NATURAL RESOURCES CONSERVATION AND DEVELOPMENT

NTQF Level -II

Learning Guide #31

Unit of Competence: - Demonstrate Routine Site Assessment and Measurements

Module Title: - Demonstrating Routine Site Assessment and Measurements

LG Code:- AGR NRC2 M01 LO1-LG-31

TTLM Code: AGR NRC2 TTLM 0919v1

LO 1: - Prepare for erosion assessment and measurement(s)

Instruction Sheet	Learning Guide #31

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- Confirming required purpose, priority and nature of assessment and measurements
- liaising to arrange site access and site clearance /permit
- Identifying & reviewing site hazards
- Assembling , checking & arranging measuring and safety equipment
- Arranging transportation
- Developing erosion assessment and measurement format
- Consulting designated personnel and community about the format content.
- Incorporating feedback & re-developing the final format
- Identifying to match project requirements as documented in the plan.

This guide will also assist you to attain the learning outcome stated in the cover page.
Specifically, upon completion of this Learning Guide, **you will be able to**

- Confirm required purpose, priority and nature of assessment and measurements
- liaise to arrange site access and site clearance /permit
- Identify & review site hazards
- Assemble , check & arrange measuring and safety equipment
- Arrange transportation
- Develop erosion assessment and measurement format
- Consult designated personnel and community about the format content.
- Incorporate feedback & re-develop the final format
- Identify to match project requirements as documented in the plan.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
4. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” **in page -6, 9, 12 and 14** respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 ” **in page -15.**
6. Do the “LAP test” **in page – 16** (if you are ready).

Information Sheet-1	Confirming required purpose, priority and nature of assessment and measurements

1.1. **Confirming required purpose, priority and nature of assessment and measurements**.

The purpose of Soil erosion site assessment and measurement are:

- to determine the environmental impact of erosion and conservation practices,
- to conduct scientific erosion research;
- for development and evaluation of erosion control technology;
- for development of erosion prediction technology
- for allocation of conservation resources and development of conservation regulations, policies and programs.

Priority given in Soil erosion site assessment and measurement

One key question on planning remains: Where are the various activities to be implemented? All things cannot be done at one time. It is necessary to carefully select those aspects of the development program which are most urgent and important to the success of the site. Priorities may be established for the activities of individual programs. The development schedule (DS) is a brief simple statement of priorities for implementation. It can include construction of physical facilities, personnel development activities and items requiring legal, policy and administrative action.

In the final analysis, the schedule is a tool which communicates the entire management and development plan to decision makers and budget officers. The fuming/incensed/ of a site may ultimately depend upon the clarity and logic with which the schedule is presented.

During each successive budgetary period it will be necessary to analyze and evaluate the activities which have been accomplished during the period which is ending. A development schedule is prepared which establishes the priorities for implementing all management and development activities in a logical order over time.

Among the many factors which influence the schedule, **eight can be considered** as most influential:

1) Expectations of the demand for each service
2) Ecological constraints
3) Urgency considerations
4) Engineering constraints
5) Budgetary expectations
6) Availability of personnel
7) Institutional constraints
8) Political and social considerations.

The first four variables are **technical** and relatively **objective in nature**. The planners can deal with them in practical terms. The second four factors are i**nstitutional and political** in nature, and relate to **strategic** questions.

Ecological information and guidelines must support the implementation of each activity. The lack of ecological understanding about a particular area may require a delay in all development until habitats, migratory routes, nesting sites, sub-soil water movements or other factors have been studied. The site for employee housing may be in line with a deer migration route and research is needed quickly.

Budgetary expectations establish both the scale and the rate of growth of the site. In scale, the ultimate total cost of parks may be on the order of hospitals, schools and sanitation projects. Where site are in fact planned as integral elements of eco-development, they require similar budgetary status to other major public efforts.

A newly-developing site will normally require newly employed personnel, or the transfer of individuals from other on-going site. This requires recruitment, training efforts, facilities, scholarships and perhaps even a study tour abroad. A well-phased program will contemplate the time necessary to recruit, train or transfer a new site director, biologist, rangers, research ecologist, or maintenance engineer.

The site service itself has internal constraints of an institutional nature. The service must be able to absorb the administration of a new site and all that is involved with site management and development. Additional decisions will need to be made purchasing, inventory control; personnel management; finance and record keeping must all be expanded or redistributed within the given structure.

Finally, the political and social climate must be weighed. This guideline has as its purpose the careful analysis of the political and social context within which the site is to be developed. It is not a question of playing politics with sites, but of sizing up the wind before setting sail.

These eight variables are interrelated and interdependent. In practical planning they should be considered one by one in the suggested order. No single factor is dominant. Each is important. Each acts to temper the others!

Nature (techniques) of soil erosion site assessment & measurements

There are **three basic** ways to gather the information needed to evaluate the community environmental situation: 1) **firsthand field observations**, 2) **interviews**, and 3) **a review of the literature**. Involving counterparts and other people from the community in these activities increases the likelihood of making an accurate environmental assessment.

a. Observations

Begin by looking at how the local environment is being managed. Are people plowing up and down hills, cutting down forests, recklessly using pesticides, or trafficking in wildlife species in danger of becoming extinct? Always carry a notebook for recording impressions and noting the locations where the environment is being mismanaged. Observing what is happening in the community can indicate which resource management problems might be serious enough to warrant the attention of a conservation education program. Especially for those who are not trained environmental specialists, however, observations need to be supplemented by the information that local people can provide.

b. **Interviews**

Two types of people can be instrumental in identifying environmental problems.

1) **Trained natural resource specialists**; may be familiar with the community's environmental problems and what should be done about them. In some communities, these specialists may be found in local agricultural and forestry extension offices or regional agricultural schools; in the capital city, they may be located in agriculture and natural resource ministries and in universities. Many international aid organizations (government and nongovernment) also have natural resource management experts on their in country staffs.

2) **Community members**; can also be of considerable help in identifying problems. These people may not be resource management specialists, but they may well have noted long term trends that reflect environmental problems. Are trees, fish, wildlife, or

medicinal plants more difficult to find now than previously? Has agricultural production decreased, does the stream flood more frequently, have people once farmed land now given over to weeds and brush, or have people been getting sick more since everyone started using a new insecticide? The development worker, in a community for only a short time, needs to learn some local environmental and social history. Community residents are usually the best source of this information. Try, however, to interview several people regarding a particular environmental situation and always include a counterpart. People tend to tell interviewers what they think the interviewer wants to hear.

c. Literature Review

Literature is a third source of environmental information. Appropriate national institutions and international organizations working in country may have technical reports on relevant environmental subjects.

Headquarter offices of many international organizations also have relevant written information, much of which is free on request. Daily and weekly newspapers can also be quite useful, covering newly-passed forestry laws, the establishment of national parks, plans for oil exploration, flooding problems, and trends in agriculture, forestry, and fisheries. Eventually, such information can be usefully incorporated in conservation education programs, as well as being a means of identifying the proper focus of a program.

Self-Check -1	Written Test

Name: _____ Date: _____

Short Answer Questions

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What are the purpose of Soil erosion site assessment and measurement?(5points)
2. What are three basic ways to gather the information needed to evaluate the community environmental situation?(5points)

Note: **Satisfactory rating >5 points** **Unsatisfactory - below 5 points**

Answer Sheet

Score = _____

Rating: _____

Information Sheet-2	Liaising to arrange site access and site clearance /permit

2.1. Liaising to arrange site access and site clearance /permit

Site access and site clearance /permit are important for the security condition and unnecessary conflicts occurrence. Over and above, **site access and site clearance /permit** protect life cost (death) to workers and property damage. Check and arrange security clearances for staff and equipment, e.g. for the purchase and use of maps, air photographs and computers. So, arranging site access and site clearance /permit from the following personnel for erosion assessment and measurement are important. Those personnel are the following but may not limited to

- Community elders,
- Farmers association leaders
- Local administrators

Site accessibility

To determine accessibility of a given site there are **two** constraints.

A. Natural constraints
   May be unfavorable climate (extremely cold or hot, heavy shower of rainfall, etc)
B. Technical & socio-economical constraints
   May be road damage, lack of permit from personnel to **access site** for staff and equipment, Security case, etc

Name: _____ Date: _____

- **Short Answer Questions**

Self-Check -2	**Written Test**

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Why site access and site clearance /permit is needed for erosion assessment and measurement?(5points)

2. Who are personnel those give site access and site clearance /permit? (3points)

3. To determine accessibility of a given site there are **two** constraints. What are?(2points)

Answer Sheet

Score = _____

Rating: _____

Note: **Satisfactory rating >5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Information Sheet-3	Identifying & reviewing site hazards

3.0 Identifying & reviewing site hazards

Site hazards

Accidents and ill health can ruin lives and affect your business too if output is lost, machinery is damaged, insurance costs increase or you have to go to court. You are legally required to assess the risks in your workplace so that you put in place a plan to control the risks.

Identifying site hazards includes identification of cause, source and type of hazard.
Hazard identification determines the hazards that may affect people in a community. Hazard identification is not straightforward - people may have quite different perceptions of what constitutes a significant hazard. For this reason seeking the views of a number of people in the community is essential.

A group technique for identifying hazards: in this case hazard identification should be undertaken by a group of people, such as a planning group, with expertise in the area of work and a commitment to the safety of that area. One quick method to determine people's perceptions of the most serious hazards and avoid the pitfalls of "groupthink".

- **"Group-think**" is a phenomenon that can occur in highly cohesive groups - to minimize conflict, the members of the group concur and restrict their thinking to the norms of the group. No one wishes to be seen as out of place. This can limit the range of ideas and views that the group could otherwise generate.

Table . Hazard ranking

	In terms of "seriousness"		
Hazard	**high**	**medium**	**low**
Hazard "a"	2	3	0
Hazard "b"	0	0	1
Hazard "c"	4	0	1
Hazard "d"	0	2	0

The numbers recorded in the table indicate how people in the planning group feel about the hazards in the community and may reflect accurate knowledge on their part. The numbers certainly reflect the group's perception of which hazards are a problem. The numbers have

no meaning outside the context of the planning group meeting and certainly should not be used for any other purposes.

Other techniques for identifying hazards include:

- ✓ researching the history of emergencies in the community, by consulting histories, newspapers, records, and older community members;
- ✓ inspecting the community for evidence of previous emergencies, existing hazards, and existing vulnerability;
- ✓ examining literature or interviewing people from similar communities;
- ✓ requesting information from provincial or national governments

Types of hazard

- ➢ Natural hazards
- ➢ Technological hazards

i. Natural hazard

- ✓ Natural **hazards** become disasters when the disruptions exceed the adjustment capacity of a community. Natural disasters like earthquakes, volcanoes and typhoons (strong winds),flood, heavy rainfall.

ii. Technological hazards

- ✓ Explosions cause loss of life, injury and destruction of buildings and infrastructure;
- ✓ Transportation accidents kill and injure passengers and crew, and may release hazardous and polluting substances;
- ✓ Industrial fires can achieve very high temperatures and affect large areas; hazardous substances released into the air or water can travel long distances and cause contamination of air, water supply, land, crops and livestock making areas uninhabitable for humans; wildlife is destroyed, and ecological systems disrupted. Large-scale disasters can threaten the stability of the global ecology.

There are different kinds of hazards would be faced during assessing and measuring of Erosion features/ Areas/ which may include, but not limited to:

- o Solar radiation, dust and noise
- o Wildlife such as - snakes, spiders, domestic animals
- o Biohazards such as - micro-organisms and agents associated with soil, air, water
- o Chemicals such as - acids and hydrocarbons

- Manual/handling of heavy equipment or materials
- Crushing, entanglement, cuts associated with moving machinery
- Falling objects, uneven surfaces, heights, slopes, wet surfaces, trenches, confined spaces
- Vehicle handling in rough terrain, boat handling in rough or flowing water
- vehicular or pedestrian traffic

Review hazards

A **Hazard Review** (Risk Assessment) is used to determine the appropriate protective measures needed to be implemented before the procedure is conducted to avoid accidents.

How to assess the risks in your workplace Follow the five steps in this information sheet:

Step 1 Identify the hazards

Step 2 Decide who might be harmed and how

Step 3 Evaluate the risks and decide on precautions

Step 4 Record your findings and implement them

Step 5 Review your assessment and update if necessary

When thinking about your risk assessment, remember:

- ✓ A hazard is anything that may cause harm, such as chemicals, electricity, working from ladders, an open drawer etc;
- ✓ The risk is the chance, high or low, that somebody could be harmed by these and other hazards, together with an indication of how serious the harm could be.

Name: _____ Date: _____

- **Short Answer Questions**

Self-Check -3	**Written Test**

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What are kinds of hazards you may face during site assessment and measurement activity? (5points)

Note: **Satisfactory rating >4 points** **Unsatisfactory - below 4 points**

Answer Sheet

Score = _____

Rating: _____

Information Sheet-4	Assembling , checking & arranging measuring and safety equipment

4. Assembling, checking & arranging measuring and safety equipment

Assembling, checking & arranging tools and equipment, safety equipment weather fitting for erosion assessment and measurement purpose means able to quantify it. Tools and equipment required for erosion assessment and measurement include, but not limited to be:

- Tape measure, rulers, micrometers callipers, water level indicators
- GPS, pegs, string, hammer, Knives, trowels, spades, forks, rakes, hoes, shovels, buckets, stationery, spades, satellite image, aerial photographs, topographic maps
- Sensitive balances
- Oven dry (for soil bulk density measurement)
- Meter/probe systems (for example, Dissolved Oxygen (DO), Electrical Conductivity (EC))
- Analogue and digital meters (for example, voltage, current, resistance, pressure,
- Temperature, barometers, anemometers, hygrometers)
- Dipsticks or spot test kits
- Clocks, timing devices.

Safety practices may include, but not limited to:

- Use of Material Safety Data Sheets (MSDSs)
- Use PPE, such as; hard hats, hearing protection, gloves, safety glasses, goggles, face-guards, overalls, gown, body suits, respirators, safety boots
- Correct labelling of hazardous materials
- Handling and storing hazardous material and equipment in accordance with labels, MSDS, manufacturer's instructions, enterprise procedures and regulations
- Regular cleaning and/or decontaminating of equipment
- Fitting machinery guards
- Signage, barriers, service isolation tags, traffic control, flashing lights
- Lockout and tag out procedures

Name: _____ Date: _____

- **Short Answer Questions**

Self-Check -4	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List tools and equipment required for erosion assessment and measurement.(5points)
2. Why assembling, checking & arranging tools and equipment, safety equipment during site assessment for erosion?(5points)
3. List Safety practices you follow for site assessment work.(4points)

Note: **Satisfactory rating >7 points** **Unsatisfactory - below 7points**

Answer Sheet

Score = _____

Rating: _____

Information Sheet-5	Arranging transportation

5.0. Arranging transportation

Arranging appropriate transport for staff and equipment for site access as required for erosion assessment and measurement purpose. Arranging transport mean providing vehicles, spares, fuel, servicing equipment, etc. It is important to arrange safe transportation to staff and equipments by assessing various conditions. This technique to avoid life lost and property damage from transportation accident.

To apply the assessment transport:

- ✓ Identify the type of materials to be transported.
- ✓ Identify and select the type of vehicle used in relation to the suitability of the materials, equipment and machinery to be transported
- ✓ Identify and select safe driver
- ✓ Identify the safest direction and routs of driving
- ✓ Follow basic safety procedures in handling and transporting materials, equipment and machinery

Safe vehicle

- Vehicles, machines and hand handling equipment are; capable of safely performing the jobs to be done and inspected daily and faults repaired promptly and properly maintained, paying particular attention to braking system;
- Drivers of material handlers and loaders are protected from falling objects and loads are stable;
- The vehicles used to transport equipped with lamps ,brakes ,horns, mirrors, wind shields and turn signals, are good in repair;
- The vehicles for it is fully charged with fire extinguisher;
- Cutting tools are carried on transport vehicles are placed in a box.

Safe driver:

- ➢ Drivers; are licensed and medically fit to drive and are properly trained and un authorized people are not allowed to drive

Follow basic safety procedures:

- ❖ Secured packages, including palletized ,against shifting within vehicle during transportation.(tying, blocks and bracing the load)
- ❖ Load packages with orientation marks so that the marks remain pointed up.
- ❖ Do not allow any smoking near the vehicle when loading / un loading flammable.

Transport:

- ✓ Vehicle fleets should be standardized (same makes and models);
- ✓ Ensure there are sufficient drivers, fuel, lubricants, spare parts, tyres, maintenance personnel and facilities;
- ✓ It may be necessary to improve access roads, bridges, airport, or other infrastructure;
- ✓ The substantial margin of spare transport capacity (10-20%) must be provided;
- ✓ With health and community services, assess particular requirements for transporting refugees in a repatriation operation, and/or distribution for vulnerable groups.

Kind of transport

- International Transport (Air & Sea)
- National Transport (Transport Networks & Road Transport)

Accident rates increase markedly with tired drivers.

A system must be established to monitor and control vehicle use. In some situations, urgent action may be necessary in order to improve access roads. Technical advice will be of paramount importance in deciding how improvements should be made (seek advice through Programmed and Technical Support Section at Headquarters).

These improvements could be undertaken by the ministry of transport .In some situations, careful briefing will be required about alternative routes in case usual roads are impassable. Vehicles, bicycles, or animal or hand carts could be used for final distribution. Observe how local movement of supplies normally takes place.

Transport Capacities

If a commodity is to be transported by truck, the number of trucks needed should be calculated from the following information:

i. The quantity of goods to be transported in weight and volume;

ii. Type of truck available and its capacity in weight and volume;

iii. How long a round trip takes (including loading and offloading);

iv. Time allowed for routine maintenance capacity or time allowed for other known factors (driver breaks);

v. A margin for unpredictable events (such as breakdowns, accidents, bad weather, road and bridge repairs). In difficult conditions, the theoretical capacity might need to be increased by 25% or more.

Transporting staff by road

Logistical support will be necessary when transporting technical staff for erosion site assessment and measurement work will be under way.

Name: _____ Date: _____

- **Short Answer Questions**

Self-Check -5	**Written Test**

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What does arranging transport mean?(3points)

2. Why caring for staff and equipment during transport?(5points)

3. How do you **apply the assessment of transport** for safe transportation to staff and equipments by assessing various conditions.(2points)

Note: **Satisfactory rating >5 points** **Unsatisfactory - below 5 points**

Answer Sheet

Score = _____

Rating: _____

Information Sheet-6	Developing erosion assessment and measurement format

6. Developing erosion assessment and measurement format

6.1. Definition and concepts of erosion assessment and measurement

Erosion Assessment is an act of overall evaluation of the loss of topsoil, the part of the soil by means of natural or manmade processes.

Erosion Measurement is an act of measuring overall factors of soil erosion which could be caused by means of natural or manmade processes.

Soil erosion site assessment and measurement

Soil erosion can be defined as a process in which soil material is detached and subsequently transported by moving agents like water or wind.

Agents of soil erosion

- **Erosion by water** is the detachment and transport of soil particles down slope through a number of processes, driven principally by the energy and the concentration of the water as it passes over the land.

- **Erosion by wind** is the detachment and transport of soil particles by wind action and commonly considers also the effect of the abrasive action of the particles as they are transported and of the soil deposits or sediments.

Types of soil erosion

A. **Geological erosion**: it is a normal process, under natural condition; landscapes are formed and subsequently molded and reshaped by the processes like weathering and erosion. Since under natural undisturbed conditions the landscape is nearly always covered by vegetation erosion is very slow process. Soil losses by erosion are in balance with soil formation by weathering, so, there is no net soil loss and no degradation of land.
   - Geologic erosion occurs at all times due to the interaction of
     - climate (weathering, precipitation),
     - vegetation (nutrient uptake, protective cover),

- parent material and
- topography.

-This is distinguished from accelerated erosion induced by man through his activities of

  - deforestation,
  - raising crops and livestock,
  - mining and construction.

B. Man made or accelerated erosion: since man started practicing agriculture he had to clear natural vegetation in order to obtain arable land. He also needed land for cattle grazing. Much higher erosion rates and degradation of land were the consequences. In the last century, however, accelerated erosion has become a serious problem in many developing countries, since population and consequently the need for agriculture land have shown virtually exponential growth. Accelerated erosion and land degradation, have become worldwide major threats to the possibility of nourishing future population properly. In addition, Ethiopian agriculture and forestry are confronted with negative consequences of land degradation.

-**Accelerated erosion** is in excess of geologic erosion. It is a form of degradation, broadly defined as deterioration in the quality of the environment for man, vegetation, animals and aquatic life.

Degradation causes and extents

- In essence, accelerated degradation results wherever man attempts to use land beyond its capability and suitability.
- Soil degradation other than geological erosion is essentially a human problem in both cause and impact.

Types of Water erosion

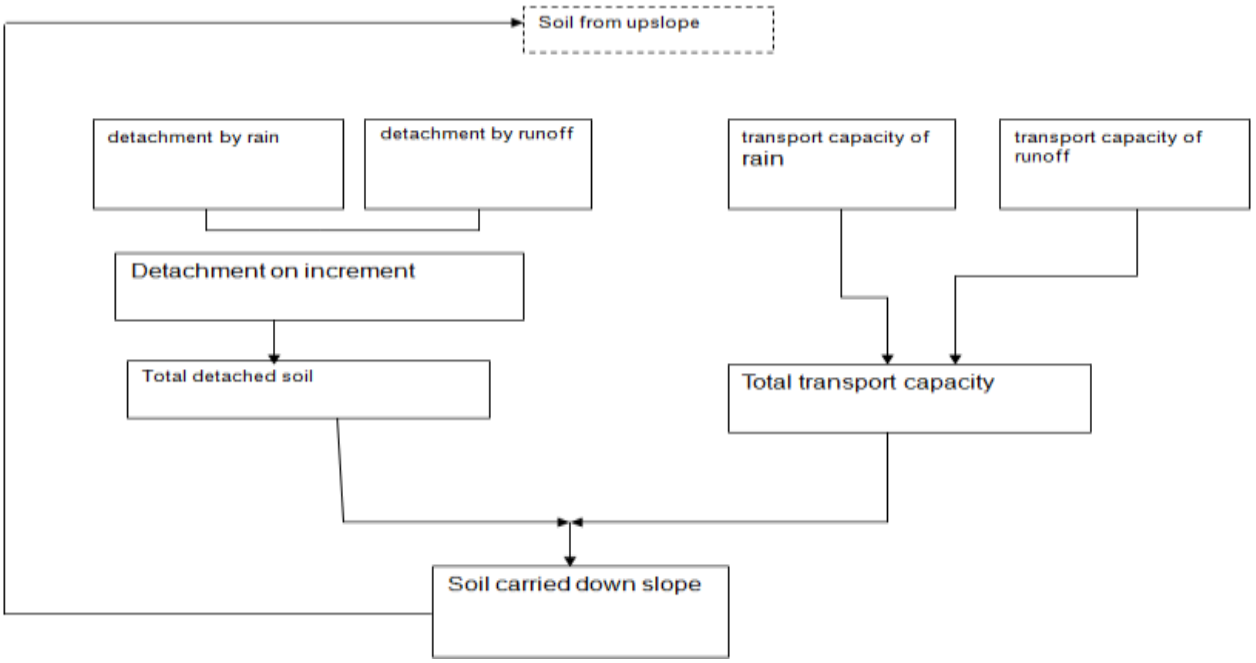
- splash erosion (due to rain drop impact),
- sheet and inter rill erosion,
- Rill erosion,
- gully erosion,
- bank erosion,
- Tunnel erosion(subsurface gulleying or pipping,
- Land slips or slides.

Mechanics of erosion (process of erosion).

Soil erosion is a two-phase process consisting of the detachment of individual particles from the soil mass and their transport by erosive agents such as rain water. When sufficient energy is no longer available to transport the particles a third phase, deposition, occurs.

In other word Erosion of soil occurs in three stages:

- Detachment of individual soil grains,
- Transportation of individual soil grains,
- Transportation of detached grains over the land surface,
- Deposition of grains being transported as sediment on a new site.



Impacts of erosion: on-site effect and off-site effect

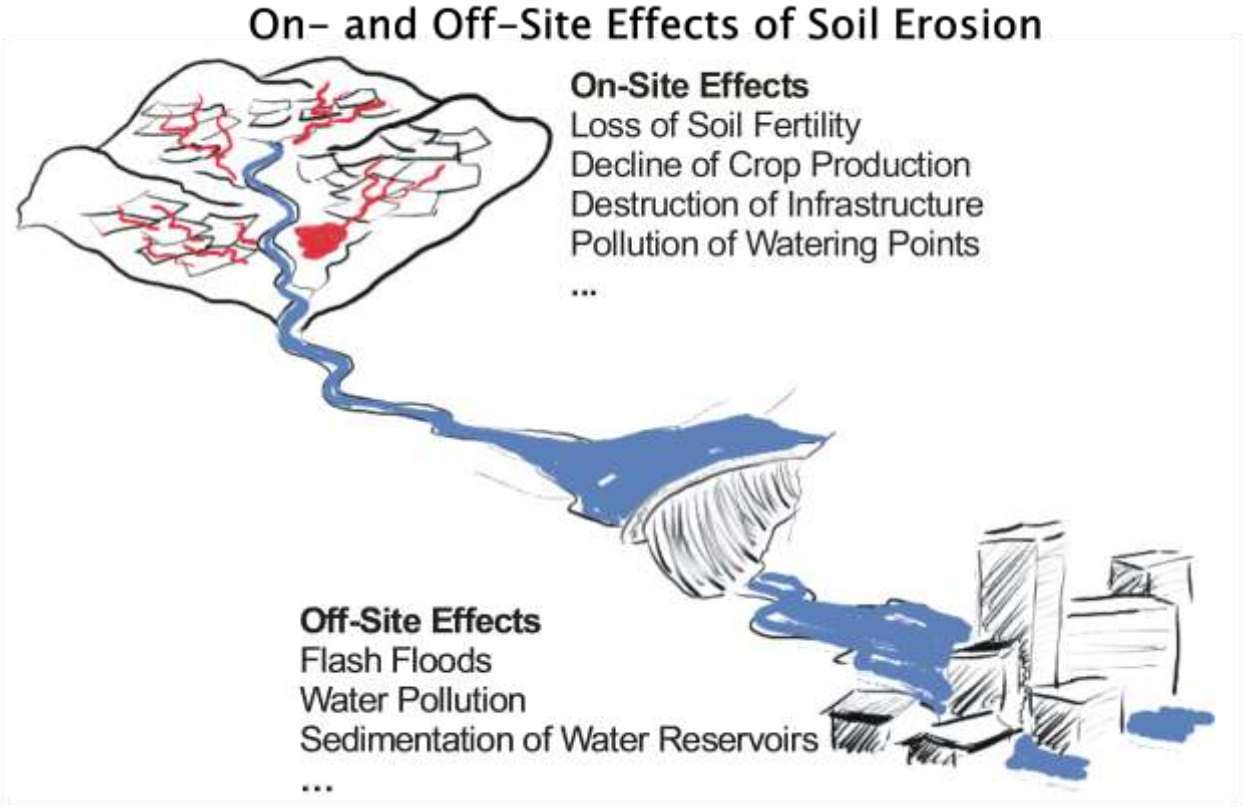
On-site impacts:

- are related to productivity of farm caused by loss of top soil (loss of nutrients and organic matter),
- reduction of soil depth,
- soil crusting and sealing and
- dissection of fields

Off-site impacts:

- Higher **turbidity** in rivers, lakes, reservoirs and sediment deposition in these same environments and flood plains.

- Also increased downstream **runoff** and **flooding** as a result of reduction of soil infiltration by the on-site impacts
- **Sediment delivery** to river channels is probably the most problematic off-site consequences of soil erosion and it is a disturbing problem in countries of northern Africa including Ethiopia.



Measurement of soil erosion

A set of simple, field usable indicators and measurements are provided to observe, quantify and report on soil erosion at detailed assessment sites in various land use types (bare field, crop, pasture / rangelands and forest). The basis is simple field observation and measurement of recognized erosion features with the aim of both recording erosion status (type, state, extent and severity) at any one site as well as comparing between sites that differ in soil, climate, land use and management practices, etc. The measurements of erosion features (dimensions) are optional and can be used where erosion is a significant degradation process to provide quantification of rates and quantity of soil loss in a study area. The specific tools to be used can be selected on the basis of the soil erosion features observed in the field during the study area characterization: i.e. sheet erosion, rills, gullies/ravines, exposed rock, sediment deposits, sand dunes, etc. Direct measurements can be made of the amount of soil eroded by runoff through rill and gully erosion. Indirect measurements can be made of soil erosion by water or wind through:

Indicators of water erosion

- Presence of rills and gullies in the field
- Pedestals
- Armor layer
- Muddy water
- Lowering of soil depth
- Siltation and sedimentation
- plant / tree root exposure
- fence post/other structure base exposure
- solution notch/rock colouration
- enrichment ratio;

indicators of wind erosion:

- Presence of dusts in buildings, on plant leaves, etc
- Sand dunes
- Dust storms, dust carrying wind

Measurement of wind and water erosion may include descriptions and measures of the erosion and deposition features but above all should focus on the impacts of the soil movement, *e.g.* the effects on the land potential through the loss of soil and nutrients and the effects of the transported and deposited particles, for example: silting of wetlands or floodplains, sandstorms, moving sand dunes, sediment load in rivers and streams). While erosion and hence loss of soil particles and nutrients will negatively impact on land productivity in the upper part of a catchment, it may provide fertile silts and nutrients downstream in the floodplains, i.e. having a positive impact on productivity.

Soil erosion site assessment and measurement Method

The methods aim to achieve clarity and uniformity in recording visible soil erosion features, in-terms of three distinct but inter-related qualifiers and quantifiers are:

- **field observations** that describe soil erosion by wind or water using four descriptors of the erosion feature: type, state, extent and severity;

- **A field scoring method**, based on the descriptors in the field observations, to provide a more quantified basis for inter-site comparisons. This was developed

and tested by the LADA team in Tunisia (DG/ACTA, 2010) and further reviewed and,

- **Field measurements** of specified dimensions of erosion features to provide quantification of rates and quantity of soil loss in a study area.

Erosion assessment and measurement helps us to convince policy makers on the impact of soil loss on production and productivity and on ecological disaster.

6.2. Erosion Assessment and Measurement *format*

Erosion Assessment and Measurement **format** may include the following but not limited to:

A. A check list for assessment of erosion by visual indicators.
B. A table which shows the dimensions of rill & gully to be measured.
C. Field scoring method

A. A check list for assessment of erosion by visual indicators

Different Erosion/Soils/Landform description form

Table: checklist for general information

<table>
<tr><th colspan="4">GENERAL INFORMATION</th></tr>
<tr><td rowspan="3">Location:_____
Watershed:_____
Village:_____
PA:_____
Wereda:_____
Zone:_____
Region:_____
Altitude:_____
Rainfall:_____</td><td rowspan="3">Agro-climatic zone:____

present land use/land cover:_____
• Cultivated
• Shrub land
• Woodland
• Bare land (hard)
• Grassland</td><td>Observation No.:</td><td>Aerial Photo No.</td></tr>
<tr><td colspan="2">Auger
Gully
Road cut
Pit</td></tr>
<tr><td colspan="2">Observer:_____</td></tr>
</table>

	• Urban built up area • Plantation forest Parent material_____ Major landform_____	Date:_____-

Table: Example of sample checklist for Relevant factors for Erosion assessment & measurement

Parameters	**Description**									
Slope (%)	0 – 5	5 – 10	10 – 20	20 – 30	30 – 50	50 -100				
Evidence of erosion	No sign to slight	No sign to slight	Moderate	Moderate	High	High	Very High			
Surface stoniness (%)										
Soil stoniness (%)										
Soil depth (cm)										
Soil drainage	Never saturated	Rarely saturated	Rarely saturated	Saturated for short period	Saturated for long period	Saturated for long period	Saturated for long period			
Soil texture (*) (Textural class)	Fine sand	Very fine sand	Loamy sand	Loamy very fine sand	Sandy loam	Very fine sandy loam	Silt loam	Clay loam	Silty clay loam	Silty clay
Rock outcrops	Few	Common	Many	Abundant	Dominant					
Available water capacity										
Infiltration	Good	Moderate	Poor							
Water logging	None	Intermittently	waterlogged	Regularly	Swamps					

				waterlogged						
Organic matter (%)	≤ 2	2 - 4	≥ 4							
Vegetation cover (%)										

B. A table shows the dimensions of rill & gully to be measured.

Dimension	**Form of soil erosion**							**Remark**
	Status of Water erosion with different types of erosion						Status of Wind erosion	
	sheet erosion		**rill erosion**		**gully erosion**			
	slight	serious	slight	serious	slight	serious		
Length								
Width								
depth								
Area covered (Km^2)								
Severity								
subtotal								

- **Channel Cross-sectional area measurement**
  - The total station was set up on a certain point (x, y, z) coordinates for determining the slope of the riverbed and the curve of the cross-section.

C. **A field scoring method**, based on the descriptors in the field observations, to provide a more quantified basis for inter-site comparisons.

Table Z: Types of erosion-definitions, indicators, boundaries

Type of soil erosion & Score	Code	Definition	Indicators (How to recognize
Splash (1)	SP	Raindrop impact displaces soil particles vertically and downslope	Soil particles on lower parts of plants and/or a compacted (or dispersed) soil surface crust
Sheet wash/ Sheet (2)	S	Erosion of the top layer /sheet of the soil as differentiated from linear erosion (rill, gully, ravine)	Gravel/stones protruding from soil surface; root exposure; loss of darker topsoil horizon; subsoil exposure
Rill (2)	R	Irregular, downslope, linear channels, shallow (up to 0.3 m deep and wide)	Shallow, commonly long channels running downslope
Gully (4)	G	Irregular, V-shaped, steep-sided, linear channel formed in loose material, deep (0.3 – 2.0 m deep) formed by water erosion	Deep, pronounced channels
Ravine (4)	A	As in the definition for "gully" but very deep and wide (> 2m deep and wide)	Very deep and wide, pronounced channels
Landslide (4)	L	Sudden downslope movement of a concentrated mass of soil and rock, mainly under influence of gravity, triggered by water saturation or earthquakes (sometimes termed mass movement)	Almost vertical sides; rounded head (gully has narrow or sharp head)
Slumping (2)	SL	Slow, irregular, downward progression or of a thin (< 1m) layer of soil, due to water saturation, but possibly in combination with freezing-thawing	Rounded scar; irregular, uneven, downslope surface
Rotational slumping (3)	RS	A form of mass movement where rock and soil move downwards along a concave face. The rock or soil rotates backwards as it moves in a rotational slip. They always have a concave sliding plane and multiple scars (while slides have relatively straight shear planes).	Series of irregular scars and wide cracks
Terracettes (2)	T	Irregular small step-like formations, from a combination of slumping and preferential animal movements (tracks) on the surface of moderate to steep slopes	Irregular on-contour steps of about 0.1 to 0.2 m height on moderate to steep slopes in grasslands

The scoring system is based on the classifications of type, state, extent and severity. Each of the classes in these four sets of descriptors will be allocated a score and the sum of the scores (for any one area, however defined) will allow the allocation of an erosion class (Table y).

Important is that this scoring system is taken and used for what it is: a simple methodology of better quantifying erosion degradation for a given area. There are several, recognized problems with the scoring system, some of which will be covered here, so users should be aware of these in interpreting the cumulative scores obtained and the resultant allocation of an erosion class :

- The allocation of the score classes to the erosion types (Table x) is somewhat arbitrary.

The concept is that either end of the scale (1 and 4) is readily ascribed. In most circumstances splash erosion is a minor feature (score = 1), whereas gully, ravine, landslide, tunnel erosion are considered very serious landscape features as they cannot be readily repaired (score = 4). Between the two extremes, the current score allocations are based on the author's experience and may change with time and wider use of this system

- As discussed above, certain erosion types, by their very nature, will never be describable as of "low" or "moderate" severity. The most obvious examples (from Table Z) are gully, ravine, landslide and tunnel – all of which fall into the severe and extreme classes, as the erosion features are >0.1 m deep. So, not only do these erosion types score "4" for type, they also immediately score "3" or "4" for severity (rate).

- If several types of erosion are found in the area under investigation, the current system scores each type separately, and then sums the individual scores to give a composite score. The basis for this summation approach is both that each of the types of land degradation is inter-related, and their presence in one area has an additive, negative effect on land productivity. This composite scoring system may change in the future with time and wider use of this system.

Table y gives the final erosion class for any one erosion type in a study area, arrived at by summing the score value of each of the four categories of type, state, extent and severity. Where more than one erosion type exists in

Table x **Scores for the individual descriptors of a) state, b) extent and c) severity of the soil erosion types**

State	score	Extent	score	Severity	score
				extreme	**4**
active	**3**	widespread	**3**	severe	**3**
partly stabilised	**2**	moderate	**2**	high	**3**
stable	**1**	localised	**1**	moderate	**2**
decreasing	**0**	negligible	**0**	low	**1**

Table y: **Erosion classes**

Erosion class :	negligible or decreasing	low /weak	moderate	severe	very severe
Score :	0-1	2-5	7-10	10-12	13 +

One area, the class values of Table Y are added together for each erosion type – to give a composite score. It is evident that in situations where two or more erosion types are present in an area, the erosion class will almost always be «severe » (i.e. a score of >13).

The erosion classes are derived by adding -up the individual scores for each of type, state, extent and severity of Tables Z and X).

Name: _____ Date: _____

- **Short Answer Questions**

Self-Check -6	**Written Test**

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List Erosion Assessment and Measurement format .(7points)

2. What is the importance of soil erosion measurement? (3points)

Note: **Satisfactory rating >5 points** **Unsatisfactory - below 5 points**

Answer Sheet

Score = _____

Rating: _____

Information Sheet-7	**Consulting designated personnel and community about the format content.**

7.0. Consulting designated personnel and community about the format content.

As to the assessment and measurement format concerns involving local designated personnel and community is important to collect local view on the matter .When we prepare for erosion assessment and measurement

- ✓ Ask for specialist advice or information, especially from a professional
- ✓ Ask for peoples' opinion or permission before taking action
- ✓ Look at relevant sources of information such as a reference book in order to get information

- Designated personnel to be consulted about erosion assessment and measurement format may include, but not limited to:
  - ➢ Officers from Woreda Agriculture offices
  - ➢ Experienced natural resource expert
  - ➢ Community elders/representatives
- Community to be consulted about erosion assessment and measurement format may be people live in Town, village, regional area, suburb or group of suburbs in a city or a coastal area where erosion assessment and measurement practices will be conducted.

Name: _____ Date: _____

- **Short Answer Questions**

Self-Check -7	**Written Test**

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Why designated personnel and community is required to be consulted about erosion assessment and measurement format? (5points)

Note: **Satisfactory rating >2.5 points** **Unsatisfactory - below 2.5 points**

Answer Sheet

Score = _____

Rating: _____

Information Sheet-8	Incorporating feedback & re-developing the final format

8.0. Incorporating feedback & re-developing the final format

Participatory erosion assessment and measurement format preparation incorporate the need and view of designated personnel and community using direct consult by using field visit/observation, meeting or phone call, hold program on local radio broadcast, etc. Incorporating feedback from designated personnel and community and re-developing the final erosion assessment and measurement format as described below:

- ✓ Present the draft erosion assessment and measurement format for comments and then based on the comments given revise and redevelop the format in to its final version.
- ✓ List the goals and criteria of assessment format.
- ✓ Gather feedback relevant to each criterion of erosion assessment and measurement format: physical, economic and social.
- ✓ Compare what has been assessed and measured with what was planned. Identify elements of erosion assessment format.
- ✓ Seek explanations of feedback for the unsuitability. Were they caused by:
    - o Incorrect assumptions of the assessment and measurement?
    - o Changed economic or political circumstances?
    - o Logistic problems of implementation?
    - o Problems of communication and participation?
- ✓ Review the format: are elements and the arrangement of the format valid?
- ✓ Initiate modification or revision of the plan with incorporating the feedback:
    - o minor modifications on by editing assessment and measurement format;
    - o Larger revisions by preparation of new assessment and measurement format.

Name: _____ Date: _____

- **Short Answer Questions**

Self-Check -8	**Written Test**

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

4. What is participatory erosion assessment and measurement format preparation mean (5points)

Note: **Satisfactory rating >2.5 points** **Unsatisfactory - below 2.5 points**

Answer Sheet

Score = _____

Rating: _____

Information Sheet-9	Identifying to match project requirements as documented in the plan.

9.0. Identifying to match project requirements as documented in the plan.

Identifying potential resource in the group, community and project to match project requirements as documented in the plan for site assessment and measurement work.

Provision of resources may be:

- Scheduling of paid and volunteer labour within availability,
- Coordinating labour and equipment required for task,
- Scheduling materials to arrive in time for tasks,
- Maintenance of security for equipment and materials,
- Maintenance of OHS and public safety,
- Rescheduling resources and activities to cater for interruptions and emergencies and borrowing,
- Leasing and hiring of equipment.

Matching project requirements as documented in the plan

Here matching the project resources requirement with the plant substantiate the work.

Project plan may be:

- Paid, trainee and volunteer labour, labour and equipment from clients, equipment borrowed, hired and bought, materials bought, donated and discounted, and OHS equipment, and
- The discussion and negotiation of what volunteers will do and with whom.

Project resource requirements include the following contents

☞ List the assessment and measurement tasks and activities. For each task:

- Identify the people and organizations responsible for or contributing to it;
- Set out the resources needed;
- Estimate the time needed.

☞ Decide which tasks need to be completed before others can be commenced.

☞ Draw up a work plan for the project as a whole (table, bar chart or critical path analysis).

☞ Draw up individual, personal work plans.

☞ Allocate money and equipment.

☞ Arrange administrative matters and logistics:

- Check and arrange security clearances for staff and equipment, e.g. for the purchase and use of maps, air photographs and computers.
- Budget for staff, equipment and transport costs.
- Provide for:
  - Transport (vehicles, spares, fuel, servicing• equipment;
  - Office facilities.
  - Provide and coordinate technical support:
  - Inputs from other agencies
  - Field assistance
  - Laboratory
  - Cartography
  - Secretarial

☞ Arrange GPS, measuring tapes, pegs, string, hammer, Knives, trowels, spades, forks, rakes, hoes, shovels, buckets, stationery, spades;

☞ Ask provision for wet or hot seasons, public and local holidays, contingencies and iteration of steps in the planning process.

☞ Make an agreement so that necessary personal which include the officers from woreda BoA; experienced natural resource expert following but not limited in assessing and measuring erosion

Forms of communication may be negotiation and completion of agreements, networking and catering for a diverse range of viewpoints including Indigenous, migrant and women.

Name: _____ Date: _____

- **Short Answer Questions**

Self-Check -9	**Written Test**

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

5. What is participatory erosion assessment and measurement format preparation mean (5points)

Note: **Satisfactory rating >2.5 points** **Unsatisfactory - below 2.5 points**

Answer Sheet

Score = _____

Rating: _____

List of Reference Materials

1- BOOKS

Mitiku, H., Herweg, K., Stillhardt, B., 2006 *Sustainable Land Management – A New Approach to Soil and Water Conservation in Ethiopia*. Mekelle, Ethiopia: Land Resources Management and Environmental Protection Department, Mekelle University; Bern, Switzerland: Centre for Development and Environment (CDE), University of Bern, and Swiss National Centre of Competence in Research (NCCR) North-South. 269 pp.

LAND DEGRADATION ASSESSMENT IN DRYLANDS (LADA) PROJECT.____. Manual for local level assessment of land degradation, sustainable land management and Livelihoods: part2 – Field methodology and tools.

2- Manuals

-Workplace communication teaching manuals used

3- WEB ADDRESSES (PUTTING LINKS)