NATIONAL PROGRAM FOR IMPROVEMENT OF WATERCOURSES – PHASE-II

WORKING PAPER

TECHNOLOGY & METHODOLOGY

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Android Based Field Progress Data Collection and GIS Based Progress Monitoring Analytical Dashboard - PMIS

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WORKING PAPER

(Technology & Methodology)

PREFACE:

Data collection and 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 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.

Though a new field, the learnt experience about how best to employ applications and ICT-enabled tools to collect data and perform M&E. One of the primary lessons is that technology itself is not sufficient to meet project objectives. Even a platform for free data collection does not guarantee the right data will be collected effectively. Maintaining a team that can design the collection of efforts and implement them accordingly to evaluate the data as per the Result Based Monitoring Framework, are as important as the technology. Training is an important component for collection of data through ICT tools.

Field enumerators using new technologies need additional training and support. With proper instruction, most organizations have found that even poor, uneducated enumerators are capable of picking up the skills.

The monitoring and evaluation (M&E) process is turning into a spry new creature with technology. With increasing emphasis on real-time feedback, more rigorous data collection, and quantifiable results, the spread and use of Information and Communication Technologies (ICT) in monitoring and evaluation — 'ICT4M&E' in short — has sparked massive interest.

COST REDUCTION:

Reducing costs in development programs is of utmost important. Limited amounts of funding in the National/International development space means that money saved in monitoring and evaluation can go to increase project's impact.

- **Mobile data collection** is one of the easiest technologies to adopt for M&E. Using cell phones to collect data reduces the costs of creating paper forms and data entry.

"The World Bank found that mobile data collection reduced costs for each survey by an average of 71%."

- Collecting data electronically reduces data-entry costs and makes the information easily accessible faster.
- Also, since the data reflects in real time, survey administrators can react faster to their M&E exercises. Areas of concern, waste, and inefficiencies can be identified and addressed faster, making programs more dynamic and cost-effective – all in real time!

According to USAID, mobile data collection also lowers the time taken to run a survey by a huge 70%; a decrease in time and increase in efficiency obviously means reduced costs.

INCREASED ACCURACY:

Catching errors in reading or entering data in pen-and-paper survey and data collection systems is incredibly cumbersome. According to USAID, the measures for data accuracy are validity, reliability, precision, integrity, and timeliness – and here's how technology can help with those.

- **Real-time data validation** helps to weed out measurement errors and increases accuracy significantly. In-built data validation prevents erroneous data from entering in the first place. This helps to ensure that data is valid and reliable.
- **Data entry errors** occur at the time of data collection or when it's being transcribed. Technology allows single-point data entry to reflect across the system. There is more — administrators can track where seemingly inaccurate data is coming from, flag it, and have it collected again. This makes data more precise and reliable.
- **Data security** ensures that your data is not manipulated or lost. Using pen-and-paper data collection puts your data at risk of being lost, garbled, or manipulated before the program manager even takes a look. Technology can help put in processes that track data from the time it is entered. This ensures data validity, precision, and integrity.

RICHER DATA:

Advances in technology have fundamentally changed the kind of data collected for M&E, and how we use it. Collecting data in multiple formats and forms opens up immense potential in getting richer data from project's Monitoring and Evaluation system.

- **Location** and GPS data has become more accessible with the use of location tracking on cell phones. This makes it easier to collect follow-up data, helping you to make connections and draw insights better, and verify the source and credibility of your data.

GREATER OUTREACH:

ICT in development programs break down the boundaries that existed in communicating lessons and results with the development world. With the creation of this global network,

which is seeing far more participation, there are huge benefits that technology can bring to development programs and their M&E.

- **Scalability** is one of the most intrinsic benefits of the use of technology. For example, there is only a marginal cost in additional people taking a survey once it has been created. M&E can therefore be scaled up now quickly at minimal cost.
- Taking up development projects in remote locations no longer means spending on expensive travel or investing human resources at the project location for long periods of time. **Managing and monitoring** projects can be done remotely.
- Promoting **awareness and feedback** related to project has never been easier. Project managers now can get direct feedback from the field teams about their activities, thanks to mobile technology. This new platform eliminates the potential biases of M&E teams by aggregating large amounts of data in real time, enabling them to have a finger on the pulse of the project.

BETTER INSIGHTS:

Technology can clearly make M&E easier and improve data collection accuracy while reducing costs. But, more intriguingly, technology can also assist in the process of learning from the M&E process. Using analytics, visualization, dashboards, and mapping can enhance your ability to make sense of all the data that you collect for M&E.

- **Visualizations** of your monitoring and evaluation data can help you understand and consume your data more efficiently. Good visualizations in interactive **dashboards** can help convey important data points and help you arrive at the right conclusions about your M&E process — something spreadsheets of data might not help you with.
- **Geospatial mapping** of project to understand its geographical footprint will help to gauge patterns and develop deeper and better understandings of your target audience.
- **Analytics** can help you measure your results and make you more data-driven. Depending upon what your project goals are, you can optimize your program to achieve those results. Analytics can help you plot the roadmap to that end goal by helping you realize what inputs will get you that result.

PROJECT SCOPE:

NPC – FPMU NPIWC-II is required for implementation of National irrigated agriculture Productivity Enhancement Project with financial assistance to improve Water and Agriculture Productivity for small and medium size farmers.

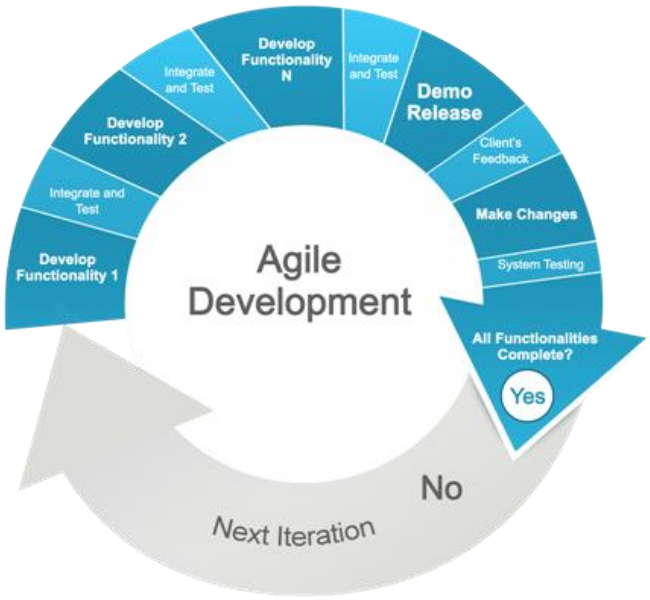
This office of the National Project Coordinator-FPMU required to implement PMIS/GIS based Progress Monitoring Dashboard for various Components of the above said project in efficient manner so to achieve the project targets with the pace of time and project will move towards their successive completion without any obstacle. In reference to project requirement, PMIS and GIS based Progress Monitoring Dashboard with extensible module that have mobile

based interface to manage project activities in accordance with the modern concept of project management and track key project indicators with GIS inputs coming in from the field. GIS inputs should at a minimum include GIS coordinates, photos, text, and numeric data.

TECHNOLOGY & METHODOLOGY:

To accomplish the assignment as defined in project scope "PMIS and GIS based Progress Monitoring Dashboard", GIS & Information System Department of Me&IE consultants' adopted the Agile Methodology as Software Development Process. Under which requirements and solutions evolve through the collaborative effort of self-organizing and cross-functional teams and end user / field experiences. It advocates adaptive planning, evolutionary development, early delivery, and continual improvement, and it encourages rapid and flexible response to change.

The logic behind the adaptation of Agile development methodology to depute the system on the earliest and keep evaluating it for better results as per the project requirement. By adopting Agile, GIS & Information System Department of ME&IE consultants' can strategies the successful implementation. Each time after evaluating an experience from the field the next iteration will start with upgradation in system and as well the implementation process.



ANDROID BASED DATA COLLECTION APPLICATION

GIS & Information System Department of ME&IE consultants developed customized android based (Mobile & Tablet) Data Collection application as per the project need. Data collection android application has following features:

- Well optimized application for better work in online/offline environment
- User friendly interface
- Consume less internet bandwidth for better connectivity at low internet areas
- Data is automatically uploaded when a connection is detected
- Data immediately available right after it's collected
- Capture GPS, error validation, logic, repeats, signatures, photos and much more
- Strong safeguards against data loss
- Synchronize data via SSL, ensures data can't be read by a third party

AGGREGATE SERVER

From data collection application collected data synchronize with Aggregate Server and submit all record over there. Secured hosted under SSL encryption a robust aggregation and data storage application server also designed and customized as per the project requirement. Aggregation Server has following features:

- It supports a wide range of data types
- It hosts blank designed data collection form and on any update in form it synchronizes with mobile application and update the blank form
- Store and manage submission data
- Visualize collected data using maps and simple graphs
- Create summary reports with graphs and tables and fine-tune your report's charts, colors and questions
- Visualize collected data on a map
- Disaggregate data in reports and maps
- Export and publish data in a variety of formats

GIS BASED PROGRESS MONITORING ANALYTICAL DASHBOARD

Data cleaning is a complex process, after receiving the field data GIS & Information System team will validate it in coordination of District Directors and Field Teams of Agriculture/Water Management. Clean the blank fields, validate data based upon internal manipulations and also can communicate with field teams to re-submit the form if found any erroneous data. On finalizing the clean data, it will push to customized designed GIS and Analytical Dashboard for Progress Monitoring. ME&IE Consultants developed GIS and Analytical Dashboard for Progress Monitoring has following features:

- GIS and Analytical Dashboard designed for all project components separately
- Custom designed Analytical Dashboard for all stakeholders for optimized reports

METHODOLOGY OF IMPLEMENTATION PROCESS:

For a successful implementation of system "PMIS and GIS based Progress Monitoring Dashboard", GIS & Information System Department of ME&IE Consultants' again adopted the Agile Methodology as project management here as well. Agile Methodology will equip the implementation team to evaluate the results after implementation of each process, which will lead to a continues process of refining the implementation strategy for quality results.

On the completion of the PMIS development phase, the next phase is implementation which is more crucial. Based on three stages of Implementation Process, GIS & Information System Department of ME&IE Consultant designed the methodology of implementation process.

STAGE I - DIGITIZE AND MIGRATE THE DATA

The commencement date of NPIWC Phase-II was 1st of July 2019, which means that two years has been passed of the project. During this period, a number of project activities were executed and achieved their milestones.

During this time along with several project activities were executed, a lot of data has been generated, it can be in digital form or may in hard copy form. GIS & Information System Department of ME&IE Consultant will digitize the hard copy data, process the preliminary data cleaning and validation process to migrate the complete data in the respective databases.

Once the completion of data migration ends, a report will be submitted to the concerned authority for data validation and approval.

STAGE II – MEETINGS WITH ALL STAKEHOLDERS AND SHORTLIST THE NOMINATIONS

Stage-1 and stage-2 will be executed parallel to execute and efficient implementation. Under the supervision of National Project Coordinator office, GIS & Information System Department of ME&IE Consultant will organize meetings with all DGs/Directors of all Zones/Units to present the concept of PMIS implementation and their role in its execution. The team will also present that how PMIS will support the concerned offices to dig out the bottlenecked areas for an efficient execution of targets.

During these presentations, GIS & Information System Department of ME&IE Consultant will brief the concept of data collection form field for the NPIWC-II PMIS and their roles. A nomination of field teams members will be required from concern departments (Agriculture/On-Farm Water Management) on the given brief concept of data collection. For the selection of nomination from all stakeholders, there can be two methods, mentioned as following:

Method 1:

Selection of nomination can be done by selecting a member (WMO or field engineer) from each field team of each Zone/Unit. This is an efficient method, as the data generates on daily basis so if it will be spread out based on field teams then the submission of field data can be sent in time to fulfil the concept of real-time monitoring dashboard.

Method 2:

The other way that each Zone/Unit can nominate a optimized selection rather than nominating at field team level.

STAGE III - TRAINING AND CAPACITY BUILDING

Training and Capacity Building of staff on PMIS and Android Application is an essential and final part of this assignment. Training modules will be designed for multiple groups of users as per their needs and requirements. Potential user groups could be the following:

- NPC – FPMU
- Provincial DGs (OFWM) -PMU
    - Regional Directors (OFWM)
    - Deputy Directors (OFWM)
    - Field Teams (OFWM)
- Project Consultants
- ME&IEC

A comprehensive document of the training plan will be compiled for this phase. As each user group has different requirements for training as mentioned below:

NPC – FPMU - National Project Coordinator and Federal Project Management Unit's need the insight of overall national level progress and impact reports. This group will not submit any primary data. Android application training will not be delivered to the users of this group.

Provincial DGs (OFWM) – PMU - Provincial DGs and their Project Management Unit's need the insight of their respective provincial level progress and impact reports. This group will not submit any primary data. Android application training will not be delivered to the users of this group.

Regional Directors (OFWM) - Regional Directors under their Provincial hierarchy requires the insight of their regional level progress and impact reports. This group will submit any primary data through the Android Application.

Deputy Directors (OFWM) - Deputy Directors under their Provincial hierarchy requires the insight of their District level progress and impact reports. This group will submit any primary data through the Android Application.

Field Teams (OFWM) - Field Teams are the basic source of primary data collection from the fields against all activities. Majorly data will be collected and submitted to MIS through this group. This group does not require access to MIS and it's training as well.

Project Consultants - Project Consultants requires the MIS access and training and the Android application training as well to access and submit the data generated by Project Consultant like certifications.

ME&IE Consultants - Monitoring Evaluation and Impact Evaluation Consultants requires the MIS access and training and Android Application training as well to access and submit the Baseline, Endline data and Progress Monitoring and Impact Reports.

The company will submit the Training Plan document and on the completion of this task will submit the Training Evaluation Report as well.