Case Study

ICT Initiatives in Madhya Pradesh Forest Department

May 2012

Governance Knowledge Centre

Promoted by Department of Administrative Reforms and Public Grievances
Ministry of Personnel, Public Grievances and Pensions, Government of India
http://indiagovernance.gov.in/

Researched and Documented by

oneworld.net
OneWorld Foundation India
www.oneworld.net.in
owsa@oneworld.net

Table of Contents

Executive Summary

The Forest Department of Madhya Pradesh envisaged designing and implementing Information communication Technology initiatives to bring in paradigmatic shift in the Department's Work culture and service delivery. Effective management of forest and wildlife was the vision that guided designing and development of several applications that were unique and advanced in their operations. The Forest Department undertook integration of various technologies such as space technology, GIS, mobile computing, communication technology to develop all applications in-house.

The basic objective of launching the ICT initiatives in the Forest Department of Madhya Pradesh was to monitor all its key activities in real time, both spatial and temporal, and to disseminate information to all stakeholders in an easy and visualized manner for facilitating social audit. The project was conceptualized in the year 2007 and was completed in 2010.

The most revolutionary applications developed are the Forest Alert Messaging System, Forest Offence Management System, Forest Dwellers Survey System, Forest Financial Management System, Wildlife Management System and Forest Planning and Geo-mapping System. These applications have immensely been successful in bringing substantial changes in service delivery. With applications like the Fire Alert System, response time to emergencies reduced drastically. Forest Offence Management System, Forest Dwellers Survey System and Wildlife Management System have created a comprehensive database of forest and wildlife related real time information that have catalyzed informed decision making and ensured transparency and accountability of the Forest Department.

Extensive use of technology has also improved work culture by increasing efficiency and reducing extra work hours. With increased interactions among al the levels of employees channels of communication improved and paved way for an equitable and healthy wok environment. The project has also initiated a culture of inter departmental convergence of resources for a participatory, interactive, responsive and service oriented governance. Madhya Pradesh Forest Department has also been adopting environment friendly measures such as using solar energy to run its computers and communication network. The Department has also been successful in disseminating its learning and expertise among other government and nongovernment organisations. Approximately INR 50 lakh is generated per annum through consultancy, web application hosting, digital forest mapping, training, transfer of technology and other services.

The Department developed all the applications in-house with existing resources at extremely low cost, indicating strong possibilities of replication. Low maintenance cost and its revenue

earned through knowledge sharing make this endeavour a sustainable one. The Department has been honoured by several awards such as with the International Green Globe Foundation Award 2012, National e-Governance Award 2010, Prime Minister Award of Excellence in administration 2010 and many others.

Methodology

The governance Knowledge Centre team decided to document the ICT initiatives in Madhya Pradesh Forest Department as a best practice because this is a unique endeavour by a Government Department to undertake innovative ICT initiative to automate all its core processes for ensuring transparency, accountability and efficiency in service delivery. The Department has developed unique applications using cost effective yet latest technologies to collect and analyse real time spatial and temporal information of all forest and wildlife resources of the state.

The team used both primary and secondary research methods for the preparation of this best practice document.

Conducting desk based secondary research that mainly comprised of project reports published by the Madhya Pradesh Forest Department and Microsoft, the team gathered important information on the background, objectives and operations of the initiative. In order to validate the secondary research findings and to know more about the project, the team visited the Madhya Pradesh Forest Department located in Bhopal. The team prepared questionnaires for the Additional Principal Chief Conservator of Forests (Information Technology), Forest Department, Government of Madhya Pradesh to gather information related to the project. An interview was also conducted with the EDUSAT Manager of Madhya Pradesh Forest Department to understand the operation of individual applications and to get a brief overview of the project's technical components.

As the OneWorld research team interviewed the key implementers and obtained first hand account of the project design, implementation challenges and its impacts, the prospects of information bias is believed to be minimal. However, as the documentation focuses on analysing the overall objectives, working design and achievements of ICT initiatives of the Forest Department, it could not focus intensively on specific initiatives undertaken by the Department.

Background

Forests and wildlife are the environmental capital of any state; maintenance and preservation of which are paramount for a healthy eco system. Sound silviculture and forest management play an important role in maintaining and restoring wildlife habitat. The state of Madhya Pradesh is endowed with rich and diverse forest resources, which cover 31 percent of the state's geographical area. With 9 National Parks and 25 sanctuaries, Madhya Pradesh shelters an unparallel panorama of wild life. As the management prescriptions of National Parks and Sanctuaries are distinct and are mainly conservation and protection oriented, the Department has the challenge of devising all inclusive public wild life interface and conflict resolution policies.

Rural tribal communities rely heavily on forest for their livelihood and thereby pose a major challenge of sensitive and proficient public dealing in front of the department.

In order to maintain this large magnitude and extent of forest and wild life, the Madhya Pradesh Forest Department has taken diverse measures in collaboration with multiple stakeholders and with the assistance of approximate 30 thousand employees. This Department has been generating 300 lakh man days of employment every year and in 2005-06 the Forest Department earned INR 491.97 crore for the state exchequer.

Despite its substantially impressive performance, the Forest Department faced certain challenges in reaching out to the remotest terrain and in maintaining transparency and efficiency at various activities. Inadequate and obsolete information and communication infrastructure was a challenge in collecting and managing real time data for monitoring and decision making. As a result it was increasingly becoming difficult to address disasters such as forest fire and to take action against poaching.

In order to bring in the much needed change in this scenario, the Department of Forest decided to introduce a range of Information Communication Technology (ICT) initiatives. The efficient use of ICT was expected to systematize planning, implementation and monitoring of forestry and other related operations through systemic collection of data and use of Management Information System (MIS) and Geo-spatial data in an integrated manner via computer based communication network. The rationale behind introducing comprehensive technological interventions in all its core activities is to make forestry related information readily accessible at the public domain and to make the administration efficient, transparent and accountable.

Objective

The basic objective of introducing state-of-the-art ICT initiatives in the Forest Department of Madhya Pradesh was to monitor all its key activities in real time, both spatial and temporal, and to disseminate information to all stakeholders in an easy and visualized manner for facilitating social audit. In March 2007, the Department decided to revamp its technological infrastructure and thereby integrated multiple technologies such as GIS, GPS, remote sensing, PDAs, etc to facilitate e-governance for improved service delivery.

Programme Design

Key Stakeholders

The Forest Department of Madhya Pradesh is responsible for implementing ICT initiatives in its core function areas. The key stakeholders, who were directly involved and are benefitted by the initiatives, are listed below:

1. Forest field staff were directed impacted by introduction of new applications as those facilitated on the spot data entry, ease in reporting, electronically tagged follow up, increase in efficiency, reduction in work time, better access to data and improved understanding of job responsibilities. Training programmes were organised even in the remotest areas to familiarise the field staff with the use of modern technology.

2. Middle level managers were empowered with better tools for objective and informed decision making, quick access to real time data, electronically tagged follow up, quicker data updation and analysis.

3. Joint forest management committees were trained on the use of modern technologies such as the use of digital map, free access to information on web etc.

4. Policy makers were largely benefitted by easy access to in depth information for analysis.

5 Media has made use of real time data available with dynamic web content to report environment issues which has guided the department in consolidating its stand in front of the policy makers.

Process Flow

Connected architecture framework: The Forest Department of Madhya Pradesh developed a set of applications for automating forest management activities. All these applications were developed in-house without the services of consultants. All the hardware, software and system related tools selected for operations were cost effective and are simple enough to be used by the existent man power with adequate training. Special emphasis was on developing applications that are web based, work flow oriented and capable of creating temporal and spatial database with collected information at source.

The client server architecture was designed for more than 900 remote clients of the rank of Range Officers and above who are working on multiple web based applications. Emphasis was on developing a connected architecture framework for enabling single window access to information and services that were being provided by multiple departments. This was expected to create a collaborated environment within the government agencies and within the Forest Department.

Following technologies are integrated into a single frame to serve data in a visualised mode to make monitoring easy and effective for even the file level workers:

- Space technology
- Global Information Systems (GIS)
- Global Positioning Systems (GPS)
- Image processing
- Mobile computing
- Communication technology

Communication network: In order to generate accurate and real time data, decision was taken to provide GPS enabled PDAs (Personal digital assistants) to remote users which is connected to the data centre. PDA is a mobile device that functions as a personal information manager and can be connected to the internet. The GPS enabled PDs introduced by the department can host applications, take pictures and videos, assists in navigation, can capture geo-spatial and real time data and useful for tracking staff and work locations.

In order to ensure internet connectivity of these PDAs, decision was taken to use existing services of an Internet Service Provider (ISP) to make it cost effective. However, it was very difficult to choose an ISP with communication network extending in the forests. A survey was

conducted that showed that only BSNL provides connectivity in almost 60 percent of MP villages located in forest areas and are continuously expanding its outreach to cover the entire state. This prompted the Department to establish its communication network using BSNL's services at a concession rate. Canopy technology of Motorola, which is a wireless networking system designed for wireless internet service providers, was selected to provide connectivity in the remotest locations.

Apart from establishing communication network for remote users, there was an urgency of establishing a network among offices of different levels located at district head quarters. The Forest Department used the non-exchange lines, also known as the dead copper lines, of BSNL for the purpose. The block level offices are networked with the headquarters through a hybrid VPN involving last mile connectivity using wireless broadband of 8mbps. NIC also provided the basic internet and nicnet facilities free of cost resulting in establishment of an extremely affordable communication network for operations.

Spatial database: Maps of the forest areas are digitised, geo-referenced and integrated into the geo-spatial database of the MP Forest department. This database is hosted on the centralised GIS server. The Department has also developed a geo-spatial query system that makes all the data available and easily accessible for effective and informed planning, decision making and management of forest and bio diversity resources.

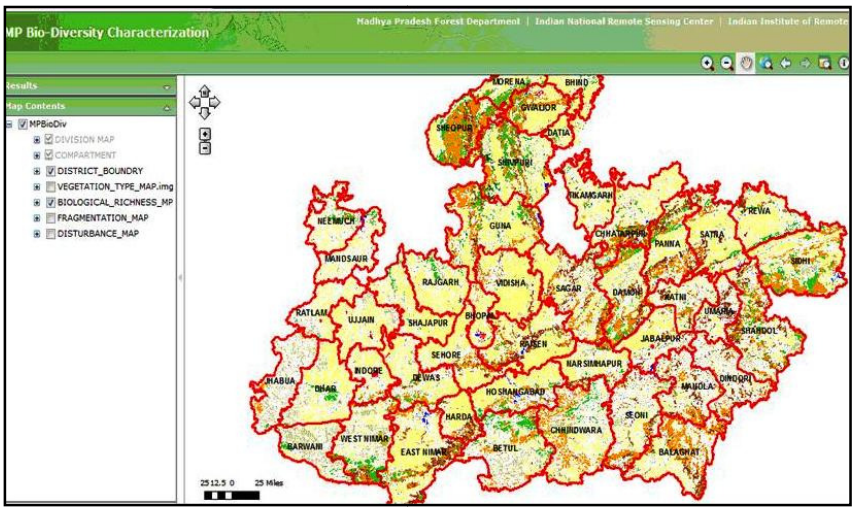

Figure 1: Spatial database of MP forests

Applications: On the basis of these technological components numbers of applications were developed by the IT team of the Department that include:

Applications	Objective	Technology	Result
Fire Alert Messaging System	▪ Create spatial and temporal database of the location ▪ Instant messaging of fires to front line field officers ▪ Identification and delineation of fire prone forest areas	GIS and MIS	Processed remote sensing data of active fire locations are used and alerts are sent to concerned field staff via SMS and email. The field officers can locate fire locations on google map. After action taken, the field officers give online feedback about the fire location, action taken, and detail of loss, if any.
Forest Offence Management System	▪ Protect and conserve highly endangered species of flora and fauna ▪ Prevent poaching and illicit trade in wildlife and wildlife parts and articles	GIS and MIS	Creates digital database of offenders and the details of crimes committed, through registration of offences on GPS enabled PDAs and then transferring data to main server through GPRS.
Forest Dwellers Survey System	▪ Survey forest dwellers land holding area ▪ Estimate land areas ▪ prepare digital map of the areas	GPS enabled PDA	Updates forest land records by capturing details with geo locations of forest dwellers' land holdings. It helps in analysing the patterns of these holdings for planning and management.
Forest Financial Management System	▪ Real time visualisation of work and finances by using High resolution satellite Imaginaries for change detection	MIS, BI, Satellite Imagery, Remote sensing	Indicates online position of budget receipt, allocation, expenditure, revenue, and physical progress of work. Web GIS enabled visualisation of work promotes social audit and facilitates strict compilation of financial rules
Wildlife Management System	▪ Monitoring of habitat status, population variance ▪ Alert for untraced key species ▪ Monitoring of patrol camp	GIS, MIS, GPS enabled PDA (Mobile, desktop and web)	Captures wild life direct sighting or indirect evidences. Then electronically generates date and time of the sight. It also records the tracking path of patrolling parties. These data are useful for effective wildlife habitat management.
Forest Planning and Geo-mapping System	▪ Real time monitoring of vegetation, plantation, water bodies, mines, and land based works	MIS, GIS, remote sensing, GPS enabled PDAs	Monitors forest resource inventory and maintains regular updates using satellite imageries to facilitate forest management planning with high degree of accuracy

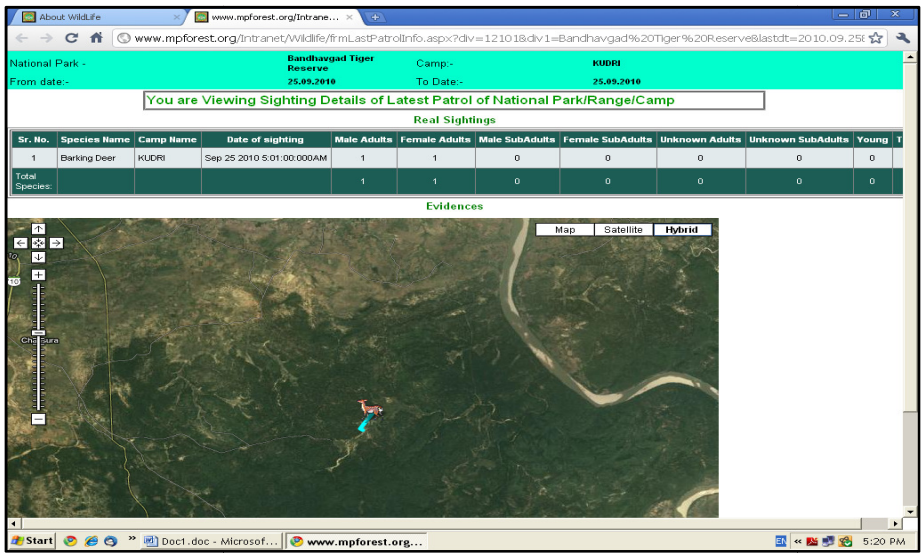

Figure 2: Sighting details of patrol of national parks under wildlife management system

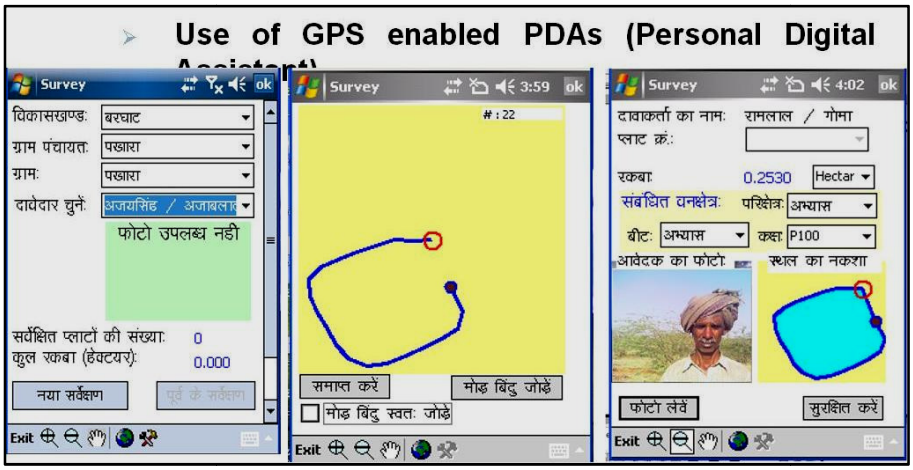

Figure 3: Use of GPS enabled PDAs for conducting surveys of forest dwellers

Monitoring: In order to enable real time monitoring of the functions of the department a command room is set up with facilities for surveillance of key works and activities of the frontline staff engaged in important duties. The command room monitors all the land based activities and publishes important detections on dashboards for all stakeholders.

Capacity building: A comprehensive capacity building strategy was designed by the Department that would involve more than 27 thousand employees. The purpose of this exercises were to train the manpower on ICT applications and to make them familiar with the

automated work environment. Multiple training programmes are continuously being organised for in house capacity building of frontline staff, computer personnel, supervisory and technical staff. A host of training facilities are created by the Department to make capacity building a critical and continuous part of the Department's work culture.

- An IT lab equipped with state of art technology was established at the Head Quarters for training of IT personnel and master trainers who act as mentors for staff. The lab can accommodate 30 trainees.

- 16 regional training centres are set up for monitoring and supervisory staff. These centres are connected to the Head Quarters from where training is imparted through video conferencing. 480 officers can be trained in a single bath through the system of video conferencing.

- 54 satellite interactive terminals are established at divisional level using the EDUSAT facility of ISRO. For the purpose of ensuring uniformity and utilization of best resources training in these centers are also centralized from the Head Quarters. Front line executives and ministerial staff receive training in these centres. The EDUSAT facility allows accommodating 5000 staff in one batch of training.

Financial Resources

The financial strategy of the Forest Department was to leverage monetary assistant from the existing state and central schemes and not to apply for a separate fund for adopting e-governance in its all functions. All the applications were designed, developed and maintained by in-house capacity, making optimum utilisation of existing infrastructure and resources. The business process reengineering and automation have vastly helped in saving crucial time and resources of the department. Free resources of various national and international agencies were utilised for implementation of the project, such as

- Free data sharing with NRSC and University of Maryland
- Free services of google map
- Free internet and intranet network of NIC
- Free SMS service of BSNL

Technology components	Cost (in INR lakh)
Hardware (Server, desktops, PDAs, data storage, hardware firewall)	500
Software	125
Digitisation of forest map	100
Services (connectivity, remote sensing data, digital maps)	50
EDUSAT and SIT equipments	200
Video conferencing equipments	100
Salary to contractual staff	50
Infrastructure	50

Table 1: Cost analysis of the project

The Forest Department of Madhya Pradesh earns approximately INR 50 lakh revenue from its services provided to other government and private organisations. The services include consultancy, web application hosting, digital forest mapping, training, transfer of technology and other services. This has substantially contributed towards the project's financial sustainability.

Impact

The Forest Department of Madhya Pradesh is the first among the country to undertake variety of ICT initiatives for automating all its processes. Ranges of applications developed, based on state-of-the-art and cost effective technologies, have revolutionised work culture and service delivery of the Department.

Democratisation of information for suitable decision making

With the project intervention collection, dissemination and maintenance of data became easy, effective and accessible. The state level central data repository presented information in real time and in a visualised mode, which makes it appealing and easy to understand even by a common citizen. This has opened up space for accurate interpretation of data and further aided the process of decision making. Democratisation of information has augmented social audit of work undertaken by the department.

Enhanced transparency and accountability

The project emphasised on making the Department's core processes online that resulted in enhancing transparency at work. As the applications enable capturing and feeding of data at

source, accountability increased among the officials. Satellite based monitoring of work made it extremely easy to monitor quality and quantity of performance, leading to improvement in service delivery.

Improved work culture

The applications developed made work easier for the human resources, especially for the frontline departmental staff who work in remote forest areas with limited facilities. The use of GPS enabled PDAs to capture, assemble and share data has reduced the burden of multiple entry and has reduced the chances of information loss. This has resulted in increasing efficiency and reducing extra work hours. With increased interactions among al the levels of employees channels of communication improved and paved way for an equitable and healthy wok environment.

The project has also initiated a culture of inter departmental convergence of resources for a participatory, interactive, responsive and service oriented governance.

People centric and unprecedented standard of service delivery

All the new applications developed have reduced time taken and improved quality of service delivery. For example, with the introduction of Fire Alert Messaging System response time to control fire reduced remarkably. Effective monitoring has also increased sensitivity to the forest fires. User friendly technology has also enhanced the experiences of the users in obtaining services. The end users now have capacity to request for provisioning and have virtual machines provisioning in an automated manner.

Protection of forest and wildlife

With the introduction of Fire Alert Messaging System and Wildlife Management System, all incidences of fire and poaching are recorded and reported, which propels necessary immediate action. As the field units and staff are properly networked effective use of resources are ensured. There has been considerable decrease in the response time to address fire. The average burnt area per active fire has also reduced from 50 hectares to just 4 hectares. The newly developed applications made it mandatory for staff to report every case of poaching which made poaching detection for subsequent action easier.

Environment friendly measures

Madhya Pradesh Forest Department is using solar energy to run its computers and communication network. An innovative IT tool was designed and developed by the Department to live monitor the status of solar systems in its remote areas. Ministry of New and Renewable Energy (MNRE) provided subsidy to the Department for initiating this endeavour and adopted the solar system monitoring tool in its fresh guidelines.

Awards and accolades:

- Madhya Pradesh Forest Department has been honored with the International Green Globe Foundation Award 2012 for outstanding achievement in environment sector.
- The Forest Dwellers Survey System application of the Madhya Pradesh Forest Department won Prime Minister Award of Excellence in Administration, 2010 and the National e-Governance Award (Gold) in the same year.
- Integrated Works and Financial Management System won the Map-IT Award given by the Government of Madhya Pradesh, 2010.
- m-Mantra for Forest and Wild Life Management System was honored with the Indian Innovation Award Gold Trophy and the m-Billionth South Asia Award in 2010.

Knowledge sharing

With all its innovative applications and cost effective in-house technological developments, the Forest Department has emerged as a leader in developing and implementing ICT applications. The Department has been successful in disseminating its learning and expertise among other government departments and private organisation. The services have also helped the department in earning substantial amount of revenue per annum. Approximately INR 50 lakh is generated per annum through consultancy, web application hosting, digital forest mapping, training, transfer of technology and other services.

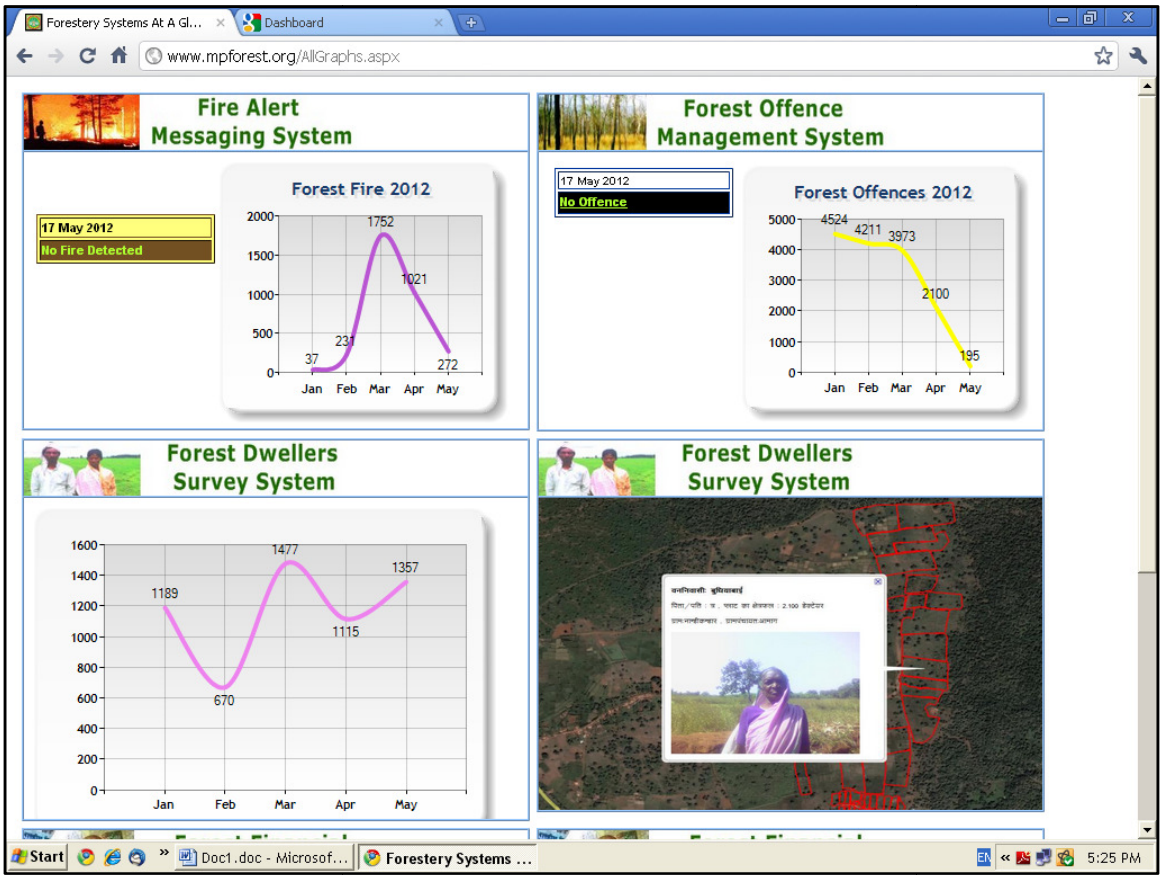

Figure 4: Dashboard showing update on various applications

Challenges in Implementation

As the project envisaged utilising existing financial resources and the expertise of its own human resources for designing various ICT components, the Madhya Pradesh Forest Department didn't face many challenges in its endeavour. The only challenge it had to deal with was the initial apprehension and resistance from the stakeholders. As the Department was planning to ICT enable all its core systems, the staff had to undergo a radical change in their method and environment of work. This inevitably resulted in certain resistance as people were to move out of their comfort zones. But with adequate training programmes the capacity of the staff in ICT applications were enhanced and subsequently the benefits of an automated work process completely diminished their initial resistance.

Apart from the Department staff, resistance was also noticed from out side the Department, especially from the State Finance Department and the General Administration Department, which was mainly out of monetary concern. Systematic approach and clear cut vision of the endeavour were instrumental in overcoming such resistance and translating it into cooperation.

Conclusion

Successful implementation of ICT projects in the Madhya Pradesh Forest Department has encouraged other government departments across the country to take up similar initiatives to enable e-governance and thereby revolutionise their service delivery. Many central government departments of various Ministries like the Ministry of External Affairs, Ministry of Rural Development, Ministry of Natural and Renewable Energy has expressed interest in adopting similar initiatives and took the Madhya Pradesh Forest Department's assistance in developing suitable applications. Tribal Welfare Department, Mining Department, Rural livelihood Mission, Madhya Pradesh State Road Transport Corporation, and Rajiv Gandhi Watershed Mission had also been assisted by the Forest Department in leveraging state-of-the-art technology for improved administration.

The Department has also established collaborations with states like Andhra Pradesh, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Maharastra, Nagaland, and Uttar Pradesh and are providing assistance to develop their own system.

Various awards and accolades have publicised the success stories of the Forest Department that had inspired range of public and private institutes, such as Indira Gandhi National Forest Academy (IGNFA), Indian Institute of Forest Management (IIFM), The Energy and Resources Institute (TERI), WIPRO and INFOSYS, to invite the Department to share their lessons learnt.

Research was carried out by OneWorld Foundation India (OWFI), Governance Knowledge Centre (GKC) team.
Documentation was created by Research Analysts ***Ajupi Baruah***
For further information, please contact Rajiv Tikoo, Director, OWFI, at owsa@oneworld.net

References

Innovative Solutions and Better Infrastructure Resolve Age Old Problems, Improve Conservation Efforts. Microsoft Customer Solution Case Study. Web on 10 May, <http://www.microsoft.com/casestudies/Windows-Server-2008/Madhya-Pradesh-Forest-Department/Innovative-Solutions-and-Better-Infrastructure-Resolve-Age-Old-Problems-Improve-Conservation-Efforts/4000009934/>.

m-Mantra for Good Governance. Madhya Pradesh Forest Department.

Oberoi, Anil. ICT Initiatives in Madhya Pradesh Forest Department. School of Good Governance and Policy Analysis.

Oberoi, Anil. Additional Principal chief Conservator of Forests. Forest Department, Government of Madhya Pradesh. Personal interview. 11 May 2012.

Siddiqui, Khurshid. EDUSAT Manager. Forest Department, Government of Madhya Pradesh. Personal interview. 11 May 2012.

Appendix A – Interview Questionnaire

Background

1. What was the motivation behind using ICT applications for management of forests and wildlife under the Madhya Pradesh Forest Department?

2. When was the project launched? What is the current status of the project?

3. According to our research, the main objective of the ICT application in the department is to systematically organize planning, implementation and monitoring of forestry and other related operations. What were the major areas in which ICT application was designed to bring in changes?

Implementation strategy

Stakeholders

4. The ICT applications of the Forest Departments are developed by NIC. Apart from NIC and the MP Forest Department, are there other stakeholders involved in the ICT initiatives? If yes, who are they and what are their roles and responsibilities?

Working Design

5. According to our research, in order to execute ICT initiatives, four major work groups were identified – (a) development of applications, (b) creation of a data centre, (c) development of a computer based communication network, and (d) sharpening the ICT skills of the manpower. What was the approach in developing suitable applications for the project?
6. Our research indicates that various technologies are integrated for development of the applications, such as GIS, space technology, mobile computing, communications technology, satellite based education and training (EDUSAT), and centralised server based processing. What are the individual functions of these technologies? How do they work in tandem with each other?
7. How does the centralised data base for integration information of forest, wildlife and human resources work?

   i. Is this database free for use by citizens or only meant for the officials?

Training

8. Our research indicates that various training programmes were organised by the department for sharpening the ICT skills of the personnel involved. Can you elaborate on the nature of the training programmes?

Financial costs

9. How is the project funded?

10. According to our research, the Forest Department has developed its applications in-house and has extensively used the existing free resources, such as free data sharing with NRSC and University of Maryland, free network of NIC for internet and intranet, free SMS by BSNL, Google Maps etc. What has been the overall cost of development of the project?

11. The department also generates revenues by providing services such as web application hosting, training, transfer of technology to other departments.. Please provide details of the revenue generation aspect of the model?

Impact

12. What have been the major achievements of the project?

13. Has service delivery become more efficient with the wide spread use of ICT? If yes, what are the indicators?

14. What have been/are the challenges faced in the planning, implementation and monitoring of the project? What are the strategies for overcoming them?

15. Have such ICT initiatives of MP Forest Department been replicated in other departments of MP or in other parts of India?

16. Are there plans for introducing newer applications for scaling up the project? If yes, please share the enhancements planned.