Monitoring, Evaluation, and Learning (MEL) Toolbox

Hydrological Assessment Tools for Better MEL in Watershed Management

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Contents

Watershed Management in India 4

How Are Organisations Conducting MEL for Water Management Programmes? 7

What Challenges Hinder Effective MEL? 9

What Is the Solution We Are Providing? 10

Four-Step Approach to Design MEL Assessments 11

About the MEL Toolbox

The MEL toolbox simplifies scientific methods for grassroots practitioners to effectively monitor, evaluate, and learn from watershed management interventions in India. It compiles existing methodologies into an accessible format to support impact assessments that are robust despite limited resources and short project timelines. By strengthening evaluation capacity, the toolbox enables users to maximise the benefits of watershed interventions. As a living document, it will evolve through testing with partner organisations and the inclusion of new methodologies to enhance MEL practices.

This document is Part 1 of the MEL Toolbox series. Click to view Part 2, Part 3, and Part 4.

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About WELL Labs

Water, Environment, Land and Livelihoods (WELL) Labs co-creates research and innovation for social impact in the areas of land and water sustainability. It collaborates with partners to design and curate systemic, science-based solutions to enable a high quality of human life and nurture the environment. WELL Labs is part of the Institute for Financial Management and Research (IFMR) Society.

About EDF

A global nonprofit, Environmental Defense Fund collaborates with governments, NGOs, research and academic institutions, corporates and others to support and advance India's vision of shared, sustainable prosperity. It combines scientific and economic foundations, a broad network of partnerships and a pragmatic approach in support of India's ambitions.

Watershed Management in India

India faces the daunting task of ensuring sustainable and equitable access to water resources despite limited, and increasingly variable, water availability. Effective watershed management is essential to achieve this goal.

Watershed management includes strategies and practices such as augmenting water supply, managing water demand, restoring natural hydrological processes, and protecting ecosystem health. Effective watershed management in India requires overcoming the following challenges:

1. **Water availability is highly seasonal.**
   About 80% of India's annual precipitation is concentrated in just four months, necessitating the efficient capture, storage, and management of water to secure drinking water and support agriculture.

2. **Low-storage and high-storage aquifers each create unique challenges.**
   About 65% of India is underlain by hard rock aquifers, which exhibit considerably low storage. Watershed management is needed in these regions to store water in the aquifers and above the ground for use in the dry season, without depleting downstream resources.
   Some regions, such as the Indo-Gangetic basin, contain alluvial formations with high water storage, which requires a different set of watershed management strategies. While these regions provide greater water availability in the dry season, excessive consumption can lead to long-term groundwater depletion, which is difficult to reverse.

3. **Intense rainfall erodes the soil, leading to land degradation and the siltation of water storage structures.**
   Watershed approaches, such as implementing interventions first on ridges and then moving lower down the slope to valleys, can reduce the surface runoff volume and the velocity of water. This allows for better management of water flowing from the ridge to the valley and ensures the efficacy and durability of soil and water conservation structures downstream.

4. **Climate change will create greater variability and uncertainty.**
   With floods and droughts increasing in frequency and intensity, watershed management is critical to buffer their adverse impacts.

5. **Disparities in water access lead to inequitable outcomes.**
   As individuals with greater water access increasingly capture more water resources, others may suffer. For instance, upstream regions may use most of the water in a watershed, leaving limited resources for downstream communities. Watershed management is key to managing supply-demand dynamics and ensuring meaningful prioritisation of water use in the long run.

Diverse watershed management efforts have been in place across the country to address these challenges, increasingly through private funding.

For example, corporate social responsibility (CSR) programmes in India[1] spent about ₹1,200 crore ($150 million) on water management initiatives in 2023-24. These interventions play an integral role in boosting the country's water security. However, not all of them are effective and scalable due to the absence of robust evidence.

To ensure that watershed management initiatives are effective, monitoring, evaluation, and learning (MEL) is critical.

Problem Diagnosis → **Planning and Implementation** → **Monitoring, Evaluation, and Learning**

Problem Diagnosis	Planning and Implementation	Monitoring, Evaluation, and Learning
Identify the problem specific to the landscape.	Build a theory of change, design the intervention, and select appropriate sites for implementation.	Measure the impact and perform corrective actions.

Investing in watershed management must also include investing in MEL to understand which approaches work in which situations, how to tailor solutions to specific geographies, and how to ensure programme investments are creating the intended outcomes. MEL is central to understanding and improving watershed management programmes.

Take the case of groundwater recharge structures. While they are a popular solution, the effectiveness of recharge structures depends on a variety of local conditions related to climate, hydrology, and water infrastructure. MEL assessments of these structures can help select more appropriate structures for a particular terrain and improve their design. MEL also has the potential to similarly improve other types of watershed management approaches.

[1]As per Indian law, corporations meeting certain financial thresholds must spend at least 2% of their net profit over the past three years on philanthropic activities.

A Robust MEL Assessment Can:

- **Identify what works:**
  MEL provides evidence regarding what worked, what did not, and what could be the best solution for a particular problem.

- **Navigate between different geographical scales:**
  While priorities might be different at the local, state, and national levels, measuring a consistent set of objectives allows stakeholders to navigate between different scales of operation. Consider the Government of India's projects implemented at the block[2] or district level, such as the Atal Bhujal Yojana or Jal Jeevan Mission. Consistent indicators can help coherently aggregate their impacts at the state and national levels.

- **Determine causal pathways:**
  Attributing changes solely to an intervention is a challenging task. A well-planned and executed MEL study can help identify confounding factors and establish plausible associations.

- **Adaptive response in a dynamic setting:**
  Climate change is causing rapid changes in the environmental context for which a particular solution was adopted. This challenges the underlying assumptions on which the solution relies. Therefore, periodic reviews are important to tweak interventions and make them more responsive to field conditions.

- **Improve governance:**
  Through MEL, communities and local governments can gain a systematic understanding of their natural resources and what interventions are most suitable for their environmental and social contexts. This can help improve decisions at the grassroots level.

- **Mainstream cross-cutting themes:**
  Themes like gender and social inclusion, citizen engagement, and climate resilience can get overlooked as they are often invisible and might not be directly associated with the primary outcomes. A robust MEL framework can help integrate them.

- **Mobilising finance:**
  MEL can help showcase impact and enhance transparency, which can boost credibility with donors and investors. It can thus mobilise finance for effective solutions.

[2]States in India are divided into districts. Each district is further subdivided into blocks. Each block comprises a number of villages.

How Are Organisations Conducting MEL for Water Management Programmes?

We conducted a landscape review, for which we interviewed 10 programme managers and heads of organisations working in the water sector to map existing initiatives, theories of change, and MEL practices. We also analysed the annual reports of six civil society organisations and six donors in the water sector. Our findings are as follows:

1. Most organisations communicate impact in a spectrum of output and outcome metrics without a systematic MEL framework.

The organisations we studied use a range of metrics, including both outputs (e.g., water storage potential, volume of rainwater harvested) and outcomes (e.g., increase in area under vegetation and change in agricultural yields). Outputs are more popular because they can be captured in a short timescale, while outcomes emerge over the long term. Organisations, therefore, use a combination of both to fulfill regulatory requirements and ensure that there are regular updates regarding their project's progress.

While some organisations reported as few as three output-based impact metrics, others were more rigorous in their approach, measuring up to eight metrics, including hydrological impact and socioeconomic gains. Water potential created and volume of rainwater harvested were the most frequently reported indicators (see Figure 1 for the list of the 10 most used indicators).

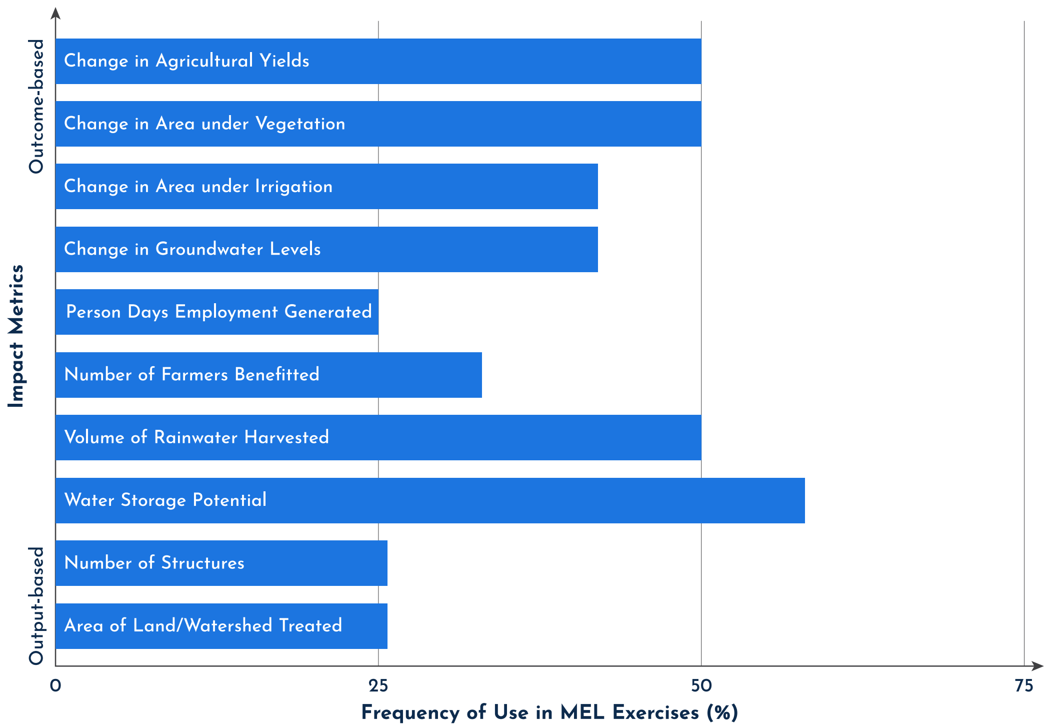

Figure 1: Impact metrics used by 12 organisations (six civil society organisations and six donors) in the water sector. The Y-axis presents indicators along a spectrum from output to outcome.

2. Water savings is a popular metric to measure impact.

The volume of water saved is a convenient indicator that allows a common means of measurement for a portfolio of interventions within a single organisation. For example, a corporate social responsibility programme funding the construction of check dams, farm ponds, and micro-irrigation projects can sum up each project into a single metric of water savings to communicate impact. It is easily understandable for diverse stakeholders and does not involve complex science. However, there are limitations to this simplistic version of impact reporting.

A skewed weightage to water savings can lead to poor problem diagnosis and inappropriate solutions.

Water management solutions are inclined to maximise water savings. However, this can often be opposite to a landscape's requirement, such as water savings in water-abundant regions. Besides, the overwhelming focus on water savings has led to many interventions being assessed for the metric even though that might not be their intended purpose.

3. Watershed-scale assessments are missing.

Since organisations implement programmes at a village level, MEL assessments are also limited to the administrative boundary. However, MEL measurement solely at a local scale can ignore wider impacts at the watershed scale.

Take the case of groundwater recharge structures. They have benefits locally, but at the watershed scale, they could redistribute water balance components—there could be an increase in local water resources and a decrease in downstream water availability. **An inadequate understanding of watershed-scale effects can conceal undesirable outcomes.**

Impact evaluations at the watershed or basin scale are clearly missing from standard MEL practices (Glendenning and Vervoort 2010 and Saha, Sikka, and Goklani 2022). To illustrate how this may present concerns, Prasad, Damani, and Sohoni (2022) conducted a systems evaluation of plastic-lined farm ponds filled using pumped groundwater. While farm ponds benefitted the farmers who had built them in their fields, cumulatively, they led to increased inequity in access, increased susceptibility to droughts, and a fall in agricultural productivity.

Within a basin, the number of structures should be planned based on rain and runoff.

Glendenning and Vervoort (2010) point out that there can be an oversaturation of interventions by creating too many structures upstream to catch runoff. This is counterproductive during droughts as it can lead to inadequate water levels in storage structures. For instance, Dashora et al. (2022) note a very minor increase in recharge due to additional structures upstream in dry years. Even though additional structures may provide additional benefits in heavy rainfall years, the economic efficiency is low due to the increased cost of building additional structures. Excessive storage can also be detrimental for downstream flows that maintain ecosystem services.

What Challenges Hinder Effective MEL?

Designing effective MEL assessments presents a number of challenges. We highlight the most salient challenges we encountered in our landscape review below.

1. Donors work with several partners at once, who might not be uniform in their approach to impact evaluation.

This is a two-fold challenge:

a. Implementing organisations follow impact evaluation requirements that come from their donors. However, their methodologies can differ widely. For example, different organisations have different standard operating procedures to measure well water level data, say in the form of sampling or monitoring frequency.

b. The MEL framework each organisation follows might be skewed towards certain kinds of indicators. For example, they might measure socioeconomic benefits, but leave out environmental changes, which might not provide a holistic picture of an initiative's impact. The aggregate impacts of multiple water management projects might go unnoticed.

Take the case of the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), a rural employment and development programme by the Government of India. While it has yielded a range of socioeconomic benefits, it is also important to study its environmental and watershed or basin level impacts, which various studies, such as Behrer and Pullabhotla (2024), have demonstrated. These can be significant, given the large scale of the programme.

A standard approach would allow comparability across projects and a common language to communicate impact.

2. Implementing organisations often have limited resources and experience.

Grassroots workers are responsible for collecting data at the community or village level. Often, there is only one worker for the entire village. While juggling between multiple responsibilities, they might miss out on timely data collection or commit inadvertent errors.

Another challenge is the instruments required for data collection. Expensive hydrological and meteorological sensors can prevent organisations from collecting data at a spatially representative scale.

Natural resources management organisations actively collect data for various indicators, for example groundwater levels. However, the frequency of data collection might be inadequate or the sampling might not be spatially representative. At other times, they might not know how to analyse the data they collect.

3. Impact evaluation can be more expensive than the intervention itself.

For programmes of a short duration (less than a year), a high-quality impact evaluation could cost more than the intervention. Besides, impact evaluation requires in-depth knowledge of hydrology, hydrogeology, systems transformation, economics, and more. This technical gap is one of the reasons why many organisations do not work with large hydrological datasets.

4. An ad-hoc approach to MEL is preventing the identification and adoption of effective solutions in the water sector.

There are two forms of learning: one focuses on providing feedback for organisations to improve programmes and decision-making. The other helps identify solutions that can help the water sector understand what works where.

Randomised controlled trials have helped identify solutions in sectors such as health and education. However, they are less feasible in the water sector as no two watersheds are likely to be identical and controlling for confounding variables is difficult. Besides, there are often trade-offs between environmental conservation and livelihoods. Therefore, it is important to strive towards minimum trade-offs and maximum benefits. Systematic learning would take these challenges into account while identifying solutions for a particular context and generating insights that are useful for a range of stakeholders.

What Is the Solution We Are Providing?

We are developing a MEL Toolbox that builds upon existing methodologies and tools.

We have collated the methodologies as guides—living documents that will be iterated as we work with partner organisations to test the methodologies. We shall expand the toolbox by including and testing other methodologies that have the potential to improve MEL for watershed management.

Here are four guides to methodologies that WELL Labs has tested in collaboration with EDF. Each guide contains step-by-step explanations and a case study to illustrate the method’s application.

1 Staff gauge tool and water balance equation for groundwater recharge estimation:
The staff gauge is a tool that measures changes in water levels. This information is used in the water balance equation to estimate groundwater recharge. This simple approach allows community participation in data collection.

2 Paired watersheds studies:
This method allows a watershed-scale impact assessment of an intervention by comparing a treated watershed to a control watershed with similar hydrological characteristics.

3 Jaltol
This web app uses IndiaSAT land use land cover maps to assess the village-scale impact of interventions. It compares the effect of interventions in a treatment village vis-a-vis a control village with similar hydrological characteristics.

4 Water level measurement tool:
A simple, DIY, low-cost sounder that can be used to measure water levels inside wells or borewells.

We have also designed and tested an approach for using MEL to assess specific interventions. Please see the approach below, which we have utilised to assess groundwater recharge structures, participatory groundwater conservation and sharing, and the Government of India's natural resources management initiatives.

Four-Step Approach to Design MEL Assessments

Step 1 Componentise

- Break down the project into components that are inputs or variables of concern.
- Build a theory of change or a logical framework connecting each component with intended outputs, outcomes, and impact.

Step 2 Hypothesise

- Convert project components into individual hypotheses that can be tested to gauge the impact.
- Identify data requirements for each

Step 3 Test

- Collect and analyse data.
- Keep a lookout for unintended consequences.

Step 4 Systematise

- Derive insights regarding the project's environmental and social context so that it can be appropriately scaled to other locations.

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