Integrated Geo-spatial ICT Solution for Scientific Planning & Monitoring of MGNREGS works in Gujarat

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ABSTRACT: *Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), aims at enhancing livelihood security of households in rural areas by providing at least one hundred days of guaranteed wage employment in a financial year to every household whose adult members volunteer to do unskilled manual work. Its auxiliary objectives are strengthening natural resource management through works that address causes of chronic poverty like drought, deforestation and soil erosion and to encourage sustainable development. The objective of this paper is to illustrate the function and benefits of the mobile based Geo-Information Communication Technology solution to monitor works performed in MGNREGS. Use of Geo-ICT initiative enhances the effective management of the works undertaken in MGNREGS and supports to better governance.*

Keywords: MGNREGS, GIS, Geo ICT, Planning, cadastral map, Cell phone, GPS.

I. Introduction

MGNREGS marks a paradigm shift from all preceding wage employment programmes. Significant aspects of this paradigm shift include a   rights-based framework for wage employment. Employment is dependent on the worker exercising the choice to apply for registration, obtain a Job Card, and seek employment for the time and duration that the worker wants. The need to act within a time limit necessitates advance planning. Timely generation of employment within 15 days with the assurance of the quality in design and selection of works are the key concerns. Gram Panchayat prepares yearly development plan and maintain various works under MGNREGS. After taking approval from Gram Sabha the proposed works are forwarded to the Block Panchayat for scrutiny and for preliminary approval prior to their commencement in the year in which the work is proposed. After obtaining approvals, at various levels of the Government hierarchy, a set of pre approved works are kept ready, to be initiated as and when the demand is registered at the Gram Panchayat.

II. Methodology

Satellite Images obtained from National Remote Sensing Center (NRSC) with 1:10,000 to 1:5,000 variable scales are used as a base maps for the geo-spatial database creation. Other departmental geo-data sets (spatial & non-spatial data) generated over the years were also collected and superimposed on the Baseline map to create composite village map. Revenue Department data & LISS IV Satellite images were used to digitize the village local boundaries. Recently the village local boundary had been revised with 2011 village census codes. Locations of ongoing works of rural natural resource development had also been captured to maintain digital Geo-asset inventory on a real time basis. By overlaying these layers, composite map was generated for every village in Gujarat state.

Technical Assistants facilitated the community participation in the Gram Sabha to plan the works that could be undertaken in the financial year 2013-14. Thus the Composite Maps were used to prepare the 2014-14 - MGNREGS Labour Budget for the entire state.

I.I Use of natural resources

Natural Resources	Features	Source
Land	Land use	Satellite Data
	Landform (hill, Alluvial, Coastal areas etc)	Satellite Data
	Soil type	Soil and Land Use Survey of India, National Bureau of Soil Survey & Land Use Planning, Agri. Dept.
	Slope/Elevation	Satellite Data & Open Source
Water	Surface Water Bodies	Satellite Data
	Ground Water condition	GWRDC, CGWB
	Wells	Revenue Department
	Check Dam	Departmental Data
Vegetation	Agriculture	Agriculture Department, Satellite Data
	Forest	Forest Department, Satellite Data
Village	Socio-Economic Facilities, SC & ST data , Actual Wages, Drinking Waters, % of SF & MF, % Poverty Index	Department of Rural Development., Bureau of Economic & Statistics
	Village Map	Computerized maps from Revenue Department
Infrastructure	Roads, Canals, Water Supply	Line Departments
Ownership Details	Forests, Government, Panchayat, Private	Revenue Department
Others	Sanctuaries, Mining areas	Line Departments

Table 1: Overview of natural resources and its features mapped for Geo-ICT initiative at village level

In addition, the requirement of the beneficiaries are also prepared and used along with the maps. The composite village maps were provided to all MGNREGS Technical Assistants for use as a planning tool.

II.I Use of composite village maps

Composite Village Map used during Participatory Planning in Gram Sabha. Budgeted work plan of MGNREGS had been digitised and a mobile application had been developed based on the budget. The Mobile application is installed in the cost effective GPS enabled mobile devices. Each Technical Assistant uses the mobile application for submission of current status of the proposed work in the labour budget. Apart from that, the weekly work progress information is reported from the work site through SMS based reporting system. SMS received with GPS coordinates provides the real time report for the supervisors and administrative functionaries to act upon.

Other than the above described mobile application, additional two mobile applications were also developed and used in the Geo-ICT initiative. With respect to the additional two applications, the first application is used by the Technical Assistants for validating the MGNREGS assets created in the previous financial years. The second one is used by Works manager for supervisory reporting. The information received through the SMS reporting system is stored in the centralized server.
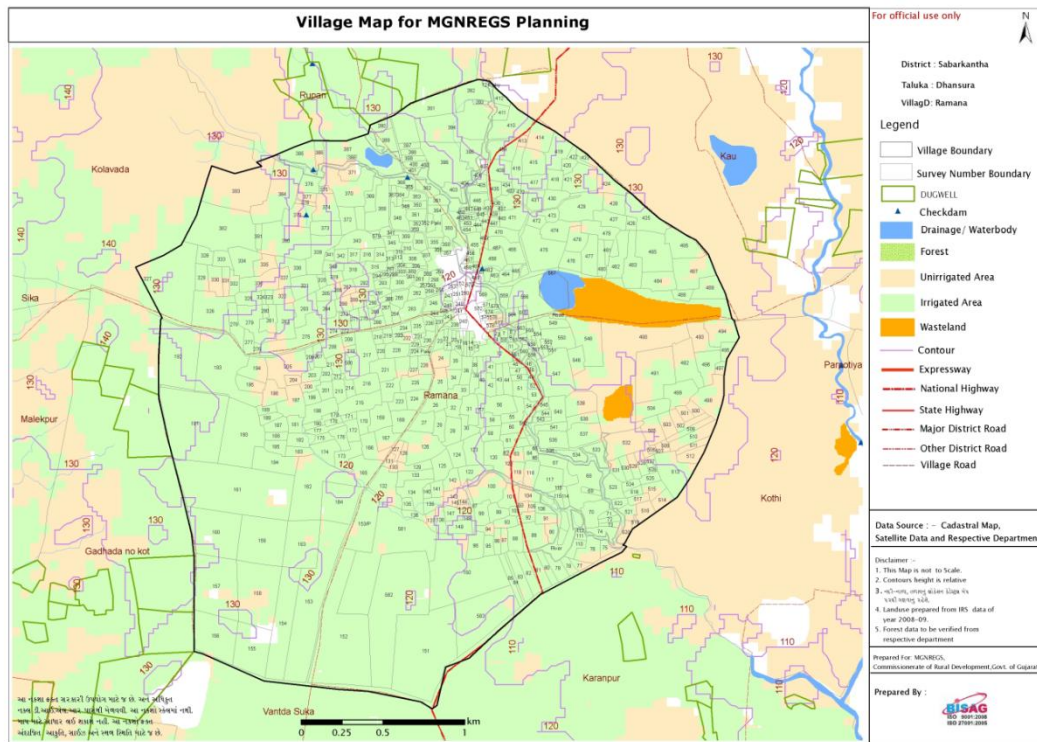
Fig 1: Composite village map for District: sabarkantha, taluka: Dhansura and village: Ramanna

For each mobile application a corresponding modem and Gateway application had been developed for running the application on internet. Refer the information flow diagram, the modem/ gateway applications 1, 2 & 3 are prepared to link the input mobile application information to the GIS website. The modem/ gateway applications 4, 5 & 6 are developed to generate reports to the different supervisory officials. Access to the server database and maps are provided to all the District and Block level officials through the web link accessible through Gujarat State Wide Area Network (GSWAN) and in later phase it is available through live internet access. Alerts on the MGNREGS performance variations are also displayed on the website. Customized alerts are also sent to the State, District & Block level officials on a daily/weekly basis using the modem application 4, 5 & 6 respectively. These facilities are useful for taking real time decisions. The work progress information captured in GIS website is linked with the NREGAsoft MIS. Following flow diagram depicts the technical overview of information flow in Geo-ICT initiative.

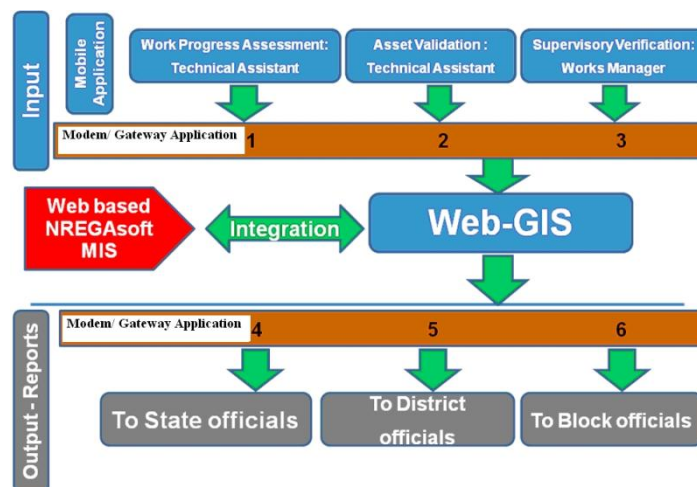**II.II MGNREGS – Gujarat, information flow in Geo-ICT initiative**

Fig 2: A framework for the integration of Web GIS and NREGA Soft and Gateway/ Modem Application

II.III Technology used in Geo-ICT initiative of MGNREGS, Gujarat

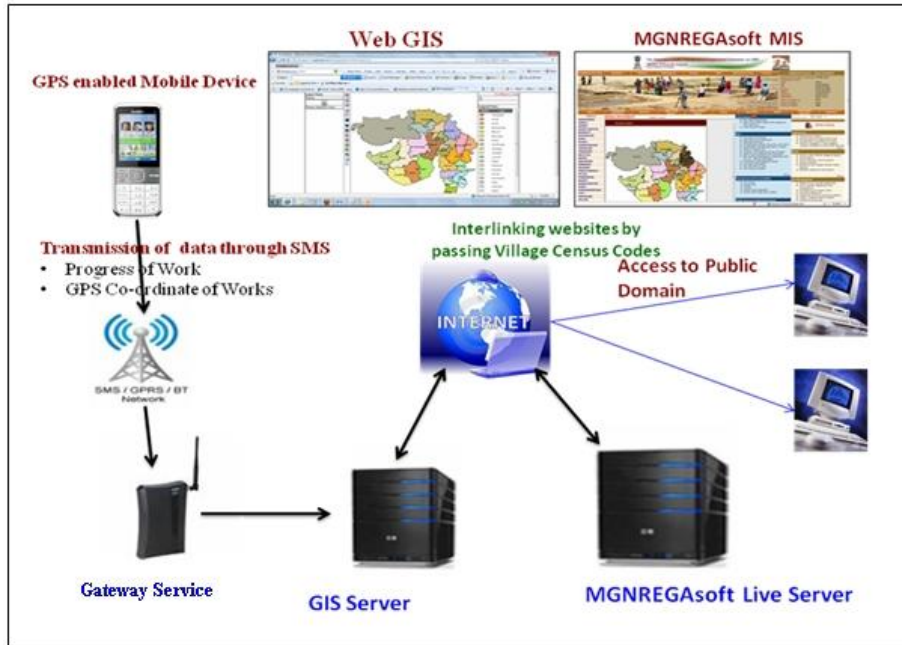| Hardware	Software
✓ 1 High End Server ✓ 1 GSM MODEM at Server side or SMS Gateway service ✓ Mobile Devices having GPS/ A-GPS	✓ In house GIS Engine ✓ Microsoft© Visual studio 2005 ✓ Microsoft© SQL Server 2005

Fig 3: Information flow diagram after integration of Web-GIS & NREGAsoft MIS

Integration of Web-GIS with NREGAsoft MIS through web interface: In order to comprehensively track the MGNREGS progress, Geo-ICT tools have been integrated with NREGAsoft MIS at various levels. Database-level integration has led to MIS and GIS sharing a common database; data changes in one reflects in the other i.e., if there is a change in the MIS, the other system (GIS) automatically changes the visual interpretation on the maps. Data sent over the mobile phones is transmitted to the central server which facilitates map creation for monitoring before, during and post implementation phases of the project. SMS from the work sites sent by the Technical Assistants are received in the Central server located at State Data Center through Gateway service. The received data updates the GIS database which in turn updates the GIS maps & also the NREGAsoft MIS.

III. Conclusion

Mobile based SMS reporting system for tracking MGNREGS work progress are useful to the supervisors & administrators to take decisions on near-real time basis. From the geo-asset directory the composite village maps are generated and used for the scientific planning. This also helps to reduce the duplication of works most efficiently. Gujarat's Geo-ICT initiative is unique in its approach. It goes one step ahead than all other initiatives in using the Geo-reference tracking system by measuring the GPS coordinates (Latitude-Longitude) of all work sites. With the encouraging results from the piloting exercise, the full fledged implementation of Geo-validation and near real time monitoring of the works have been achieved. The Geo-ICT initiative enhances the effective management of the works undertaken in MGNREGS, Gujarat. It also increases the transparency, accountability, and therefore credibility of the Program.

Acknowledgements

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