SECTION E

SECTION E	Environmental aspects and EIA principles in Water Harvesting (WH) and Small Scale Irrigation (SSI)
Rationale	Over the past decades, water harvesting has been largely promoted to capture run-off water for multiple uses, including domestic, irrigation and livestock, especially in many places. Indeed, many have been convinced that water harvesting and small scale irrigation systems could make a difference in terms of addressing food security needs of vulnerable communities. These widespread promotions of water harvesting structures, however, are gradually becoming questionable due to a number of negative impacts and failures to achieve the desired results. In some cases, the negative impacts outweigh the benefits, leading to abandonment of the water harvesting structures and associated lands. Among other things, such discouraging situations are results of, insufficient environmental considerations at the various stages of the interventions starting from their inception through planning processes to implementation. Yet, experience has shown that water-harvesting projects do not solely depend on good engineering and suitable agronomy for the success of water harvesting systems. Environmental considerations are just as important; and therefore, need to be adequately addressed through the entire process of the development interventions. People in the drier environments have been living at subsistence level for centuries and have developed their own priorities for their way of life and survival. It is of the utmost importance, therefore, to take their values, perceptions, attitudes and preferences into consideration rather than trying to impose solutions on them. The objective of this learning activity is to provide an opportunity to planners and practitioners in the identification and integration of these environmental factors in their development plans involving WH and SSI Systems.
Objectives	After covering this section, participants will have: • Identified the most important environmental aspects that need consideration in the planning and implementation of WH and SSI Systems; • Articulated general and specific constraints resulting from inadequate consideration of environmental factors; • Enhanced conceptual knowledge and practical skills in facilitating participatory planning and implementation of WH and SSI Systems
Learning Methods	▪ Synchronous learning: interactive conference room sessions (lecture/ presentations, Q&A, plenary discussions of participants) ▪ Asynchronous learning: Classroom exercises/assignments, reading)
Contents	▪ Session 1: Environmental aspects and EIA principles in WH and SSI ▪ Session 2: Environmental aspects and EIA principles in WH and SSI continued … and discussion
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Nile Basin Initiative

Environmental aspects and EIA principles in Water Harvesting (WH) and Small Scale Irrigation (SSI)

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Efficient Water Use for Agricultural Production

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1. Introduction

Rain water harvesting is a technology used for collecting and storing rainwater for human use from rooftops, land surfaces or rock, plastic, and concrete catchments using various storage techniques such as jars and pots as well as engineered techniques. Evidence of roof catchments systems dated back to early Roman times. Rainwater was the principal water source for drinking and domestic purposes since at least 2000 B.C. Water security, like food security, is becoming a major national and regional priority in many parts of the world for various reasons. The reasons for the need to develop technologies and institutions to promote rainwater harvesting can be cited as rainfall shortages, un even rainfall distribution, incapability of centralized systems to supply water for all, contamination/ pollution of other sources, population growth Vs global water crisis, and the need for sustainable and affordable water sources. RWH is also an alternative technology to augment freshwater resources

2. Important components of Rain Water Harvesting

Rain water harvesting has to be viewed as a complete set of activity with all its components listed below in the design, construction and utilization of all its systems. The system consists of Catchments Systems, Conveyance Systems, Storage Systems, Extraction Systems, and Utilization

2.1 Rain Water Catchments Systems

Roof Water catchments using roofs made of various materials like tiles, C.I.sheets, concrete, plastic sheets etc for households, institutions like schools, air ports, stadiums, factories etc, Rock catchments (Domestic and agriculture), Land surface catchments (Domestic and agriculture), Concrete surface catchments (Domestic and agriculture), Plastic sheets surface catchments (Agriculture), Soil cement surface catchment (Agriculture), and Storm water collection from urbanized catchments (Domestic, gardening and other various uses)

2.2 Rain Water Conveyance Systems

Harvested rain waters are transported through various conveyance structures from their sources to the reservoir areas or from the reservoirs to places they are intended to provide services. Some of the common conveyance systems are Concrete floors, Concrete lined canals, C.I.sheet, gutters and down pipes, Plastic/PVC gutters and down pipes, Plastic hoses/pipes, earth canals etc.

2.3 Rain Water Storage Systems

Rain water storage systems vary based on the type of use, the availability of resources, choice of technology, local community experiences and the combination of all these and others.

Water jars, Water caves, Ferro-cement tanks, Clay pots, Reservoirs (sand dams, masonry dams), Terraces, micro basins, trenches, Wells, Sausage tanks, Ponds etc are some of the commonly known RW storage systems.

2.4 Rain Water extraction systems

The choice for Water extraction systems for rain water harvesting seems limited in number and technology types, and the limited use of the already existing technologies may be attributed to limited resources, inaccessibility to the existing ones, inadequate awareness of the technologies, and poorly developed rainwater harvesting systems which could demand the technologies required to develop it. The types of water extraction systems vary based on the purpose of the extraction, and the type of storage system.

Rope and bucket, Hand pumps (various types), Electric or diesel powered pumps, and Faucets are some of the systems used to extract water from RW storage systems.

2.5 Rain Water Utilizations

The types of water uses are dependent on the awareness of users, availability of resources to develop RWH systems, the severity of the scarcity of water or the combination of these. Rainwater utilization also varies between rural and urban or rich and poor households. Rainwater is for drinking, washing and cooking, gardening, agriculture (drip, furrow and sprinkler irrigation), ecological and/or environmental needs (soil erosion control, anti-drought strategy, flood/storm control/mitigation, watershed management), air conditioning, fire hydrant, etc. All these endeavors to utilize rain water will have a negative or positive impact on the environment. Therefore, the need for environmental impact assessment would become inevitable.

3. Environmental impact assessment of RWH and SSI

3.1 What is Environment?

Environment is a Dynamic system that is comprised of hydrosphere, atmosphere, lithosphere, and biosphere. These include soil, water, air, climate, landscape, flora, fauna, ecosystems & biodiversity, Use of land, natural resources and raw

materials, Protected areas & sites of special significance, Heritages, recreation & the Socio-economic issues.

3.2 What is Environmental Impact Assessment ?

Environmental Impact Assessment (EIA) is a Systematic & interdisciplinary identification, prediction & evaluation, mitigation & management of impacts of a proposed project & its reasonable alternatives, and is a method of identifying and analyzing the potential impacts of a project, with a view to ensuring environmentally sustainable development.

It is also an instrument used to forecast & evaluate both the positive and negative environmental consequences of proposed projects. Hence it is an environmental management tool. Therefore it is a means for:

Identification- to specify the impacts associated with each phase of the project and activities undertaken

Predication-to forcast the nature, magnitude, extent and duration of the main impacts

4. Objectives of EIA

To integrate environmental considerations at the earliest phase of the project cycle so as to select the best project alternatives that are socially acceptable and environmentally sound & sustainable

Facilitate and encourage the identification of environmental issues early in the planning cycle; designing environmental improvements into these activities and thereby avoiding the need to mitigate or compensate for adverse impacts.

Advance an understanding of the state-of-the-art of sustainable rain water harvesting and small-scale irrigation by developing a document that will be determining whether or not to proceed with RWH and small scale irrigation development and how to efficiently and effectively plan and manage these activities.

Build staff capabilities and organizational systems which lead to more sustainable RWH and small-scale irrigation systems.

5. Principles of EIA

EIA should be:

Relevant by providing sufficient, reliable & usable information / data

Interdisciplinary by including people from various disciplines and experiences in the Environment team.
Based on issues so that environmental teams will screen the projects to identify, any which may be of environmental concern.

Practical by establishing *mitigation* measures for observed environmental impacts

Participatory by fully involving all the concerned through information sharing, consultation, involvement, collaboration and empowering.

Transparent by being open and easily understandable and nnotification of Projects of Environmental Concern should be done to all the concerned who will decide on whether an EIA of the project is required following which the project may be approved, the design modified, special plans drawn up or the project may be disapproved.

Efficient: Using least/modest cost in all the EIA processes and implementation of mitigation measures

6. Environmental Impacts

Some of the RWH and SSI environmental impacts anticipated could be depletion of existing water sources,
increase in social tension/conflict over water allocation,
increase in waterborne diseases,
disruption of sensitive downstream ecosystem, land acquisition, displacement of land users, and displacement of private assets etc

Commonly known environmental impacts of RWH and SSI which do require due attentions are:

6.1 Water wastages

Inefficient use of the precious resource (water) as a result of leakage through unlined canals, earth dam structures, and breakage in the canal system

6.2 Soil erosion

This includes mainly depletion of soil nutrients and organic matter when topsoil is carried away, washing crop seeds down slope, exposure of plant roots, and degrading downstream water sources when runoff spills out of the command area.

6.3 Soil fertility and quality

Soil fertility and quality maintenance problem owing to increased cropping intensity and removal of nutrient from the soil

6.4 Soil salinity problem

All year round irrigation causes the water table to rise and this makes the dissolved salts to be transported into the root zone and deposited on the soil surface and left behind when the water evaporates. Existing salinity problems (applying saline water, existence of naturally saline water) are further exacerbated by conditions that led to higher water table.

6.5 Water related disease hazard

Health hazards associated with RWH and small-scale irrigation are related with water and vector borne diseases. These are diseases acquired by water contact or from insect bites.

6.6 Displacement and /or changes in land use pattern and social equity

These are unintended impacts associated with displacement of people as a result of the construction, shifts in access to the irrigated land, disruption of downstream user access to water resources, and change in food security and or dietary habits of local people.

Certain members of the community will be obliged to give up their farm plots and/or grazing areas in order to make way for the construction of ponds, head works, canals, and in particular, lands that would be flooded behind an earthen storage dam.

6.7 Rehabilitated and/or upgraded systems that shifted the command area

An improved diversion system leads to the realignment of the canal system as art of the pursuit of greater efficiency in water use. Although this may make it possible to expand the actual area under irrigation, it is possible that a certain portion of the community may then find its lands outside the command area because the layout of the canal system shifts to accommodate the upgraded diversion weir or main canal.

6.8 Over-use of water in diversion systems

This deprives downstream users of their water rights. Although this is presumably part of the planning associated with schemes of this type, the actual difficulties in measuring lean flow and the potential for shortage in water supply, suggest that many such schemes over-use water and deprive down stream users of water for

human and animals consumption and/or the possibility of establishing additional SSI schemes.

6.9 Tardy completion of scheme development.

This delays the opportunity for compensation. Because of SSI establishment/ construction works in large volume within the limited window of the dry season, and with a large labour force that must be attracted to the site, many schemes take several years to complete. This situation exacerbates the difficulties for those who have been displaced because the standard approach to compensation is to offer them land within the command area.

6.10 Changes in the household diet as a result of SSI

Food security will be enhanced if small farmers are able to produce cash crops, generate income and buy food. Unfortunately, this approach does not always work perfectly, with possible impacts resulting from marketing difficulties and gender differences.

7. EIA processes

The key steps in an EIA are Screening, Scoping, Baseline, Impact Assessment, Mitigating Measures, Implementing the Mitigating Measures, and monitoring their Implementation

7.1 Screening

Screening is the process of determining whether or not a project requires further attention for environmental purposes.

Each of the proposed projects should be subject to a guideline that can be used to identify the potential impacts, which may require the project to be earmarked for special attention, redesign or rejection

7.2 Scoping

Scoping refers to the process of identifying the following, as early as possible:

- The appropriate geographic boundaries of an EIA baseline and impact assessment
- The important issues and concerns (interests)
- The information necessary for decision-making, and

The significant effects and factors to be considered

A written recommendation summarizing the above in the form of a simple Terms of Reference for the EIA

Action plans are then drawn to carry out the following tasks such as baseline, impact assessment, development of mitigating measures, making recommendations for implementation, and monitoring of mitigating measures

7.2.1 Baseline

Firstly, the Impact Assessment involves drawing up a baseline - a brief description of the biophysical, social and cultural heritage features of the areas likely to be affected by the project. These are done by:

- Identifying areas to be covered and type of data to be collected
- Arranging who will collect which data and
- Dispatching team to the impact areas

7.2.2 Impact Assessment

The impact assessment usually involves two principal tasks. These are analysis of the likely impacts, including determination of their nature, magnitude, extent and effect, and an assessment of the significance of the impacts (i.e., whether they matter and whether something needs to be done to mitigate them). The most common formal methods used for impact identification are check lists, professional experience, overlays and geographic Information Systems, mathematical models etc.

Checklists

Checklists are usually developed from lists of environmental features of activities that should be investigated for possible impacts, based on experience.

Professional experience

Although not strictly a formal method, EIA practitioners use the knowledge and expertise they gain in their work to systematically develop data-banks and technical aids that can be used to assist in future projects.

- Overlays and Geographic Information Systems

- Map overlays or computer images can be used to display impacts pictorially.

- Mathematical Models

7.2.3 Mitigation Measures

Rain Water Harvesting mitigating measures are designed to avoid or minimize impacts through good design or design modifications (mitigation). Depending on the nature of the impacts and the timing in the design cycle there are a number of different ways in which problems can be managed. These include, alternatives ways of meeting the need, changing the project design, compensating in monetary terms, replacing, relocating, and rehabilitating. Mitigation measures in order to avoid and/or minimise negetive impacts and optimize the positive ones could be sited as follows:

- Preventing, reducing or minimizing impacts before they occur
- Eliminating an actual impact over time by incorporating approprate maintenance measures
- Rectifying an impact by repairing, rehabilitating or restoring the affected environment
- Compensation for an impact
- Maximizing beneficial impacts through specific additional actions.

8. Implementation and Monitoring

Implementation and monitoring should include recommendations and information on how and when to implement Mitigating Measures, cost estimate of implementing the Mitigating Measures, and recommended method of monitoring implementation of the Mitigating Measures

9. The EIA Report

The EIA report prepared by the environmental team must contain sections such as baseline, impact assessment, mitigating measures, recommendations for implementation, and recommendations for monitoring

10. Community Involvement in the EIA Process

It is very important to involve the community in all aspects of the EIA process. The objectives of community involvement in the EIA process may be summarized as follows:

Obtaining local and traditional knowledge

Minimizing conflict through the early identification of contentious issues.

Providing those involved with planning the proposal with an opportunity to ensure that the benefits are maximized and that no major impacts have been overlooked

Providing an opportunity for the community to influence project design in a positive way

Increasing public confidence in the reviewers and decision-makers

Providing better transparency and accountability in decision-making

Providing an opportunity for those otherwise unrepresented to present their views and values