



Monitoring and Evaluation

DEEP DIVE

NOTE: This document is an accompanying resource to the [Watershed Investment Program How-To Guide](#). Readers are strongly encouraged to review the guidance in its entirety before delving into any accompanying subject-matter “Deep Dives,” including this document.

Document Objectives

Monitoring and evaluation (M&E) of a Watershed Investment Program (WIP) is critical for ensuring outcomes on the ground, reducing uncertainties, informing reporting and communication to investors and donor, and adaptively managing the program over time. This document introduces key terms used in M&E, summarizes some key principles and considerations in program monitoring design, and directs readers to existing resources that provide detailed guidance on metric selection, monitoring design and data collections and analysis.

This document does **not** present specific indicators for monitoring as they vary across biophysical and programmatic contexts. Such details must necessarily be a direct result of local stakeholder needs: *who* needs to know *what*, *how often*, and for *what purposes*. For more information on detailed indicator selection, please reference the following guidance documents: [Measuring the Effectiveness of Water Funds, A Primer for Monitoring Water Funds](#), [Measuring and Evaluating the Impacts of Corporate Watershed Projects](#). A bibliography of resources on M&E are provided below.

Key moments for M&E planning and implementation in relation to the WIP development cycle include:

1. **Pre-feasibility:** Develop initial understanding of stakeholder goals and decision-making information needs.
2. **Feasibility:** Determine general scope (spatially and temporally) of monitoring; identify critical constraints; scope existing monitoring efforts within targeted area and data availability; conduct reconnaissance monitoring as needed to support feasibility planning.
3. **Design:** Co-develop M&E plan informed by the WIP's SMART objectives with partners and key stakeholders. Includes finalizing metrics and indicators, determining monitoring design, data collection and management protocols, data analysis methods, and reporting needs (all reviewed and vetted by partners and other key stakeholders to confirmed relevance). Also define adaptive management processes for integrating monitoring data into decision-making.
4. **Execution:** Continued monitoring data collection, analyses, and evaluation, regularly adjusting/updating M&E plan and implementation plan based on learnings from M&E (i.e., adaptive management); reporting out to stakeholders

Links to M&E Resources

- [A Primer for Monitoring Water Funds \(2013\)](#)—Provides an overview of general considerations for M&E as applied to water fund projects. Also describes common experimental designs for field monitoring, primarily for biophysical processes, outcomes, and impacts.
- [A Guide to Monitoring and Evaluating Water Funds \(2019\)](#)—Abbreviated applied guidance focusing on best practices for M&E implementation for water funds. Includes suggestions of base requirements for any M&E program.
- [Water Funds Minimum Monitoring Standards \(2020\)](#)—Identifies and defines a checklist of necessary components and preconditions for any water fund M&E program.
- [Measuring and Evaluating the Impacts of Corporate Watershed Projects \(2021\)](#)—Review of major M&E components developed for corporate actors but applicable for other users groups. Includes an extensive list of possible indicators for tracking outputs and outcomes from water investment projects.
- [Bridging Theory and Practice for Hydrological Monitoring in Water Funds \(2015\)](#)—Case studies of M&E developed and implemented within water funds in Latin America.

Glossary of M&E Key Terms

The following list includes commonly used terms relevant to M&E; for clarity and consistency, these are defined in alignment with other initiatives at TNC despite occasional usage heterogeneity in broader M&E circles. We also specify synonymous terms that are sometimes used interchangeably; these are indicated with an *.

| | |
|----------------------------|--|
| Baseline/Comparator | <p>The natural range of values of an indicator against which changes can be measured, prior to or in comparison with the implementation of a project or program.</p> <p><i>Note: Baselines can be used to make Before-After or Control-Impact comparisons. These values are sometimes referred to as a comparator.</i></p> |
| Evaluation | <p>The systematic and objective assessment of an ongoing or completed activity to determine its relevance, effectiveness, and impact. An important part of the adaptive management cycle where we make sense of what the data is telling us and use it in decision-making.</p> |
| Goal/Target* | <p>The value (or an acceptable range of values) of an indicator that a project or program aims to achieve over time through implementation.</p> |
| Indicator | <p>Context-specific quantitative variables or qualitative statements that provide simple, precise, and reliable means to establish baselines, and to measure human well-being or environmental changes over time.</p> <p><i>Note: ‘Measure,’ ‘indicator,’ and ‘metric’ are sometimes used interchangeably within the M&E community, but we use these terms distinctly in the document. Specifically, an ‘indicator’ is the context-specific means of informing a ‘measure.’</i></p> <p>Example: <i>Indicator: Leadership roles held in a watershed management committee</i> <i>Measure: # of people with increased ability to meaningfully participate in decision-making about lands, waters, or resources</i></p> |
| Impact | <p>The positive or negative, primary or secondary, direct or indirect, intended or unintended effects of a project or program. Longer-term than an outcome.</p> |
| Intermediate Result | <p>A way to measure progress toward outcomes, which may be longer-term significant milestones or near-term measures of a project or program’s progress or a confirmation of its key assumptions. They often provide evidence as to whether a Theory of Change is playing out as expected.</p> |
| Measure/Metric* | <p>A standard means of assessing the size, amount, degree, or quality of something. Composed of a value and a unit of measure.</p> <p><i>Note: ‘Measure,’ ‘indicator,’ and ‘metric’ are sometimes used interchangeably within the MEL community, but we use these terms distinctly in the document. Specifically, a ‘measure’ is informed by context-specific ‘indicator(s).’</i></p> <p>Example: <i>Measure: # of people with increased governance capacity</i> <i>Indicator: Community governance index score</i></p> |
| Monitoring | <p>The systematic continuous, ongoing collection of data to provide information on the status or trend of indicators relevant to the project or program’s objectives or goals.</p> |
| Objective (noun) | <p>A formal statement detailing a desired result (or intermediate results) of a project or program’s strategies or activities. The realization of a project or program’s objectives should lead to the fulfillment of its ultimate outcomes.</p> |
| Outcome/Result* | <p>Major measurable effects of strategies (and activities undertaken) within the scope and time frame of a project or program. More specific and shorter-term than an impact. Also includes unintended or negative effects.</p> |

| | |
|------------------------------|--|
| Output | A discrete deliverable over which the project or program implementers have control, for example a report, training, or workshop. |
| Perception Indicators | A subjective indicator that conveys a way of regarding, understanding, experiencing, or interpreting something; an indirect assessment through individual recounting. |
| Primary Data | <p>Data which is observed or collected directly from first-hand sources. For example, water quality data collected through autonomous monitoring stations, or socio-economic data collected via a social survey, through use of focus groups or key informant interviews conducted by program staff.</p> <p>Primary data can be strictly continuous quantitative like number of trees planted or qualitative, categorical data. Depending on their characteristics, they can be used for different purposes and carry different levels of information.</p> |
| Proxy | An indicator that can be used to approximate or represent a phenomenon of interest where its direct measurement is not feasible. |
| Qualitative Data | <p>Data that can be observed, described, and recorded, but is not measured in objective, numeric terms.</p> <p>Note: in some cases, based on their intrinsic information and characteristics, qualitative data can be converted to numeric data (e.g., ordinal scales) and then analyzed statistically.</p> |
| Quantitative Data | Data that can be objectively measured and expressed numerically, and thus analyzed statistically. |
| Secondary Data | Existing data generated by another party or for another purpose. For example, demographic data collected by a previous census conducted by a regional authority, or environmental data compiled by another agency. |
| Unit of Measure | <p>Standard unit or system of units by which a measure is expressed.</p> <p><i>Example:</i> # of hectares</p> |

Key Principles of M&E

What is M&E?

Monitoring and evaluation are the processes by which data are systematically collected and analyzed to track project or program progress towards objectives and to measure outcomes and impacts, and evaluated to inform program decision making and management.

Why Invest in M&E?

An effective M&E program provides valuable information about the intensity and direction of changes and whether project or program objectives are being achieved, to inform adaptive management, and to help inform further investments in WIPs based on a deeper understanding of elements of success. To illustrate further,

- The links between our strategies (and the interventions/activities we undertake) and the outcomes we seek are sometimes empirically untested.
- Evidence is needed to assess the impacts of our strategies or interventions/activities, and to improve on them where possible.

- Risks are important to consider. By continuously monitoring and evaluating how our work impacts both people and nature, we are better able to avoid, minimize, and mitigate unintended consequences and negative impacts, and to adaptively manage for better outcomes.

For WIPs, it is recommended that M&E be done at the scale of targeted intervention implementation (usually watershed or sub-watershed scales) to evaluate cumulative responses. Some WIPs may also want to conduct M&E at the individual NbS level to assess effectiveness of specific NbS for demonstration purposes. However, financial, logistical, and other constraints may limit monitoring efforts, allowing only the cumulative impacts to be monitored. Mathematical models can be used to complement field monitoring efforts. However, depending on the complexity, data availability and scale of the watershed, model predictions can have large uncertainties which need to be carefully assessed and any assumptions used in the modeling need to be clearly communicated.

Common M&E failure points to be mindful of

- *Poor communication between partners to set realistic expectations:* While NBS have the potential for significant environmental and human benefits, it is critical that limitations and assumptions also be concurrently communicated in order to ground expectations. Besides obfuscating project goals, poor communication can lead to unsubstantiated or unnecessary monitoring investments.
- *Vague objectives and/or poor experimental design:* Successful monitoring is predicated upon clear and relevant project objectives, which in turn must inform clearly defined and justified monitoring objectives.
- *Failure to turn data into information and knowledge:* There can be an overemphasis on the planning of data collection and experimental design. During M&E planning, at least equal emphasis is needed on defining data analysis and reporting processes to ensure monitoring investments actually result in useful information for decision-making purposes.
- *Failure to act on and not just review the data collected:* Successfully collecting, analyzing and reporting monitoring data is a sizeable achievement. However, the real value of M&E depends upon its ability to support evidence-based decision-making. As with data analysis and reporting, the procedures under which monitoring results will be leveraged for decision-making must be clearly established at the outset. What decisions? When? By whom? According to what thresholds?

M&E in Decision Contexts

There is wealth of guidance available on how to design M&E for a WIP and NbS more broadly. There is a danger however, of getting lost in the technicalities and missing the opportunity to take a step back and think about how M&E can be used in a strategic fashion. In this section, we suggest a few key ways of thinking about it that can help organizations and collectives move forward in a way that maximizes on-the-ground impact, reducing the risk of detailed M&E plans being drawn up but then left 'gathering dust on a shelf'.

Too often, monitoring is conducted to collect a vast array of data and little (if any) of it is ever communicated or used to guide or evaluate management decisions. Placing monitoring data into context for communicating it to a specific audience is critical, and hence the questions of '*who are we measuring for*' and '*what information is needed*' ought to be asked upfront. For example, donors (individuals, foundations) may want to know, as part of a regular annual reporting cycle, what progress is being made in implementation of NbS, and high-level summaries of environmental, social, or economic outcomes (ha of wetland restored, # of people employed, etc.) to inform their funding decision; investors may also care about the return on investments at the end of a 5-year cycle; program managers and participating partners (making management decision of the WIP and directly implementing activities) need more detailed information on where and when NbS are implemented, how much each activity cost per hectare, how many households or private landowners have contracted with the WIP, if interventions are collectively being implemented at sufficient scale to achieve objectives, whether there are new or changing environmental conditions previously not accounted for, etc. at a more frequent basis, to adjust the Strategic Plan as well as annual implementation planning.

An effective monitoring system must be based on a clear understanding of the questions that the monitoring data will need to answer. These questions will determine what types of information will be needed, and subsequently guide the entire monitoring and evaluation process, including when, where, what and how frequent data need to be collected. Therefore, it is critical to define and prioritize information needs, understand the types and sources of information/data that already exist now and into the future (and who has it), identify critical information gaps and opportunities to fill those gaps. From a planning perspective, it is also useful to consider the financial resources for M&E currently available and that which may be accessible in the future, as well as the proposed timeframe of the WIP. Lastly, it is also necessary to ensure that the appropriate expertise is engaged in designing M&E early on, to ensure that data collection and analysis is rigorous and strategic.

Given the often-limited funding and capacities to implement monitoring programs that deal with NbS and green infrastructure, it is important to target monitoring resources which will capture the most relevant information.

These questions generally focus on judging progress toward meeting the program goals; providing information to investors and participating programs and communities regarding this progress; and giving feedback to facilitate adaptive management. A big part of this is making sure you understand who will eventually use the information and for what purpose.

Given the variety of stakeholders in a watershed, it's highly unlikely that they will be interested in the same type(s) of information or face similar decisions. These stakeholders usually interact with information generated through M&E in distinct 'decision contexts'. For more details on 'decision contexts', please reference [this blog post](#).

Unless the stakeholders and decision makers are taken into account when designing an M&E program, it is much less likely that the results of M&E will be considered both credible and salient when they are presented. As a consequence, the likelihood of 'going to scale' with NbS programs is much reduced.

Developing an Effective M&E Plan

The effectiveness of an M&E program depends on clear objectives and good planning. The specifics of the planning process will vary depending on the project context, but all effective monitoring and evaluation programs share common components that must be addressed. Each step is briefly described below. See [Measuring and Evaluating the Impacts of Corporate Watershed Projects](#) for more details on each step.

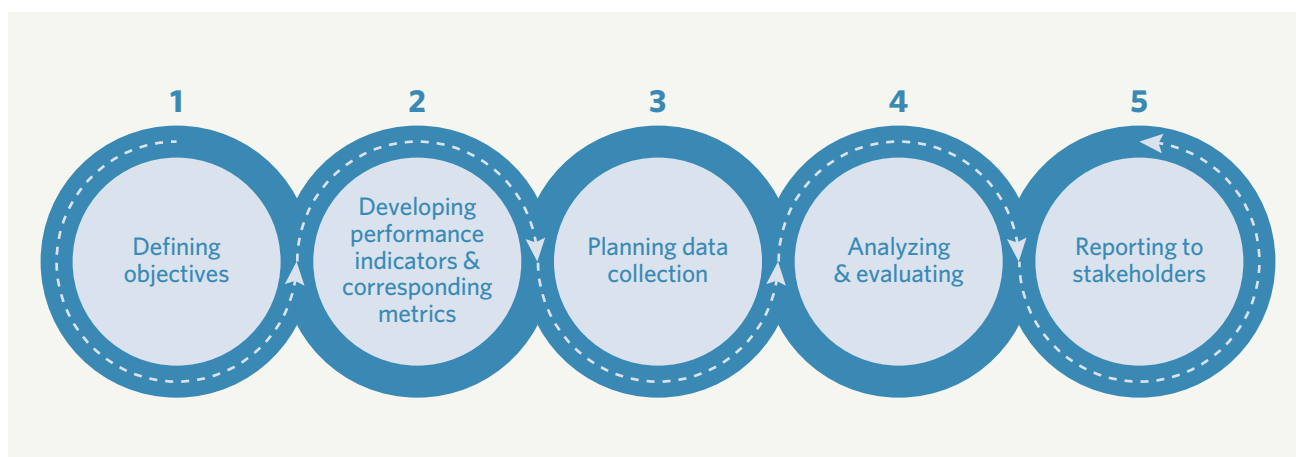


FIGURE 2. The five steps of monitoring and evaluation. *Source: Measuring and Evaluating the Impact of Corporate Watershed Projects (2021)*

STEP 1: Defining program objectives

In order to define the objectives of the monitoring and evaluation program, it is important to first understand the specific challenge(s) that the WIP is aiming to solve, what solutions are being considered and what the goals are of each solution or set of activities that comprise the solution.

STEP 2: Developing metrics & indicators

Indicators and metrics (see definition above) are systems of measurements used to quantify or describe changes associated with actions implemented in a WIP. They can be quantitative or qualitative. Deciding on the metrics and indicators for the M&E program is not always easy given the many factors that need to be considered. Selection of indicators should consider not only those that assess expected environmental and biophysical changes, but also benefits to people and the environment. It is important to keep in mind that the indicators need to be relevant to the WIP, measurable within the required time frame and resources available, have enough sensitivity to detect changes at the appropriate temporal and spatial scales, and relatively easy to measure while providing an accurate description of the changes expected. The SMART criteria can be helpful to decide which indicators would be the most informative and also practical for the specific conditions of a particular M&E program.

A strong M&E program is *not* characterized by the number of indicators it tracks but rather by the relevance of indicators included and their ability to detect changes. Ideally, an M&E program will have a mix of different types of indicators that meet varying needs of stakeholders and managers. The final selection of indicators should be decided with the input of project partners in addition to that of experts.

STEP 3: Planning data collection

After indicators are selected, reviewed by partners and other key stakeholders and confirmed for relevance, the next step is to determine how to measure progress, the expected changes and impacts. It is important to ensure that the necessary data are collected and that they are consistent and representative of the project goals and monitoring objectives. The data collected should serve a specific purpose, and the scale and frequency of sampling optimized to provide the necessary information. To develop a well strategized monitoring plan, it is important to have a good understanding of the extent of the problem that the project is trying to solve, knowledge of where and when interventions or activities have been implemented in the watershed, the frequency of which the problem occurs and whether or not there are lag-times associated with the expected changes. The stability of baseline conditions is also an important consideration.

STEP 4: Analyzing & evaluating

The information produced through monitoring can provide valuable insights into whether the project is delivering on objectives, or heading in a positive direction, through the comparison of baseline conditions or model predictions against estimates of measured responses. It is important to understand that, given the complexity of environmental processes within watersheds, there might be many factors influencing the measured changes. Our confidence in project interventions as the primary driver of the measured outcomes increases as the amount of unexplained variability in the observed data decreases, and also as we gain a better understanding of how different variables correlate to the changes through continued evaluation and learning.

STEP 5: Reporting to stakeholders

Reporting and communicating results are a critical part of the M&E program. The main purposes for reporting and communicating results are accountability, transparency, tracking progress, and learning. Accountability and transparency are important to gain legitimacy and credibility for the project, among both internal and external stakeholders.

It is important to recognize that for communication to be effective, the message needs to be tailored to the needs and interest of the audience, such as why the water problem being addressed is relevant to them. Interactive approaches to communication, where audiences are able to ask questions and provide feedback, are most effective regardless of the audience.

Key questions to ask in these steps of developing M&E

The following questions can help you think through key components of an M&E program design. For more information, check out [A Primer for Monitoring Water Funds](#), [A Guide to Monitoring and Evaluating Water Funds](#), and [Measuring and Evaluating the Impacts of Corporate Watershed Projects](#).

- Who needs to have information?
 - Examples include donors, investors, organizational leadership, partner organizations, project managers, upstream community members, general public, etc.
- What types of information do they need?
 - **Reconnaissance monitoring**—learn more about the context and situation; often low rigor, includes qualitative approaches, done in a rapid time frame; to inform temporal and spatial variability and potential monitoring design
 - **Implementation tracking**—report on progress of actions or interventions; can be as simple as summaries of activities or field reporting, but recommend being spatially explicit and quantitative, does not necessarily involve experimental design
 - **Impact or trend monitoring**—show cause/effect from actions, illustrate change over time; requires experimental design, sampling, statistical analyses, time frames and rigor vary with requirements
- How often do they need to have it?
- What level of rigor is necessary to support effective decision-making?
 - Examples include irrefutable evidence (causal), strong suggestion (correlative), tracking change (trends), etc.
- What are the monitoring objectives?
 - Examples for implementation monitoring tracking:
 - To inform decision-making regarding resource allocation for intervention implementation (How much of each activity has been implemented in this reporting cycle?)
 - To inform budgetary planning and fundraising decisions (How much has each activity cost per unit area?)
 - Examples for impact monitoring:
 - To validate forecasting models and provide early indicators of outcomes (Is silvopasture practice having an impact on sediment loading/turbidity?)
 - To track overall changes in water security in order to determine the trajectory of risks for stakeholders (Since the onset of project activities, how have dry season streamflows and water availability changed?)
 - To provide evidence of improved water security resulting specifically from project interventions (What would have happened if the WIP was never established?)
- What are the critical constraints for monitoring?
 - Identify all legal, financial, social, scientific, technical or other constraints
 - Also determine whether constraints are fixed and mutable
 - In some cases, monitoring objectives may not be achievable (or feasible) due to one or more of these constraints.

- What are the attributes and indicators/metrics to evaluate the answer to those monitoring questions?
- What resolution, precision, and accuracy are required?
- What is the most efficient and effective approach to providing the level of rigor necessary to address the monitoring questions?
 - Sampling design—before/after, control/impact/reference, replicates, trends only, etc.
 - Spatial design—where are the sampling locations to fulfill design needs
 - Temporal design—how often should samples be taken
- What are the appropriate statistical approaches for evaluating the experimental designs, and/or what experimental designs are needed for specific desired statistical approaches?
- What are the other considerations when designing M&E?
 - Baseline and project implementation timelines
 - Time lags of cause/effect, spatial scale considerations
 - External factors and counterfactuals (climate change, land use change, etc.)
 - Changes in sampling methods during monitoring efforts
 - Quality assurance/quality control
 - Access to proposed sampling locations
 - Need for certified laboratory analyses
 - Costs/capacity
 - Daily, seasonal, annual, inter-annual variability in parameters
 - Need for multiple parameters for the same target outcome
 - Logistics of equipment installation, operations, and maintenance
- What monitoring efforts are already in place? Are the data available? To what extent do these existing efforts fulfill your information needs for M&E? What are the gaps in your needs? Can you add samples or attributes to existing monitoring efforts?
- What are your plans for data collection, management, and reporting?
 - What equipment is needed to conduct sampling?
 - Who will install, maintain, and collect data from stationary equipment?
 - Who will conduct manual sampling?
 - What skill levels are necessary to conduct sampling?
 - How will data be stored and who will manage data entry, storage, and access?
 - Who will conduct statistical analyses and reporting?
 - How will information be summarized and reported?
 - What format works best to connect with your target audience?

Key elements in an M&E plan

- Monitoring objectives that are representative of stakeholder needs.
- Experimental design which allows sufficient ability to detect changes resulting from interventions as compared to non-intervention conditions.
- Sampling design for all field measures (number, location, frequency) based on required rigor, resolution, accuracy, and precision.

- Sampling protocols, including quality control and quality assurance, technical skill requirements, equipment requirements.
- Analytical approach including statistical methods.
- Programmatic considerations:
 - Define the management structure for M&E;
 - Define the timelines;
 - Define a budget and sources of funding for M&E;
 - Have the M&E plan reviewed by monitoring experts.

Data types and sources commonly included in WIP M&E

- Spatial locations and extents of all conservation activities/interventions are tracked, and field validated. i.e., clear documentation of how much (extent) of each activity is being implemented in a watershed, where, when, for which purpose and for how long.
- Land use/land cover (LU/LC) change data for the entire watershed(s) in which interventions are taking place (and control or reference watershed(s) as well if defined as needed).
- Water cycle input/output data across watershed(s) where interventions are taking place (e.g., precipitation, trans-basin diversions, water withdraws, changes in water infrastructure)
- Appropriate flow and water quality data for measuring outcomes at appropriate locations and intervals (e.g., discharge, stage, sediment, nutrient, bacteria).
- Field measurements to validate spatial models, create flow/sediments rating curves, and other empirical relationship data required for measures.
- Appropriate impact measures (progress towards goals), i.e., changes in/avoidance of negative impacts to water security, biodiversity.
- Upstream community/household surveys to evaluate willingness to participate in and perception of source water protection activities.
- Biodiversity assessments used to evaluate environmental conditions (macroinvertebrates, fishes, birds, botanical composition, etc.)

Monitoring & Evaluation Case Study: Greater Cape Town Water Fund

How was the GCTWF M&E Plan Developed?

The elements of the Greater Cape Town Water Fund (GCTWF) Monitoring and Evaluation (M&E) framework were conceptualized during the development of the Business Case¹. At its core, the Business Case makes the argument for investing in nature to gain water benefits for downstream beneficiaries. In the case of the GCTWF,

¹ Stafford, L., Shemie, L., Kroeger, T., Baker, T., Apse, C., Turpie, J. and Forsythe, K. 2018. The Greater Cape Town Water Fund. Assessing the Return on Investment for Ecological Infrastructure Restoration. Business Case. The Nature Conservancy, Cape Town, South Africa

the water benefits are dependent on watershed restoration, which is achieved through the removal of non-native vegetation and the restoration of native vegetation. Often M&E fails because it is overcomplicated. To avoid this, it is important to ask the right questions. The questions underpinning the development of the GCTWF M&E framework were: How will we know we have succeeded? What are the indicators of success? What are the key elements that we should monitor?

The GCTWF M&E Plan² was developed through a consultative process with the GCTWF M&E Working Group. This group comprises of subject matter experts from various disciplines. The GCTWF M&E Working Group provides oversight to ensure M&E is systematic, rigorous and scientifically based. Through various interactive workshops including one-on-one meetings with subject matter experts, five thematic areas of output and outcome indicators were identified, i.e., Water, Biodiversity (Terrestrial and Freshwater), Management and Operational Effectiveness, Socio-economic Impacts and Partnership Satisfaction. These thematic areas are regarded as being essential to track the environmental, social and economic impacts of the GCTWF. A rigorous process was followed to develop SMART output and outcome indicators for each of these thematic areas. The GCTWF M&E Plan:

- Tracks overall progress against targets.
- Describes the monitoring and evaluation protocols of the GCTWF.
- Provides a mechanism to ensure that investments are achieving their anticipated targets and if not, to provide reasons why this is the case.
- Tracks the operational effectiveness and cost of watershed restoration activities.
- Allows for the implementation of adaptive management approaches where required.
- Informs communication on the progress of the GCTWF.

The Nature Conservancy (TNC) lead the drafting of the M&E Plan and it was reviewed by experts from TNC and external subject matter experts.

What are the primary questions that the GCTWF M&E Plan aims to address?

1. What volumes of water are reclaimed through watershed restoration activities, i.e., the removal of Invasive Alien Plants (IAPs) and subsequent restoration of the native vegetation, across the priority watersheds of the GCTWF?
2. Will the implementation of suitable IAP control measures result in a net gain of native vegetation and the freshwater ecosystem and structure reverting to a more natural state?
3. Which combination of IAP control methods, e.g., mechanical, fire and/or biological, are the most effective in achieving the desired impacts and the most cost effective.
4. What impact does green job opportunities have on beneficiaries and their households, e.g., skills gained, poverty alleviation and how many Full Time Equivalent (FTE) green jobs are created?
5. How sustainable is the partnership? E.g., do partners have a sense of ownership and a shared vision? How do partners experience transparency and communication?

2 Bugan, R., Stafford, L., Leukes, W. 2020. The Greater Cape Town Water Fund Monitoring and Evaluation Plan. The Nature Conservancy, South Africa.

What are the key activities of the GCTWF M&E Program?

Planning and prioritizing IAP clearing: An Operations and Data Working Group was started by the GCTWF to prioritize implementation, coordinate planning and implementation and bring together the key role players within the priority watersheds of the GCTWF. This group meets monthly to track progress, to share insights and lessons learned and to address any challenges.

Track progress against targets: To facilitate routine progress tracking, collective planning and the coordination of activities, a Decision Support System (DSS) was developed by TNC. The DSS also serves as a communication tool for the public and supporters.

Monitoring the water reclamation benefits of IAP clearing: The GCTWF has implemented long-term paired watershed experiments in untreated areas of the priority watersheds. These experiments aim to directly monitor the increases in streamflow which result from the removal of IAPs. The experimental design includes before-after-control-impact (BACI) paired watershed experiments and control-reference-impact multiple watershed experiments. Ultimately, the outcomes of these experiments will improve the quantification of the water benefits of the watershed restoration activities applied as part of the GCTWF.

Monitoring the benefits to biodiversity: At the paired watershed experimental sites, annual freshwater biodiversity surveys are completed to track the freshwater ecosystem response to IAP clearing. To track the long-term terrestrial biodiversity recovery, in response to the IAP clearing, permanent vegetation survey plots will be established. Data collected from these vegetation plots will also inform the selection of control methods and the scheduling of follow-up control interventions to optimize restoration.

Management and operational effectiveness: The GCTWF collaborative aims to ensure that there is long term coordinated strategic prioritization towards achieving overarching objectives. Operations focus on priority areas, follow a strategy to deliver a set of objectives, and interventions are implemented according to best practices. To effectively address the problem, non-native trees are to be removed in such a way as to restore native vegetation in the most cost effective and efficient manner through a combination of control measures.

Socio-economic impacts: The GCTWF offers an opportunity to achieve an important social benefit, i.e., poverty alleviation through creating green job opportunities. The GCTWF is making significant impact at the community level. A socio-economic impact survey conducted in November 2020 demonstrated that the GCTWF is having a positive socio-economic impact on 245 interviewed beneficiaries and their nearly 800 dependents.

Partnership satisfaction: The objectives of the GCTWF cannot be achieved in isolation. It requires a multi-stakeholder approach and collective action. The GCTWF aims to develop a healthy, transparent and functioning collaborative, where partners feel valued, recognized for their contributions and empowered by their achievements. It is also aimed that the collaborative share resources towards achieving a common vision while maintaining corporate and institutional identities and mandates. To track the partnership satisfaction, annual surveys are completed by the GCTWF Operations and Data Working Group and the GCTWF Steering Committee.