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MEL-IWMP/M&A/D2/1699-1700/124   October 28, 2016

To
The Director (WM),
Department of Land Resources,
Government of India, Ministry of Rural Development,
6th Floor, Block 11, CGO Complex,
Lodhi Road,
New Delhi - 110 003.

Kind Attn.: Shri. Amit Kumar, Director (WM)

Sir,

Submission of "Capacity Building Module for ME&L"
West Region

Sub: "Monitoring, Evaluation & Learning" under IWMP - Reg.

Ref.:   Contract Agreement - West Region dt. 10 July 2015.

With reference to the above, please find enclosed 'Capacity Building Modules for ME&L" for **West Region**.

Assuring you of our continued cooperation,

Sincerely,
for **MUKESH & ASSOCIATES,**

D. MUKESH,
MANAGING PARTNER.

Encl.: As above

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Monitoring, Evaluation and Learning (ME&L) under Watershed Development Component of PMKSY (West Region)

Capacity Building Module
for Monitoring Evaluation & Learning

Revisions			Submitted by:	Submitted to:
Rev. No.	Particulars	Date	**Mukesh & Associates** consultants & engineers	**Department of Land Resources (DoLR),** MoRD, Government of India, New Delhi.
			Tamil Nadu. India.	
			File Path: \\server\MD5\E_Drive\Suresh\2014\RFP\26. MoRD - (IWMP) MEL under IWMP (RFP) 16.10.14\IWMP\Capacity Building Module\West Region	
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Contents

Abbreviations

CEO	:	Chief Executive Officer
CBOs	:	Community-Based Organizations
DoLR	:	Department of Land Resources
DPR	:	Detailed Project Report
EDPR	:	Electronic Detailed Project Report
EPAs	:	Entry Point Activities
FGD	:	Focused Group Discussions
GIS	:	Geographic Information System
GPS	:	Global Positioning System
IGAs	:	Income Generating Activities
IWMP	:	Integrated Watershed Management Project
M&E	:	Monitoring & Evaluation
ME&L	:	Monitoring, Evaluation & Learning
MEL&D	:	Monitoring, Evaluation, Learning & Documentation
MGNREGA	:	Mahatma Gandhi National Rural Employment Guarantee Act
MIS	:	Management Information system
MoRD	:	Ministry of Rural Development
GOI	:	Government of India
MWS	:	Micro Water Shed
NGO	:	Non-Government Organization
NRSC	:	National Remote Sensing Centre
NTFPs	:	Non Timber Forest Produce
PHC	:	Primary Health Care
PIA	:	Project Implementing Agency
PMKSY	:	Pradhan Mantri Krishi Sinchai Yojana
PMU	:	Project Management Unit
PRA	:	Participatory Rural Appraisal
RGMWM	:	Rajiv Gandhi Mission for Watershed Management
RRSSC	:	Regional Remote Sensing Service Centre
SHGs	:	Self Help Groups
SLNA	:	State Level Nodal Agency
UGs	:	User Groups
WC	:	Watershed Committee
WCDC	:	Watershed Cell cum Data Centre
WDD	:	Watershed Development Department
WDF	:	Watershed Development Fund
WDT	:	Watershed Development Team
WSHGs	:	Women Self Help Groups
WUA	:	Watershed Users Association

1.Executive Summary

Mukesh & Associates has been awarded the National ME&L project for West Region to carry out the ME&L activities in Rajasthan, Gujarat & Maharashtra vide Contract Agreement dated 10th July 2015 between Department of Land Resources, Ministry of Rural Development and Mukesh & Associates, Salem, Tamil Nadu.

The projects under IWMP are being implemented by Batch systems viz., Batch I, II and III sanctioned during 2009-10, 2010-11 and 2011-12, respectively are under implementation phase. The projects under Batch IV and V have been sanctioned during 2012-13 and 2013-14, respectively. The projects implemented under these three states under 5 batches are 884, 549 and 1064 in Rajasthan, Gujarat & Maharashtra, respectively.

Till 2014-15, country as a whole, 7179 projects have been sanctioned for all the five batches covering 340.69 lakhs ha of project area in 27 states with total project outlay of Rs. 44264.02 crores. An amount of Rs. 9517.79 crores (both centre and state contribution) has been released for implementation of the programme. An amount of Rs. 7564.98 crores has been utilized till 2014-15, resulting in to 73% achievement.

In accordance with contracts signed between DoLR and Mukesh & Associates, it is required to submit Capacity Building Module for Monitoring Evaluation & Learning. Accordingly, this report is being submitted.

The Major Modules recommended are the following:

1. Understanding poverty, Environment, Ecology and Development	6. Project Management and values
2. Management Skills	7. Livelihood Skills
3. Institution Building	8. Participatory planning and research
4. Watershed Development and Natural Resource Management	9. Visioning and Strategic Planning for institutions, Units and individuals
5. Livelihoods, Micro finance and Micro insurance	10. Visioning and Strategic Planning for institutions, Units and individuals
	11. Individual Development

2. Introduction to Capacity Building

Capacity Building in watershed development envisages improvement in the productive capability of involved personnel through human, scientific, technological, organizational and institutional and resources to implement the programme with specific objectives and to tackle problems related to methods of development with available resources. It allows individual participants to build and enhance existing knowledge and skills as well as to engage in the "process of learning and adapting to change". At institutional level, it would involve the pre-existing implementing philosophy and to bring a change in the management of the project. Capacity Building will support the establishment of more "interactive public administration that learns equally from its actions and from feedback it receives from the population at large" at societal level. Hence, Capacity Building could be used to develop public administrations that are responsive, social safeguard issues and accountable. Thus it would facilitate the farmers and other stakeholders of watershed development to approach the project with clarity and involving all the concerned to ensure the growth with stability in the production and environment.

3. Objectives of Capacity Building for ME&L

Capacity building activities help to improve the knowledge base and skills of DoLR (National) and SLNA (State) level stake holders of the project for improved planning, implementation and to ensure the sustenance of increased productivity and livelihood in watershed areas. The area of capacity building will be on management of watershed project under Changed scenario, Resource conservation , Land use changes, Crop intensification, Risk management, livestock & dairy management, market oriented value chains, pisciculture, development of common property, participative planning, Income generation activities, M&E, MIS, RS & GIS Tools, value addition etc.

4. ME&L - An Overview

Monitoring, Evaluation & Learning (ME&L) is a process of measuring, recording, collecting, processing and communicating information. It continuously tracks performance and provides information on whether progress is being made towards achieving the goals and objectives. Monitoring mainly looks at the processes and changes in conditions of target groups, institutions and natural resources.

M & E is an important tool targeting two key elements in development initiatives - effectiveness and sustainability. In the ideal situation, M & E should span the life cycle of a project providing a continuous stream of data and feedback. During the initial stages of the project, M & E can aid in developing and clarifying the project goals and objectives. Once the project reaches operational status, M & E can promote greater transparency and accountability within organizations. Feedback from M & E during project execution means adjustments can be made to improve the prospect of sustaining successful outcomes.

United Nations Evaluation Group (UNEG) defines "Monitoring" as a continuous management function that aims primarily at providing programme managers and key stakeholders with regular feedbacks and early indications of progress or lack thereof in the achievement of intended results. Monitoring the actual performance against what was planned or expected according to pre-determined standards. It generally involves the continuous collection and analysis of data on programme processes & results and recommending of corrective measures, asking the question "Is the programme doing things right, in order to achieve its goals?" Hence, Monitoring is a systematic, evidence-oriented and quality-based exercise where Specific, Measurable, Attainable, Reliable and Time-bound indicators (SMART) show proof for the substantive programme progress.

Evaluation is a rigorous and independent assessment of either completed or ongoing activities to determine the extent to which they are achieving stated objectives and contributing to decision making. Evaluation, like monitoring, can apply to many things, including an activity, project, programme, strategy, policy, topic, theme, sector or organization. The key distinction between the two is that evaluations are done

independently to provide managers and staff with an objective assessment of whether or not they are on track. They are also more rigorous in their procedures, design and methodology, and generally involve more extensive analysis. However, the aims of both monitoring and evaluation are very similar: to provide information that can help inform decisions, improve performance and achieve planned results.

Monitoring and evaluation are essentially the core processes for "learning from experience." Learning implies a process of analysis which, in turn, requires the existence of relevant information or evidence on which the analysis is based. The primary function of M&E is to provide pointers on how to do things better through a better understanding of what works and what does not. Data are the raw materials used to fuel the monitoring and evaluation process. Access to appropriate data and data sets that can be processed into usable, timely, and relevant statistical information is essential for effective monitoring and evaluation that in turn can lead to a learning experience. A fully evolved M & E system is much more than simply a means of tracking and measuring performance and outcomes. It is a central component of the process of *management for results*. M&E is then put in the context of a cyclical approach to management in which:

- **Planning** involves the articulation of strategic choices in light of past performance;
- **Implementation** includes ongoing performance monitoring and periodic evaluation that provides opportunities for learning and adjustment; and
- **Reporting** on results is used for both internal management purposes and for external accountability. The reporting phase also provides managers and stakeholders with the opportunity to reflect on what has and what has not worked, creating a process of learning and adjustment to feed into the next planning.

5. Challenges of ME&L

Technically, the ME&L system is supposed to be a part every national and organizational planning, however, lack of emphasis has somewhat side-lined this function, restricting it to periodic reporting in many forms and shapes with fancy presentations of figures and graphics and without thorough analysis and future guidelines. As a result, planners are left

to guess work whether to build upon the existing work or to introduce a shift in policies and programs. At micro level, many organizations also underestimate the importance of regular monitoring and evaluation in their development and operation. The thrust of work is normally on project development and implementation in areas where funding is available through national or international sources. The process is activity oriented which could be mistaken as an indicator of achievement by a cursory look. In most of the cases, regular progress reporting is conducted for donors' purpose that gives an account of activities undertaken and immediate outputs, but misses out a qualitative information as to whether the objectives of the program are being achieved or fall short at the end of the project. Neither does it integrate into the overarching national development objectives nor to policy making.

Inadequate stakeholder involvement is one of the most common reasons for the failure of programmes and projects. Therefore, every effort should be made to encourage active stakeholder engagement in the planning, monitoring and evaluation processes.

6. ME&L Approach and Its Evolution

This evolution of M&E has been grouped into several distinct phases for the purpose of clarity. This disguises the fact that progress is not necessarily linear, but it does help to show how ideas have generally evolved and how expectations have expanded over the years.

M&E began as a branch of applied research with much of the initial emphasis being placed on the "E" –that is, evaluation. But this view was soon challenged by those who saw it much more as a management tool. Normally the focus of the M&E reporting systems was on projectlevel budget management and performance budgeting, and the users were mainly those with a financial or management interest in the project (donors, government). By the early 1990s, there was a shift in focus from projects to sectors. A sector-wide approach (SWAP) became increasingly popular as a means of promoting and co-ordinating sector-wide and national development planning. Monitoring and evaluation became functions of sectoral ministries and appropriate M&E units were established at the ministerial level.

During this period National Statistical Organisations (NSOs) were not very much involved with the monitoring and evaluation of projects and sectoral programmes. Although they were occasionally commissioned to undertake baseline surveys or panel surveys, they were on the whole not well set up to carry out this work. Sometimes these requests were piggybacked onto an established household survey programme, but often the data were required at highly disaggregated levels which the NSO was unable to deliver, or the complexity of the study design required a level of survey supervision that the NSO did not have the resources to provide. These early attempts at collaboration between sectoral M&E programmes and the NSOs were not particularly successful.

But, in the early 1990s, NSOs became increasingly involved with the monitoring of poverty using multi-topic household surveys. In most countries, NSOs were the only agency with the capacity to administer large-scale national household surveys, and for the most part they did a good job. However, their expertise and skills were primarily on the data collection and processing side, not on the analysis of the data which often requires a good knowledge of the subject matter and related government policies. The analysis undertaken was primarily descriptive and the analysis of crucial links between specific policies and their outcomes in living standards was missing. One had to turn to universities and research centres to find the appropriate analytical capacity. Still, useful capacity for poverty analysis was created during this period, and a number of excellent poverty assessments were prepared.

It was not until the 2000s and the advent of poverty reduction strategies that one started to see the coming together of project- and sector-based M&E efforts with poverty monitoring activities. The driving force behind this was the growing interest in evidence-based development and the need to establish national M&E programmes centre on the monitoring of PRS results. This also marked the beginning of a recognition that M&E information had uses that extended beyond serving as a tool for policy-makers and planners, and that, when made available to members of the public and to civil society, it could promote accountability in public sector managers and good governance.

From the 1990s onward, European (EU) regulations imposed an obligation to undertake evaluations of regional policy programmes. This requirement, combined with broader trends in policy making such as "new public management" and "evidence based

policy" which spread from the UK and the USA to most of the European countries during the last twenty years, contributed to develop an evaluation culture in Europe. Except from some countries such as the UK, Germany and Sweden, most Member States were not evaluating their regional policies on a regular basis. EU regulations not only improved managerial practices in *European Regional Development Fund (ERDF)* programmes with the implementation of systematic monitoring and evaluation, but also induced spill overs on domestic management practices. This also helped to develop an evaluation market in EU Member-States, still underway in countries having recently joined the EU.

7. M&E Indicators - A Brief Note

Indicators are measurable or tangible signs that something has been done or that something has been achieved. In some studies, for example, an increased number of assets in a community has been used as an indicator that the standard of living in that community has improved. An indicator of community empowerment might be an increased frequency of community members speaking at community meetings.

An indicator is a variable that is normally used as a benchmark for measuring program or project outputs. It is "that thing" that shows that an undertaking has had the desired impact. It is on the basis of indicators that evidence can be built on the impact of any undertaking. Most often, indicators are quantitative in nature, however, in some few cases, they are qualitative.

Most often indicators are confused with other project elements such as objectives or targets. Indeed, understandably so. Unlike targets or results which specify the level of achievement, indicators do not. For example, in a project on access to safe water, statements such as "an increase in the proportion of households reporting the consistent use of chlorinated drinking water" or "70% of households reporting the consistent use of chlorinated drinking water" are not indicators. Rather, an indicator could be "The proportion of households reporting the consistent use of chlorinated drinking water."

7.1 Importance of Indicators

Indicators are an important for any project, particularly for monitoring and evaluation purposes. Some of the benefits of indicators are highlighted below.

1. At the initial phase of a project, indicators are important for the purposes of defining how the intervention will be measured. Through the indicators, managers are able to pre-determine how effectiveness will be evaluated in a precise and clear manner.

2. During project implementation, indicators serve the purpose of aiding program managers assess project progress and highlight areas for possible improvement. In this case, when the indicators are measured against project goals, managers can be able to measure progress towards goals and inform the need for corrective measures against potential catastrophes.

3. At the evaluation phase, indicators provide the basis for which the evaluators will assess the project impact. Without the indicators, evaluation becomes an audacious responsibility.

7.2 Types of Indicators

The three widely acknowledged types of indicators are process indicators, outcome indicators and impact indicators.

- **Process indicators:** are those indicators that are used to measure project processes or activities.
- **Outcome Indicators:** Are indicators that measure project outcomes. Outcomes are medium impacts of a project.
- **Impact Indicators:** Are indicators that measure the long term impacts of a project, also known as the project impact.

Any appropriate M&E indicator must meet particular thresholds. They must be:

- **Precise/Well defined**: Probably the most important characteristic of indicators is that they should be precise or well defined. I other words, indicators must not be

ambiguous. Otherwise, different interpretations of indicators by different people implies different results for each

- **Reliable:** Reliability here implies that the indicator yields the same results on repeated trials/ attempts when used to measure outcomes. If an indicator doesn't yield consistent results, then it is not a good indicator.

- **Valid:** Validity here implies that the indicator actually measures what it intends to measure. For example, if you intend to measure impact of a project on access to safe drinking water, it must measure exactly that and nothing else.

- **Measurable:** Needless to say that an indicator must be measurable. If an indicator cannot be measured, then it should and must not be used as an indicator.

- **Practicable:** In other cases, although an indicator can be measured, it is impracticable to do so due to cost or process constraints. An indicator must be able to utilize locally available resources while at the same time being cost effective.

8. Envisaged ME&L System for IWMP

With increasing pressure on result based management system and accountability, the need was never been greater for an effective monitoring and evaluation system in developmental projects. ME&L are the learning tools that form the backbone of adaptive management.

Need for ME&L

Monitoring information and evaluation findings can contribute to sound governance in a number of ways like evidence based policymaking, policy development for management, transparency and accountability. In a project like watershed development, responsive and adaptive monitoring becomes necessary to comply that the community level implementation processes are in conformation with pre-set guidelines, timelines and targets. The project needs timely and appropriate information on its performance, measured by both qualitative and quantitative performance indicators.

An effective M E & L system proposed would carefully develop for monitoring and learning framework that would be critical to ensure learning in real time. The system would result in:-

➢ Supportive of learning among the various stakeholders including primary users of the project through facilitating information gathering, analysis and decision-making;

➢ Give highest priority to the communities at the micro watershed level to adopt the learning's during the project life itself.

➢ Facilitate a bottom-up modes of functioning and learning by providing links to decision making forums at different levels starting from the micro watershed level (Executive Committees and other CBOs) to sub watershed (PIA/WDT & NGO), district (WCDC) and the State level (SLNA). It proposes to develop optimal information flow between these groups of stakeholders.

➢ Make use of the expertise of the external and independent agency in monitoring and learning, which would contribute for better implementation of the project.

➢ It also would facilitate self-monitoring mechanism particularly at the Community level.

➢ The design of an effective monitoring and learning system is expected to improve operational learning at all levels (village, gram/taluka, district, and state) throughout the project implementation.

The M&E strategy thus to be evolved and adopted is based on the following requirements.

➢ The project envisages a bottom-up approach of implementation involving community, NGO and other organizations, which necessitates a lot of online learning processes. The organizational learning processes assist the project functionaries at various levels. This requires a regular continuous monitoring of events.

➢ The process monitoring exercises, as a methodology of organizational learning and policy change tool for the project management authority needs to be carried out on near real time basis. This needs a very objective and professional approach, with a team exclusively dedicated to the task.

➢ Impact evaluation of watershed projects in particular has to be made using state of art technology including Remote Sensing and GIS for unbiased and reliable assessment of biophysical parameters.

- Specific thematic studies need professional expertise. They may also require research insights so as to add on to the conceptual thinking and policy implications in the long run. Such an effort needs keen analytical approach to the issue/theme concerned.

- Documentation of concurrent processes is the most essential part of monitoring and evaluation. It also requires discrete documentation of case studies/success stories. Proper documentation at different levels of different types namely – written form, electronic, presentations, needs to be ensured by the ME&L (it may be recalled that earlier Process Monitoring was termed as Process Documentation).

Objectivity, transparency and integrity are the guiding principles of this system. Each of these aspects would be converted in to operational mode involving the human resource personnel, who would be specially trained for the purpose.

8.1 Components of ME&L

To achieve the above objectives a comprehensive ME&L system should involve process monitoring, input / output monitoring and impact assessment with a learning and documentation element imbibed in it. An operational Monitoring and Evaluation System is very essential to track the progress and performance of the project, streamlining the interventions and assessing the impacts under various components. It would include following components.

8.2 Concurrent Process Monitoring:

The process monitoring is designed to capture a real time information on the key project processes. Process monitoring (PM) is a set of activities designed to collect information of both qualitative and quantitative nature on a dynamic platform with respect to a project. It is 'dynamic overtime' and 'activity specific'. It has both functional and structural characters to monitor. It includes 'process documentation'as well as 'process analyses. It also extends its sphere in to the future in the sense that based on the observation of past and present processes; it helps to modulate the future processes. The independent monitoring system (Nest) acts as a facilitator for the better performance of other nests, nodes and niches managed by other partners of a project.
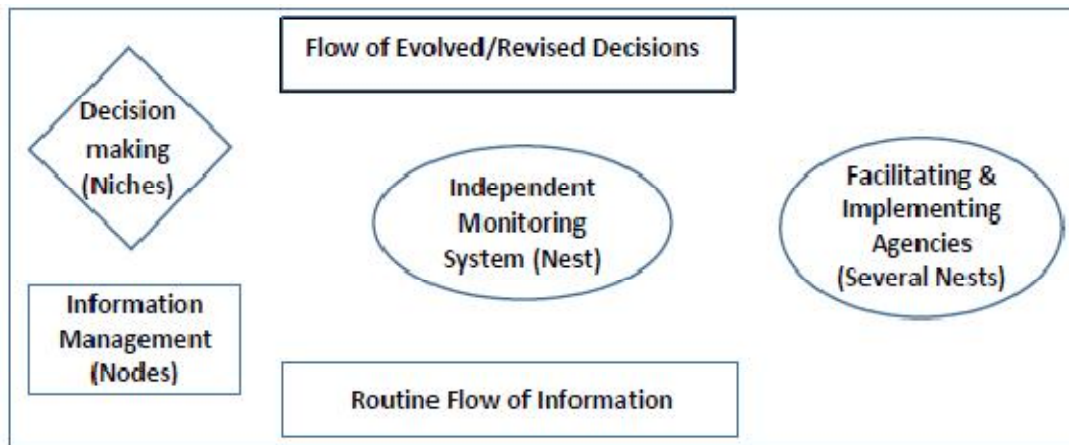
A revisit to important basic features: Process monitoring is the closest link of the M&E system with project implementation and decision-making. The features of process monitoring is as follows;

8.2.1: Four Basic Activities of Process Monitoring: The PM includes four basic activities viz-Selection, Observation, Reflection and Action. The key of successful PM is to structurally and functionally select, observe, reflect and initiate action on each of these stages. It can follow 'vertical approach' of knowing more and more of specifics with greater intensity and horizontal approach covering broader aspects with lesser intensity.
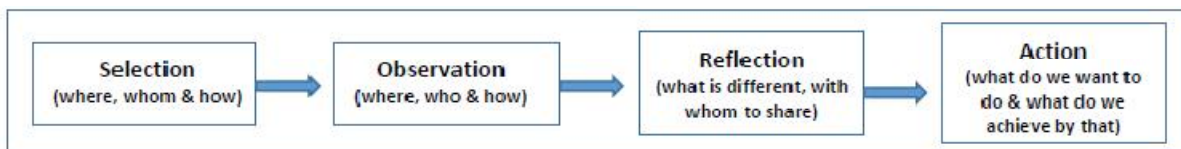

8.2.2: The Process Monitoring Loop: By and large, any process monitoring activity should follow the following steps or path. This path can be called as the monitoring loop, which connects the issue/activities and its process identified in to a refined policy linkage option with better alternatives to achieve the identified output goal/objective.
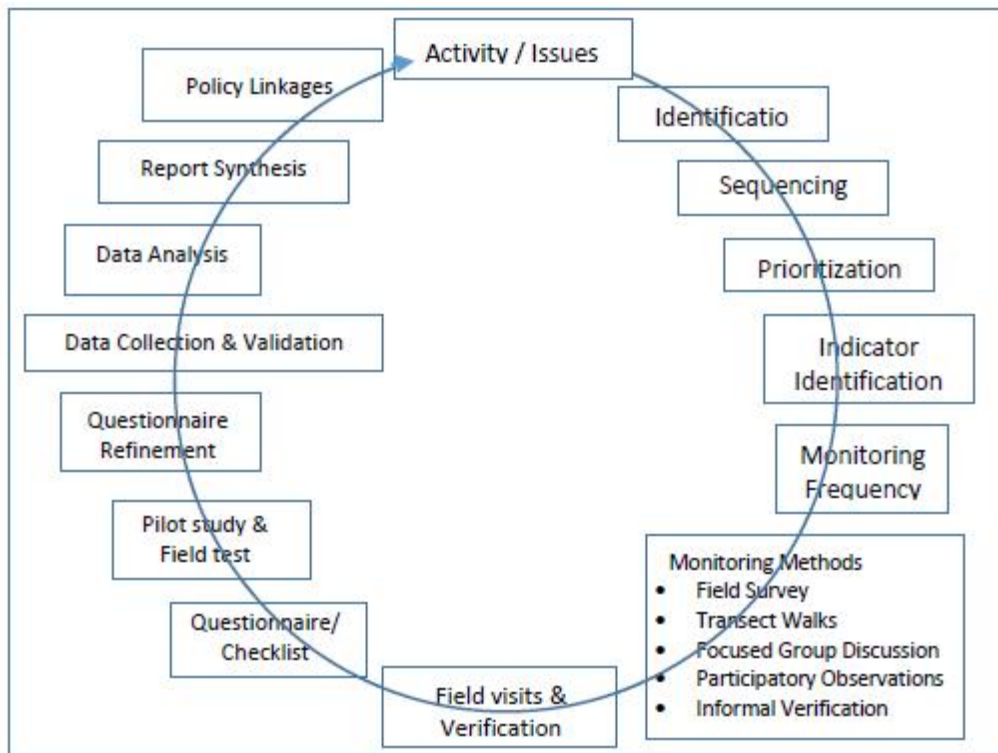
8.2.3: The Three Dimensional Nature: The process monitoring in any project is of three-dimensional in nature. The present state of the project owes itself into past processes. The future course of project is derived from both the past and present processes. It is a continuity and not a single time event. Thus process monitoring is a real time learning mechanism with past and present observations modulating the future course. Thus it is three dimensional in nature.
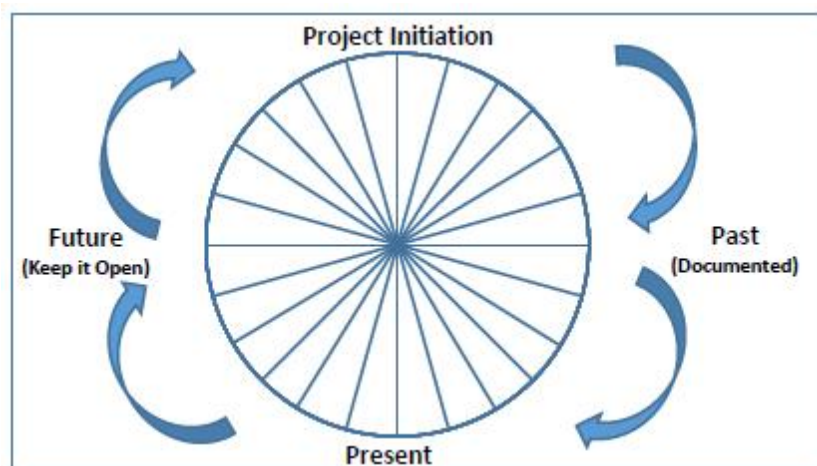

8.2.4: The Four Stages of Project & Process Monitoring: Any project cycle can be broken into four stages based on the nature of processes it undergoes. As the figure indicates in

each stage a specific process is carried out, which is to be monitored with relevant specific indicators. Thus the indicators are to be identified, prioritized, and operationalized and need to be monitored as per the project stage. The indicators also should have options of flexibility (to identify new or discontinue the old) overtime.
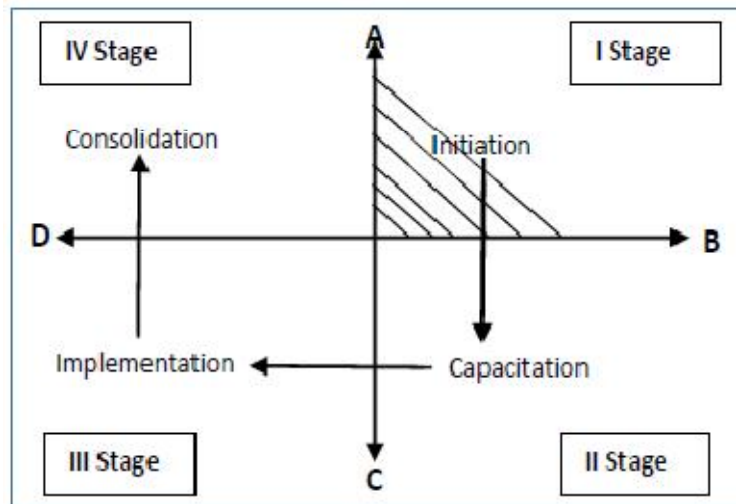
8.2.5: Process Monitoring Approaches: The PM can be carried out through functional approach or structural/institutional approach. The functional approach focuses on the functional process of a given project, while the institutional approach takes a monitoring path following the institutional roles and responsibilities of key partners involved in the project. However, in any case the outcomes are the same, reflecting upon the project status.
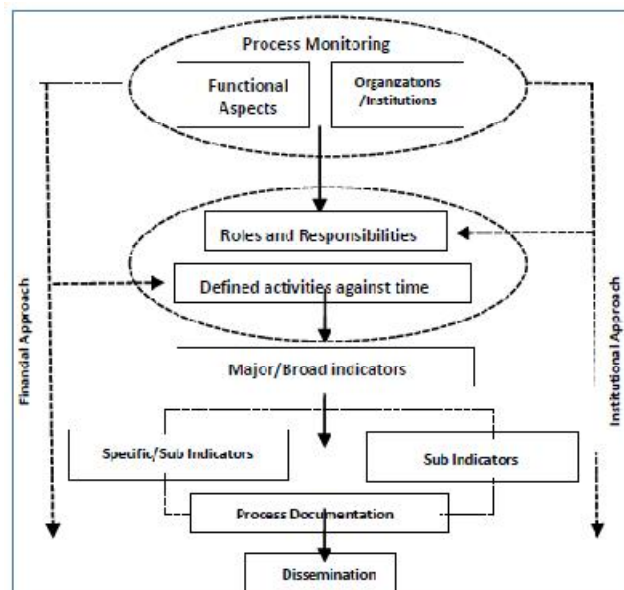
8.2.6 Project Road Map: The project process is intricately connected with the project time span. The project road map guides a defined broad set of activities in a given time. Nevertheless, there may be a few overlapping of events. This defined functional and temporal demarcation needs to be well defined, which enables a shifting of monitoring weightage to a particular process/activity in the changing time frame. SHG institutional monitoring path is an example.

Time Frame / Institution	Ist six months	IInd six months	IIIrd six months	IVth six month
SHG (Indicators)	• Formation • Meetings • Attendance • Savings	• Capacitation • Savings • Meetings • Lending	• Financial transaction • Book Keeping • Skill based training • IGA • Linkages	• IGA • Value additions • Employment • Expansion plans • Federating • Sustainability

8.2.7 Organizational Structure of Process Monitoring: The process monitoring needs dedicated personnel with expertise in the field. It should be led by an expert, who should have clear perception and keen knowledge of project process and team building capability. The field staffs are the critical and crucial component of process monitoring. They should be well trained and dedicated.

- The P.M should have its own field staff
- It should be independent of PIA
- It should be able to track the immediate (short-term) impacts as well
- The field staff to be equipped with ICT tools for effective results.

8.2.8 Process Monitoring and Documentation: Process monitoring also should have proper documentation strategies. As per the project requirement it should be on real time basis (monthly), thematic as well as intervention specific. The thematic and intervention studies are to be carried on the specified "processes" in time as per the requirement of PIA.

8.2.9 Characteristics of Process Monitoring Indicators: In addition to the general feature of 'SMART', the PM indicator should have following attributes as well.

- The indicators must be flexible

- There should be options for including new indicators overtime

- The indicators should be developed involving all key partner of the project (in a workshop)

- Frequency of monitoring of each indicator or set of indicators is project process specific

The indicators can be developed using a structured matrix/format

Issue (To be maintained)	Expected output/outcome	Key indicators	Means of verification	Method/ Approach	Frequency of monitoring
* Institutional building * Capability building * Implementation of activities	→	→	→	→	→

8.2.10 The Major Activities Monitored: Based on the time frame, importance and context of the process monitoring, several key activities are identified for monitoring under watershed development programmes. They are as follows:

a) Sensitization and awareness,

b) Entry point activity

c) CBO formation

d) CBO functioning

e) Capacity building

f) Transparency

g) Action plan preparation

h) Action plan implementation

i) Flow of funds

j) Procurement procedures

k) Income generating activities

l) Livestock

m) Demonstration

n) NGO functioning

o) WDD functioning

p) Withdrawal strategy

Each of the above broad areas is further broken down into specific indicators. However, a unique feature is that the weightage attached for each indicator varies according to the phase of the project, which has been divided into three. For instance in phase 1, for the first two months, the focus of monitoring is mainly on number of visits of project staff and partners to the field and publicity campaign to promote the project. In the next 6 months, the focus would focus on entry point activity, formation of community based organizations (CBOs), etc. Similarly this focus shifts towards institutional strengthening activities such as training and capacity building, development of institutional linkages from the 6-12 month of the project and subsequently to implementation of action plan and withdrawal.

8.2.11 Major Institutions Monitored and Key Indicators used: There are several partners and stake holders normally involved in watershed implementation. The projects largely follow PPP approach (i.e. people + private + public partnership). Thus a number of CBOs, NGOs and Government departments are involved in the planning and implementation of a project. Training and capacity building is a core plank of the project. Thus there is a need for assessments of this institutional intervention. The key institutions to be monitored under watershed development during the implementation through process monitoring are:

Sl. No.	Institutions Monitored	Parameters/Indicators used
1	Community Based Organizations. ➢ Self Help Groups ➢ Area Groups ➢ Watershed Executive Committees	Formation, Functioning, Participation, Transpiration, Gender Equity, Social Inclusion, Capacitation, O &M, Linkages, Sustainability
2	Non Govt. Organizations (FNGO, LNGO, PNGO)	Human Resources, Field functioning, Monitoring, Facilitation, Capacitation, Handholding, Linkages, Co-ordination, Withdrawal strategy
3	IGA Agencies (SNGOs)	Human resources, Infrastructure, Skills, Handholding, Linkages, Innovativeness, Follow-up, Local Technology
4	Govt. Department	Level of Involvement, Technical Guidance, Field Visits, Supervision, Monitoring, Involvement in CPR, Check measurement
5	Technical Partners (ICRISAT, University of Agriculture Sciences)	Technical Training, Training Capacity, Human Resources, Technology Transfer

8.2.12 Documentation of Process Monitoring: The process monitoring observations and learnings are documented through regular and discrete reports, which are helpful in identifying promising practices that can be replicated and scaled-up, and also pinpointing the bottlenecks, which hinder the project implementation to derive suggestive and corrective measures.

The report can follow a specific format as shown. It reflects both qualitative and quantitative aspects of project implementation. The monthly observations from process monitoring will record the outcome of interventions and their environmental as well as social implications.

Issues Observed	Situational Status (What is happening in the field)	Reasons (Why it is happening)	Suggestion/Scope for improvement (What is desirable)	Stakeholders to be involved

The discrete monitoring studies are carried out at two levels - a) Specific thematic studies and b) Feedback assessment studies. These studies are mainly based on the outcomes of monthly or quarterly reports and as identified by PIA. However, since the monthly reports can only provide pointers to such issues, specific thematic assessments on specific key interventions such as CBO formation and functioning as well as on other crosscutting themes such as equity, social inclusion, women empowerment, investment patterns, involvement in CPRs, etc. are to be carried out overtime. They provide critical evidence for program to make design corrections or policy adaptations. The basic principles for thematic studies are:

- It addressed specific questions in the short run that help in policy derivations and adoption for next phase of project.
- Both positive and negative impacts are reflected
- Themes are demand driven and identified by the PIA from time to time

Feedback reports include the functioning of institutions- like NGOs, Govt. departments, Specialist agencies, and Specific tasks like trainings, etc.

8.2.13 The Structural Composition of Field Level Process Monitoring Units: In each state/district a process monitoring unit/office need to be established. A project scientist supported by two project assistants operate at this level, equipped with computer/laptop. Constant connectivity to be maintained with these staff with the help of cell phones. They are initially trained with field exposure and on the job training as per the project needs. Subsequently, annual refresher programmes ensure up-gradation of skills of these staff. In a month, these field staff are mandated to be at the actual project implementation sitesat least 20 working days.

8.3 Input – Output Monitoring:

Under the concurrent input-output monitoring, the financial and physical progress of the project would be monitored. Aspects such as fund release from the PIA to grass root level, actual condition/status of physical achievements, awareness creation, CBO's capacity building, etc. will be monitored using specific indicators. This would be done through the MIS deployed and operationalized by the project. ME&L unit would verify the MIS data integrity through field verification on sample basis through process monitoring. Project will ensure flow of MIS data to ME&L for analysis. The MIS data thus received would be analysed and the report would be made available to the top management once in six months.

8.4 Impact Evaluation:

Impact Assessment (IA) is "a process aimed at structuring and supporting the development of policies. It identifies and assesses the problem at stake and the objectives pursued. It identifies the project objective and analyses their likely impacts in the economic, environmental and social
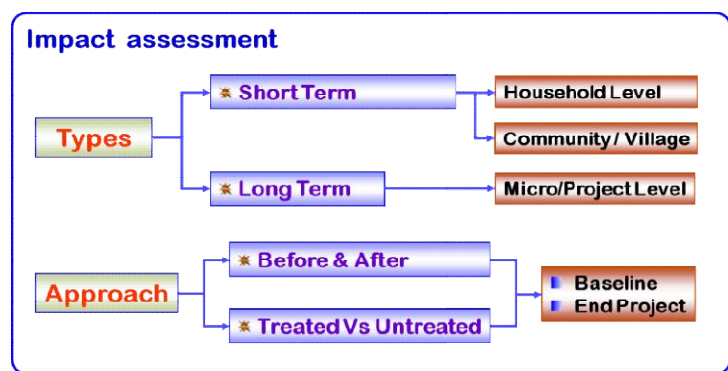
Type and Approaches of Impact Assessment Studies

fields. It outlines advantages and disadvantages of each option used for achieving these objectives and examines possible synergies and trade-offs". The success of any programme is judged by the fact that weather it addresses the issue of equity, productivity,

sustainability and replications of the same in a wider scale. It also plays a key role in the policy decisions.

As a component of the monitoring and evaluation process, impact evaluations are an essential instrument to test the validity of specific approaches to development and poverty alleviation. Impact evaluations help those involved on a project to establish whether or not there is a causal link between an intervention and those outcomes that are of importance to the policymaker. The counterfactual analysis used by impact evaluations is a critical tool for assessing the effectiveness of development interventions. By providing critical feedback with respect to what works and what does not, impact evaluations can help to solidify a results-based project structure.

In order to measure the impact of an intervention, a clear, well-designed evaluation strategy is necessary. Incorporating an impact evaluation into a development program requires a well-structured monitoring and evaluation plan. Every impact evaluation requires a specific methodological design, many of which are described on this site. Through conversations among project managers, government officials, and researchers, the appropriate methodology is chosen and incorporated into the monitoring and evaluation process.

Impact evaluations fit into the chain of monitoring and evaluation process in several ways. First, they help to assess the casual link between an intervention and an outcome of interest. Second, impact evaluations provide baseline evidence for the effectiveness of an intervention, which can be compared with other similar interventions. Through this process, impact evaluations assist in establishing credible cost-effectiveness comparisons. Third, impact evaluations can serve to build the knowledge base of what works in development. With and increasing demand for evidence of aid effectiveness, rigorous evaluations offer a method through which development successes can be highlighted.

Information about long-term impact assessments are termed as evaluation studies. Of late in addition to traditional sample based/ground based survey techniques, observations under Remote Sensing and GIS techniques are being used to carry out both impact and evaluation studies.

8.5 Baseline Survey:

As a part of impact assessment, baseline survey will be conducted in the sampled watersheds. This analysis will provide a bench mark enabling a comparative analysis at the end of the project. The degree of project goals and objectives achieved would be assessed as against this bench mark. For a better comparison, *'control samples'* outside the watershed (i.e. untreated area with the similar topographic and socio-economic condition) also be analysed.

8.5.1 Sampling Strategy for Baseline Survey:

Ten percent of the total projects in each State from each Batch is considered for the Baseline study. From each project, three villages are selected based on the concept of ridge, middle and valley and the same number of villages are identified as control villages considering the similarity in agro-climatic conditions. From each project village, about 30 households and from the control village about 15 households are selected through random sampling method. Structured Questionnaires are used for village and household survey. The detailed sampling strategy is presented in Annexure I.

8.6 Mid-term Impact Study:

Mid-term evaluation is conducted for an ongoing programme or project. It serves two immediate purposes: decision-making and taking stock of initial lessons from experience. Specifically, a mid-term evaluation provides a programme or project manager with a basis for identifying appropriate actions to: (a) address particular issues or problems in design, implementation and management, and (b) reinforce initiatives that demonstrate the potential for success. Data are collected with respect to the same samples used during the baseline.

8.7 End Project Impact Study:

At the End of the project, impact assessment is carried out to establish the net impact of the project on the socio-economic and natural resource indicators. Data are collected with respect to the same samples used during the baseline.

The major perceivable impacts are:

- Hydrological - Ground & Surface water, Drinking water status, etc.

- Soil Status - Runoff, infiltration and moisture content, nutrient capacity, etc.

- Agriculture and allied - Cropping pattern, cropping intensity, land reclamation, productivity and diversity

- Institutional Aspects - CBOs, PRIs, any other

- Socio-economic - Income level, Employment status, Migration, Women Empowerment, Educational status, Living condition, Livelihood options, etc.

- Environmental - Land use land cover change, a forestation, biomass and carbon sequestration and

- Spillovers / Externalities (if any) - Political involvement, linkages with other projects, financial linkages, etc.

8.8 Thematic / Special Studies:

ME&Lwill also conduct certain thematic studies on key issues as identified. Some of the thematic areas include Capacity building, Investment pattern; CBO participation, women empowerment, gender issue, level of participation, Income generating activities; Run-off and land cover transformation, success stories, etc.

The basic principle governing the thematic studies are that (i) it should answer specific questions in the short run and help in policy derivations for next phase, (ii) should reflect both positive and negative aspects of the project, (iii) should be demand driven and locally identified (local specific) by the PIA. It is proposed that about 5 thematic studies to be conducted per year/per state.

8.9 Pathway Analysis:

It describes the links between outputs, outcomes and impacts as a project intervention. It was originally used to represent these links in theoretical research, and subsequently extended to development interventions as well. This is generally referred as Participatory Impact Pathway Analysis (PIPA), when applied in operational projects. It is a practical

Planning, Monitoring and Evaluation approach / tool used in complex developmental projects.

However the approach is also used to analysis the intermediate or medium term objectives in middle of the project intervention (or as specified in the project time line), offering corrective options. This is called as 'Outcomes Logic Model', where the corrective option or changing option is used to set right the policy options or strategies in the interim path of the project intervention. When this is used to analysis the project impact on the target groups (people/community) as result of achieved project outcomes it is called as 'Impact Logic Model', in a way an end of project analysis more like an evaluation.

The pathway analysis when it is adopted as a part of progress and process monitoring strategy it is largely the 'Outcomes Logic Model' that is used. In this, participants/ monitoring agency/ project management would derive targets & milestones which are regularly revisited as part of project monitoring. The further analysis of the outcomes of these targets & milestones achieved provides an interim corrective option if required.

8.10 Meta Evaluation

It is the evaluation of the evaluating agencies. This can be carried out any level, state or national. This is applicable to process monitoring & impact assessments, thematic studies or any other studies that are carried out by M, E, L & D agencies. Besides, the identified agency will provide assessment and feedback on the functioning of the MEL&D agencies including the personnel, logistic and adherence to reporting & transparency aspects.

8.11 Sustainability Assessment:

Post project sustainability of assets generated and also the institutions created is very essential. The level of involvement various institutions particularly the CBOs are crucial for the sustainability. In the long run the maintenance of the assets has to be taken up by the community on their own. Particularly the *Common Property Resources (CPRs)* need to be maintained by the community. It requires a support system built in by the project during the project period. The withdrawal strategy needs to be evolved on these lines. The M E & L studies need to focus on the successful and effective functioning institutional arrangements

for replication at a larger scale over time. The withdrawal strategy adopted in a project is assessed for evolving a strategy in the next phase of the project. The sustainability study would include not only the natural resources assets generated but also institutions like SHGs, UGs and WCs, etc. Even specific technical human resources developed under the projects also to be covered along with IGAs that are initiated.

8.12 Case Studies / Success Stories:

Case studies to identify the specific project impacts are carried out from time to time. These case studies will reflect the immediate outcomes and outputs of the project with respect to specific area or sector. The case studies reflect both positive and negative aspects. This will help to consolidate on the success stories of the project and to improve upon the weak areas if any.

8.13 Feedback and Dissemination Mechanism for Learning:

Feedback and dissemination mechanism assists in reviewing the M&E observations/findings, evolve compliance mechanism and provide feedback for decision-making. Dissemination of the findings through learning events is made to ensure that available and accumulated knowledge is fed back into an operational learning process that provides appropriate and timely information to relevant stakeholders, including management, to allow informed participation and on-going corrections/adjustments.

8.14 Learnings and Adoptability:

The regular feedback of process monitoring provides real-time corrections in the course of project implementation itself. The regular dissemination of information both from process monitoring and impact assessment enhances the corrective options. The thematic studies carried out at a larger scale discretely would support the policy corrective measures to be adopted as a future strategy. Annual learning workshop are organized at the National, Regional and State level to exchange the ME&L findings arrived at through various monitoring and assessment mechanisms. Even below the SLNA level, i.e. at district level (WCDC) learning workshops are organised.

The End of Project reports would lead to a national level workshop disseminating the major findings which would guide in developing new policy requirements if any.

9. Integration of ICT for Capacity Building under ME&L

Monitoring and evaluation (M&E) efforts take a great deal of time and methodical planning and implementation. In the past, these tasks were performed with paper and pen, which made them prone to error, difficult to conduct on a large scale, and high in transaction costs. Information and communication technology (ICT) tools, including hardware like PC, mobile phones and tablets, applications with the capacity to create digital surveys, and software that allows users to upload data to storage facilities in real-time, have reduced the conventional challenges associated with remote data collection and M&E.

9.1 Management Information System (MIS)

The Management Information Systems (MIS) is an Information Technology (IT) enabled service which helps in effective project monitoring, systematic data collection, compilation and Information extraction. The database gets stored under a well-structured RDBMS for specific Query, Analysis and Report generation. Voluminous data can effectively be handled and converted in to a useful information in a cost effective manner using MIS.

9.2 Role of MIS in the M & E System:

The crucial step towards evolving an approach to employ MIS in strengthening the M&E system needs of technological tools for the purpose. It would require articulating an MIS concept, defining clear objectives and creating a vision to transform manual system into electronic (computerized) system focused on substantial improvement in the delivery of services. In doing so, three key issues are to be considered in advance:

- State and performance of the existing system Potential of work inside and outside any organization
- Desired change in the state and performance

The existing system's analysis tells us where the organization stands at the moment; where it would be after introducing the MIS and what change would it bring to the M&E performance. Such a decision would need tremendous support from all levels in the organization. An all-out effort is needed to convert the MIS concept into a reality once the management decision is made. The process would be divided into phases such as:

- Phase I: Designing and Development
- Phase 2: Testing & debugging
- Phase 3: Installation of prototype at work stations
- Phase 4: Receiving feedback, fine tuning Phase
- Phase 5: Integrating systems inputs / outputs
- Phase 6: Delivery and operationalizing of MIS system
- Phase 7: Training of personnel
- Phase 8: Maintenance and updating of system

Each phase consists of a series of activities which at times may overlap across various processes due to their inherent interdependence on each other. Further, each activity is based on a methodology as follows:

- Purpose
- Roles
- Prerequisites and inputs
- Deliverables and outputs
- Applicable techniques
- Sub-steps

MIS is often mistaken as a substitute to an M&E system. It is because the computerized MIS is able to manage huge amount of information and provide large sets of reports for use in a presentable formats and in a short time. Such misperception can lead to weakening of the system rather than strengthening it. Therefore, it is important to understand the concept of MIS as a technical tool to support the existing system in enhancing its efficiency in terms of time and efforts and effectiveness in producing results. While converting a system from

informal to formal and from manual to computerized system, some structural changes in formats, procedures and schedules may be required. This would not mean changing the nature, purpose or use of information; rather it would provide an opportunity to improve upon existing system to generate faster, more streamlined and better quality information with lesser efforts. Besides computerized database system or management information system, there are other support systems and technical tools available for information collection, analysis and dissemination, e.g. network facilities, geographical information system and satellite imaging. To ensure delivery of high quality of services is to make optimal use of Information Technology by:

- Extending MIS facility to cover operations for data collection, analysis and reporting; building capacity and providing training to new users up to field level;
- Enhancing Website and Internet facilities for imparting knowledge, sharing information, and facilitating communication among offices, partners and stakeholders as well as maintaining linkages with market in particular with regard to core development work of the organization;
- Enhancing use of geographical information system tools like DA (digital atlas) and GPS (global positioning system) for establishing an accurate project mapping.

The objective of developing a web based "M E & L MIS" application is to facilitate the decision makers with a tool to query and analyse periodic field data, and to provide a facility to generate reports for the same. Considering the necessity to have an effective input-output monitoring of the project an information system has been conceptualized and developed to facilitate the same. The package facilitates a systematic database creation on various aspects of the project for generating regular reports on performance monitoring. The package is so designed, such that it helps the administrators in concurrent monitoring of the project at various stages of implementation. The design is so conceptualized, such that it can be deployed at any level for database access and monitoring by specifying different access levels depending on types of users of the package.

9.3 Objectives of MIS

• To assist in Input / Output monitoring at all levels

• To facilitate concurrent and transparent monitoring through identified indicators

• To relate and report on the progress achieved in implementation

• To prompt action / mid-course correction, if required, based on observations

• To use the data base over a period of time to do Impact assessment

The software design for monitoring and evaluation activities requires to be implemented in a hierarchical manner to allow assessment of the project implementation at all levels.

9.4 Scope of MIS

The Scope of Management Information System includes the Information technology components of the integrated suite of applications that forms the framework for effective, Knowledge-based, State of the art Solution for implementing the information technology environment in the project. Management Information System addresses the needs of project functions, required to be carried out in an efficient manner to attain the enhanced performance through the benefits of Information technology. The MIS computerizes all the major functionalities of a project by achieving the synchronization of information flow between different sections of a project. The System addresses all the intricacies of the manual system like duplication of data entry and errors arising due to it, Delay in Reconsolidation of information, Problems in management Reporting and decision making etc., The goal of the MIS System is to implement a methodology to carry out the day-to-day functionalities of a project in such a way that the MEL MIS's long-term vision is to ensure fast, efficient, and productive systems in place to meet its mission envisaged..

This software product will do the following:

• Automate entire MEL with MIS Data.

• Reduce Paper work and avoid maintaining registers.

• Online processing of request for the materials or services (Demand) by the various users.

• Search facility according to pre-defined criteria or key parameters.

• Integral functioning of all the functional modules.

• Report generation in all the modules based on activity which is selected.

9.5 System Requirements & Analysis

The user at the National level (DoLR) can access any level of information.The user has to select a State Level Nodal Agency (SLNA) at the next level of the hierarchy, followed by the next levels such as district, taluk, project and micro watershed. The Server must be capable of servicing multiple users at the same time, providing requested functionality to each of the user exclusively. This suggests that client-server architecture is required to achieve the desired functionality. Secure access to the application requires that a user authentication system be established. This can be achieved by username, password, and security code verification to log in to the system. Here, if the user is a district level user, then he will be given information about that particular district to which he has been given access by the System Administrator. If the user is a higher level officer (super-user), then he will have a provision to go to any district of interest i.e., there will not be any constraint on the area of working for the super-user as against the general district level user. Once a user has selected a region, he can issue queries on the area selected. The system will automatically display an overview of the particular area under consideration. This overview will be a summary report giving aggregates and other salient features as relevant to the extent of the area selected. The system displays dynamically created menus that consist of queries that are applicable to a particular area boundary.

*These are further categorized as follows*:

9.5.1 Pre-defined reports that allow the user to view results of queries such as monthly status reports, progress reports, performance evaluation, target vs. achievements, and the like, along with a graphical representation of the same.

9.5.2 The system should allow the user to build the query according to the results/reports that he wishes to see. This implies that any combination of indicators may be queried upon, and reports of the same will be dynamically produced. Associated graphs may be produced

on request. The reports and charts are dynamically produced in HTML format. The package should also provide the user with an option to view and save the same in printable format, like PDF (Portable Document Format) files.

9.6 Hardware Requirements

Since the application is a web based software and to be made available on the internet and clients are accessing the application through an internet browser. Here server are the basic hardware requirements.
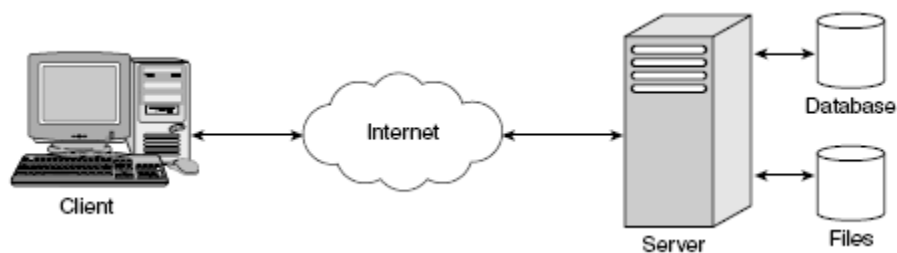
Software Interfaces:

The following software packages were used in developing the current MIS for IWMP.

Programming Language:

• PHP 5.X, Java Scripts, HTML and JQuery

Database Server:

• MySQL 5.X

Web Application Server:

• Apache 2.X

Framework:

• Cakephp 2.X

CakePHP is a web application framework. It is a foundational structure to make web applications. CakePHP follows the MVC (Model-View- Controller) software design pattern & ORM is programming technique (Object Relational Mapping techniques) in which a metadata descriptor is used to connect object code to a relational database. Object code is written in object-oriented programming (OOP) languages.

MVC separates your application into three main parts:

1. Model Layer
2. View Layer
3. Controller Layer

9.7 The Model

The Model layer represents the part of application that implements the logic. It is responsible for retrieving data and converting it into meaningful concepts for application.

9.8 The View

The Views are responsible for generating the specific output required as per the request.

9.9 The Controller

The Controller layer handles requests from users. It provides the application's main functionality by collecting input coordinating the model and view code.

Model layer is used for database application while View layer for the implementation of the graphical user interface and Controller layer for business logic. The layer helps to make the whole process faster, smoother and less complex. Every layer can be worked independently.

9.10   CakePHP Request Cycle
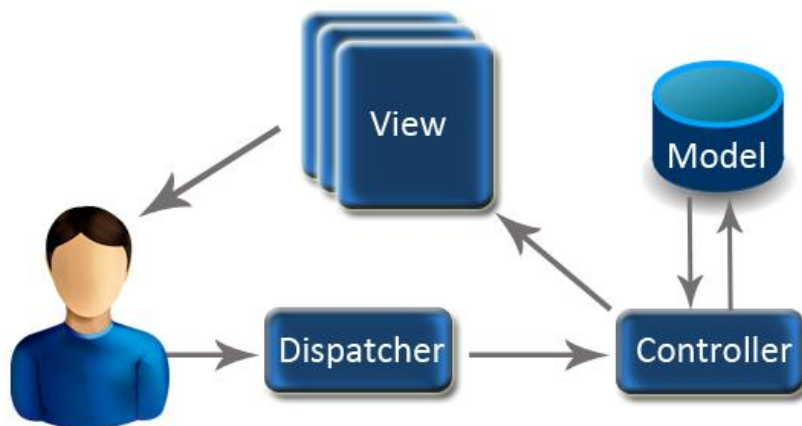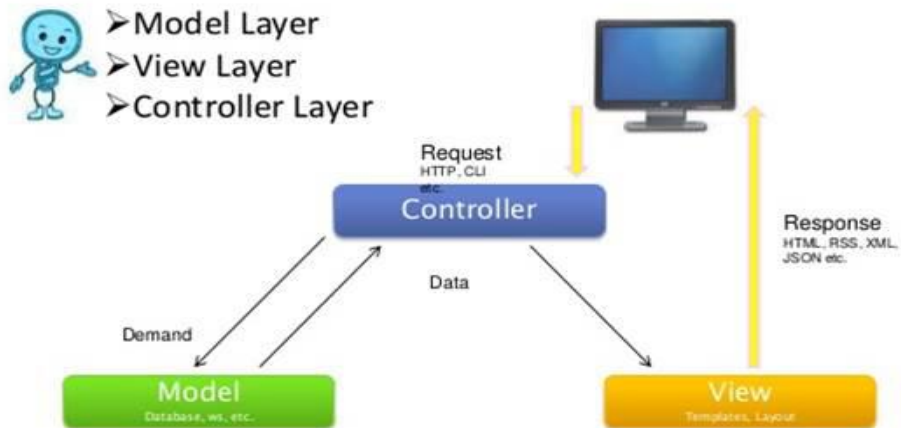
9.11 MVC Request in CakePHP

The CakePHP request cycle starts with a user requesting a page or resource in the application. This request is first processed by a dispatcher which will select the correct controller object to handle it. Once the request arrives at the controller, it will communicate with the Model layer to process any data-fetching or saving operation that might be needed. After this communication is over, the controller will proceed to delegate to the

correct view object for generating output resulting from the data provided by the model. Finally, when this output is generated, it is immediately sent to the user.

9.12 Benefits of MIS

- Separation also allows developers to make changes in one part of the application without affecting the others.
- Making application assignments into separate models, views, and controllers makes the application perfect.

9.13 Technical Features of the software

- Active, friendly
- Automatic code generation using the console tool Bake
- Dynamic scaffolding
- Flexible licensing
- Compatible with versions PHP 5.2.8 and greater
- Integrated CRUD (Create, Read, Update, Delete) for database interaction
- Code generation
- MVC architecture
- Fast and flexible templating (PHP syntax, with helpers)
- View helpers for AJAX, JavaScript, HTML forms and more
- Email, cookie, security, session, and request handling Components
- Works from any web site directory, with little to no Apache configuration involved

9.14 Reporting Features of MIS

The MIS contains general information modules, process monitoring modules ME&L activity modules, capacity building modules and report modules.

9.15 Impact Evaluation using MIS

The impact assessment is to establish the net impact of the project on related productivity, socio-economic and environmental indicators. Data would be collected on watershed basis

from a variety of sources viz.; satellite data, household surveys, focus group discussions, and also MIS data etc.

High resolution satellite imageries of pre and post project implementation, same jpeg image will also can be uploaded into MIS (on a sample basis).

9.16 Input – Output Monitoring

The MIS allows for Generation of following reports viz monthly, quarterly, half-yearly, and annual reports through MIS application. The input output monitoring will be provide the physical & financial progress of the Project.

9.17 Process Monitoring Analysis from MIS

The following analysis can be made from the MIS once it is deployed

- EPA Activities status
- NGO functioning Details
- Sensitization and awareness programs details
- CBO formations
- DPR preparation
- Net planning Details.
- Action plan preparation
- Capacity building
- Flow of funds based on sector
- Maintenance of registers at all levels
- Action plan implementation
- Component wise implementation of the project as per approved annual action plans.
- Quality assessment of all components.
- Monitoring of data collection of various scientific observations/recordings.
- Functioning of PIA
- Functioning of SHG

- Institutional and financial sustainability of Community based organizations, Income Generating Activities and Micro Enterprises.
- Transparency (Community participation, social auditing, wall writing, Publicity materials)
- Gender equity (equity in terms of distribution of benefits and costs, gender issues)
- Any other indicator which may be required to improve the quality of implementation

All the process monitoring indicators are analysed and reports would be uploaded in to the MIS, as monthly process monitoring report. A link would be provided in the MIS, which would facilitate viewing of the report as per the need.

10. Integration of RS and GIS for Capacity Building under ME&L

The space based remote sensing technology, especially with the availability of high spatial and temporal resolution satellite data aided with Geographic Information System (GIS) tools could be effectively used for watershed management and M & E activities. The geospatial technology helps in baseline survey, planning for development activities, monitoring and evaluation, apply mid-course corrections and assessing long-term effectiveness of the programme implemented.

In general, the potentiality (sustainability) of assets generated under watershed development project is getting concentrated over time, which can be related to the quality of soil and moisture harvesting structures, change in forest and horticulture assets, cropping pattern and the rate of soil erosion, etc. These resources can be monitored by using RS and GIS in conjunction with field survey. Under this context, the study "Impact/Sustainability Assessment of the watersheds is being carried out with the objectives (i) to analyse the locational sensitivity based resources monitoring. (ii) to establish the relationship between natural resources monitoring and evaluate the applicability of RS and GIS for this purpose (iii) to assess the sustainability of assets generated under project in the watershed for their specific use and management purpose.

10.1 Remote Sensing Data:

LISS IV and Cartosat images with spatial resolutions 5.8 m and 2.5 m respectively are used for M&E purpose. Three-time period data pertaining to pre, mid-term and post treatment periods are acquired from NRSC, Hyderabad to monitor the biophysical changes that occurred due to various interventions by the project in selected sub-watersheds. The LISS IV images of IRS-P6 (Resourcesat) having a spatial resolution of 5.8 m are being used at sub-watershed and micro-watershed levels respectively for (i) Landuse/landcover (LULC) analysis and (ii) biomass estimation & run-off studies. In addition, Cartosat with a spatial resolution of 2.5 m is utilized to get parcel level information for key activities. NRM structures, horticulture and forestry activities are mainly identified using the hybrid images prepared by the spatial merging of LISS IV and Cartosat.

10.2 Satellite Data Analysis:

The analysis of satellite data involves geometric correction, digitization of watershed boundary, extraction of the study area and delineation of land use/land cover types. Image to image registration for three period satellite data (pre, mid-term & post treatment) will be performed through inputting common GCPs with an accuracy of less than a pixel and subsequently used for the generation of thematic layers i) LULC and ii) Normalized Difference Vegetation Index (NDVI).

Image enhancement techniques such as density slicing, contrast stretching, histogram equalization, principal component analysis (PCA), Fourier transformation and spatial filtering methods are applied for enhancing the satellite imageries to make them more informative and to assist in image interpretation.

10.3   Generation of Normalized Difference Vegetation Index Maps:

The spectral response of green and healthy vegetation is characterized by a strong absorption in the red region together with a high reflection in the near IR region of the electromagnetic spectrum. The NDVI is highly correlated with vegetation parameters such as green leaf biomass, leaf area. In order to monitor the condition of the vegetation and

assess the biomass; NDVI layer is generated using the infrared and red bands of the multispectral satellite data as NDVI= (IR −R) / (IR+R).

10.4 Image Classification and Preparation of Landuse/landcover Maps

Landuse/landcover map is generated from enhanced satellite data sets through supervised classification. In this process, each pixel is supervised for the categorization of the data by specifying to the computer algorithm, numerical descriptors of various classes or types. A training area is generated using AOI tools and used for a numerical description of the spectral attributes of the class or land cover type. During the generation of training area the location, size, shape and orientation of each pixel type for each class is considered. When the pixel differs from the required class of interest, then it is labelled as unclassified. Each pixel is categorized into various LULC classes to which it closely resembles using maximum likelihood classifier and submitted to spectral pattern reorganization for classification.

10.5 Accuracy Assessment:

To ensure the quality of classified image, accuracy assessment is carried out using ERDAS IMAGINE. Rationing the number of points found correctly on the classified image to that of total number of points checked in the field multiplied by hundred. This gives the total accuracy of the classified output in percentage. The confusion matrix between populations of pixels in a training set to that of its distribution among different classes would give over all accuracy of classification. Accordingly, the commission and omission errors are estimated to give percentage of accuracy of each class. In addition the Kappa accuracy is also provided along with the area statistics.

Errors of commission for each class are computed by summing the number of pixels assigned to incorrect categories along each row and divide this number by total number of true pixels in this category. Errors of commission are computed by summing the number of pixels assigned to incorrect categories along each column and dividing this number by the total number of true pixels in this category.

10.6 Field Inventory:

During ground survey, the sampling strategy are being determined with reference to LULC Map and Survey of India (SOI) Topographical maps. The required number of sample plots are generated and distributed statistically using randomizer function of ERDAS Imagine software.

Since the study is for impact analysis, in case of tree (above 6 m height and 10 cm dbh) biomass assessment, the Time-1 (baseline) data is procured from concerned departments (if there is no availability; Time -1 data would be considered as "zero" for biomass assessment). In case of Time-2 & 3 (mid-term &baseline) data, intensive fieldwork is carried out as per project requirement. The sample plots are be distributed across the sampled sub/micro watersheds by inputting classified LULC map (digital) as primary stratification base and were located in the field using a mobile GPS unit. Biophysical parameters such as tree height and girth at breast height (gbh) are measured by adopting standard methods and these values subsequently used as input for biomass estimation.

11. Learning under Monitoring & Evaluation

As a finer product, learning is inscribed & embedded into entire M E& L System. Though the word comes at the end of monitoring & evaluation process, it is of topmost significance. The ultimate purpose of M & E is learning. All the results or findings of M& E are learning for future corrections, adaptation or up scaling and without the learning element M&E remains ineffective and of context. Its relevance is entirely on its learning element. The project needs to take up the learning and disseminate it at different levels as per the need. This is to be done through policy changes, workshops (National, Regional, State and District levels, etc.), models, demonstrations, up scaling efforts.

As a feedback mechanism, the M E & L should share its observations at appropriate level and with proper frequency. At the National level (i.e., the DoLR) and SLNA level, a regular monthly feedback mechanism needs to be maintained. Further, below the line i.e. districts (at PIA level), the information sharing by M & E is very crucial for real-time on field

corrective adoptions. The DoLR need to facilitate this mechanism at the national level & also ensure SLNAs to uptake the learning from M&E inputs.

The learnings from the M & E to be disseminated in the following types:

- National level works - for general orientation as well as for policy guidance.
- Best practices works – National & Regional levels

Measures adopted at the project level.

In general the following means of communications to be used for dissemination of M&E learning.

- Workshops - National, Regional & State levels.
- Best practices – Replication
- Models - Development of model watersheds
- Electronic Media – Videos and Audios (of best practices, or policy changes).
- Print Media – Specific booklets (of best practices, models, scientific inputs etc.)
- Mobile Apps – For field specific findings or corrective measures taken/ adopted
- Links with Bhuvan portal

12. Specific Tools for Capacity Building

- ❖ Workshops
- ❖ Flip charts / photos
- ❖ Maps
- ❖ Pamphlets / Monographs
- ❖ Audio-visuals / Documentary Film
- ❖ Learning from Success Stories / Good Practices
- ❖ Field Demonstration

13. Activities Proposed for Capacity Building

- Workshops at National / State level involving DoLR, SLNA, WCDC, PIA staff / representatives.

- Structured trainings at National / State level for the DoLR, SLNA, WCDC, PIA staff / representatives on various subjects based on need assessment identified for the capacity building activity.

- Exposure visits of technical and management staff will be undertaken within country to share experiences. Specific training to the DoLR, SLNA, WCDC, PIA staff / representatives on planning process, tools for effective integrated watershed management.

- IEC activities such as publication, mass media to build awareness over larger community and wider areas.

13.1 Workshops

In order to educate above stakeholders, leaders and decision-makers series of workshops on techno-managerial aspects need to be organized. These Workshops is to benefit the officers at national and state level experts. At national and state level the workshop is on orientation of the M E & L Project to the staff of DoLR and SLNA representative and other authorities to ensure coordinated support for the implementation of project.

13.2 Structured Trainings

Structured training for capacity building will be organized with support from resource persons of National ME&L Agency. These programs will be mainly on technical and managerial aspects as well as productive aspects to the National and State level planning, managing and implementing staff.

13.3 Demonstrations

Demonstration of various technological aspects such as MIS, Remote Sensing and Geographical Information tools to the staff of DoLR, SLNA and other authorities. The remote sensing products such as landuse/landcover maps, NDVI maps for baseline, mid-term and end of the project period will help in spatially understanding the impact of the project interventions.

13.4 Exposure Visits

The National ME&L Agency will arrange for demonstration during the exposure visits organized by DoLR / SLNAs for their technical and management staff.

13.5 IEC Activities

Project will undertake Information, Education and Communication (IEC) activities as part of capacity building in the watershed areas to have wider coverage and effective. The IEC activity will be mainly on the crop production practices, water conservation, post-harvest management etc. This will be done though small booklets, and pamphlets mass media, etc.

14. Institutional Arrangements for Capacity Building

The following arrangements for Capacity Building Projects will be made.

The resource from the National ME&LAgency will be utilized to train the representatives of DoLR, SLNAand other key staff. The Agency will also involve in the Exposure visits organized by the DoLR.

15. Indicative Modules for Various Capacity Building Programs

Based on the project requirements, the various modules required for training of the above projectstakeholders have been categorized into 11 generic modules. The indicative contents ineach of the modules have been furnished in table below.

Sl. No.	Module	Content
1	Understanding poverty, Environment, Ecology and Development	➢ Poverty- dimensions, coping mechanisms, poverty webs and vicious cycles Participatory identification of the poor ➢ Development- process, dimensions, approaches ➢ Delivery- roles of state, civil society and markets, functions, evolution and growths ➢ Government Programs- their approach, present programs ➢ Vulnerability Sensitization- Gender, Tribal, Youth ➢ Environment and Ecology ➢ Watershed and Natural Resources
2	Management Skills	➢ Visioning- Strategic Planning ➢ Financial- Costing, Budgeting, Accounts, Financial Statement and Auditing ➢ Marketing- Marketing basics, Market intelligence and Consumer ➢ Management, commodity Marketing-Forward Linkages ➢ Project Management-Project Planning, Sequencing & activity scheduling, Responsibility matrix, monitoring & evaluation ➢ Human Resource management-Monitoring, team Building and management, performance measurement & review ➢ Communications and Information Technology- Documentation, Written and Oral Communication, Written Analysis & Facilitation
3	Institution Building	➢ Community Mobilization-process ➢ Structure of the primary and federations of poor and their groups-group dynamics, group development processes

		➢ Design Principles of the People's Institutions
		➢ Promotion Process of the institutions
		➢ Institution Development- Organization Development-lifecycles
		➢ Systems for the institutional Requirement- Statutory & Transparency
		➢ Institution rating-credit rating, groups and federations rating
		➢ Conflict resolution and accountability
		➢ Bylaws and Business Rules
4	Watershed Development and Natural Resource Management	➢ Watershed concept, micro-watershed, ridge-to-valley approach
		➢ Natural Resource Cycles
		➢ User Groups
		➢ Various elements of watershed development including soil and moisture conservation
		➢ Operations and Maintenance
		➢ Ownership and access- individual, common and publicproperties
		➢ Enquiry considerations
		➢ Engineering works
		➢ Rural Infrastructure
		➢ Fodder Conservation and Augmentation
5	Livelihoods, Micro finance and Micro insurance	➢ Livelihoods basics, concept, frameworks, Sectors & localeconomy
		➢ Livelihood mapping and analysis-tools
		➢ Livelihoods-value chains, sub-sector assessment
		➢ Livelihood Opportunities, new Livelihood Development Process
		➢ Feasibility, Viability and Cost-effectiveness considerations
		➢ Enterprises for livelihoods opportunities – management
		➢ Collective Enterprises for Livelihoods
		➢ Gender, Tribal, Youth, Disabled, Vulnerable andEnvironment- Livelihoods
		➢ Marketing-Backward and Forward Linkages
		➢ Fund Management-Revolving Fund & Financing Livelihoods

		➢ Risk management-Insurance, People institution basedinsurance, Insurance-life asset, health etc. futuresoptions	
6	Project Management and values	➢ Project Scope, objectives, outputs, Components, indicators, Processes, Value Non-negotiable, keyprinciples– Sustainability ➢ Equity and Productivity ➢ Project Budget and Implementation arrangements	
7	Livelihood Skills	➢ Sectoral requirements ➢ Sectoral Understanding and inputs	
8	Participatory planning and research	➢ Participatory identification of Poor (PIP) ➢ Participatory Research-processes, tools, methodology & sampling framework ➢ Participatory processes- decision making, planning, monitoring, evaluation & review	
9	Visioning and Strategic Planning for institutions, Units and individuals	➢ Strategic management-basics ➢ Visioning, Development of Vision and Plans ➢ Monitoring the plans- progress- quantitative and qualitative ➢ Learning-feedback, review & view of poor	
10	Individual Development	➢ Personality development, Career Development ➢ Counselling & Monitoring ➢ Development Worker- Characteristics & Love ➢ Leadership-skills ➢ Conflicts& Time Management	
11	Specific functional knowledge and skills	➢ Training Needs Assessment (TNA) and Training ofTrainers (TOT) ➢ Training specific to Functional Area at cluster, District and State levels	

16. Documentation

Training reports, feedback, application results will be documented. In addition IEC material will also be produced on various technology aspects and watershed implementations.