Case Study

Flood Monitoring System

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Governance Knowledge Centre

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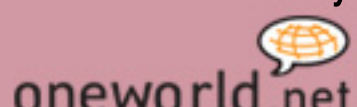
Researched and Documented by



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EXECUTIVE SUMMARY

Situated in the Godavari drainage basin, in Maharastra, Gadchiroli has abundant natural resources and experience good rainfall. The rivers and rain are source of irrigation here, and many villages are on the bank of the rivers passing through the district. Due to heavy monsoon, these rivers often get flooded between July-September and cause damage to people and property. In order to respond to this recurring problem, the district administration designed a technology-based disaster management programme that combines eFlood Alerts with blood donor information system.

The innovation integrates several ICT components to provide a comprehensive solution. The disaster management system includes a 24*7 Control Room to coordinate all efforts, an eFlood Alert System that uses a sensor to detect water level and send an automatic update to important government and non-governmental functionaries; a water level monitoring system in observation wells to check the ground water level and a blood donor information system that links donors to the recipients.

Introduction of the disaster management plan has streamlined the information flow during crisis, and also eased rescue operation. The government departments receive alert prior to river reaching danger levels or floods occurring. This helps them in planning evacuation and rehabilitation strategies in advanced. Overall, the programme has proved to be useful as it responds to the needs of the government and citizens, and mitigates the risk of recurring disaster.

METHODOLOGY

The Governance Knowledge Centre (GKC) research team conducts extensive research to identify initiatives that contribute towards the betterment of public service delivery in India. The Disaster Management Cell in Gadchiroli, with its focus on improving implementation of ICT based disaster response mechanism was considered to be a unique and important initiative. Gadchiroli model streamlines the rescue and relief operation in case of floods.

With this in mind, the GKC team conducted thorough secondary research using web sources to understand the implementation model of Disaster Management Cell. The publications reviewed include Gadchiroli District Administation's case study on Disaster Management Cell in Government of India publication *Cause for Applause- Award Winning Case Studies.* In addition,

I-District documentation published by Atul Patne, then District Collector, Gadchiroli was referred.

BACKGROUND

Gadchiroli district in Maharashtra, bordering Andhra Pradesh and Chattisgarh, lags behind in terms of socio-economic development but is home to abundant natural resources. Situated in the Godavari drainage basin, the Gadchiroli has ten important rivers passing through its geography: Godavari, Wainganga, Pranhit, Indravati, Gadvi, Sati, Khobragadi, Kathani, Parlakota and Palamgoutam. The farmers are dependent on these rivers for irrigation, however, due to heavy monsoon, these rivers often get flooded between July-September. The floods cause damage not only to property but also to people residing on the banks of these rivers. While the government has made much effort in effective disaster response, it has been challenging to rehabilitate people to safer areas every year.

Furthermore, Gadchiroli also experiences man-made disasters due to prevalence of Naxalism in the area. For example, in the year 2011, there were many instances of killings, torching and land mine blasts. In addition to a dozen cases of arson and two landmine blasts, 30 civilian deaths were reported. There were cases of torching gram panchayats and police stations on several occasions. While the administration addressed these issues, in cases of such incidents, there was shortage of blood as there was no blood bank in the district.

To improve the disaster management response to these man-made and natural disasters, the District Administration designed Information and Communication Technologies based innovation known as e-Disaster Management System/Cell. The programme is a comprehensive solution to disasters that are often experienced in the region, in addition to resolving unexpected occurrences.

The innovation has several ICT components merged together to provide all-inclusive plan in case of disaster. It includes:

- eFlood Alert System
- SMS based water level monitoring in the observation wells
- SMS based Blood Donor information and registration system
- eNews

OBJECTIVE

The objective of the project is to build innovative solutions to mitigate the impact of recurring floods in the region by establishing a pre-warning system. In addition, include solutions to address other man-made crisis situations as well.

- To address the threat of flood disaster in Gadchiroli
- To reduce the vulnerability with respect to all types of hazards, natural and manmade
- To integrate IT based initiatives with the district's disaster management system

PROGRAMME DESIGN

As mentioned, the programme design offers a comprehensive, need-based solution to disaster management in the region, and is implemented by the local administration

KEY STAKEHOLDERS

Gadchiroli District Collectorate – The programme was conceived, designed and implemented by the District Collector's office. The Control Room for Disaster Management Cell is at the Collector's Office.

Citizens – The programme benefits the residents of Gadchiroli village in terms of providing necessary care and support in case of disaster.

WORK FLOW

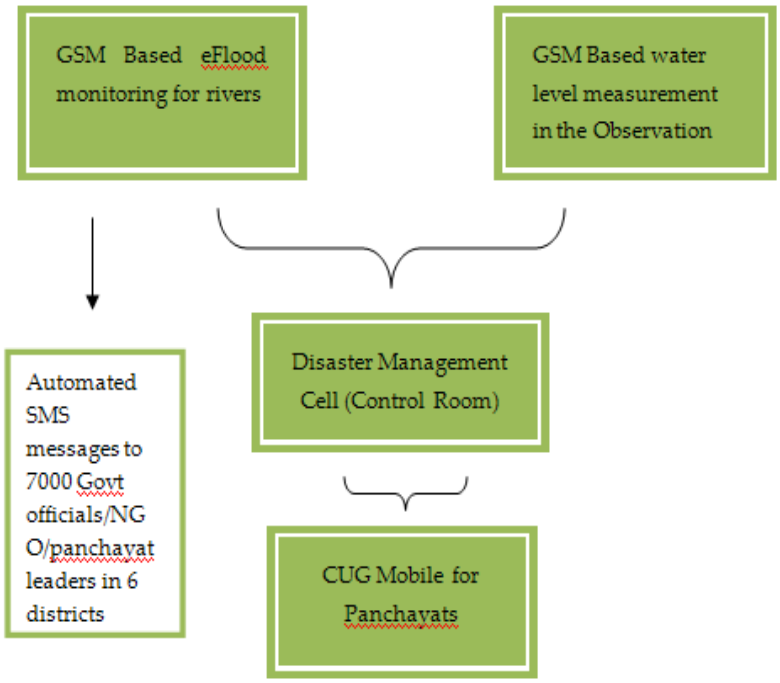

FIGURE 1: DISASTER MANAGEMENT PLAN

Control Room

At the centre of disaster management plan is the Control Room, situated at District Headquarters, that administers all the components of the programme, irrespective of the disaster situation. Also known as Emergency Operations Centre, the control room operates 24/7 to:

- collect and disseminate information on natural calamity,
- maintain records of standard operating procedure,
- store contact details of State level authories
- coordinate with local government at affected villages,
- interact with State-level authorities in connection to relief,

GSM-Based eFlood Monitoring System

A survey conducted by District Management Cell revealed that there are 13 areas that are chronically flood affected, thus most vulnerable. For these areas, a customised flood monitoring system was developed through use of various electronic equipments synchronised through mobile technology.

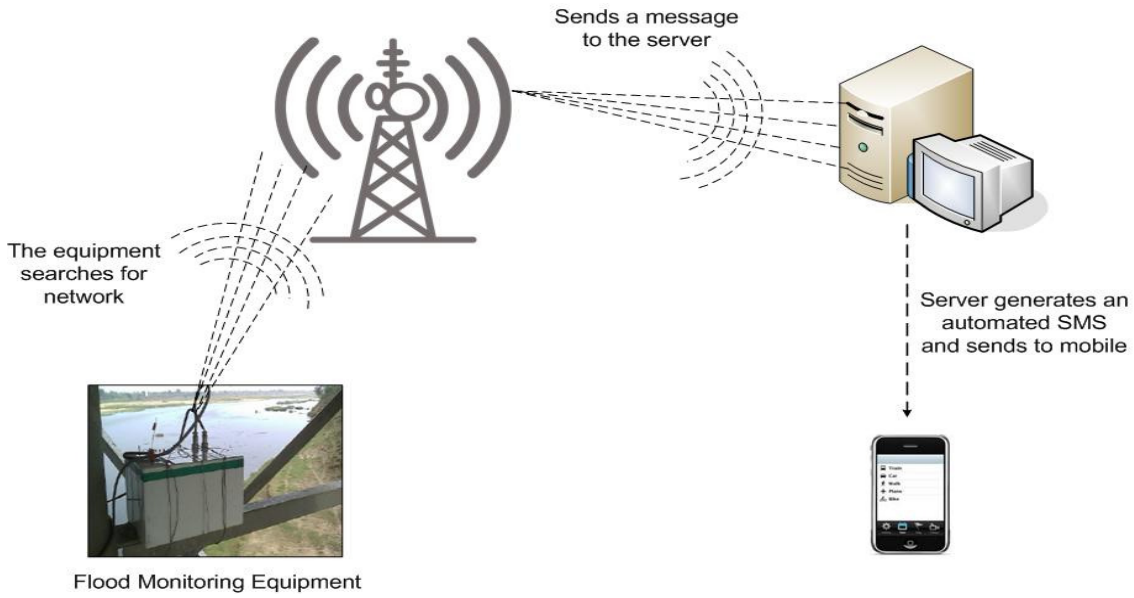

FIGURE 2: E-FLOOD MONITORING SYSTEM

The flood monitoring system includes:

- GSM flood monitoring equipment with solar panel to check the level of water. This equipment is installed on a high-point on the river bank such as a bridge or on the top of well besides the river. The height of the equipment varies depending on the water level that is expected during normal and abnormal periods, and based on this alert levels are decided. For instance, if the high-point for the river is considered to be 10 meters, then following levels will be set:
    - Up to 2.0 m – Normal
    - Between 2.0 – 5.0 m– Above normal level
    - between 5.0 – 7.0 m– Danger level
    - More than 7.0 m – Flood alert

Sensors are installed at each level, and when the water level touches the sensor, automatic updates are sent to the flood server.

- Flood servers are installed for collecting data on current water level through GSM module. Upon receiving the automated signal from the flood equipment, the server generates and sends out an SMS to the stored mobile numbers. The SMS are sent in English, and are short messages indicating the water level. For example, in case the water level is normal, then it will be "River flow of water is normal level". In case, there are changes to the level, then the SMS message is repeated. Even in the case of water level going down.

  To facilitate information dissemination, the mobile numbers of all the important officers in disaster management is stored on the server. In total, 7000 numbers are stored, and the list includes district administration officers, police officers, gram sevak, talathi, even the NGOs.

- An SMS gateway is created to generate demand based SMS. In case anyone wants to know information on specific river, they can send an SMS to 54242 with pre-assigned codes. Such as, Gad Mark for Makanda Vainganga, Gad Som for Somnur Godavari.

- Web Portal for live updates on current water levels to disseminate information to the relevant authorities.

The flood monitoring is fully automated, and is installed in remote, Naxal affected areas as well. Basically, upon

Closed User Group (CUG) Mobile Distribution

Based on the records, it was noticed that out of 290 villages near the river banks, 42 villages are in the high flooding zone. Therefore, efforts were made to ensure adequate resources are available at the village level to send faster alerts/information regarding flood situation. Village heads such as sarpanch, talathi and gram sevak were provided with a CUG mobile phones to send and receive messages from the control room.

GSM based water level measurement system in Observation Wells through SMS

This innovation was implemented to predict drought like situation. Similar to the flood alert, sensors have been installed in the observation wells across the district. These sensors send timely alerts about the ground water level in the area. These alerts are useful when it is difficult to access the specified observation well.

SMS Blood Donor information and registration facility

An SMS based solution has been introduced to overcome the challenge of finding donors at the time of crisis. This eye and blood donation registration and information system connects the donors to the recipients through mobile technology. There are two aspects to the design:

A *Blood Donor Registration System*, that allows interested people to register themselves in the database. An SMS has to be sent to 54242 in a specified message format Gad <space>BD<space>Name of the donor<space>Blood group<space>Mobile Number. This data is then connected to the Blood Donor Information System.

A *Blood Donor Information System* that is a combination of web-based technology and mobile technology. An SMS gateway is integrated with web-based customised solution to access information of the donors registered in the database. The information is stored on the web, when a user requests for information through SMS, names of three donors are sent to the mobile. Interesting, the system is designed such that the same blood donor's information is not repeated within three, as an individual is only allowed to donate blood once in three months.

SMS Formats

SMS Format for Blood Registration

To: 54242

Message:
Gad<Space>BD<space>name of the donor<space>Blood Group<space>Mobile Number

SMS Format for Eye Registration

To: 54242

Message:

Gad<Space>ED<space>name of the donor<space>Mobile Number

SMS Format for retrieving blood donor information

To: 54242

Message: Gad<space> Blood group.

Blood groups need to be listed as:
Apositive
Bpositive
ABnegative
Opostitive

Technologies Used

Open source technologies were used for to develop all the applications for the programme. These include

- PHP open source platfor
- MySQL database
- Crystal Report 08 for reports

ACHIEVEMENTS

The implementation of the programme has **streamlined the disaster information flow** for the entire district. The automated SMS informs all the important departments/officials about the flood situation and the control room helps in coordinating the efforts. Prior to the programme, the response time was high because of the linear information flow (top-down), however, now, everyone gets the message at the same time which makes taking action faster.

There is a faster response in disaster situation as all officers get the information at the right time. While the evacuation is easier as the village level leaders have receive updates through CUG phones, the blood donor information system and the ambulance ensures smooth accomplishment. In September 2010, Gadchiroli experienced floods and heavy rainfall because of which the communication and transport services were hampered. However, the SMS alert was sent out because of which the disaster management cell was able to respond timely to the situation, move the people to safer areas and take the necessary precautions, in case.

The implementation of the programme has been made cost effective by using open source software for developing the applications. In addition, the use of Solar Panel for charging the batteries of the flood equipment

CONCLUSION

The creation of eFlood Monitoring System is a pioneering effort by a district administration in India. The innovation benefits a population of 11 lakh in the entire district, and 290 villages on the river banks specifically. The monitoring system has ensured that the impact of the disaster is mitigated by coordination among the disaster response team from different departments, and resources. From the success of the programme in Gadchiroli, it is certain that the programme can be replicated in other districts as well. The technology utilized in this programme is available at the grassroots, and is cost-effective.

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