right of Ways |
| RPS | Rural Pipe System |
| RSU | Regional Support Unit |
| SECRs | Social, Environmental and Climate Risks |
| SECRSM | Social, Environmental and Climate Risk Screening and Management |
| SECRSMP | Social, Environmental and Climate Risk Screening and Management Plan |
| SNNPR | Southern Nation's Nationalities People Region |
| SW | Shallow Well |
| ToT | Training of Trainers |
| WASH | Water Supply, Sanitation and Hygiene |
| WASHCO | Water Supply, Sanitation and Hygiene Committee |
| WoA | Woreda office of Agriculture |
| WoE | Woreda office of Education |
| WoH | Woreda office Health |
| WoW | Woreda office of Water |
| WoWCA | Woreda office Women and Child Affairs |
| WPs | Water Points |
| WUA | Water User Association |
| WWT | Woreda WASH Team |

## Background

Extending and sustaining access to Water Supply, Sanitation and Hygiene WASH services remains vital for poverty reduction in Ethiopia and elsewhere in Sub-Saharan Africa (SSA). For a scheme to be sustainable, planning needs to consider the water resources that are available - whether there is enough water, of suitable quality, to meet demand across seasons and between good and bad years.

Climate change and weather variability and environmental degradation presents several challenges to drinking water supply and sanitation including increased frequency and duration of droughts, floods associated with intense precipitation events, degraded water quality, and subsequent changes in demand for services. Therefore, risks to water supply systems posed by flooding, land degradation and other environmental hazards also need to be addressed, especially as climate change accelerates. There are also social issues related to WASH service provision that have to be addressed carefully at its scale to ensure social sustainability of the WASH programming.

Understanding the above impacts of climate variability and change, environmental degradation, and social impacts, COWASH has developed and has been using Social, Environmental and Climate Risk Screening and Management (SECRSM) guideline since 2009EFY. The basic for the SECRSM is the *Climate and Environmental Risk Screening* (CERS) guidance note for rural water supply in Ethiopia. This is a research document prepared by Oversea Development Institute (ODI) with financial support from DFID Ethiopia and Government of Finland and technical support from COWASH.

The guidance note addresses the water resource sustainability and environmental risk elements highlighted above. The aim is to show how WASH organizations, working in partnership with communities, can integrate these concerns into projects and programs. The focus of this guidance note is on groundwater-based, community-managed wells and springs in rural areas. These sources are *potentially* most vulnerable to changes in recharge from rainfall, changes in demand from population growth, and environmental hazards such as droughts, landslides, floods, and wider catchment degradation.

However, since the CERS guidance note does not address how to analyst risks, prepare risk management and monitoring plan, woredas had difficult in implementing the CERS guidance note. Having understood this, COWASH has developed SECRSM tool that helps regions, zones, and woredas to implement CERS guidance note effectively. CERS guidance presents the basic science and facts how climate variability and change, and environmental degradation impact the sustainable provision of WASH service to the target beneficiaries. Whereas SECRSM guides regions, zones and woredas how to analyze risks, and prepare management and monitoring plan for implementation.

These two materials (documents) were prepared separate, and COWASH decided that the two documents combined into one guideline so that users can access and use together without difficulty. This document is presented in two parts. The first part contains the basic science in climate and environmental risks on WASH service provision, and the second part contains the SECRSM tool.

# Part one: Climate and Environmental Risk Guidance Note

## 1. Climate Change Risk on WASH

**Climate Change:** According to IPCC definition Climate Change refers to any change in the climate over time, whether due to natural variability or as a result of human activity.

Water is predicted to be the primary medium through which early climate change impacts will be felt by *people*, *ecosystems* and *economies*. Both observational records and climate projections provide strong evidence that freshwater resources are vulnerable, and have the potential to be strongly impacted by climate change and variability.

Many water supply services rely on groundwater, particularly in rural settings, so developing a better understanding of climate-groundwater links is vital. The development of groundwater for rural water supply offers significant advantages (compared to surface water sources) in terms of climate resilience because of the storage groundwater aquifers offer, specifically, large storage volume per unit of inflow makes groundwater less sensitive to annual and inter-annual rainfall variation and longer-term climate change.

Recharge to groundwater is highly dependent on prevailing climate as well as land cover and underlying geology. Climate and land cover largely determine rainfall and evapotranspiration, whereas the underlying soil and geology dictate whether a water surplus (precipitation minus evapotranspiration) can be transmitted and stored in the subsurface. Groundwater recharge will also be affected by soil degradation and vegetation changes, both of which may be affected by climate change and variability, and human activity.

When there is increased intensity of rainfall there is increased risk of flooding, leading to both infrastructure damage and contamination of surface and groundwater supplies. In rural areas for example, floods can damage or inundate springs, wells, rainwater harvesting systems and boreholes, though boreholes are typically less vulnerable. This can hamper both access to water and cause contamination and health risks. The pit latrines widely used in rural areas are also vulnerable to flooding and can cause serious environmental contamination which may be a cause for water source pollution and public health problem. See annex 8 of this guideline for further information on climate change on WASH facilities.

*Impact of environmental degradation on WASH sustainability*

Degraded micro-watershed has significant impact on the sustainability of the water supply. In the one hand, degraded micro-watershed has low recharging capacity of the ground water leading to decreased yield of the water point. In the other hand, degraded micro-watershed generate more flood that may damage the water supply infrastructures and cause contamination of the shallow groundwater resource. For the detail of this issue, refer section 5 of this guide note.

## 2. Understanding Water Availability – Tapping Existing Knowledge (Step 1)

This section introduces how to collect existing information on the factors that are likely to influence the availability and sustainability (and quality) of water for a village or group of households. This may include geology of the area, performance of existing water sources, yield of the different water sources. This is the first step in climate and environmental risk screening processes.

**Why this section is important?**

Having the knowledge and skill on how to collect *existing information* on the factors that are likely to influence the availability and sustainability of water can help the project team assess (a) what water supply options (e.g.: springs, wells, boreholes,) are likely to be feasible and cost-effective; and (b) the likely yield and sustainability of water sources. Taking the time to tap *community knowledge* can provide valuable information on which sources and locations are the most reliable. In this section, the following important topics are treated.

- *Understanding Local Geology*
- *Understanding Source Behavior*
- *Measuring the Yield of the Existing Sources*

### 2.1. Understanding Local Geology (Step 1.1)

Knowing 'where you are' in terms of underlying geology is a first step. This can be approached in two ways: (a) looking at secondary information (e.g. maps, well records) to assess groundwater potential and likely yields; and (b) follow-up observation in the project area – looking at rock outcrops and exposed soil/rock profiles – to understand *geology* and *groundwater* condition and *potential*.

The underlying geology of an area will determine whether water is *stored* in underground formations, how much is stored, and the ease with which water can flow to a water point. This determines the *yield* of an individual source. Geology can also influence water point choice, construction, cost and periodic rehabilitation requirements. Storage is the key factor affecting the resilience of water supplies. Aquifer storage transforms highly variable natural recharge from rainfall into more stable natural discharge regimes.

Storage is the key factor affecting the resilience of water supplies. Aquifer storage transforms highly variable natural recharge from rainfall into more stable natural discharge regimes. Storage is a function of rock porosity. The most porous geologies (e.g. alluvial sediments, highly weathered hard rocks) can store large volumes of water, so that when recharge from rainfall or discharge through pumping occurs, changes in water levels are relatively small. However, if the porosity of the rocks is small (e.g. with mudstones, shales, unweathered hard rocks), changes in recharge or discharge will have a bigger impact on water levels and a well or spring can dry up. Please refer Annex 2 for groundwater potential of major African hydro-geological environments.

**Hint – when to seek expert advice**

*If there is no previous experience of well digging or spring development in the project area, the advice of an experienced geologist should be sought to help decide (a) if well/spring development is feasible; and (b) well sitting, if well development is feasible.*

*If previous wells have failed or do not provide water throughout the year, or if there is evidence of hard rock at shallow depths, alternative options (e.g. a borehole) should be considered.*

*If a large number of wells in a particular area are planned, it may be cost effective to employ a geologist and possibly geophysical techniques in the sitting of wells, since the increased success rate may offset the extra cost of hiring a specialist.*

*Key questions*

When the geologist or team of experts are doing site investigation for the rural water supply project, the following key questions should be answered by the geologist or team experts.

- What is the geology of the area? What is their likely groundwater potential?
- How might geology vary within the village boundary?
- What information or evidence (if any) did previous project teams/drillers leave behind that might help?

*How to get answers for these questions?*

- Consult a *geological map* of the area. What sort of rocks are likely to be present?
- Visit places where rocks are exposed. River, valleys, cliffs and hills are often good locations
- Look at boulders in the village used for seats, grinding stones etc. Where did they come from? What kind of rocks?
- Visit wells that have been dug previously and examine soil-rock profiles
- Encourage people to investigate potential sites themselves e.g. by digging trial pits or using a shallow auger.

***Note that*** *practicing/site selecting experts should answer for the above-mentioned key questions, and also and use the approaches indicated to answer the questions.*

*Annex 1 provides an example of a field guidance sheet prepared for project staff in the highlands of Ethiopia. Similar sheets may already be available in country, or could be developed with the help of a geologist.*

**Hint - local observation**

***Field guidance sheets*** *can be used to help the non-expert identify rocks in the field and place their water scheme in a geological context.*

*A field guidance sheet can help the user identify rocks at hand specimen scale, at outcrop scale and regional land setting scale. Photographs and block diagrams can be included as an*

*aid. The photographs of hand specimens can be used to identify color, texture and mineral composition of rocks for comparison with field specimens.*
*At outcrop scale a set of features of rocks (e.g. color, layering, thickness) can be captured in index photographs. Such photographs can later be used by practitioners in the field as reference. The same applies to observation of regional geomorphologic setting. Geomorphology is an index to geology. It is much easier to describe geomorphology (such as dome forming, cliff forming, undulating, flat laying, plateau, valley forming, dissected, etc) than to name rocks.*

***What next?***

The information collected above (sub section 2.1 of this section) – from secondary sources and/or field observation – could be used to draw a rough map of the project area showing *geology*, *existing water points* and *springs (functional and non-functional)* and *likely groundwater potential*. Notes on the performance of existing water points (see table 2.1 below) could also be added. This will help focus discussion on which areas and source types are likely to provide the most reliable sources of water. *The trainer is expected also to assist trainees prepare their own map based on the information collected above on their locality. For illustrative example, see fig 2.1 and 2.2 below. The two figures shows how maps are used as a guide for water point sitting.*

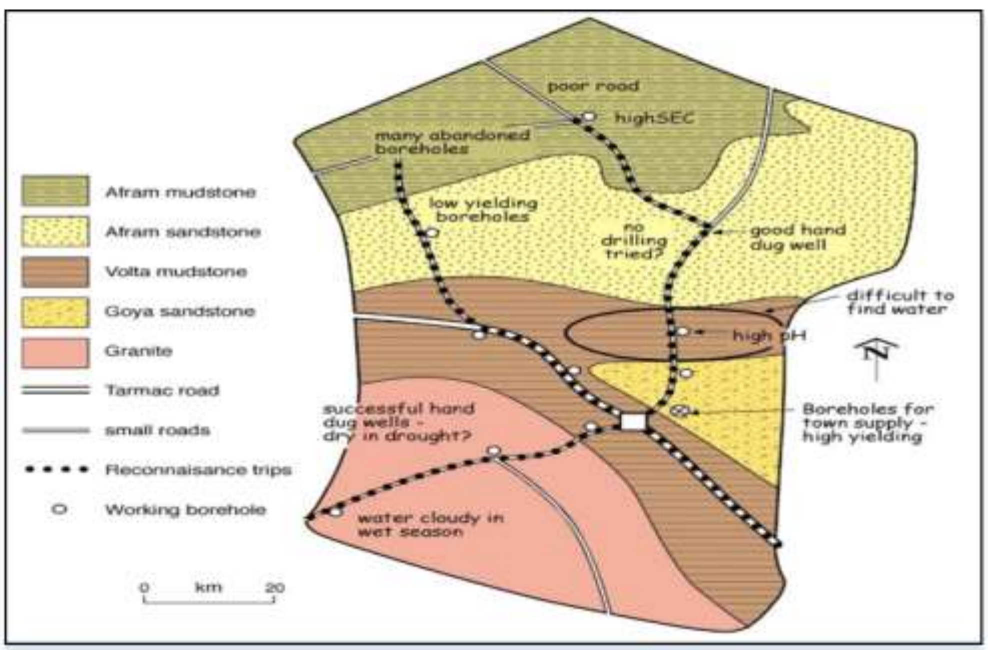



**Fig. 2.1. Figure showing how hydro-geological field notes can be plotted on a geological base map**

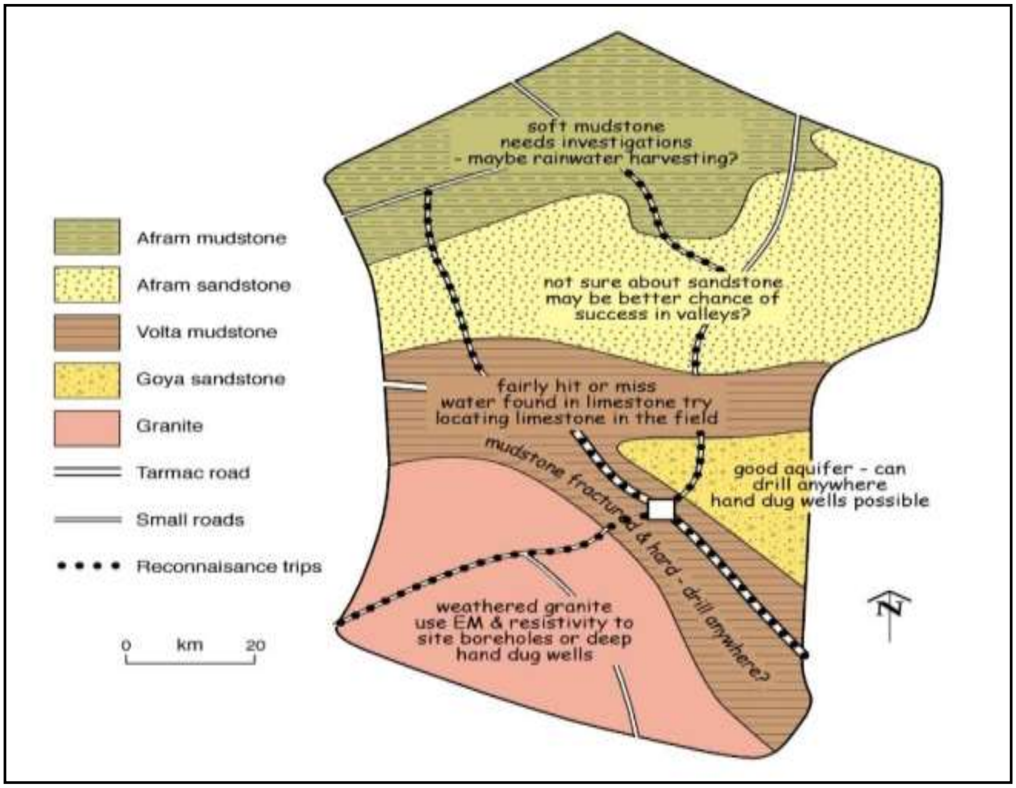



**Fig. 2.2. Preliminary groundwater development plan developed from information collected in the field**

## 2.2. Understanding Source Behavior (Step 1.2)

Asking communities about the performance of existing sources can provide useful information on which areas and sources provide the 'best' groundwater – the most reliable, as well as the highest quality and most accessible. This information can be used to inform the selection of new sites and sources, and/or the rehabilitation of existing ones. To understand this subsection, we can ask the following questions.

- What are the main sources of water available for use by the community, or by groups within it? What sources no longer provide water, and why?
- How does water availability vary between sources? Which are the most reliable, and why?
- How does availability from these sources change over time, e.g. across seasons and between good and bad years?
- What other factors affect the use and performance of sources, e.g. mechanical failures, environmental hazards (flooding, drought, contamination...) etc?

The following tables can be used to capture information on the type, number and functionality of existing schemes, and on the reasons for any water supply problems.

**Table 2.1. Source type, functionality and access**

| Source type | No. | No. fully functional schemes | No of schemes functional in part of year (indicate months when functional) | No of non-functional schemes | Access (Open to all? Restricted to some? Only available to owner?) |
|---|---|---|---|---|---|
| Hand-dug well | | | | | |
| Drilled well/borehole | | | | | |
| Protected Spring | | | | | |
| Unprotected Spring | | | | | |
| Roof catchment | | | | | |
| Open source (e.g. stream) | | | | | |
| Other (specify) | | | | | |

**Table 2.2. Source problems and their causes**

| Scheme name and type | Not enough water found on drilling/digging | Collapse of wall or sedimentation | Hand pump failure | Environmental hazard e.g. flood, erosion, gully | Water table decline; decline in spring yield | Other (specify) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**2.3. Measuring the Yield of Existing Sources (step 1.3)**

The equipment used and procedure employed to measure the yield of a water sources are mentioned below.

Equipment needed to measure yield: bucket & stop-watch

Measuring yield: How long does it take to fill a bucket of a known volume?

**Example**:

If a 10 liter bucket took 8, 10 and 6 seconds to fill at different time, then the average yield of the water point = (10/8 + 10/10 + 10/6)/3 = (1.25+1+1.67)/3 = 1.3l/sec.

Ideally, yield should be measured during the dry season to assess whether the well or spring is viable (i.e. can meet demand). The yield has to be measured three times and the average be taken as the yield of the source. For a well equipped with a pump, information from the community on how much water can be extracted in a 24-hour period may be more valuable than an instantaneous measure of pump yield.

**Table 2.3. Yield of existing water source**

| **Source** | **Yield (l/sec) dry season** | **Yield (l/sec) wet season** |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

If the yield (in l/sec) for different seasons is not available, ask the following questions: How do people using this source describe its yield over the year (e.g. fluctuation between dry and wet season, months when source is dry, etc.)? Use table 2.3 above to measure the yield during the dry and wet seasons. Is the source producing enough water throughout the year for all users? If not, where do people get water from during the time when the spring is dry?

*What next?*

The information collected above will provide an indication of:

- Groundwater availability, groundwater quality, groundwater development potential and the likely cost of developing it (e.g. whether spring sources can be developed, or whether shallow groundwater can be accessed via wells)
- The likely resilience of groundwater resources and sources (based on an understanding or groundwater storage, and the behaviour of existing sources)
- The kinds of sources that may be feasible to develop, or rehabilitate (e.g. do existing technology types and designs provide reliable water supplies? If not, can they be developed/rehabilitated to meet target requirements, or do new sources need to be developed?

**3: Ensuring Sustainability - Estimating Supply and Demand (Step 2)**

This is the second step of environmental assessment and climate risk screening. The section focuses on estimating how much groundwater is needed to meet current and projected needs of the community beneficiaries, and how big does the catchment (recharge) area of a well or spring need to provide this water. This section describes how to identify potential sites for a well or spring that can provide water, at the required yield, on a continuous basis for domestic needs

**Why this section is important?**

Working through this section will help WASH staffs identify potential sites for a well or spring that can provide water, at the required yield, on a continuous basis for domestic needs. Understanding of which sites are likely to provide reliable water can also help project staff identify which existing sites might fail to provide enough water during the dry season, or during drought. Marginal sites could be targeted for extra monitoring, or could be re-visited to develop additional ‘back-up’ sources.

**Comment – catchment areas for wells and springs**

*If a well is sited without an adequate catchment area, this increases the risk that it will be dry, or that dry season yields will be insufficient to meet community needs.*

*For a spring source, local knowledge is normally used to assess whether dry season flows are adequate, and so springs will not normally be developed if the catchment area cannot provide enough water.*

*In both cases (springs and wells), if catchment areas are marginal in relation to required yield and demand, then any reduction in recharge, whether from climate variability or catchment degradation, will put the source under strain.*

This section enables readers to:

- ✓ employ the basic rules of thumb for selecting site of a water point,
- ✓ estimate water demand based on the number of households a scheme needs to serve and their per capita water needs, and
- ✓ estimate the catchment size needed to meet the water demand.

To achieve the section objective, the following interrelated three steps (step 2.1 through step 2.3 of this section) should be implemented and followed.

**Section content**

- *Selecting sites - rules of thumbs*
- *Estimating water demand*
- *Estimating catchment size*

### 3.1. Selecting sites – rules of thumb (Step 2.1)

Before looking in detail at the catchment size needed to meet demand from a source, it is useful to look firstly at the ***topography of the project area – the relief or terrain of the land*** (*the first rule of thumb).*

***The importance of drainage***

Steep slopes pose a challenge for sitting water points. Water within an aquifer will naturally drain to the lower parts of a catchment. In the worst case, an aquifer may have adequate annual recharge, but be unable to sustain dry season yields as recharged water drains down slope (See fig 3.1, and table 3.1 below).

For this reason, both catchment area and topography (drainage) need to assess the vulnerability of a water point to change – from climate variation, environmental degradation or changes in population and demand.

**Table 3.1. Importance of topography to avoid rapid drainage**

| Slope | Level of vulnerability |
|---|---|
| > 20 m drop off within 150 m | Highly vulnerable |
| 10 - 20 m drop off within 150 m | Vulnerable |
| 5 - 10 m drop off within 150 m | Possibly vulnerable |
| < 5 m drop off within 150 m | Adequate |

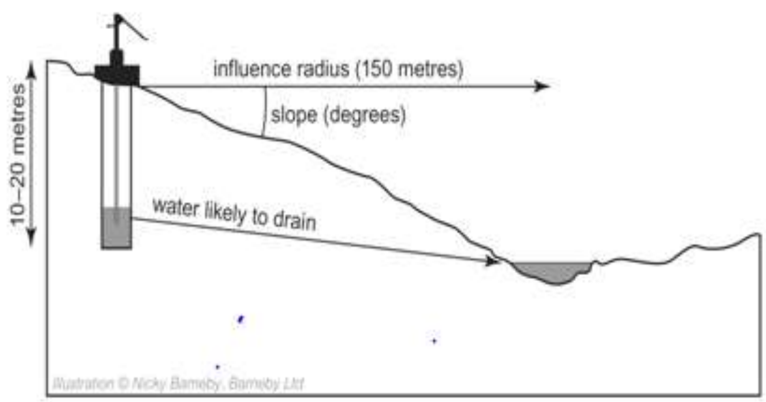



**Fig 3.1. Estimating the slope to avoid rapid drainage**

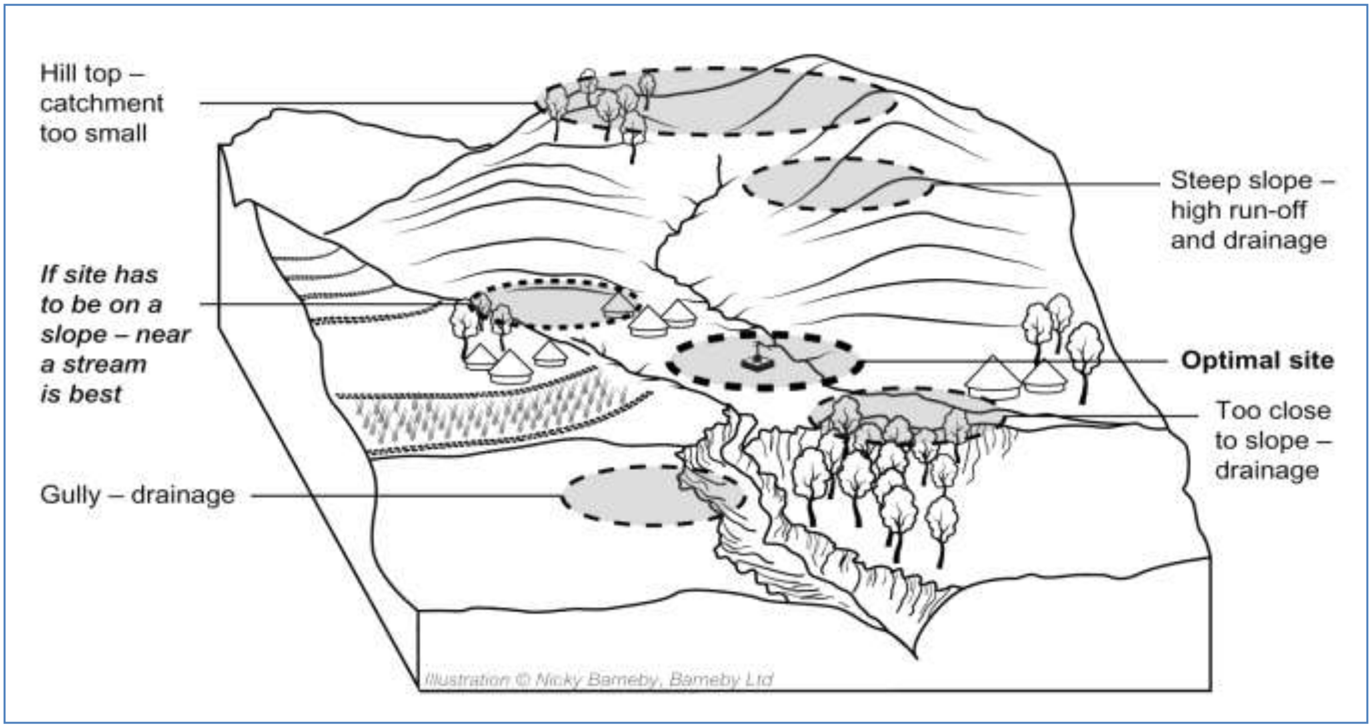



**Fig. 3.2. Scoping the best sites for a water point – the influence of drainage**

The ***second important rule of thumbs*** employed when selecting a water supply site is to consider ***contamination risk***. Table 3.2 below provides some similar 'rules of thumb' for minimizing the risk of water contamination.

**Table 3.2. Minimum Distances from Sources of Pollution**

| Feature | Minimum distance from water source |
|---|---|
| Community-level solid waste dump | 100m |
| Storage and dumps of petroleum or pesticides | 100m |
| Slaughterhouses / areas where animals are slaughtered | 50m |
| Toilets / latrines (open pit) | 30m |
| Household waste dump | 30m |
| Stables / kraals | 30m |
| Main road | 20m |
| River / lakes | 20m |
| Laundry place | 20m |
| Dwellings | 10m |

*Source*: Collins (2000)

**Comment – minimizing the risk of contamination**
*The recommended distances above will not always be possible to achieve. In densely populated areas, for example, latrines might be closer to water sources than the recommended 30 m. In such cases, it might be necessary to upgrade latrines from open pit latrines to either sealed pit latrines or latrines with septic tanks.*

### 3.2. Estimating demand (Step 2.2)

To assess the catchment area needed to provide sustainable supply, water demand can be estimated based on the number of households a scheme needs to serve and their per capita water needs.

For domestic uses, i.e. drinking, food preparation, personal and domestic hygiene, a figure of 25 litres per capita per day (lcd) is planned for rural Ethiopia during the GTP-II period. This figure may need to be increased if sources are used for 'productive' water uses such as small-scale irrigation, brewing, brick-making or livestock watering.

**Table 3.3. Estimating water needs**

| **Water use** (assuming 5 persons per household, demand = 25lcd for rural Ethiopia during the GTP-II period) | | | |
|---|---|---|---|
| **Households** | **People** | **Daily needs ($m^3$)** | **Annual needs($m^3$)** |
| 20 | 100 | 2.50 | 912.50 |
| 50 | 250 | 6.25 | 2,281.25 |
| 100 | 500 | 12.50 | 4,562.50 |
| 500 | 2500 | 62.50 | 22,812.50 |
| 1000 | 5000 | 125.00 | 45,625.00 |
| 2500 | 12500 | 312.50 | 114,062.50 |
| 5000 | 25000 | 625.00 | 228,125.00 |

**Estimating current water demand**
For 50 HHs, the total beneficiary will be 50*5 = 250;
The daily demand is 250 person*25lcd*1$m^3$/1000Litre = 6.25$m^3$
The annual demand/need = 6.25$m^3$*365days/year = 2,281.25$m^3$

**Hint – estimating future demand**
If to build resilience to carry out the assessment for the current number of households that will use the well/spring and how the situation might look like in 10 years' time/in 20 years' time. Also consider that a new well/water point might draw in additional people from the vicinity currently unserved.
<u>Example</u>
Current population: 250 people
Growth rate: 2.5%/year

Population in 10 years' time: 321

Formula used: $N_t = N_0 \times e^{(rt)}$ where:

$Nt$ = Future population after t years

$N_0$ = Current population

e = Euler's number = 2.718

r = growth rate (e.g. 0.025)

t = Number of years

$Nt = 250 * e^{(0.025*10)}$ = <u>321</u>

So, estimate the daily and annual demand of the estimated population using the same water point after 10 years assuming the same 25 lcd.

Daily neeeds = 321 person*25 liter pcd*1$m^3$/1000Litre = 8.03$m^3$

The annual demand/need = 8.03$m^3$*365days/year = 2,929.13$m^3$

### 3.3. Estimating the Required Catchment Size (wells) or yield (springs) - (Step 2.3)

The catchment area can be used to assess the <u>*vulnerability of a water supply system*</u> to change (be it climate variation, environmental degradation, or changes in population and demand). *If the catchment area is sufficiently large the water point should, other factors being equal, be resilient to climate variability, and have some capacity to satisfy increases in demand. At the other extreme, catchment areas that are marginal with respect to the required yield are likely to be more vulnerable to change.*

**Comment – a simplified water balance**

For a system to be sustainable in the long term there must be balance between recharge to the aquifer, and discharge from the aquifer, whether natural or from pumped abstractions. An assessment of the catchment water balance for an aquifer, quantifying the sources of recharge, natural discharges and artificial abstractions (water use and projected demand) is an important part of water resource management.

A detailed assessment of the water balance of an aquifer in a catchment is complicated, requiring long term monitoring of rainfall, groundwater recharge, natural discharges (e.g. to base flows in rivers) and human withdrawals. However, simple methods can give reasonable estimates of the recharge area (i.e. catchment) needed to meet demand from a source based on *rainfall data*, assumptions about *how much rainfall recharges groundwater resources*, and the *required yield of a source.*

As a rule of thumb, and based on evidence from numerous empirical studies across Africa, recharge can be assumed as 10% of rainfall in areas with over 750mm of rainfall per year. In areas with less rainfall, the linear relationship between rainfall and recharge breaks down and recharge is related more to extreme rainfall events than averages.

Not all recharged water can be withdrawn from a well, borehole or spring. This is because some of the '10% recharge' may infiltrate deeper aquifers, discharge laterally to rivers, or evaporate back into the atmosphere. ***Recoverable*/*Extractable recharge*** may therefore be only 10 - 30% of the '10%' recharge that infiltrate into the ground water aquifer.

*The required catchment area can be calculated as demand (in $m^3$) divided by recharge (in m), or 'recoverable recharge'.*

**Hint – calculating a catchment area for a source in flat terrain**

Demand = 50 HH x 5 members x 25 l/day x 365 = 2,281,250 litres per year; 2,281,250 l/year/1000 = **2,281 $m^3$/year**

Marginal area: Recharge = 10% of rainfall of 1300 mm = 130 mm; 130mm/1000 = **0.13 m/year**
Required catchment area: 2,281$m^3$/year/0.13 = **17,000 $m^2$**

Small area: Recharge = 3% of the rainfall of 1300mm= 390mm; 390mm/1000 = **0.039m/year**
Required catchment area: 2,281$m^3$/year/0.039 = 56,000 **$m^2$**

Adequate area: Recharge = 1% of rainfall of 1300 mm = 13 mm; 13 mm ÷ 1000 = **0.013 m/year**

Required catchment area: 2,281$m^3$/year/0.013 = **168,500 $m^2$**
N.B: If the catchment area is less than the marginal area, it is ***'Inadequate area'***.

The table below shows the required catchment area for a source under different demand and rainfall – recharge assumptions, plus the required spring yields needed to meet different demands.

*Here we assume that the catchment size is likely to be **marginal** if we base calculations on an optimistic rainfall-recharge-recoverable groundwater scenario: that recharge is 10% of rainfall, and all of this (10%) can be captured by a source. Small and adequate catchment area calculations are based on more cautious assumptions: that recoverable/extractable recharge is 3% and 1% of rainfall, respectively.*

**Table 3.4. Estimating the catchment size and spring yield needed to meet demand**

| Demand | | | | Approx catchment area for well | | | Spring yield |
|---|---|---|---|---|---|---|---|
| (assuming 5 persons per household, demand = 20 litres/capita per day) | | | | (assuming 1300mm average rainfall) | | | |
| Households | Persons | Daily needs | Annual needs | **Marginal**: Extractable recharge - 10% of rainfall | **Small**: Extractable recharge - 3% of rainfall | **Adequate**: Extractable recharge - 1% of rainfall | L / sec |
| | | m³ | m³ | m² | m² | m² | |
| 20 | 100 | 2.50 | 912.50 | 6,700 | 22,500 | 67,500 | 0.03 |
| 50 | 250 | 6.25 | 2,281.25 | 17,000 | 56,000 | 168,500 | 0.07 |
| 100 | 500 | 12.50 | 4,562.50 | 34,000 | 112,000 | 337,000 | 0.14 |
| 500 | 2500 | 62.50 | 22,812.50 | 168,500 | 561,500 | 1,685,000 | 0.69 |
| 1000 | 5000 | 125.00 | 45,625.00 | 337,000 | 1,123,000 | 3,369,000 | 1.39 |
| 2500 | 12500 | 312.50 | 114,062.50 | 842,500 | 2,808,000 | 8,423,000 | 3.47 |

**Hint – interpreting the catchment size table**

In Table 4.4 above, the 10% figure gives the required catchment area assuming that 10% of rainfall infiltrates, and that *all of this* (100% of the recharge) is available to a water point (an optimistic assumption – see comment above). Any *existing* water point that does not satisfy this criterion is highly vulnerable, and additional sources should be provided. A proposed site that fails to meet the criterion should only be developed if there are no better options, and as one of a number of water sources.

The 10% figure indicated in the table 4.3 above assume that 100% of the recharge (10% the rainfall - 1*0.1*100% = 10%) is available to the well, 3% figure assumes that 30% of the recharge (0.3*0.1*100% = 3%) is available to a well, and the 1% figure assumes that only 10% of recharge (0.1*0.1*100% = 1%) is available. These are the extractable recharges. The latter assumption is much more cautious, and should produce water points that are relatively secure.

Once the rough catchment area in $m^2$ is known, the area itself needs to 'walked out' on the ground. In flat terrain, the catchment can be viewed as a circle around the water source, and the radius of the circle used to 'walk out' distances from the source.

**Hint – calculating a catchment area for a source**

Demand (in $m^3$)/recharge (in $m^3$)

<u>Example – flat terrain</u>

<u>Demand</u> = 50 HH x 5 members x 25 l/day x 365 = 2,281,250 litres/1000 = 2,281.25 $m^3$/year

<u>Extractable Recharge</u> = 10% of rainfall of 1300 mm/year = 130 mm/1000 = 0.13 m/year

Required catchment area: 2,281.25 $m^3$/yr/0.13m/yr = 17,548.08 $m^2$

- ⇨ Approximate square catchment = 132.47 m * 132.47 m
- ⇨ Circular catchment = 74.74 m radius from source

Example – hilly terrain:

From the selected well site, estimate the length in meters of the catchment either estimated visually or paced out upstream to the ridge line. The width of the catchment is estimated by taking the distance between ridge lines, or alternatively half the distance between the valleys or stream lines on either side of the well under investigation. The catchment area is the two measurements multiplied – fig 3.3, and example below.

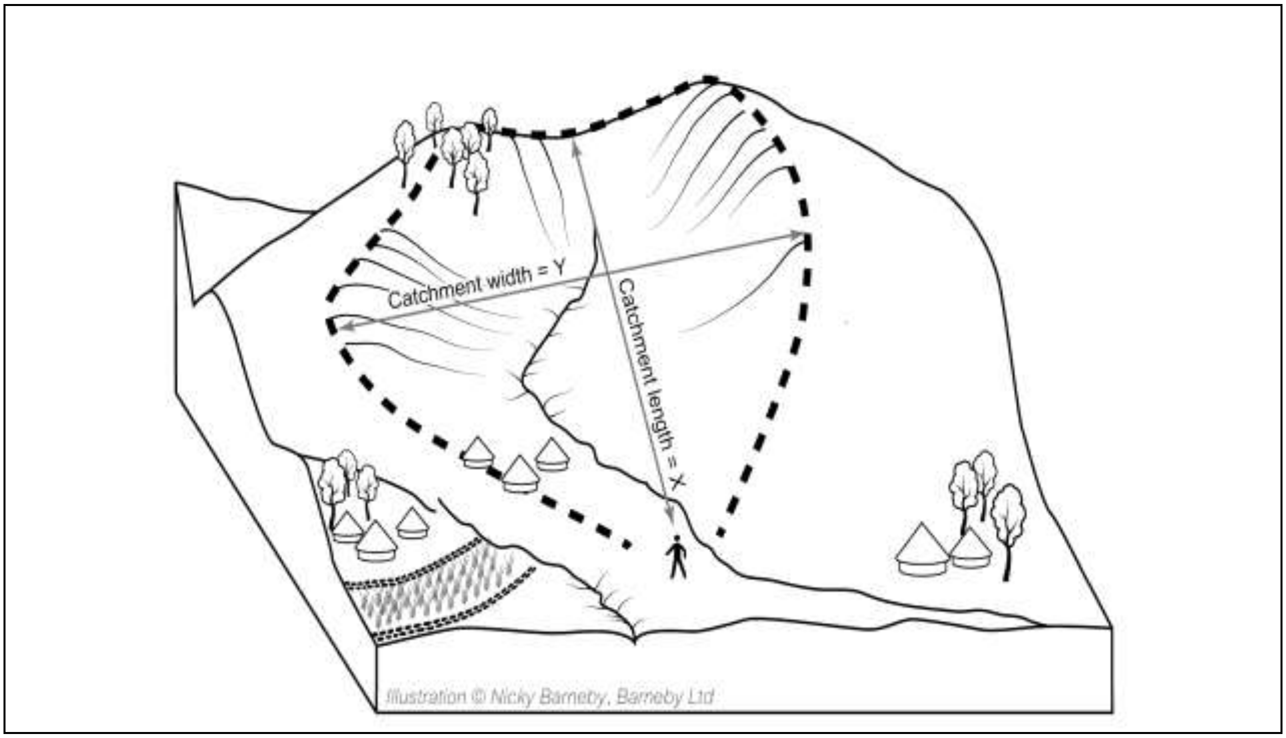



**Fig 3.3. Width and Length of a catchment to calculate the size of a catchment**

To decide whether it is worth developing a spring, a simple assessment is made comparing yield with demand, based on the population served, or likely to be served in future. As a precaution, the yield of the spring during the *driest period of the year* is used for the calculation.

**Hint - comparing spring yield to demand**

To assess whether the yield of a spring is sufficient to meet demand, calculate the total water demand of the population to be served annually and compare this to yield. The calculation of total yield should be done based on the lowest yield as measured during the dry season.

Demand: Number of Households*number of household members*25 l water per day per capita*365
Yield: spring yield (l/sec)*60sec/min*60min/hr*24hrs/day*365days/year

**Example**:
Demand: 50 households*5 members*25 l per day*365 days = 2,281,250 l/year (2,281 $m^3$/year)
Yield: Yield during driest period: 1.25 l/sec*60 sec*60 min* 24 hours*365 days = 39,420,000 l/year (39,420 $m^3$ / year). The yield of the spring is safe in terms of providing what is demanded.

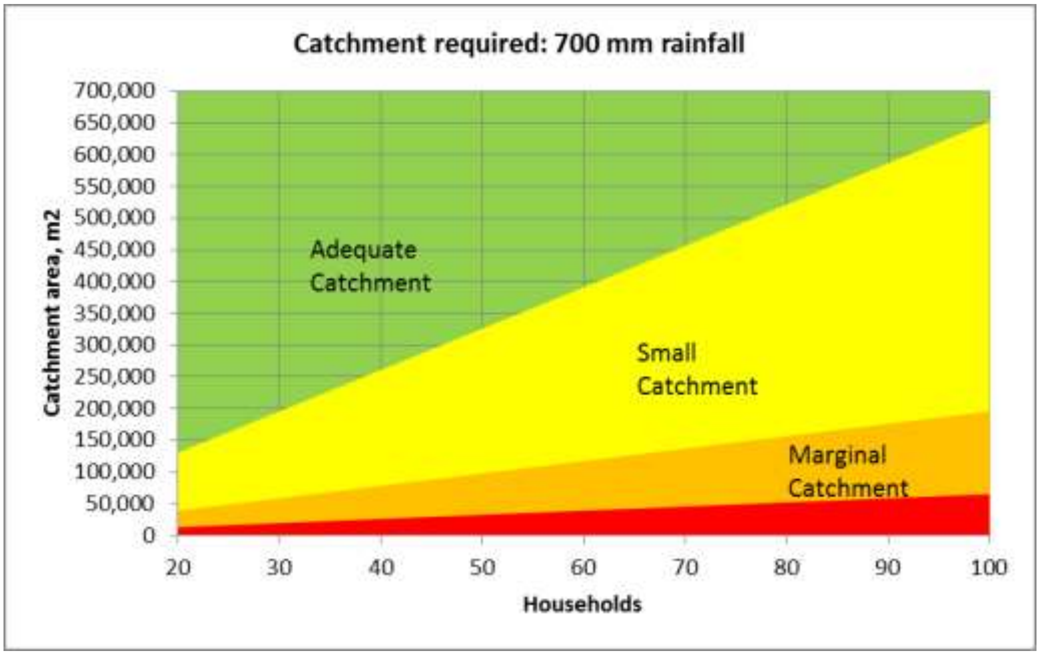
The calculations above may appear daunting for some users. For this reason, they have been embedded in the 'look up' graphs below (Figure 3.4). These allow users to find the catchment areas needed to meet demand for different numbers of households under different rainfall-recharge scenarios. Alternatively, they can be used to see if an existing well is likely to have a marginal, small or adequate catchment area.

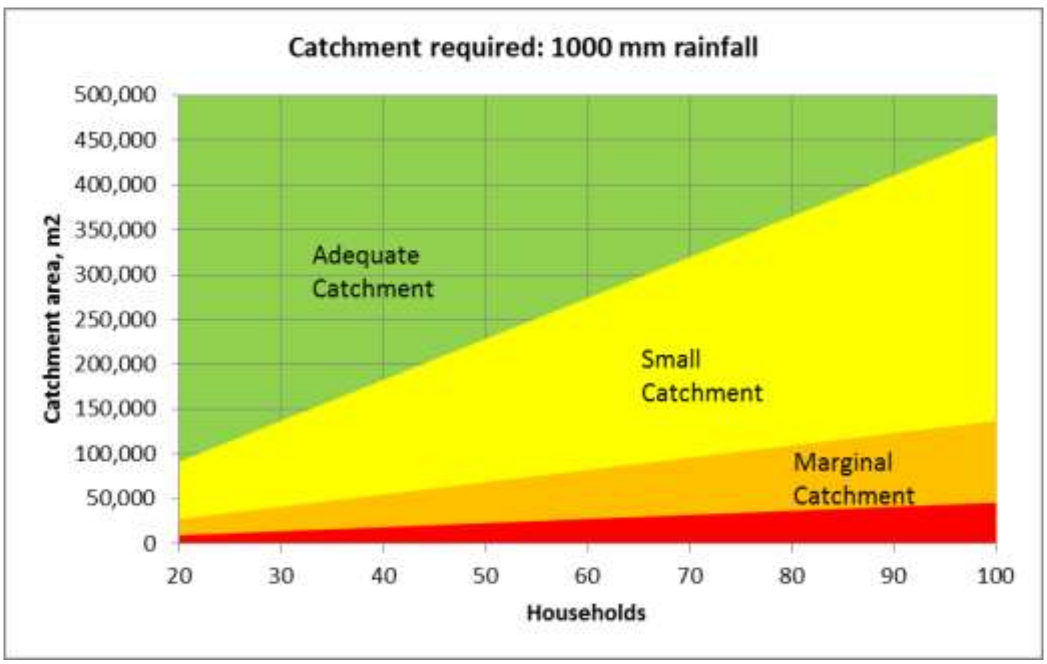
For an existing well, select the graph closest to the mean annual rainfall for the community. *Using measured or estimated catchment areas, plot the area on the vertical axis against the number of households served by the well*. If the site plots in the red zone at the bottom of the graph, the well has an inadequate catchment for current demands. In the orange, marginal catchment zone, wells are likely to be very vulnerable to seasonal variation in rainfall. In the yellow area catchments are still small and vulnerable to environmental change. If a well is in the green zone this suggests it has an adequate catchment area, although its performance will depend on local aquifer properties and topography.

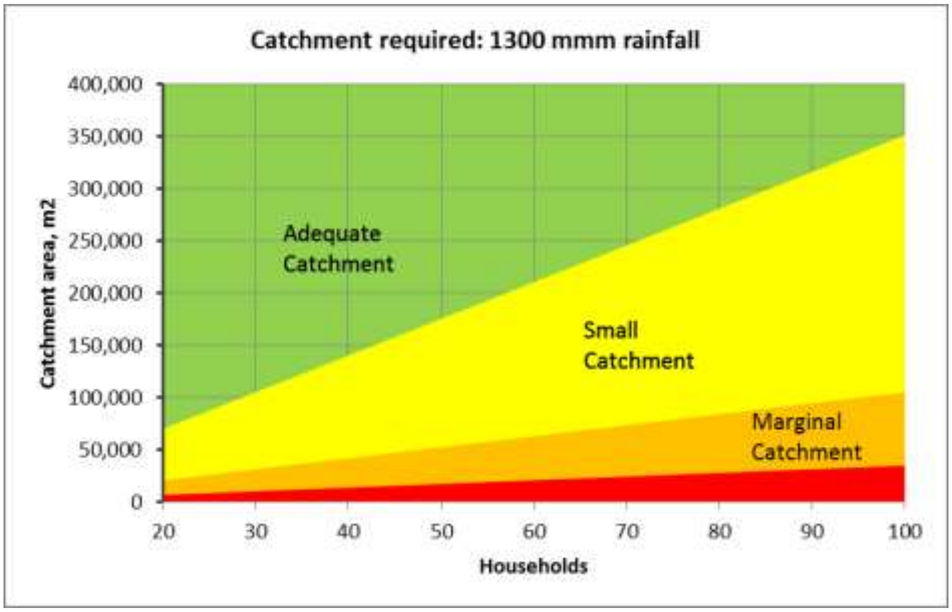
For a proposed well, the graph should be read upwards from the number of households to find areas associated with adequate, small and marginal catchments. Other factors being equal a site with an adequate catchment will be preferred. If the communities' preferred sites have a marginal catchment, the risk of seasonal well failure should be explained before commencement of excavation.

Although primarily designed to assess shallow dug well catchments, the same graphs can be used to assess the security of spring sources. If dry season flow measurements suggest a spring is marginally able to support the desired number of households, a catchment area calculation can suggest whether the spring is likely to be vulnerable to low flow in particularly dry years.

**Fig 3.4. Catchment sizing for different rainfall, recharge and demand scenarios**






**Hint – sustainability risks for existing water points**

The approach outlined above can also be used to assess whether existing water points are vulnerable in terms of their topography-drainage and catchment characteristics.

Project staff may already have an informed opinion about which sources *might* be vulnerable. They can apply the tools above to check/confirm and, if necessary, consider developing additional water sources that would help spread risk.

**4: Protecting Sites and Sources – Hazard Assessment and Mitigation (Step 3)**

This section focuses on how to assess the direct environmental hazards to the water point, and the indirect environmental degradation processes in the catchment. The importance of doing this is also discussed in this section. The section also describes how to identify measures to address direct and indirect hazards via a catchment protection plan

**Why the section is important?**

Besides the impacts of well construction and spring protection on the environment (e.g. cutting trees, temporary water pollution, improper disposal of dug out sub-soil), a well-protected and managed environment is crucial for the sustainability and functioning of water points. This is because:

- ➢ Direct environmental hazards, such as expanding gullies, floods and landslides can damage water points directly.
- ➢ There are indirect environmental aspects to consider as well, relating to degradation processes within the broader catchment that can affect the sustainability of a water system.

Ultimately, the sustainability and resilience of a water system is influenced by how well a catchment of a water source can absorb rainfall through infiltration - water that will eventually feed into the (shallow) groundwater on which the water system depends.

This section enables readers to:

- o Assess direct environmental and climate change hazards to the water point,
- o Assess indirect environmental degradation processes in the catchment, and
- o Identify measures to address direct and indirect hazards via a catchment protection plan.

**Contents of the Section**

- ✓ *Assessing Direct Hazards Near a Water Point*
- ✓ *Assessing Indirect Environmental Hazards in the Wider Catchment*
- ✓ *Developing a Catchment Protection Plan*

Once a site has been identified (section 2 and 3 of this guideline), direct and indirect environmental and climate change hazards should be assessed. If there are direct hazards in the vicinity of the proposed water point (section 4.1), these need to be addressed. If that is not possible – because of the size of the hazard or the lack of financial or technical capacity – alternative sites may need to be considered.

Figure 4.1 below summarizes the decision-making process in relation to site selection. Once a final site has been identified, indirect environmental and climate change hazards in the wider catchment of the water source should be identified (section 4.2) and addressed (section 4.3).

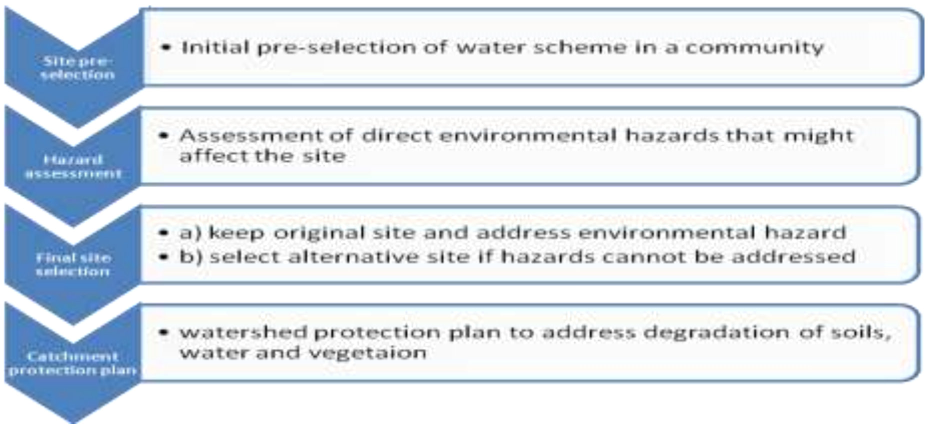


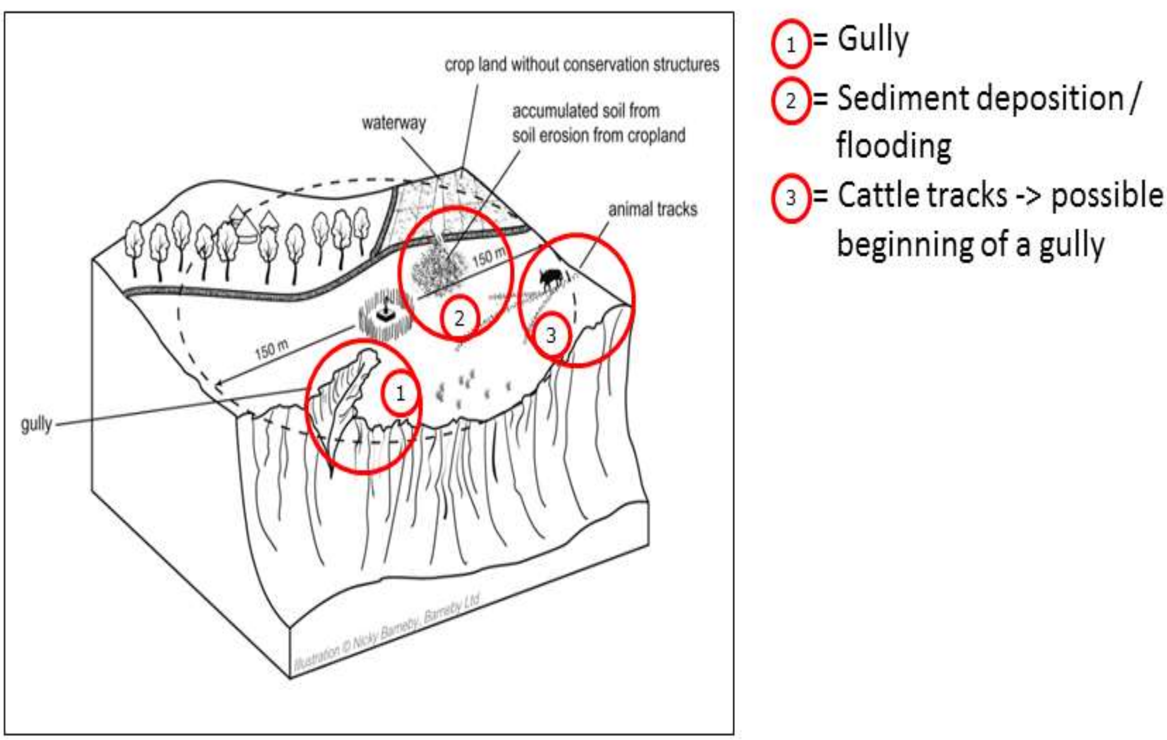

**Fig. 4.1. Integrating environmental risk assessment in water point sitting**

### 4.1 Assessing direct hazards near a water point (Step 3.1)

The first step in assessing the environmental hazards and identification of mitigation measure is assessing direct hazards near a water point. A good place to start is with a map of the vicinity of the water point (approx. 150 m radius), whether planned or an existing source – showing the main hazards and degradation features. These may include *gullies*, *areas affected by flooding*, *landslips* or *areas prone to landslides*. *Pollution risks* can also be included, such as *latrines* and *waste dumps* (see Table 4.2).

Degradation features that might not pose an immediate threat to the water point but left untreated might be a hazard in future (e.g. rills, cattle tracks developing into a gully, etc.) can also be included.

**Fig 4.2. Environmental hazards that might affect a water source**



In order to decide whether to go ahead or not with the final site selection, direct environmental threats should be assessed for their severity. If they are so severe that they cannot be resolved within reasonable limits, it might be better to identify alternative sites.

***i. Gullies***

The existence of gullies in an area do have a multitude of impacts in the rural water supply system including, but not limited to:

- Local lowering of the water table (gullies suck water from springs, dug-wells and hand pumps, because by lying below they have an effect of negative pressure)
- Damage to infrastructures such water supply schemes

Figure 4.3 shows active and deep gully that may pose serious damage to the water point both infrastructure damage and lowering of water table.

**Fig. 4.3. Picture showing active and deep gully**

Table 4.1 below provide a simple 'traffic light' system to identify whether gullies might pose a major threat to water points.

**Table 4.1. Assessing the risk posed by gullies to water points**

| | | Dimension (length x width x depth = $m^3$) | | |
|---|---|---|---|---|
| | | 0-10$m^3$ | 11-25$m^3$ | >25$m^3$ |
| Number of gullies in vicinity of water point | 1 | | (C) | (B) |
| | 2-3 | (C) | (B) | (A) |
| | 4 or more | (B) | (A) | |

Low

High

Example: length (25m) x width (2m) x depth (0.5m) = 25 $m^3$

**Hint – what to do about gullies**

If there is a gully or gullies in the vicinity of a water point, they need to be treated – i.e. if in a yellow-shaded cell.

Consider identifying alternative locations for a water point if you identify several and or significant gullies – i.e. in a red-shaded cell.

In both cases, consult natural resource management experts or relevant guidelines for how to do this.

If a gully of a given dimension and/or frequency is located <u>down slope</u> of the water point it is often *posing a more serious* threat to the water point than if the gully is located elsewhere. In that case, consider relocating the water point and initiate gully rehabilitation measures.

- If a gully of the dimension/frequency labelled 'A' in Table 4.1 above is in the down slope area of the water point, classify as highest ('severe') threat level.
- If a gully of the dimension/frequency labelled 'B' in Table 4.1 is in the down slope area of the water point, classify as second highest ('high') threat level.
- If a gully of the dimension/frequency labelled 'C' in Table 4.1 is in the down slope area of the water point, classify as third highest ('moderate') threat level.

***ii. Area affected by flooding***

*Regular flooding*

If the area where a water point is to be constructed and its immediate environment (e.g. within a radius around the site of the water point of 150 m) is regularly flooded (e.g. during the rainy season) then consider the following actions:

- Relocate the site of the water point away from flood prone areas
- Raise the well head and seal the well to prevent any polluted flood water from entering the well
- Manage water flows through cut-off drains, artificial water ways and levees
- Ensure areas from where floodwater originates is open-defecation free and free from other pollutants
- If water point is not accessible during periods of flooding, ensure alternative protected water sources are available

*Periodic flooding*

- Raise the well head and seal the well to prevent polluted water from entering the well.

**Hint – thinking about extremes**

Also consider flooding that might happen less frequently (e.g. every 5 years, every 10 years) during very heavy rainfall events that might affect a large area and/or create a lot of damage. Consider measures that might reduce the impacts of such extreme events.

### *iii. Landslides/slips*

Landslips may occur because of a variety of natural (geological and morphological structures, such as weak or weathered material, differences in permeability of material) and human causes (deforestation, cultivation of steep slopes, road construction). Often they are found on steep hillsides where vegetation is disturbed, for example along a foot path or where rills have developed as a result of uncontrolled runoff. Landslips can also develop around springs because springs often appear at the intersection of different rock formations Landslips need to be treated otherwise there is a danger that they expand and result in more severe damage to a water point.

**Fig 4.4. Landslips/landslides**

## 4.2. Assessing Indirect Environmental Hazards in the Wider Catchment (step 3.2)

Once a potential site for a water point has been identified and deemed safe, i.e. *not threatened by environmental and climate change hazards*, potential indirect environmental hazards should be identified in the wider catchment of the water point. This is important as natural resource degradation in the wider catchment can affect the risk of flooding, and gully that might draw down local water tables.

Changes in land use and land degradation can also have longer term impacts on groundwater conditions by affecting local water balances. Making predictions is difficult, however, because recharge to groundwater is strongly influenced by prevailing climate, as well as land cover and underlying geology (see below).

**Comment – catchment protection and groundwater recharge**

*Recharge to groundwater is highly dependent on prevailing climate, as well as land cover and underlying geology. Climate and land cover largely determine rainfall and evapotranspiration, whereas the underlying soil and geology dictate whether a water surplus (precipitation minus evapotranspiration) can be transmitted and stored in the sub-surface.*

*Land use change can have a very significant impact on groundwater recharge, and outcomes can be counterintuitive. For example, it is often assumed that planting trees and 're-vegetating' catchments will increase groundwater recharge and availability. In practice the reverse can be true, because trees and perennial native vegetation can draw up and evaporate a lot more water than grass or crop land. So a decrease in runoff and greater soil moisture retention can still translate into less groundwater recharge*

As a first step, a base map of the catchment of the water point should be drawn, main land cover units mapped and major degradation features identified. An example is provided in fig. 4.5 below, and in three-dimensional form in Figure 4.6 below.

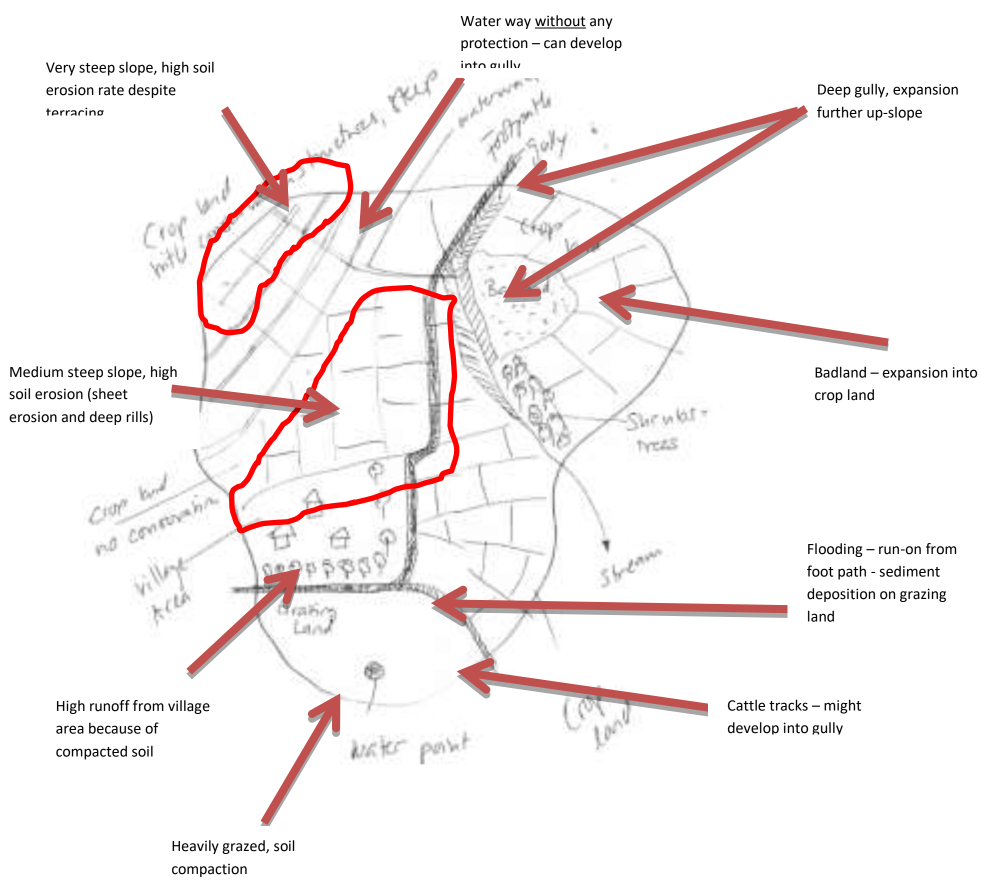



**Fig 4.5. Topographic base map showing areas of environmnetal degradation and initial identification of causes**

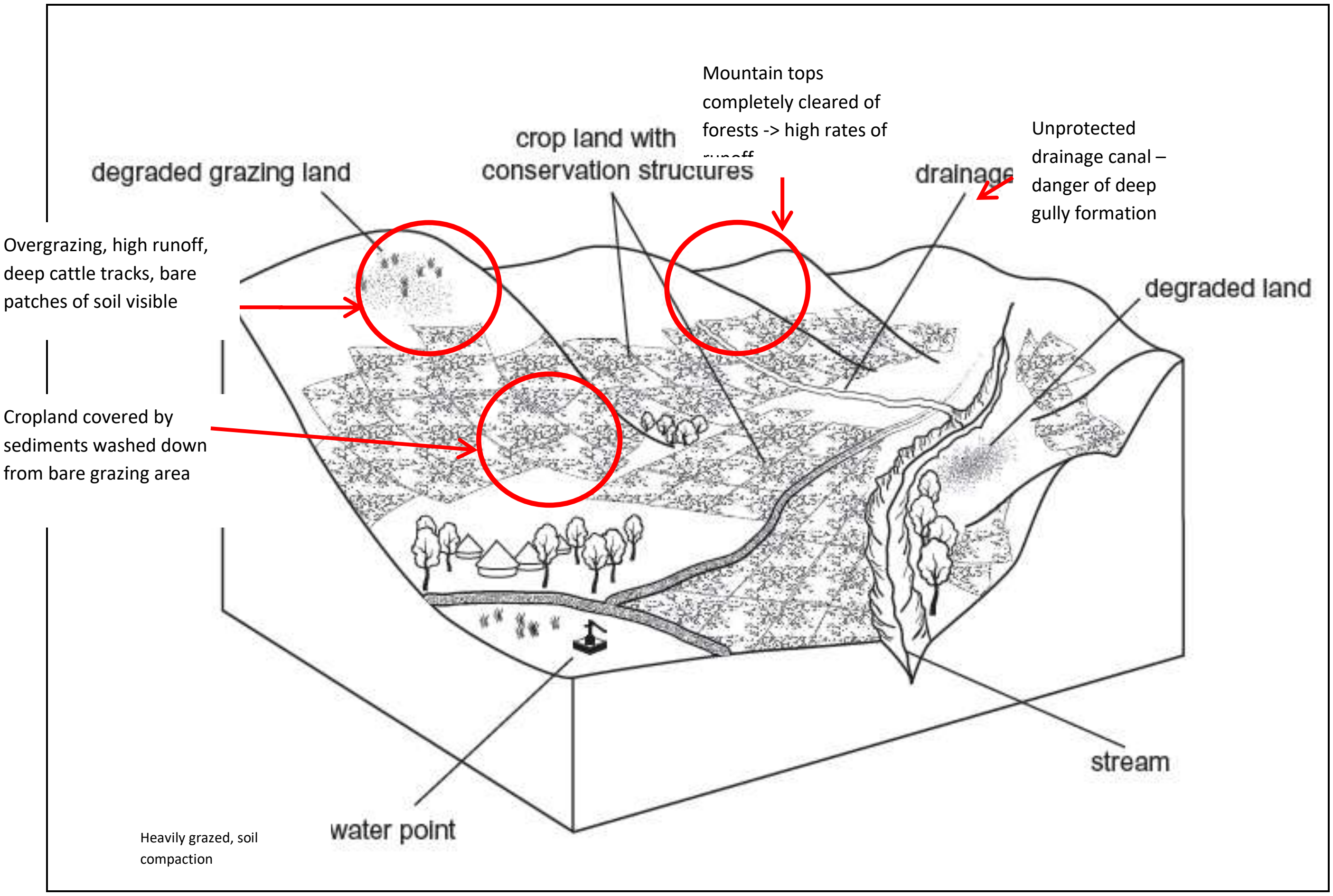



**Fig 4.6. Similar base map including major areas of environmental degradation and initial identifications of causes**

**Hint – accounting for gender**

Involve both men and women in drawing the catchment map – this might identify special features particularly important for either men or women – for example, accessing water points on a steep slope might be more of an issue for women if they are mainly responsible for collecting water. Or certain areas may be used for defacation by different groups.

**Table 4.2. Examples of degradation features and possible reasons**

| Degradation feature | Location | Possible Reason |
|---|---|---|
| Gully | on grazing land | Overgrazing, Cattle tracks |
| | on crop land | Traditional furrows to drain excess water<br>Ploughing up & down the slope<br>Absence of constructing cut off drain above the crop land |
| | on bush/forest land | Bush/forest clearing |
| | as a result of foot path/sealed area/cattle track | Alignment, lacking maintenance |
| Sheet & rill erosion | on crop land | land management practices |
| Flooding | on grazing land/on crop land | Inappropriate drainage<br>Insufficient water infiltration |
| Land slips | On steep crop & grazing land | Land management practices |
| Land slides | Along rivers, around springs, on steep slopes | Deforestation |

An assessment of the severity of indirect hazards can also be carried out. This can help establish priorities for action – see Table 4.3 below.

**Table 4.3. Assessing the severity of degradation features**

| Description of degradation features | Severity/extent of degradation | | | | Comments |
|---|---|---|---|---|---|
| | none | Low | medium | high | |
| Sheet/splash erosion on crop land | | | | | |
| Rills[1] on crop land | | | | | |
| Gullies[2] on crop land | | | | | |
| Gullies on grazing land | | | | | |
| Gullies on degraded land | | | | | |
| Gullies in forest land | | | | | |
| Sediment deposition | | | | | |
| Cattle step | | | | | |
| Land slip/land slide | | | | | |
| Riverbank erosion | | | | | |
| Deforestation | | | | | |

**NB**: Gullies or landslips identified in this step are gullies/landslips in the catchment/watershed area and are **not** a direct threat to the water point. Nevertheless, such environmental degradation features in the catchment/watershed need to be addressed as well.

[1] Rills = can be smoothed out completely by normal land management / cultivation practices.

[2] Gully = larger than rills and can no longer be smoothed by normal cultivation practices, persistent.

### 4.3 Developing a Catchment Protection Plan (Step 3.3)

Using the base map drawn in step 3.2 showing the main indirect hazards and areas where degradation processes are ongoing (see Table 4.2 and 4.3), identify appropriate mitigation measures.

For all degradation processes classified as medium or high seek collaboration with relevant authorities (office of agriculture) or partners with expertise in natural resource management to identify the most appropriate conservation technology. Table 4.4 below provides some examples of corrective measures depending on the degradation feature and its location. It also provides some ideas what the underlying causes of the degradation feature might be which should be addressed as well.

**Table 4.4. Possible corrective measures for main degradation features**

| Degradation feature | Location | Cause | Correction |
|---|---|---|---|
| **Gullies** | Grazing land | Overgrazing<br>Cattle tracks<br>Absence of cut-off drain above the grazing land | ✓ Check-dam<br>✓ Fencing<br>✓ Re-vegetation of gully & surrounding areas<br>✓ Construction of cut-off drain |
| | Crop land | Traditional furrows to drain excess water<br>Absence of cut-off drain above the crop land<br>Ploughing up & down the slope | ✓ Ploughing along the contours<br>✓ Cut-off drain & area closures above crop land to reduce run-on & increase infiltration<br>✓ Terracing<br>✓ Check-dam |
| | Bush/Forest land | Bush/forest clearing | ○ Area closure<br>○ Cut &carry |
| | As a result of foot path/sealed area/cattle track | Alignment<br>Inefficient maintenance | ➢ Re-alignment<br>➢ Cut-off drains<br>➢ Stone paving and check structures |
| **Sheet & rill erosion** | Crop land | Land management practices | ➢ Land management practices (e.g. contour ploughing, increasing organic matter content of the soil)<br>➢ Soil & stone bunds<br>➢ Artificial water ways<br>➢ Cut-off drains above crop land |
| **Flooding** | Grazing land/Crop land | Inappropriate drainage<br><br>Insufficient water infiltration | ○ Artificial water ways<br>○ Cut-off drains<br>○ Soil and/or Stone bunds on crop land to enhance water retention and infiltration<br>○ Area closures/afforestation on hill tops / steep slopes |

| Degradation feature | Location | Cause | Correction |
|---|---|---|---|
| **Land slips** | Steep crop & grazing land | Land management practices | |
| **Landslides** | Along rivers<br>Around springs | Deforestation | ○ Area closure<br>○ Afforestation<br>○ Retention walls<br>○ Fencing to avoid damage from livestock |

Once the main degradation features and corrective measures have been identified and drawn on the base map (Figure 4.7 below), a catchment protection plan should be elaborated and agreed by all relevant stakeholders. Such a plan should include where which corrective measure is best suited, how much resources (labour, finance, in kind and other) are needed, who should provide the resources, who provide technical support including monitoring, and what additional material might be required.

In addition to the catchment protection plan, monitoring plan should be prepared that include the objective of monitoring, the parameters/indicators to be monitored, who and when to monitor, frequency of monitoring and the resources required to monitor.

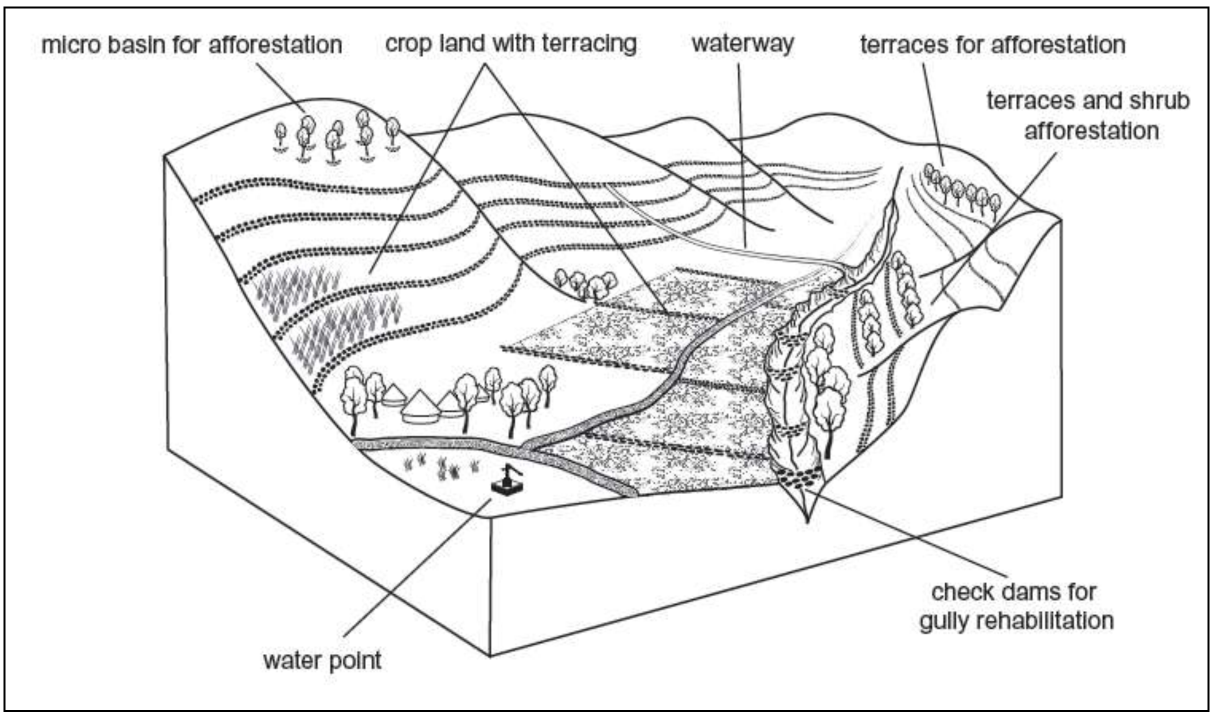



**Fig. 4.7. Base map showing measures to address catchment degradation**

**5: Record Keeping**
This section focuses on what, why and where to record, store and make available all relevant records of water points.

**Content of the Section**

- *What data should be kept?*
- *Why should data be kept?*
- *Where should the data be kept?*

*What data should be kept?*

- Geological field notes from reconnaissance trips
- Data from geophysical surveys (if any were carried out)
- The digging or drilling report (log), including all data relating to the drilling, construction and geological/geophysical logging, including all dry holes
- Data and results from pumping tests
- Water level (using a dipper, if required) across different season
- Number of people using the scheme and estimate of amount collected per person/household across different seasons
- Any incident when water supply system was not functional, reasons and actions undertaken
- Any incident when water supply system was damaged as a result of direct environmental hazards and actions undertake to fix the damage
- Any chemical, biological and physical parameters from water testing.

*Why should data be kept?*

This kind of information is helpful in building a picture of the hydrogeology of an area and can help better inform future water scheme developments. For example, it may help governments to develop planning tools, it may help the district hydro-geologist to increase his/her understanding of the groundwater occurrence in the area and it can help implementing partners in their decisions to develop further water schemes.

*Where should the data be kept?*

Collected data should be kept at local level and a copy should be made available to local and district authorities (e.g. at the office of the district water authority) and to implementing partners.

**Hint – drilling logs**
A drilling log is a written record of the soil layers and/or geological formations found at different depths. Soil/rock samples should be taken at regular depths (e.g. every meter) and described during the drilling or digging process. The soil/rock description is then recorded in the form of a drilling log. The drilling log will help to determine:

- ✓ The right aquifer for installation of the well-screen

- ✓ Depth and length of the well-screen
- ✓ Depth and thickness of the gravel pack
- ✓ Location of the sanitary seal

# Part Two: Social, Environmental and Climate Risks Screening and Management (SECRSM) Tool

## 6. Introduction

As mentioned in part one of this guideline material under background section, the CERS guidance note treats the basic subject matter on the impact of climate change and environmental degradation on the WASH service provision. However, it does not give clear approach how to do analysis of the risks, and how to prepare management and monitoring plan to manage the risks. The SECRSM tool or this section of this guideline gives step by step procedure on how to analyze and prioritize risks, prepare management and monitoring plan. In addition, the CERS guidance note does not treat the social aspects of the project which is also very important sustainability factor which should be properly addressed, and is included here in the SECRSM tool.

### 6.1. General

People depend on the natural environment for survival. Our food including water, medicines, shelter, fuels and clothing are all sourced from it. Environmental degradation (ED) is the consequence of past and present generations using up or damaging natural resources faster than nature can restore them.

The effects of climate variability and change are already being experienced. The impact of climate variability and change has been felt the most in developing countries, due to their geographical location and lack of capacity to cope with it. Climate variability and change and environmental degradation affects all types of development projects including WASH in all countries. Development projects on WASH must give consideration to the climate variability and change and environmental degradations as they have an impact on the project's sustainability.

Social, Environmental and Climate risk (SECR) assessment and management is a project planning and management tool to assess the impacts of individual projects on the local environment, and the impacts of the change in the local environment and climate variability and change on the project sustainability. In order to ensure that the WASH developments interventions are sustainable, it is essential to integrate social, environmental, and climate risks into development interventions. Hence, SECRSM has been recognized as effective tool for facilitating the inclusion of the principles of sustainable development into development activities.

### 6.2. Objective of SECRSM tool

The objective of the SECRSM tool is to establish clear procedures and methodologies for integrating social, environmental and climate risks in planning, reviewing, approving and implementing (construction and post construction) of COWASH project activities. It guides identification of SECRs, design of appropriate measures, and plans to prevent, minimize, and mitigate adverse impacts and enhance positive outcomes.

### 6.3. Who Use the tool?

This tool will be used by all COWASH woreda implementing sector offices when implementing COWASH project activities to screen project activities, and develop and implement management plans to avoid, minimize or mitigate the risks. Regions and zones use it in case where woreda delegate them to conduct the feasibility and design of high-tech water supply and sanitation technologies such as deep wells, shallow wells, and institutional latrines.

### 6.4. COWASH Project Activities

Description of project activities is crucial in order to understand which COWASH project activities include social, environmental and climate risks. The main COWASH project activities which have social and environmental risks, and are also affected by the climate change and environmental degradation are:

- construction of new water schemes such as spring developments (on spot, with collection chamber, RPS,...), HDW, shallow wells, and deep wells;
- construction of latrines (school and health institutions latrines);
- rehabilitation of water schemes; and
- construction of stores and offices for micro and small enterprises (MSEs) working on Sanitation Marketing (SM) and spare part supply.

The nature and scale of these activities range from micro to small scale. Their impact on the environment is minimal. However, the environmental degradation, and climate variabilities and change may significantly affect COWASH project sustainability. COWASH project activities may not require full environmental and social impact assessment. However, they require some sort of social, environmental and climate risk analysis, and preparation of management plan to prevent, minimize and mitigate the risks.

## 7. Policy and Legal Frameworks

This section of the SECRSM tool is important for the WASH practitioners as it helps them to have clear understanding of the existing policies and legal frameworks related to social, environmental and climate risks in planning and implementing development projects. Ethiopia has different policies, strategies, proclamations, regulations and guidelines to ensure that the biophysical and human environments are protected from harm as a results of development intervention, and adapt and mitigate the impact of climate change and environmental degradation so as to bring sustainable development outcomes.

The major policy and legal frameworks relevant to COWASH project activities are:

- The constitution of Ethiopia,
- Environmental policy of Ethiopia,
- Environmental impact assessment proclamation and guideline,
- Water resources management policy and water sector strategy,
- Land expropriation and payment of compensation: proclamation and regulation,
- National Climate Resilient Green Economy (CRGE) strategy of Ethiopia,
- Climate Resilient (CR) strategy: water and energy sector developed by Ministry of Water, Irrigation and Energy (MoWIE) etc...

Summary of the aims of these policies, strategies proclamation, regulations and guidelines are outlined below. For the detail of this please refer annex 4 of this guideline.

- Ensure that all persons have the right to live in a clean and healthy environment.
- All persons who have been adversely affected or whose rights have been adversely affected as a result of state programs have the right to commensurate monetary or alternative means of compensation, including relocation with adequate state assistance.
- People have the right to full consultation and to the expression of views in the planning and implementation of environmental policies or projects that affect them directly.
- Improve and enhance the health and quality of life of all Ethiopians and to promote sustainable social and economic development through the sound management and use of natural, human-made and cultural resources and the environment as a whole so as to meet the needs of the present generation without compromising the ability of future generations to meet their own needs.
- Enhance and promote all national efforts towards the efficient, equitable, and optimum utilisation of the available water resources of Ethiopia for significant socio-economic development on sustainable basis.
- Ensure access to water for everyone fairly and in a sustainable manner, protect water resources and sources, and promote cooperation for the management of river basins.
- Conserve, protect and enhance water resources and the overall aquatic environment on sustainable basis.

- Ensure the integration of environmental considerations in development planning processes, in order to make use of natural resources in a responsible manner to protection and enhance the quality of all life forms.
- Ensure the implementation of appropriate watershed management practices to promote water conservation, maximise water yields, improve water quality, and reduce reservoir siltation and flooding.
- Protect the country from the adverse effects of climate change and build a green economy.

Therefore, all the above principles has to be taken into account and well addressed when planning, designing, and implementing WASH project activities for the sustainable provision of WASH services to the intended users in a sustainable manner.

## 8. Procedure for SECR Screening and SECRSM Plan Preparation

### Important notes

- When we say environmental impact assessment/study, consideration should be given for both the assessment of impact of the project on the environment (social, physical, biological and cultural environment), and the impact of the environment (degraded environment) on the project sustainability. The impact of the environment on the project should be considered because it may affect the success or long-term sustainability of the project. For example, for a water supply project, if the environment/micro-watershed where the water supply project is to be constructed is degraded, we may not get sufficient yield especially during the dry period, and there also be flood hazard due to high run off from that degraded land causing infrastructure damage and pollution of water sources. Expanding gullies and landslides are also another threat to the water schemes to be considered. It is important also to assess possible pollution sources around the water source, and plan for its management. So, the impact of the environment on the project should be taken into account when planning, designing and implementing WASH projects.

- The water resource which is to be developed and the technologies used for water resource development should also be resilient to the impact of climate change and variability. Water resources and WASH facilities are vulnerable to the impact of climate change and variability. The risks of climate change should be identified, appropriate adaptation measures should be planned, implemented and monitored so that the water supply system provide sustainable services to the intended community.

- WASH activities have also social impacts related to land acquisition and property losses. When water schemes are constructed, they may take piece of land from farmer/s. According to the Proclamation **No. 455/2005** *(Expropriation of Landholdings for Public Purposes and Payment of Compensation*) and Regulation **No. 135/2007** (*Regulations on the payment of compensation for property situated on landholdings expropriated for public purposes*), the owner/s of the land (land holder/s) where the water scheme is to be constructed should be consulted meaningfully, compensated (if required) either in cash or kind like land for land or both.

- The other social impact as a result of project development is impact on cultural heritages and religious sites. This may include construction of water points on or near grave sites, demolishing of local cultural site, and development of holy water for the community water supply. If you construct water points in these sites community may not use it, and it will be a waste of resources.

- According to the Environmental Impact Assessment (EIA) guideline, COWASH project activities fall under schedule 2 of the guideline (annex 4). Schedule 2 projects need environmental and social analysis and preparation of Environmental and Social

Management Plan (ESMP) including its implementation and monitoring of its effectiveness.

- When identifying impacts and evaluating risks you need to have clear understanding of:
  - ✓ The nature and scale of the project activities to cause impact on the social, cultural and biophysical environment,
  - ✓ The vulnerability and adaptive capacity of the project to cope up with the impact caused by climate change and variability, and environmental degradation, and
  - ✓ The vulnerability and adaptive capacity of the environment to cope up with the impact from climate change and project intervention.

### 8.1. Staged Approach of SECR Screening and SECRSM Plan Preparation

Risk assessment is the formal process of evaluating the consequences of an impact and probabilities of impact occurring. Therefore, social, environmental and climate risks are determined using the combination of the ***consequence*** of an impact and the ***probability*** of the impact occurring. It addresses what can go wrong, what the consequences are, and how likely the consequences are.

It involves four stages:

1. Identifying the impacts,
2. Assessing the potential consequences of the impacts,
3. Assessing the probability of the impact occurring, and
4. Evaluating the risk level

#### 8.1.1. Identifying Impacts

Impact is an effect on natural and human systems. It generally refers to effect on lives, livelihoods, health, ecosystems, economies, societies, cultures, services, and infrastructure due to hazardous events occurring within a specific time period and the vulnerability of an exposed society or system. For example, the impacts of climate change on geophysical systems, including floods, droughts, and sea level rise, are a subset of impacts called physical impacts. Impact identification is determining which impacts will result from the implementation of each project activities, and as a result of climate change and variability and environmental degradation.

#### 8.1.2. Assessing the Potential Consequences of the Impacts

***Consequence*** of an impact is an adverse effect to health, property, the environment, or other things of value. It refers to the extent to which a project might affect the environment, and the environmental degradation and climate change affect the project sustainability. When determining the consequence of an impact/hazard, consideration should be given to the *intensity/severity of the impact, extent/scale of the impact, and the duration of the impact.*

**Intensity** is related to the magnitude of the impact in relation to the sensitivity/adaptive capacity of the environment and/or the project, taking into accounts the degree to which the impact may cause irreplaceable loss/damage of resources/project activities. It is expressed in terms of relative severity of the impact. Intensity also takes account of other aspects of impact whether or not an impact is reversible and the likely rate of recovery. The value of project activities/WASH facilities should also be taken into account. For example, RPS and hand HDW have no equal value in terms of investment. On the other hand, if RPS serving hundreds of HHs is impacted by climate change, and/or environmental degradation, the severity of the impact is much more than that of the impact that occurs on HDW serving a maximum of 50HHs.

**Extent/scale of the impact** indicates the geographical area over which the impact of the project on the environment will be experienced. It will also measure the extent of which the WASH facility is impacted by climate change and environmental degradation. A description should be provided as to whether impacts are either limited in extent or affect a wide area or group of people. For example, impacts can either be site-specific, village, kebele, woreda, regional, national or international. The extent of an impact may also be damage to part of the WASH facilities, the whole facility at one site, a number of facilities in the surrounding site, and so forth.

**Duration of the impact** tells the time frame over which the impact will be experienced and its reversibility (0-5years, 6-10 years, greater than 10 years, permanent).

**Table 8.1: Rate, definition of rate and score of the consequence of an impact**

| Rate level | Definition of rating for impact of the project on environment | Definition of rating for impact of climate change and environmental degradation to the project | Score |
|---|---|---|---|
| **Low** | **Minor** effects on biophysical, social and cultural environment so that functions and process of the environment is not affected. Piece/strip of land is taken from farmer, and farmer's livelihood is not affected. Insignificant impact on cultural and religious sites.<br><br>The impact is site specific. The impact can be managed immediately and is reversible. | **Minor** damage to WASH facility. Mostly repairable impacts from the impact of environmental degradation and climate change and variability. Though there is pollution source in the area, it is not a threat to the water source or scheme. The catchment is well protected and the size of the catchment is sufficient enough to serve the beneficiaries of the water scheme to be constructed. The facility is giving service.<br><br>The hydrogeological environment is good in terms of storage capacity of the acquirer, water quality, reliability of yield/transmissivity, durability, stability, and others.<br><br>The impact is limited on the project specific site, and only parts of the facility is impacted. The impact can be managed immediately and is reversible. | 1 |
| **Medium** | Moderate effects on biophysical, social and cultural environment but not affecting the ecosystem function though some impact occur (for example water and soil are polluted but not serious, no significant depletion of freshwater water resource, low deforestation and no wildlife and plant species loss, no drainage of wetlands, and so forth). Impact beyond the project site but not far beyond adjoining sites.<br><br>Moderate cultural and religious sites impact (such as demolition of cultural and religious structures by the construction water points, construction of water points on or near grave sites, development | The WASH facilities are flooded, and the flood cause damage to the facility but it still is giving service. There is reduced yield due to drought, insufficient recharge or insufficient catchment size and/or catchment degradation. There is also pollution source that may affect the quality of the water but is easily manageable with appropriate mitigation measures.<br><br>The hydrogeological environment is average in terms of storage capacity of the acquirer, water quality, reliability of yield/transmissivity, durability, stability, and others.<br><br>These impacts are beyond the project site but not far beyond adjoining sites. The whole facilities may be | 2 |

| Rate level | Definition of rating for impact of the project on environment | Definition of rating for impact of climate change and environmental degradation to the project | Score |
|---|---|---|---|
| | of spiritual water for the community water supply, but all these impacts are not serious).<br><br>Land acquisition and property losses of farmer/farmers affected their livelihood moderately (the land taken/properties lost is relatively big so that the income from that farm/land will affect the income/livelihood of the farmer/farmers but not serious). The impacts lasts from 0-5 years, and are reversible. | impacted. Beneficiary community using that facility will be affected (minor water quality related health problem). It is medium term effect (lasts up to 5 years). | |
| **High** | Biophysical, social and cultural functions and processes are altered seriously to the extent that it will temporarily ceases (for example water and soil are polluted, depletion of freshwater water resource causing water shortage, deforestation causing wildlife loss and loss of plant species, drying of wetlands, and so forth).<br><br>Land acquisition and property losses of farmer/farmers affected their livelihood seriously (the land taken/properties lost is relatively big so that the income from that farm/land will affect the income/livelihood of the farmer/farmers).<br>It may impact the environment at Kebele level. It may last from 6-10 years. | The WASH facilities temporarily stopped functioning due to contamination, infrastructure damage due to flood, land slide and gully expansion. The yield is reduced highly and facility does not function due to drought, insufficient recharge or insufficient catchment size and or catchment degradation.<br><br>The hydrogeological environment has problem in terms of storage capacity of the aquifer, water quality, reliability of yield/transmissivity, durability, stability, and others (low yielding aquifer, it is rocky to dig, etc...).<br><br>Beneficiary communities using those facilities will be seriously affected (major water quantity or quality problem causing health problem).<br><br>Impact a number of facilities within a kebele, and sometimes beyond kebeles. It may lasts from 6-10 years. | 3 |

| Rate level | Definition of rating for impact of the project on environment | Definition of rating for impact of climate change and environmental degradation to the project | Score |
|---|---|---|---|
| **Very high** | Biophysical, social and cultural and religious environment functions and processes are altered very seriously to the extent that it will permanently cease (water and soil are highly polluted, depletion of freshwater water resource, deforestation causing wildlife loss and loss of plant species, drying of wetlands, and so forth). Impact which may have more than one kebele effect concern, and it may be woreda level extended impact.<br><br>Land acquisition and property losses of farmer/farmers affected their livelihood seriously (the land taken/properties lost is relatively big so that the income from that farm/land will affect the income/livelihood of the farmer/farmers seriously).<br><br>The impact may be permanent. | The WASH facility permanently damaged and ceases giving service due to climate change and environmental degradation (flood, land slide, gully expansion and wider catchment degradation), and contamination.<br><br>Beneficiary communities using those facilities will be seriously affected (water quality related health problem).<br><br>The hydrogeological environment has serious problem in terms of storage capacity of the aquifer, water quality, reliability of yield/transmissivity, durability, stability, and others (low yielding aquifer, it is rocky to dig, etc...).<br><br>Impacts a number of facilities even beyond Kebele, and may be woreda level extended impact (intense rainfall that cause flooding and infrastructure damage of a number of water points located in more than a kebele, pollution of these water points by flood, draught that results shortage of water in a number of waters located beyond one kebele, series of landslides and gullies found in the adjoining kebeles damage a number of water points, micro-catchment highly degraded resulting less recharge and hence dry during the driest period). The impact may be permanent. | 4 |

### 8.1.3. Assessing the Probability of the Impact Occurring

The probability of occurrence of an impact is the description of likelihood that the impact is occurring. It is indicated as improbable, possible, probable, and definite as indicated in the table 8.2 below.

**Table 8.2: Probability – the likelihood of the impact occurring**

| Rating | Definition of rating | Score |
|---|---|---|
| **Improbable** | The possibility of the impact to occur is very low, either because of design, historic experience or implementation of adequate corrective action. Could occur at some time but has not been observed; may occur only in exceptional circumstances. | 1 |
| **Possible** | There is a distinct possibility that the impact will occur. | 2 |
| **Probable** | It is most likely that the impact will occur. | 3 |
| **Definite** | Almost certain to occur or may have already occurred. The impact will occur regardless of any prevention or corrective action. | 4 |

### 8.1.4. Evaluating the risk level

Having identified the impacts involved, they need to be assessed or measured in terms of the chance (probability) they will occur and the severity or amount of loss or damage (consequence) which may result if they do occur. Therefore, risk can be rated by:

- *the chance of the impact happening – 'probability'*
- *the amount of loss or damage if the impact happened – consequence).*

**Risk of an impact = Consequence of impact x Probability of impact**

See table 8.3 below for the risk evaluation.

**Table 8.3: Risk Level Rating**

| | | Probability | | | |
|---|---|---|---|---|---|
| | | Improbable (1) | Possible (2) | Probable (3) | Definite (4) |
| **Consequence** | Low (1) | **Low (1)** | **Low (2)** | **Medium (3)** | **Medium (4)** |
| | Medium (2) | **Low (2)** | **Medium (4)** | **High (6)** | **High (8)** |
| | High (3) | **Medium (3)** | **High (6)** | **Very high (9)** | **Very high (12)** |
| | Very high (4) | **Medium (4)** | **High (8)** | **Very high (12)** | **Very high (16)** |
| | | | | | |
| | **Risk score** | **≤2** | **3-4** | **6-8** | **≥9** |
| | **Risk level** | **Low** | **Medium** | **High** | **Very high** |
| | | | | | |
| **Definitions of risk levels** | Low | The potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development. It is not a priority but need monitoring of the impact. | | | |
| | Medium | Medium to long term priority and needs attentions. Risk is of marked concern that will necessitate action for mitigation that need to be demonstrated as effective. SECRMP plan including monitoring plan should be prepared. | | | |
| | High | The risks under this category are perceived as unacceptable and a strategy is required to manage the risk like SECRMP including monitoring plan. | | | |
| | Very High | The proposed activity should only be approved under special circumstances. It may need further assessment and need preparation of the SECRMP including monitoring plan. | | | |

## 8.2. Prepare SECRSM Plan

Table 8.4 below is template for SECRSM plan (SECRSMP). It contains the project activities, the impacts, consequence of the impacts, probability of the impact, risk, risk mitigation measure, institutional arrangements to implement the mitigation measures, schedule to implement the plan and the cost of implementation of the mitigation measures. The table shows how to screen a risk and prepare management plan. Table 8.4 is included in this document (annex 5) by filling all the elements of the table except risk (col. 3-5) and cost columns (col. 9). This is done to make easy for woreda team of experts, who are responsible for the screening and management plan preparation. Basically, all the columns of the table should be filled by the Woreda experts. What is expected from Woreda team of experts is to fill the risk and cost columns. Therefore, Woreda experts should use annex 5 when screening and preparing management plan. SECR management plan is not a one-time activity. It is a continuous process. When monitoring the implementation of the prepared plan, additional risk may be encountered for which management plan should be prepared, implemented and monitored.

**Table 8.4: SECRSMP Template**

**Region:____________; Zone:____________; Woreda:_____________; Kebele:_____________; Site:__________; WP:____________**

| **№** | **Risk Screening** | | | | | **Risk Management** | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Project activity (1)** | **Impact (2)** | **Risk** | | | | | | |
| | | | **C (3)** | **P (4)** | **RL (5)** | **Mitigation measures (MMs) (6)** | **Responsible body (7)** | **When to implement (8)** | **Cost for MMs (9)** |
| I | **Impact of the *project* on the *Biophysical Environment*** | | | | | | | | |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| II | **Impact of the project on the Social Environment** | | | | | | | | |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| III | **Impact of Environmental Degradation on the Project Sustainability** | | | | | | | | |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| **IV** | **Impact of Climate Variabilities and Change on the Project Sustainability** | | | | | | | | |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |

**N.B**: C: Consequence of an impact; P: Probability of the impact occurring; and RL: Risk Level (L-Low, M-Medium, H-High, & VH-Very High).

### 8.3. Prepare SECRM Monitoring plan

Having SECRSMP; social, environmental, climate risk management monitoring plan is required to assess whether the various mitigation measures planned in the SECRMP are implemented, mitigation measures are effective, and to take action to manage un-anticipated impacts or other unforeseen changes. Table 8.5 below shows the template for monitoring plan. Example of monitoring plan is included in Annex 6 of this guideline. Monitoring plan is also continuous process, and should be prepared, implemented, reviewed and updated.

**Table 8.5: SECRSM monitoring plan template**

**Region:____________; Zone:____________; Woreda:_____________; Kebele:______________; Site:__________; WP:____________**

| No | Potential Impacts that need mitigation [c] | Description of mitigation (elements to be monitored)[d] | Responsible body | Indicators to be monitored | Monitoring method | When to monitor | Monitoring Cost |
|---|---|---|---|---|---|---|---|
| I | **Impact of the *project* on the B*iophysical Environment*** | | | | | | |
| | | | | | | | |
| II | **Impact of the project on the Social Environment** | | | | | | |
| | | | | | | | |
| III | **Impact of Environmental Degradation on the Project Sustainability** | | | | | | |
| | | | | | | | |
| | | | | | | | |
| IV | **Impact of Climate Variability and Change on the Project Sustainability** | | | | | | |
| | | | | | | | |
| | | | | | | | |

[c]: Taken from SECRSMP table 4 above (col. 2)

[d]: Taken from SECRSMP table 4 above (col. 6)

***NB: Table 8.4 and 8.5 should be documented at WASHCO, and in respective Woreda WASH sector office (in water office for community WASH, in education office for school WASH, and health office for health WASH project activities).***

### 8.4. Template to collect data on land acquisition and property losses

If COWASH project activities involve land acquisition and property losses, the land holder/s should be consulted, and agreement should be reached before the commencement of the construction. In most cases, farmer/s is/are willing to provide land for free for the construction of WASH facilities. In some cases, if the land taken and property lost is big, their livelihood will be affected and may need compensation. In both cases, the land owner/s should be consulted meaningfully and legally binding documents (the minutes of consultation, and table 6 below filled) should be signed and documented at Woreda Water Office, Kebele administration, WASHCO and the land owner/s. This will be done together with Kebele/sub kebele administrator. The minutes of the consultation should be signed by the community including WASHCO members and the land owner/s. If the water point is constructed on communal land which belong to the beneficiary community, only check the communal box of table 8.6 and should be documented. The template for the minutes of community consultation is included in annex 7 of this guideline.

**Table 8.6: Land acquisition and property lose risk management information data collection form**

**Region:_________; Zone:__________, Woreda:__________; Kebele:___________; Site:____________, WP:_________________**

1. Is land taken for the WASH Facility construction private or communal? **Private**: ☐ **Communal**: ☐
2. If private farmer/s land is taken, fill the information below.

| Name of the farmer/s (MHH/FHH) | # of HHs | Amount expropriated/taken ($m^2$) including the ROWs for footpath, fencing… | | % of land expropriated from what the farmer/s has/have in total | Risk level (from table 4) | Risk management | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Voluntarily given | Compensated | | |
| | | Crop land | Grazing land | | | | In kind/land (m2) | Cash (birr) | Both ($m^2$, & birr) |
| 1. | | | | | | | | | |
| 2. | | | | | | | | | |
| 3. | | | | | | | | | |
| | | | | | | | | | |
| **Total** | | | | | | | | | |

**Name and signature of parties**

| Parties | Name | Signature | Date | Remarks |
|---|---|---|---|---|
| 1. Land Owner | | | | |
| 2. WASHCO chairperson | | | | |
| 3. Kebele Administrator | | | | |

## 9. Institutional Arrangements

### 9.1. SECR Screening, SECRMP Preparation, Implementation and Monitoring

Woreda water office is the lead institution for SECRSM implementation (risk screening, management and monitoring plan preparation, implementation, monitoring, reviewing and updating the plan) for community water points. Woreda education and health offices are also responsible for the same activities in their institutional WASH activities. Though these institutions take the lead in their respective WASH project activities, all the SECR Screening, management plan preparation, implementation and monitoring activities will be done by woreda team of experts. The team of experts includes water supply engineer and geologists/hydrogeologist from Water Office (or technical experts that do these jobs if these experts are not available), NRM expert from Agriculture and Natural Resources office), and environmental health expert from Health Office. Kebele health extension workers and NRM Development Agents (DA) are also part of the woreda technical team at kebele level. The beneficiary community and WASHCO should be fully involved in all of these processes in terms of providing information during screening and management plan preparation, contributing for the implementation of the management plan (cash, labour, in kind or both), and monitoring activities. SECR screening should be done as part of the field appraisal activity.

Woreda office of Agriculture and Natural Resources and its structure at Kebele level (NRM DA) provide technical support and training for the implementation of mitigation measures related to NRM, ground water recharge and flood protection structures. Woreda health office and its structure at Kebele level (HEW) is also responsible for the implementation of environmental health related mitigation measures like pollution prevention and control. Memorandum of understanding (MoU) may be needed with these offices. However, beyond the MoU, these offices should come to on board through inviting on WWT meetings, lobbying, inviting on trainings and actual implementation works so that they will be part of the process. The same is true at regional level with these line bureaus.

RSU, regional water bureau and zone water department will provide technical support in accomplishing all the above-mentioned activities.

### 9.2. Reporting and documentation

Water bureau through the CMP supervisor is responsible to prepare quarterly and annual report on the performance of SECRSM and submit to RSU. This will be done as part of the COWASH performance report. The CMP also receive the same report from Woreda office of education and health, and compile the report including water office one and send to RSU. RSU compile and send to Federal COWASH (FTAT).

Both woreda and region will review the performance of social, environmental and climate risk screening and management having annual performance review workshop either together with the COWASH annual performance review workshop or by its own. The report of the review workshop will be summarized and send to FTAT.

## 10. Training

For the successful implementation of the SECRSM related activities, relevant institutions' experts at region, zone, woreda, and kebele level should get the required training and awareness. The beneficiary community should also get awareness on how to manage risk and their role in this regard. First, ToT on SECRSM will be given to relevant RSU and regional experts for four days at federal level, and will be cascade the training to zone and woreda along with CMP appraisal training or independently. Woreda technical team who took the training will aware Kebele level technical experts (NRM experts and HEW), WASHCO and the beneficiary community. See table 10.1 below for the experts that will participate on the training, and their institutions.

**Table. 10.1: Experts to be trained on SECRSM at different level**

| S. No | Level of training | Proposed field specialization of experts | Bureau/Offices | Quantity per region/zone /woreda | Remark |
|---|---|---|---|---|---|
| | **Federal ToT: For regional experts** | | | | |
| **1** | | Water supply engineer | Water Bureau | 1/region | |
| | | Hydrogeologist | Water Bureau | 1/region | |
| | | Team Leader | RSU | 1/region | |
| | | CMP specialist | RSU | 1/region | |
| | **Subtotal** | | | | |
| **2** | **Regional level training: For zone and woreda experts** | | | | |
| | From Zone | Zone water supply engineer | Zone water department (ZDW) | 1/zone | This is per zone participant |
| | | Zone Hydrogeologist | ZDW | 1/zone | |
| | From Woreda | Water supply expert | WoW | 1/woreda | |
| | | CMP supervisor | WoW | 1/woreda | |
| | | Hydrogeologist/geologist | WoW | 1/woreda | |
| | | NRM expert | WoA | 1/woreda | |
| | | COWASH Focal Person | WoH | 1/woreda | |
| | | COWASH Focal Person | WoE | 1/woreda | |

**NB:** 1. Region will provide the training for zone and woreda experts when they are giving CMP/appraisal training by adding one additional day for the SECRSM training or independently.

2. Woreda will orient NRM DAs and HEWs when they are giving KWT training on CMP management.

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## Technical Annexes

### *Annex 1: A field guidance sheet that can help the user identify rocks and their water resource potential*

# Basalt– Identification in shield volcanoes

Morphology: Cliff forming, flat topped, sharp edges

Outcrop: Variegated when weathered & dark when fresh

Hand-specimen: Minerals rarely visible, dark colored

**Water schemes implication**

- Zoned groundwater occurrence
- Groundwater occurs in joints, between flow contacts and in weathered top;
- Fractured zone is Low storage, high permeability ;
- Scorea zone is high storage high permeability; Weathered zone is high storage low permeability;
- Springs generally contact and focused type;
- Water quality is generally good ;
- Seasonal water level fluctuation is generally small
- Wells fill rapidly once pumped;
- Lining required near top (0-6 meters) and can be open in lower part
- Target weathered tops for successful water point
- Weathered zone is diagable, fresh zone is not

# Trachyte– Identification in shield volcanoes

Morphology: dome forming

Outcrop: rounded cliff; low weathering degree

Hand-specimen: visible crystals/minerals; grey color, heavy

**Water schemes implication**

- Low storage, low yield, low permeability;
- Groundwater occurs in joints, between flow contacts and in weathered top (weathering is low in trachytes);
- Fractured zone is Low storage but high permeability ;
- Springs generally contact and focused type;
- Water quality is generally good ;
- Seasonal water level fluctuation is generally large;
- Wells fill rapidly up on drainage
- Low diggability

# Volcanic ash– Identification in shield volcanoes

Morphology: gentle slope undulating; slope break when hard

Outcrop: Light colored, friable, sugary texture

Hand-specimen: light weight, porous

**Water schemes implication**

- Low yield but sustainable;
- Diffuse springs;
- Low water level fluctuation between wet and dry periods;
- High storage but low permeability (release to well);
- Springs generally diffuse discharge type;
- When deeply weathered is poor water bearing formation;
- Water quality is generally good may contain high F;
- Water level least vulnerable to rainfall variation
- Dispersion of ashes lead to sedimentation in well bottom – periodic dredging of sediment needed,
- Optional lining required in the top part

# Alluvial sediments (Regolith)– Identification in shield volcanoes

Morphology: flat plain bounded by higher grounds

Outcrop: Occurs in foot hills of mountains, adjacent to rivers

Hand-specimen: Mix of clay, silt, sand, gravel, pebble, cobble

### Water schemes implication

- High storage, high yield;
- Low to medium water level fluctuation between wet and dry periods;
- High storage and medium to high permeability;
- Springs generally diffuse discharge type;
- Water level least vulnerable to rainfall variation (decrease in recharge);
- Groundwater occurs in courser part of the formation;
- Groundwater occurs also at the contact between the soft rocks and underlying bed rock;
- Underlying weathered and decomposed bed rock is good water bearing zone;
- High digability, but vulnerable to collapse, need lining all the time

## Annex 2: Groundwater Potential of major African Hydro-geological Eenvironments

| | Hydrogeological sub-environment | GW potential & average yields | Groundwater targets |
|---|---|---|---|
| Crystalline basement rocks | Highly weathered and/or fractured basement | Moderate<br>0.1- 1 l/s | Fractures at the base of the deep weathered zone.<br>Sub -vertical fracture zones. |
| | Poorly weathered or sparsely fractured basement | Low<br>0.1 l/s – 1 /s | Widely spaced fractures and localized pockets of deep weathering. |
| Consolidated sedimentary rocks | Sandstone | Moderate – High<br>1 – 20 l/s | Coarse porous or fractured sandstone. |
| | Mudstone and shale | Low<br>0 – 0.5 l/s | Hard fractured mudstones<br>Igneous intrusions or thin limestone / sandstone layers. |
| | Limestones | Moderate – high<br>1-100 l/s | Fractures and solution enhanced fractures (dry valleys) |
| | Recent Coastal and Calcareous Island formations | High<br>10 – 100 l/s | Proximity of saline water limits depth of boreholes or galleries. High permeability results in water table being only slightly above sea level |
| Unconsolidated sediments | Major alluvial and coastal basins | High<br>1 – 40 l/s | Sand and gravel layers |
| | Small dispersed deposits, such as river valley alluvium and coastal dunes deposits | Moderate<br>1 – 20 l/s | Thicker, well-sorted sandy/gravel deposits.<br>Coastal aquifers need to be managed to control saline intrusion. |
| | Loess | Low – Moderate<br>0.1 – 1 l/s | Areas where the loess is thick and saturated, or drains down to a more permeable receiving bed |
| | Valley deposits in mountain areas | Moderate – High<br>1 – 10 l/s | Stable areas of sand and gravel; river-reworked volcanic rocks; blocky lava flows |
| Volcanic Rocks | Extensive volcanic terrains | Low - High<br>Lavas 0.1 – 100 l/s<br>Ashes and pyroclastic rocks<br>0.5-5 l/s | Generally little porosity or permeability within the lava flows, but the edges and flow tops/bottom can be rubbly and fractured; flow tubes can also be fractured.<br>Ashes are generally poorly permeable but have high storage and can drain water into underlying layers. |

## Annex 3: Definition of Key Terms

***Adaptive Capacity***: Adaptive capacity is defined as the ability of a system [human or natural] to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

***Climate***: Climate is "average" weather for a given place or a region. It defines typical weather conditions for a given area based on long-term averages. For example, on average, Addis Ababa is expected to be sunny in May, rainy in July and cold in January but there may be annual deviations.

***Climate Change*****:** According to IPCC definition Climate Change refers to any change in the climate over time, whether due to natural variability or as a result of human activity.

***Climate variability***: It refers to the climatic parameter (temperature, rainfall,...) of a region varying from its long-term mean. Every year in a specific time period, the climate of a location is different. Some years have below average rainfall, some have average or above average rainfall.

***Ecosystem***: An ecosystem is a dynamic complex of plant, animal and microorganism communities and their non-living environment interacting as a functional unit.

***Ecosystem functions:*** Ecosystem functions/services are the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling, that maintain the conditions for life on Earth.

***Environmental degradation*****:** It is the deterioration of the *environment* through depletion of resources such as air, water and soil; the destruction of ecosystems and the extinction of wildlife. It is defined as any change or disturbance to the *environment* perceived to be deleterious or undesirable.

***Impact:*** It is an effect on natural and human systems. It generally refers to effect on lives, livelihoods, health, ecosystems, economies, societies, cultures, services, and infrastructure due to hazardous events occurring within a specific time period and the vulnerability of an exposed society or system. For example, the impacts of climate change on geophysical systems, including floods, droughts, and sea level rise, are a subset of impacts called physical impacts.

***Resilience***: Resilience can be defined as the ability of a system [human or natural] to resist, absorb and recover from the effects of hazards in a timely and efficient manner, preserving or restoring its essential basic structures, functions and identity.

***Risk*****:** Risk is the probability that negative consequences may arise when impacts interact with vulnerable areas, people, property and environment.

***Sensitivity:*** Sensitivity is the degree to which a given community or ecosystem is affected by climatic stresses. For example, a community dependent on rain-fed agriculture is much more sensitive to changing rainfall patterns than one where mining is the dominant livelihood. Likewise, a fragile, arid or semi-arid ecosystem will be more sensitive than a tropical one to a decrease in rainfall, due to the subsequent impact on water flows.

***Vulnerability:*** It is the degree to which a system (natural or human) is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity.

***Weather:*** Weather is the current atmospheric condition in a given place. This includes variables such as temperature, rainfall, wind or humidity. Anyone looking outside can see if it is raining, windy, sunny or cloudy and can find out how hot it is by checking a thermometer or just feeling it. Weather is what is happening now, or is likely to happen tomorrow or in the very near future.

**Annex 4: Policy and Legal Frameworks**

***The Constitution of Ethiopia, 1995***

The Constitution has an exclusive article on the environment and therefore states in its Article 44 Sub Article 1 that: "All persons have the right to live in a clean and healthy environment." Furthermore, concerning compensation to Project Affected Peoples (PAPs), Sub Article 2 provides that: "All persons who have been adversely affected or whose rights have been adversely affected as a result of state programs have the right to commensurate monetary or alternative means of compensation, including relocation with adequate state assistance." Regarding public consultation and participation, in Article 92 sub Article 3, it states that: "People have the right to full consultation and to the expression of views in the planning and implementation of environmental policies or projects that affect them directly."

***Environmental Policy of Ethiopia, 1997***

The overall policy goal is to improve and enhance the health and quality of life of all Ethiopians and to promote sustainable social and economic development through the sound management and use of natural, human-made and cultural resources and the environment as a whole so as to meet the needs of the present generation without compromising the ability of future generations to meet their own needs.

The principal features of the Environmental Policy are:

- ✓ Provides for protection of human and natural environments,
- ✓ Provides for an early consideration of environmental impacts in projects/program design,
- ✓ Recognizes public consultation,
- ✓ Includes mitigation and contingency plans,
- ✓ Provides for auditing and monitoring,
- ✓ Establishes legally binding requirements, and
- ✓ Institutionalizes policy implementation.

***Ethiopian Land Tenure laws***

Related to land acquisition and property losses due to project development, there is one proclamation and one regulation as indicated below. The proclamation and regulation strongly support that projects plan must include attractive and sustainable resettlement strategies to the people who are going to be displaced as a result of the development plan, and they have to be meaningfully consulted, fully convinced, compensated and have to participate in all phases of the project implementation. It is the right for existing land owner to be compensated fully and satisfactorily if land is expropriated by the state for public purpose. Related to this, there are one proclamation and one regulation to enforce the proclamation. These are:

- *Proclamation* ***No. 455/2005:*** *Expropriation of Landholdings for Public Purposes and Payment of Compensation:* The proclamation address issues related to *Public domain Entitlement, Property laws, Land asset classification and valuation, customary laws, Procedures for expropriation, Procedures for grievance redress.*

- *Regulation* ***No. 135/2007:*** R*egulations on the payment of compensation for property situated on landholdings expropriated for public purposes: It addresses regulation for the payment of compensation for property situated on landholdings expropriated for public purposes. It describes the detail implementation procedures in when settling issues related to public domain entitlement, property laws, land asset classification and valuation, customary laws, procedures for expropriation, procedures for grievance redress.*

***Ethiopian Water Resources Management Policy, 1999***

The overall goal of the national water resources management policy is: *to enhance and promote all national efforts towards the efficient, equitable, and optimum utilisation of the available water resources of Ethiopia for significant socio-economic development on sustainable basis.* The policy aims to ensure access to water for everyone fairly and in a sustainable manner, protect water resources and sources, and promote cooperation for the management of river basins. The following are five major water management policy objectives.

- Development of the water resources of the country for economic and social benefits of the people, on equitable and sustainable basis.
- Allocation and apportionment of water resources based on comprehensive and integrated plans and optimum allocation principles that incorporate efficiency of use, equity of access, and sustainability of the resource.
- Managing and combating drought as well as other associated slow on-set disasters through, *inter-alia*, efficient allocation, redistribution, transfer, storage, and efficient use of water resources.
- Combating and regulating floods through sustainable mitigation, prevention, rehabilitation and other practical measures.
- Conserving, protecting and enhancing water resources and the overall aquatic environment on sustainable basis.

***Environmental Impact Assessment Proclamation No 299/2002***

This Proclamation establishes the requirement of an Environmental Impact Assessment (EIA) procedure for projects, and provides the processes and procedures to be followed by project owners with respect to EIAs. As per this proclamation, the objectives of the EIA process are:

- Integration of environmental considerations in development planning processes, in order to make use of natural resources in a responsible manner; and
- Protection and enhancement of the quality of all life forms.

***The Environmental Impact Assessment (EIA) Guideline, May 2000***

The EIA guideline is the basic foundation for environmental and social studies of development projects. It provides basic framework of potential impacts of various sectors of development activities. The aim of the guideline is to guide all stakeholders that prepare, review and approve EIA report. In addition, it also classifies the type of development projects into three based on whether or not a full EIA is required as indicated below.

- **Schedule 1**: Projects which may have adverse and significant environmental impacts, and may, therefore, require full EIA.
- **Schedule 2:** Projects whose type, scale or other relevant characteristics have potential to cause some significant environmental impacts but not likely to warrant an environmental impact study. Water and Sanitation projects are under this schedules/category. Activities under this schedules need preparation of Environmental and Social Management Plan (ESMP) with recommended measures to prevent, minimize, mitigate or compensate for adverse impacts. This needs some environmental and social analysis of the project activities.
- **Schedule 3:** Projects which would have no impact and does not require environmental impact assessment.

For the detail, please refer Ethiopian EIA guideline prepared by the former Federal Environmental Protection Authority.

***Environmental Pollution Control Proclamation No 300/2002***

This proclamation established fundamental principles and guidelines to control environmental pollution. These major principles are: the protection of the environment in general and the safeguarding of human health and well being, as well as the maintaining of the biota and the value of nature, in particular, are the duty and responsibility of all. It is appropriate to eliminate or, when not possible, to mitigate pollution as an undesirable consequence, or social and economic development activities.

***Ethiopian Water Sector Strategy, 2001***

The main objective of the water strategy is to translate the national water resources management policy into action. Under this strategy, section 4.1.2, #2, it emphasis the implementation of appropriate watershed management practices to promote water conservation, maximise water yields, improve water quality, and reduce reservoir siltation and flooding.

Again, in the same strategy, section 4.1.10, # 1&2, it states that environment conservation and protection will be treated as an integral part of the water related projects. Towards this aim, Environmental Impact Assessments will be made mandatory for all water resources projects. In this same section, the strategy also indicate that incorporate environmental studies as a component of the studies to be carried out for water resources development projects.

***CRGE Strategy of Ethiopia, November 2011***

Ethiopia is experiencing the effects of climate change. The impact of climate change is more pronounced in the agriculture, water, and forest sectors. The Government of the Federal Democratic Republic of Ethiopia, recognizing the effect of climate change in all of the development sectors, has developed the Climate-Resilient Green Economy (CRGE) strategy to protect the country from the adverse effects of climate change and to build a green economy that will help realize its ambition of reaching middle income status before 2025.

***Climate Resilient Strategy: Water and Energy***

Climate resilience is the ability to cope with, and manage the change brought by weather stresses and shocks. A climate resilient economy is one in which the negative impacts of climatic variability and climate change are minimized and the opportunities realized so that the national growth and development objectives of the country are achieved and sustained. The Climate Resilience Strategy for the water and energy sector, prepared by the MoWIE, sets out the implementation priorities for the Ministry of Water, Irrigation and Energy, building on the Green Economy Strategy. The strategy has three objectives:

- ✓ *Identify the economic and social impacts of current climate variability and future climate change on water and energy in Ethiopia (The Challenge).*
- ✓ *Identify priorities for the water and energy sectors to build climate resilience and reduce the impact of current climate variability and climate change (The Response).*
- ✓ *Map the necessary steps to finance and implement measures in the water and energy sectors to build climate resilience in Ethiopia (Implementation) and deliver an integrated Climate Resilient Green Economy.*

## Annex 5: SECRSM Plan TEMPLATE

**Region: _________; Zone: __________, Woreda: __________; Kebele: ___________; Site: ____________, WP: _________________**

| Nr | Risk Screening | | | | | Risk Management | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Project activity | Impact | Risk | | | Mitigation Measures (MMs) | Responsible body | When to implement | Cost for MMs |
| | | | C | P | RL | | | | |
| I | **Impact of the *project* on the B*iophysical Environment*** | | | | | | | | |
| 1 | Construction of water points (HDWs, SW, SD, DW), and latrines | Depletion of ground water due to a number of water point constructed (cumulative impact). | | | | Develop and implement watershed management plan to improve the ground water recharge. Aware the community on water conservation. | WoW, WoANR, community, WASHCO | Throughout the project life | |
| 2 | | Land slide and gully formation/erosion around the spring capping structure, collection chamber, and latrines as a result of soil excavation work. | | | | Construct retaining wall/protection structure around the spring capping structure and collection chamber. Construct cut off drain above these structures. | WoW, community, WASHCO | During construction | |
| 3 | | Poor construction quality leads to leakage of water which is wastage of scare water resource, and pollution of water. | | | | Ensure the construction quality through construction supervision, checking the construction materials, and contracting to experienced Artisan especially for structures which need it. | WoW, community, WASHCO | During construction | |
| 4 | | Well water contamination through the well during construction, and as a result of standing water around the well. | | | | Minimize well contamination through educating Artisans. Continuous awareness creation to the community on the cleaning of standing water around the water point/well. Disinfect wells before use. Construct drainage ditch to drain water around the water points especially wells. | WoW, WoH, WoEd, community, WASHCO | During and after construction . | |

| Nr | Risk Screening | | | | | Risk Management | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Project activity | Impact | Risk | | | Mitigation Measures (MMs) | Responsible body | When to implement | Cost for MMs |
| | | | C | P | RL | | | | |
| II | **Impact of the project on the Social Environment** | | | | | | | | |
| 1 | | Water points are not comfortable to fetch, carry and transport water as the site, technology and design are not comfortable for women and children. | | | | Consult women meaningfully and take into account the opinion of women with respect to site selection, technology selection and design. | WoW, WoWA, community | During site selection, design and construction | |
| 2 | | Occupational health and safety problem during the construction of water points especially HDWS, SWs & DWs. Artisan and community members may also get injured during the construction time.<br>Animals and human being may enter into wells and die. Abandoned wells also creates to children and animals. | | | | Safety education should be given to the community, WASHCO and Artisans.<br>Prevent the approach of children and animals to the wells till completed. Put temporary fence around the well.<br>If possible, safety equipment like helmet shall be dressed by Artisan and excavators.<br>Abandoned wells should be refilled/backfilled by the cart away soil. | WoW, WASHCO, community | During construction<br>. | |
| 3 | Construction of water points, public latrines; and store & offices for MSEs. | Land acquisition and property losses of farmers affecting their livelihood. | | | | Consult with the land owner/owners, and settle it before the commence of construction. The agreement should be signed and documented (see section 6.4 of this guideline). | WoW, Kebele, WASHCO, Land owner/s community | During the field appraisal | |
| III | **Impact of Environmental Degradation on the Project Sustainability** | | | | | | | | |
| 1 | Wider catchment degradation: No/limited vegetation cover, and highly eroded.<br><br>Land slide around water | Water points damaged by flood, land slide and gully.<br>Decrease water yield leading water shortage.<br>Drainage of well water if the well is located above the gully head and well sited in a sloppy area (gullies suck water from springs, dug-wells and hand pumps).<br>All these lead the community to | | | | Relocate the site of the water point away from flood prone areas, land slide, and gullies at least 150m away from land slide.<br>Develop and implement watershed management plan: construct cut off drain, check dam, terrace, ground water recharge structure, implement biological conservation measures, and others. | WoW, WASHCO, WoANR, community | During design, construction, and the rest of the project life. | |

| Nr | Risk Screening | | | | | Risk Management | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Project activity | Impact | Risk | | | Mitigation Measures (MMs) | Responsible body | When to implement | Cost for MMs |
| | | | C | P | RL | | | | |
| | points.<br><br>Gully within 150m of radius from the water point.<br><br>Sloppy topography (slop drop off at least 10m within 150m of radius). | go to unsafe water source, and hence health risk, and lose of capital resources. | | | | Construct protection structure like retaining wall, and vegetative measures to avoid the land slide.<br>Design and construct water supply structures in such a way that they resist the impact of land slide. | | | |
| 2 | Intensive agronomic practices that use agrochemicals including artificial fertilizer and pesticide | Water source contaminated with chemical, and result health risk to the community | | | | Promoting Integrated Pest Management approaches to manage pests.<br>Treatment of the catchment upstream of the water point where agronomic practices is exercised. | WoW, BoANRM, the community. | During the whole project life. | |
| 3 | Open defecation around the water points; latrines are constructed not far from the WPs, and waste dumping near water point. | Water source contaminated with microbial and chemical, and result health risk to the community. | | | | Maintain the minimum 30m recommended distance between the latrine and the water source. If that is not possible, upgrade latrines from open pit latrines to either sealed pit latrines or latrines with septic tanks.<br>Aware the community to construct and use latrine. | WoW, WoH, WASHCO, the community | During field appraisal, and the rest of the project life. | |
| **IV** | **Impact of Climate Change on the Project Sustainability** | | | | | | | | |
| 1 | Intensive rainfall | Inundation of spring and HDW–groundwater contaminated by incoming flood. Damage to | | | | Implement watershed management activities in wider catchment to reduce severity of floods. | WoW, WoH, WoEd, BoANR, | During field appraisal, design, | |

| Nr | Risk Screening | | | | | Risk Management | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Project activity | Impact | Risk | | | Mitigation Measures (MMs) | Responsible body | When to implement | Cost for MMs |
| | | | C | P | RL | | | | |
| | | infrastructure e.g. from landslips, gullies due to high rainfall and resulting flood. As a result water quality deteriorate and cause public health risk. | | | | Site well away from latrines and other sources of groundwater pollution. Seal any abandoned wells to protect groundwater quality.<br>Relocate the site of the water point away from flood prone areas. Raise the well head and seal the well to prevent any polluted flood water from entering the well.<br>Raise awareness of risks from water quality changes during & after flooding, and need for household water treatment/use of safer alternatives.<br>Regularly check and repair infrastructure. Conduct sanitary inspection. | WASHCO, the community | construction and the rest of the project life. | |
| | | Collapsing of pit latrines due to flooding and people divert to open defecation practices.<br>Water point may be polluted causing public health problem. | | | | If possible located latrines away from flood rout. Construct sealed - improved latrines (sanitation facilities) using durable materials higher above the potential flood level<br>Construct flood protection structures. | WoW, WoH, WoEd, BoANR, WASHCO, the community | Same as above. | |
| 2 | Decreased rainfall | Seasonal or drought-related shortages – insufficient water for demand. **Drought** resulted in lowering of the groundwater table and as a result HDW, spring and shallow well dried<br>Public health risk from water rationing/cut-backs, or use of alternative (unsafe) sources<br>Public health risk from deteriorating water quality at end of dry season or drought. | | | | Estimate spring yield and catchment size needed to meet current and projected demand.<br>Collate secondary information on geological conditions to understand water availability & supplement with field observations.<br>Analyse seasonal yields of alternative sites with community – select most reliable source(s).<br>Increase capacity of collection and storage facilities.<br>Investigate management practices that | WoW, WoH, WoEd, BoANR, WASHCO, the community. | During field appraisal, design, construction and the rest of the project life. | |

| Nr | Risk Screening | | | | | Risk Management | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Project activity** | **Impact** | **Risk** | | | **Mitigation Measures (MMs)** | **Responsible body** | **When to implement** | **Cost for MMs** |
| | | | **C** | **P** | **RL** | | | | |
| | | | | | | might increase infiltration and groundwater recharge – in vicinity of water source and in wider catchment. Monitor water quality during high risk periods at end of dry season or drought. | | | |

**N.B**: **C**: Consequence of the impact occurring; **P**: Probability of the impact occurring; **RL**: Risk Level (L-Low, M-Medium, H-High, & V.H- Very High)

**Annex 6: SECRSM monitoring plan EXAMPLE**

**Region:_________; Zone:__________, Woreda:__________; Kebele:___________; Site:____________, WP:_________________**

| No | Potential Impacts that need mitigation [c] | Description of mitigation (elements to be monitored) [d] | Responsible body | Indicators to be monitored | Monitoring method | When to monitor | Monitoring Cost |
|---|---|---|---|---|---|---|---|
| I | **Impact of the *project* on the B*iophysical Environment*** | | | | | | |
| 1 | Depletion of ground water due to a number of water point constructed (cumulative impact). | Develop and implement watershed management plan to improve the ground water recharge. Aware the community on water conservation. | WoW, WoANR, community, WASHCO | Protected watershed, and constructed groundwater recharge structures. | Observation | During construction and operation time. | XXXbirr (operational cost- per diem and fuel cost) |
| 2 | Land slide and gully formation/erosion around the spring capping structure, collection chamber, and latrines as a result of soil excavation work. | Construct retaining wall/protection structure around the spring capping structure and collection chamber. Construct cut off drain above these structures. | WoW, community, WASHCO | The presence of these structures, land slide and gully formation... | Observation | During the construction time, and after the heavy rainfall | XXXbirr (operational cost- per diem and fuel cost) |
| 3 | Poor construction quality leads to leakage of water which is wastage of scarce water resource, and pollution of water. | Ensure the construction quality through construction supervision, checking the construction materials, and contracting to experienced Artisan especially for structures which needs it. | WoW, community, WASHCO | No leakage, no contaminatio n. | Observation , Water quality analysis | During construction | |
| 4 | Well water contamination through the well during construction, and as a result of standing water around the well. | Minimize well contamination through educating Artisans. Continuous awareness creation to the community on the cleaning of standing water around the water point/well. Disinfect wells before use. Construct drainage ditch to drain water around the water points especially wells. | WoW, WoH, WoEd, community, WASHCO | No water quality problem. | Water quality analysis, and interview of WASHCO and community. | During and after construction . | |

| No | Potential Impacts that need mitigation [c] | Description of mitigation (elements to be monitored) [d] | Responsible body | Indicators to be monitored | Monitoring method | When to monitor | Monitoring Cost |
|---|---|---|---|---|---|---|---|
| II | **Impact of the project on the Social Environment** | | | | | | |
| 1 | Water points are not comfortable to fetch, carry and transport water as the site, technology and design are not comfortable for women and children. | Consult women meaningfully and take into account the opinion of women with respect to site selection, technology selection and design. | WoW, WoWA, community | Comfortable water points for women and children | Observation, interview of WASHCO and beneficiary | During site selection, design and construction. | |
| 2 | Occupational safety and health problem during the construction of water points especially HDWS, SWs & DWs. Artisan and community members may also get injured during the construction time.<br>Animals and human being may enter into wells and die. Abandoned wells also create problem to children and animals. | Safety education should be given to the community, WASHCO and Artisans.<br>Prevent the approach of children and animals to the wells till completed.<br>Put temporary fence around the well.<br>If possible, safety equipment like helmet shall be dressed by Artisan and excavators.<br>Abandoned wells should be refilled/backfilled by the cart away soil. | WoW, WASHCO, community | No occupational health and safety problem recorded, abandoned well backfilled, well fenced during construction. Artisan worn helmet. | Observation, interview | During construction. | |
| 3 | Land acquisition and property losses of farmers affecting their livelihood. | Consult with the land owner/owners, and settle it before the commence of construction. The agreement should be signed and documented (see section 6.4 of this guideline). | WoW, RSU | Minutes of consultation and table 6 of this guideline. | Document review, interview with the land owner and WASHCO | During construction time | XXXbirr (operational cost- per diem and fuel cost) |

| No | Potential Impacts that need mitigation [c] | Description of mitigation (elements to be monitored) [d] | Responsible body | Indicators to be monitored | Monitoring method | When to monitor | Monitoring Cost |
|---|---|---|---|---|---|---|---|
| III | **Impact of Environmental Degradation on the Project Sustainability** | | | | | | |
| 1 | Water points damaged by flood, land slide and gully.<br>Decrease water yield leading water shortage.<br>Drainage of well water if the well is located above the gully head and well sited in a sloppy area (gullies suck water from springs, dug-wells and hand pumps).<br>All these lead the community to go to unsafe water source, and hence health risk, and lose of capital resources.<br>Absence of cattle trough leads to water point contaminated from mud mixed with cow dung around the water point. | Relocate the site of the water point away from flood prone areas, land slide, and gullies at least 150m away from land slide.<br>Develop and implement watershed management plan: construct cut off drain, check dam, terrace, ground water recharge structure, implement biological conservation measures, and others.<br>Construct protection structure like retaining wall, and vegetative measures to avoid the land slide.<br>Design and construct water supply structures in such a way that they resist the impact of land slide.<br>Construct cattle trough if sufficient water available for the cattle.<br>Fence water point properly. | WoW, WASHCO, WoANR, community | Water points are safe from flood, gully and land slide.<br>Sufficient water throughout the year.<br>Watershed protected well.<br>Flood protection structures well constructed,<br>Cattle trough constructed,<br>fence properly managed. | Field observation, and WASHCO and Community interview. | During construction and operation time, when there is heavy rainfall. | XXXbirr (operational cost- per diem and fuel cost) |
| 2 | Intensive agronomic practices that use agrochemicals including artificial fertilizer and pesticide. Hence, Water source contaminated with chemical, and result health risk to the community | Promoting Integrated Pest Management approaches to manage pests.<br>Treatment of the catchment upstream of the water point where agronomic practices is exercised. | WoW, BoANRM, the community. | Protected watershed, reduced use of Agrochemical | Observation, interview, water quality analysis | During the operation time. | |

| No | Potential Impacts that need mitigation [c] | Description of mitigation (elements to be monitored) [d] | Responsible body | Indicators to be monitored | Monitoring method | When to monitor | Monitoring Cost |
|---|---|---|---|---|---|---|---|
| 3 | Open defecation around the water points; latrines are constructed not far from the WPs, and waste dumping near water point. Hence, Water source contaminated with microbial and chemical, and result health risk to the community. | Maintain the minimum 30m recommended distance between the latrine and the water source. If that is not possible, upgrade latrines from open pit latrines to either sealed pit latrines or latrines with septic tanks. Aware the community to construct and use latrine. No solid waste around water point. | WoW, WoH, WASHCO, the community | No OD and solid waste, water points are constructed at the recommended distance from latrines, each HH have HH latrines. | Observation, water quality analysis | During and after construction. | |
| IV | **Impact of Climate Change on the Project Sustainability** | | | | | | |
| 1 | Inundation of spring and HDW–groundwater contaminated by incoming flood. Damage to infrastructure e.g. from landslips, gullies due to high rainfall and resulting flood. As a result water quality deteriorate and cause public health risk. | Implement watershed management activities in wider catchment to reduce severity of floods.<br>Site well away from latrines and other sources of groundwater pollution.<br>Seal any abandoned wells to protect groundwater quality.<br>Relocate the site of the water point away from flood prone areas. Raise the well head and seal the well to prevent any polluted flood water from entering the well.<br>Raise awareness of risks from water quality changes during & after flooding, and need for household water treatment/use of safer alternatives. Regularly check and repair infrastructure. Conduct sanitary inspection. | WoW, WoH, WoEd, BoANR, WASHCO, the community | Watershed protected; water points are safe from flood, and contamination; | Observation; water quality analysis; Interview WASHCO and community. | During construction time, when there is heavy rainfall. | XXXbirr (operational cost- per diem and fuel cost) |
| | Collapsing of pit latrines due to flooding and people divert to open | If possible located latrines away from flood rout. Construct sealed - improved latrines (sanitation | Same as above | Latrines protected | Observation, interview | During construction | |

| No | Potential Impacts that need mitigation [c] | Description of mitigation (elements to be monitored) [d] | Responsible body | Indicators to be monitored | Monitoring method | When to monitor | Monitoring Cost |
|---|---|---|---|---|---|---|---|
| | defecation practices. Water point may be polluted causing public health problem. | facilities) using durable materials higher above the potential flood level Construct flood protection structures. | | from flood. No health problem due flooding of latrine | | time, when there is heavy rainfall. | |
| 2 | Seasonal or drought-related shortages – insufficient water for demand. **Drought** resulted in lowering of the groundwater table and as a result HDW, spring and shallow well dried. Public health risk from water rationing/cut-backs, or use of alternative (unsafe) sources. Public health risk from deteriorating water quality at end of dry season or drought. | Estimate spring yield and catchment size needed to meet current and projected demand. Collate secondary information on geological conditions to understand water availability & supplement with field observations. Analyse seasonal yields of alternative sites with community – select most reliable source(s). Increase capacity of collection and storage facilities. Implement management practices that might increase infiltration and groundwater recharge – in vicinity of water source and in wider catchment. Monitor water quality during high risk periods at end of dry season or drought. | WoW, WoH, WoEd, BoANR, WASHCO, the community | Recharge structures implemented ; sufficient yield throughout the year; safe water. | Water quality analysis, WASHCO and Community interview, | During construction time, during high risk periods at end of dry season or drought. | XXXbirr (operational cost- per diem and fuel cost) |

[c] = taken from annex 5 column 2

[d] = taken from annex 5 column 6

**Annex 7: Template for Minutes of Community Consultation for Land Acquisition Issue**

**Minutes of community consultation**

1. Date:_____________; 2: Time:____________________

3. Place: Region____________; Zone:____________; Woreda___________; Kebele_________; Village________; WP_________

4. Participants (their names and signatures):

4.1. Land owner:

4.2. Kebele administrator:

4.3. Community (name and signature of the beneficiary community should be registered and attached with this minutes)

5. Agendas: To discuss with the land owner/s on land to be taken from him/her for the purpose of water point construction.

6. Issues discussed and agreement reached.

**Annex 8: Impact of climate variability and change on Water Supply and Sanitation System**

| Climate related hazards | Impact | Adaptation Measures |
|---|---|---|
| **I. Impact on Water Resource** | | |
| Decreased rainfall, increased temperature, drought | • Reduction in quantity and quality of ground water sources at the end of dry season<br>• High concentration of chemical and organic contaminates due to poor dilution<br>• Reduced ground water recharge Eutrophication | • Develop and Implement watershed management plan to improve groundwater recharge<br>• Investigate alternative water sources and water harvesting methods.<br>• Raise awareness among the community of possible contamination issues resulting from decreased water flow. |
| Increase in frequency and intensity of extreme weather events<br><br>Sudden and intense rain events leading to increased risk of flooding | Pollution of surface and ground water sources due to discharging of over flooded pit latrines and waste water facilities<br>Contamination of source water (Borehole/SW/HDW/Spring) due to runoff/flood washed animal and human faeces, and agrochemical from uphill grazing and crop land and directly enters the source<br>Shallow groundwater may also be affected by infiltration of floodwater through soil layers | • Sitting of the ground water sources away from flood ways, latrines and other groundwater pollution sources.<br>• As much as possible, protect catchment around upstream of the source from activities that could introduce contaminants to the water source<br>• Construct flood protection structures Construct sealed-improved latrine (sanitation facilities) using durable materials above the potential flood levels<br>• For deep wells, ensure the casing extends below the level of shallow aquifers.<br>• Extend lining above ground.<br>• Improve well lining to prevent ingress of water from soil and shallow groundwater, where appropriate.<br>• Provision of alternative water sources during inundation or household treatment.<br>• Conduct sanitary inspection.<br>• Increase water quality monitoring after floods have receded.<br>• Construct check dam, and implement watershed management work to rehabilitate gullies and prevent/minimize the land slide.<br>• Casing wells with watertight material, raising the wellhead, and placing wellhead on mound to allow floodwater to drain away.<br>• Raise awareness of the user community about risks from water quality changes during and after flooding, and the need for household water treatment. Incorporate the need of PWD when developing awareness creation program so that have equal opportunity to get information |
| **II. Impacts on water supply services and public** | | |
| Increased temperature, drought | • Facilities are overused during drought to meet Demand. Dry pumping damages pumps<br>• Intermittent water supplies and pressure changes in the distribution network lead to | • Plan and implement no-regret measures (use more resilient technologies, adopt comprehensive risk assessment and risk management approaches, etc)<br>• Repair/replace water supply infrastructure with high quality goods<br>• Strengthen climate risk management, |

| Climate related hazards | Impact | Adaptation Measures |
|---|---|---|
| | damage of the infrastructure.<br>• Interruption or temporary reduction of services due to lack of water availability leading water user conflict and shift to unsafe water source and hence public health risk<br>• Drop in quality of water distributed (high concentration of chemical contaminants<br>• Low pressure in system may allow ingress of contamination into the water distribution network.<br>• Challenges in sustainable sanitation and hygiene practices/behaviours<br>• Vulnerable groups including women, children, the poor and Person With Disability (PWD) disproportionately affected by the shortage of water. | operation and maintenance capacity of the government (utility/WASHCO) and the community to be able to deal with climate related shocks and stresses<br>• Strengthen operational monitoring and take corrective measures<br>• Promotion of point-of-use water treatment and safe storage practices<br>• Improve efficiency of water use in nondomestic water use.<br>• Increase water storage capacity to provide supply over extended dry periods<br>• Investigate safe alternative water sources and water harvesting methods<br>• Pipe maintenance programme to reduce leaks.<br>• Monitor water pressure in pipes to aid in detection of leaks.<br>• Implement education programme to reduce water demand.<br>• Include vulnerable groups in identification and implementation of control measures/actions. |
| Increase in frequency and intensity of extreme weather events, Sudden and intense rain events leading to increased risk of flooding | • Flooding/inundation of wells/springs, other infrastructures, pit latrines, erosion/damage of infrastructure/facilities, bursting of pipelines and leakage leading to WASH service interruption and is more problematic to vulnerable groups<br>• Flooding cause contamination of water sources: water quality compromised due to pollution of water by flooded sanitation facilities, flood loaded agrochemicals, open defecation: People divert to using unsafe water sources and are at risk of water borne diseases. | • Conduct risk assessment including climate risks and water quality monitoring, develop and improvement plans/corrective actions including water treatment<br>• Repair/replace water supply infrastructure with high quality goods<br>• Strengthen management and maintenance capacity of the WASHCO<br>• Construct flood diversion structure to prevent intrusion of flooding to source/reservoirs and treatment plants.<br>• Include vulnerable groups in identification and implementation of control measures/actions.<br>• Ensure water supply that infrastructures are properly designed adopting higher design standards, protected and maintained to prevent infrastructure damage and entry of contaminated water, and are constructed from durable materials taking into account higher and more frequent floods into consideration, particularly in terms of return periods for significant events.<br>• Site major water supply infrastructures away from flood zones, or build appropriate flood defenses.<br>• Intensify water quality monitoring after flood.<br>• Raise awareness about risks from water quality changes during flooding and the need for household water treatment. Incorporate the need of PwD when developing awareness creation program so that |

| Climate related hazards | Impact | Adaptation Measures |
|---|---|---|
| | | have equal opportunity to get information.<br>• Conduct sanitary inspection. |
| | Entry of contaminated water at service and storage reservoir, and distribution system causing localized or widespread contamination of the water distribution system. This leads to major public health risk from consuming the water | • Replace or repair damaged access points to the service and storage reservoir.<br>• Flush out reservoir and distribution pipes before re-commissioning to remove sediments. Increase water quality monitoring after floods have receded. Implement shock chlorination.<br>• Construct flood diversion structure to prevent intrusion of flooding.<br>• Site reservoirs and distribution pipes away from flood prone areas, and from open sewers and drainage channels.<br>• Introduce a pipe maintenance programme to reduce leakage and potential for ingress of contaminants.<br>• Develop back-up sources, such as linkages to other water sources or community water supply systems.<br>• Conduct sanitary inspection of reservoirs and distribution pipes.<br>• Raise awareness about risks from water quality changes during flooding and the need for household water treatment. Incorporate the need of PwD when developing awareness creation program so that have equal opportunity to get information. |
| | Standpipes inundated with contaminated floodwater which causes standpipes become inaccessible or are damaged by the floodwater. This leads to<br>Quality of the water at the standpipe<br>deteriorates and there is potential for more widespread contamination of the distribution system, and hence major public health risk from consuming the water | • Place on elevated platform to allow access during floods. Site standpipes away from flood prone areas.<br>• Construct standpipes from durable materials to reduce damage during floods.<br>• Regularly check standpipes and adopt a maintenance programme to reduce potential for ingress of contaminants.<br>• Develop response plan after flooding to assess<br>• damage to standpipes and to inform future improvement.<br>• Flush out pipes and clean standpipes after floods.<br>• Conduct sanitary inspection of standpipe.<br>• Increase water quality monitoring after floods have receded.<br>• Raise awareness about risks from water quality changes during flooding and the need for household water treatment. Incorporate the need of PwD when developing awareness creation program so that have equal opportunity to get information. |
| | Increased risk of landslides and expanding gullies causing damage to water supply infrastructures | • Site water supply infrastructures away from potential landslide and gully areas.<br>• Reinforce slopes where there is a risk of |

| Climate related hazards | Impact | Adaptation Measures |
|---|---|---|
| | resulting potential failure of the drinking-water supply system, and loss of service.<br>Contaminants enter the water supply system and cause water contaminated leading to public health risk from contaminants entering the water distribution system through damaged pipes. | landslide and rehabilitate gullies that may damage infrastructures.<br>• Construct check dam, and implement watershed management work to rehabilitate gullies and prevent/minimize the land slide<br>• Enhanced inspection of infrastructures.<br>• Do community awareness as recommended above in other impact categories |
| III. **Impact of Climate Change on Sanitation Services** | | |
| Raising in average temperature<br>Variability of seasonal rainfall pattern<br>Drought | **<u>Sewers</u>**<br>Low or intermittent flows may lead to sewer blockages building up more quickly.<br><br>Poor quality waste water is discharged to the environment (soil and water sources, and used for irrigation) : Disruption of aquatic ecosystem and biodiversity<br><br>Increased water born diseases and odour to the community and waste handlers | • Increase attention to construction quality and setting out of sewers.<br>• More inspection chambers and rodding eyes.<br>• Consider low-flush toilets.<br>• Low-cost, small-bore, shallow, and solids-free sewers (with interceptor chambers) all work better with lower water availability than conventional system.<br>• Adapt maintenance programme to reduce blockages and increase flushing.<br>• Educate community about what is appropriate to be flushed down toilets in low flows. If necessary, advice may need to include that paper cannot be flushed down toilet.<br>• Ensure that no waste disposal units allowed in sinks.<br>• Monitor sewer performance for blockages. |
| | **<u>Septic tank and improved pit latrines</u>**<br>Less water available for flushing and cleaning leads to toilet and discharge pipe becomes dirty or blocked | • Examine lower-water use approaches (plastic seals rather than water seals, for example) and slabs that are easier to clean.<br>• Septic tank system inspections.<br>• Education and awareness of lower-water use latrine options.<br>• Consider low-flush toilets.<br>• If no water available, septic tanks will not be a viable option. Investigate other systems for management of human excreta.<br>• Ensure that no waste disposal units allowed in sinks. Educate people about low-flush toilets. |
| Increase in frequency and intensity of extreme weather events,<br>Sudden and intense rain events leading to increased risk of flooding | • Collapsing of pit latrines due to flooding and people divert to open defecation practices,<br>• Interruption of pit-emptying services due to damage to road infrastructures,<br>• Flooding/inundation cause damage to waste water infrastructure (sewer, septic tank, electric, pumps, treatment system, etc)<br>• Failure to waste treatment processes due to flooding | • Construct sealed - improved latrines (sanitation facilities) using durable materials higher above the potential flood level<br>• Install electromechanical equipment above the potential flood level<br>• Install separate sewer system for the storm and waste water,<br>• Strengthen disease surveillance and response system<br>• Regularly monitor the blockage of sewer and drains. Clean sewers and drains regularly especially |

| Climate related hazards | Impact | Adaptation Measures |
|---|---|---|
| | • Increased discharge of untreated waste water and contents of pit latrine to environment (soil, public road and water sources)<br>• Lack of access to sanitation facilities and shifting to open defecation Increased water born diseases | just before wet season.<br>• Install flood defenses, catchment management.<br>• Invest in emergency response equipment e.g. mobile pumps kept in separate location.<br>• Prepare and implement rehabilitation plan.<br>• Design decentralized systems to minimize impact of local flooding.<br>• Ensure that sewers are gravity flow wherever possible. Low-cost and shallow sewers have much lower pumping requirements.<br>• Septic tanks and pump chambers can fill with silt and debris, and must be pumped out and cleaned after a flood. Design to prevent ingress of silt.<br>• Ensure adequate access to tanks so that they can be cleaned. |
| | Pit overflowing or inundated; very mobile contamination. These results faeces leaving pit and causing pollution downstream. Silt and solids entering pit and filling it. | • Design pit to allow regular emptying and post-flood rehabilitation to remove silt.<br>• Proper pit covers to prevent material flowing out in a flood.<br>• Where possible, site latrine away from water supply, and away from areas prone to flooding.<br>• Build pit latrine superstructure at the same level as the houses, as these usually are above normal flood level.<br>• In urban areas, consider small pits which need regular (monthly or less) emptying to minimize the amount of faecal matter exposed to flooding.<br>• Consider if dry or composting latrines or sewerage is appropriate.<br>• Regular pumping or emptying of pit latrine (particularly in urban setting).<br>• Site latrine away from drainage channel. Build bunds (banks, dykes or levees) to divert flow away from latrine.<br>• Use durable materials in construction to protect pit covers.<br>• Proper compaction of soil around the latrine and presence of adequate base and earth filling to protect pits, pit covers and slabs.<br>• Install robust upper foundations, collar and footing to protect from erosion and flooding damage.<br>• Adopt more conservative design standards for infrastructure to take higher and more frequent events into consideration (more expensive), or have systems that can be quickly and cheaply replaced. |
| | • Erosion and landslide exposing and damaging sewer pipe work, septic tank, and other | • Site pipe away from drainage channel. Construct flood water away from the sanitation infrastructure that may be one cause for landslide. |

| Climate related hazards | Impact | Adaptation Measures |
|---|---|---|
| | sanitation infrastructures.<br>• Environmental pollution<br>• Lack of access to sanitation facilities and shifting to open defecation<br>• Increased water born diseases<br>• PwD are more vulnerable and affected in accessing sanitation facilities. | • Build treatment works and sewer networks away from slopes that are at risk of slippage. Construct retaining wall.<br>• Compaction of soil and planting above sewers, under paved roads etc.<br>• Adopt more conservative design standards for infrastructure to take more severe and more frequent extreme weather events into consideration (the more expensive option), or<br>• have systems that can be quickly and cheaply replaced.<br>• Reinforce slopes where there is a risk of slippage that may damage infrastructure.<br>• Raise awareness of the community about the damage that landslides can cause to sanitation infrastructures. |
| | Flotation of septic tank due to rising of groundwater table. This may cause Damage to infrastructure.<br>Inundation of soakaway pits and improved pit latrine from below: this leads to increased potential for contamination of groundwater, and treatment of sewage by soil in soakaways may be reduced.<br><br>Environmental pollution that may leads to public health problem | • Do not locate septic tank and soakaway pits in soils which are regularly waterlogged.<br>• Where possible, site system away from water supply.<br>• If groundwater rises above the bottom of the tank and pits, the tank and pits will need to be secured to prevent floating during pumpout<br>• Ensure that septic tanks are emptied regularly.<br>• Design septic tank and pit systems in conjunction with drainage to lower the groundwater table.<br>• Introduce trees and other plants to improve drainage and increase water loss by transpiration.<br>• Education to increase awareness of possible contamination of water resources.<br>• Consider options: shallower pits and more frequent emptying;<br>• dry composting latrines; sewerage.<br>• Build round pits instead of square to increase stability.<br>• Use durable materials in construction to protect pit covers.<br>• Regular pumping or emptying of pit latrine (particularly in urban setting) – link to smaller pit sizing.<br>• Raise awareness about the dangers of unstable pit latrines, and under what conditions these might occur. |