CHAPTER 28

Mobile Applications in Irrigation Department for Reservoir Level Monitoring

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ABSTRACT

Reservoir Status Information System (RSIS) is a web-enabled package developed by the Centre for Good Governance (CGG). Initially, reservoir levels were recorded at the reservoir locations and sent to head offices, where they were fed into the data base through the interface provided by this package. In order to minimise human involvement at every, CGG re-designed the system so as to use mobile technology. Reservoir level information can be now collected by field engineers and sent to head offices by SMS. During a crisis or other dangerous situations of flood etc. at reservoir locations, the information can be sent through SMS and by fax to the collectorate and police authorities. Relevant measures can then be initiated to evacuate people in submergent and low-lying areas.

Introduction

Andhra Pradesh has experienced varying weather patterns in the past few years. At certain times all the reservoirs are full of water, at others they are dry for years together. The need of the hour is to know when there is enough water in the reservoirs, and also the varying levels of water during peak monsoon and flood seasons. This information is an important tool in the hands of administrators, enabling them to manage both crisis, and disaster situations.

Reservoir Status Information System (RSIS) is a web-enabled package developed by the Centre for Good Governance (CGG) for use by the Irrigation & Command Area Development, Andhra Pradesh. In the normal course of business, reservoir levels are recorded at the reservoir locations and sent to head offices, where they are fed into the data base through the interface provided by this package. The hard copy of the consolidated report is faxed to various relevant offices such as the chief minister's office, irrigation minister's office and other heads of departments. Human involvement at every stage is needed despite and in spite of the presence of modern technologies. An attempt is now made by CGG to resolve and eliminate some of these issues.

Objectives

The RSIS package has been re-designed to meet the following objectives using the latest information and communication technologies.

1. Collecting the reservoir level information through short messaging service (SMS) from field engineers
2. Updating the data base at the head office to make it available through the internet
3. Sending reservoir levels information to heads of departments through SMS the moment it is received from the site engineer
4. Automatically sending reports of all reservoir levels to the chief minister, other concerned ministers' offices and to secretaries by computer-generated fax messages
5. During a crisis or other dangerous situations of flood etc. at reservoir locations, the information is sent through SMS and by fax to the collectorate and police authorities.

To achieve the objectives, the procedure that needs to be followed is

Step 1: The reservoir level information collected by the field engineer should be passed on to the designated mobile number through SMS.

Step 2: The GSM modem located at the head office with the designated mobile number should receive the SMS and the software loaded in head office system should capture it and send it to the data base installed in the same or a different system.

Step 3: Trigger technology of the data base, on receiving the SMS should update the reservoir data table

Step 4: The information on reservoir levels should reach the concerned head of departments through SMS.

Step 5: Consolidated reports of reservoir levels should be sent by fax automatically through the dedicated phone lines (land lines) connected to the system.

Maintaining timely information on these reservoir levels with the administrators is very important during the flood season. Then, once the reservoir level starts crossing the warning level, the district administrative and police authorities can be alerted through SMS and also by fax message. Relevant measures can be initiated to evacuate people in submergent and low-lying areas. SMS technology offered by mobile operators is a store-and-forward method. The advantage of this technology is that the SMS reaches the mobile phone to which it is intended, the moment the device is in the signal area. Information available with the authorities at the right time during a disaster situation is an invaluable help to citizens, because their lives and properties could be easily protected with appropriate initiatives.

Advantages

Reduced delay in transmitting information from the reservoir location to the head office and other authorities improves the efficiency of the system. The end users of the system are at highest comfort level, because the information is available in the mobile handset of the concerned from time to time. The number of touch points are reduced to only two from about four with the introduction of mobile technology. The field officer collects the information and sends it through SMS to the designated mobile number, and the package will take care of forwarding the SMS to the appropriate, as defined earlier.

Technology

Fig. 1 *A typical GSM modem* (Source:http://visiontek.co.in/products/Products.htm)

The GSM modem (Fig. 1) plays an important role in connecting mobile technology with computers. Fedora Core 4 Linux operating system is installed on the server computer, which connects to the GSM modem. Tomcat web server is used to offer web services and Postgresql RDBMS server to store the data. Security of the system is ensured from two different aspects. Linux- and Unix-based systems are known to be less virus-prone. Firewalls supplied along with the package have been installed to provide extra security. The second aspect is that the site engineer's mobile numbers are captured into the system well in advance and only the SMS coming from these mobiles is considered as correct information. A minimum of three mobile numbers are stored in the system from each reservoir site to act as standbys. Validation of data at the server end is also available in the system. Hence, reliable and secure information is fed into the system. There is no chance of an unauthorised person to give wrong information that will adversely impact the entire system. The entire package is built with JSP pages on the Tomcat web server and Postgresql RDBMS data base server on a Linux operating system in simple modules. It takes no time to install these

modules on any system anywhere across the country, provided there is a PC with at least 1GB RAM and 40 GB HDD, a GSM modem and SIM card of any GSM operator that has good signal strength around the office. The only constraint is that with the present set of modules developed, Linux operating system is must. As it is available free of cost and is also a reliable system, this should be considered a strength, and not a constraint.

Sustainability

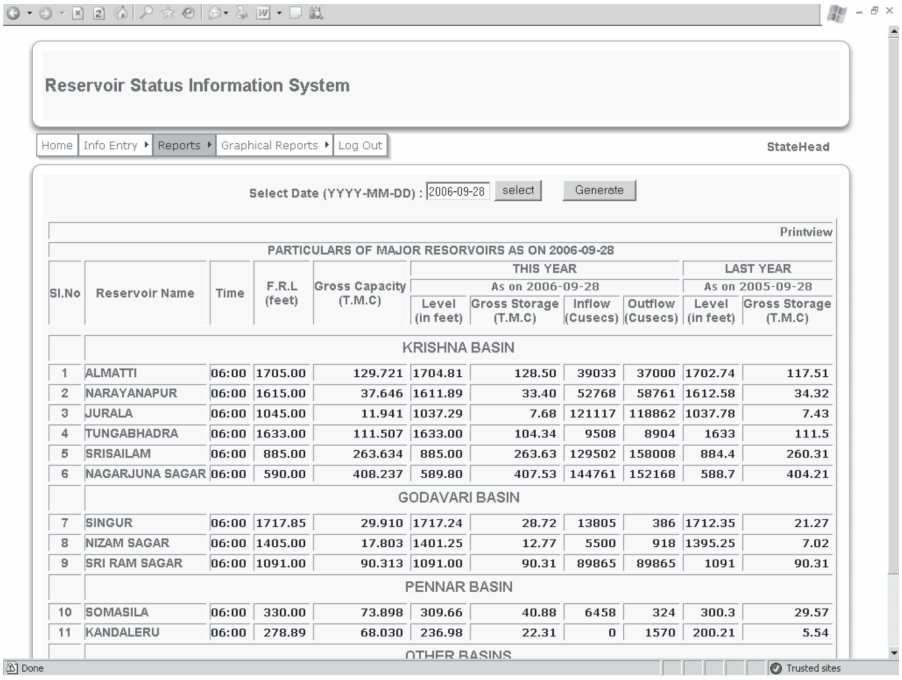
When the package come into force, only very few people need a small amount of training. These days almost everyone is aware of how to send and receive SMS with a mobile handset. What matters is that all numbers have to be fed as SMS and not as alphabets in the pre-defined order, which can be learnt by anyone in under half an hour. Sending fax messages automatically from the system does not need any training as it does not need pushing and pulling papers from fax machines. The end users who receive the SMS from the system need to be informed about the services offered. It becomes their responsibility to view all the messages coming to their mobile handsets duly excluding irrelevant messages and considering only this SMS as important.

Success of the entire package depends on the site engineers and end users being comfortable with using SMS. Anyone reluctant to use this service, of course, has the stand by of supplying and receiving information through the internet. But the internet requires a computer with an internet connection. The Government of Andhra Pradesh recently extended the cell phone facility to many field engineers above a certain rank. It is anticipated that there will be no difficulty in making everybody use the mobile device for such a needy and important work.

Cost-Effectiveness

Before introducing mobile technology, communication from reservoir locations to head offices was either through wireless stations or land lines. The cost of sending an SMS is cheaper thus adding to indirect cost reduction. As the capital cost is not heavy, no proposals are planned for cost recovery.

A few screen shots are shown here demonstrating the reports:



Reservoir Status Information System

Home | Info Entry | Reports | Graphical Reports | Log Out

StateHead

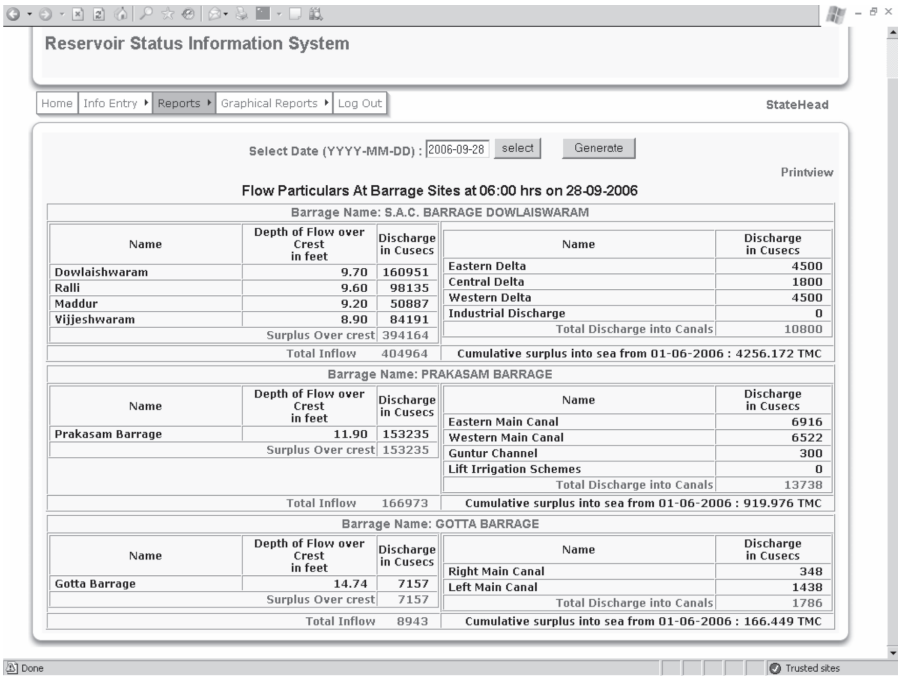
Select Date (YYYY-MM-DD) : 2006-09-28 select Generate

Printview

PARTICULARS OF MAJOR RESORVOIRS AS ON 2006-09-28

Sl.No	Reservoir Name	Time	F.R.L (feet)	Gross Capacity (T.M.C)	THIS YEAR As on 2006-09-28 Level (in feet)	Gross Storage (T.M.C)	Inflow (Cusecs)	Outflow (Cusecs)	LAST YEAR As on 2005-09-28 Level (in feet)	Gross Storage (T.M.C)
	KRISHNA BASIN									
1	ALMATTI	06:00	1705.00	129.721	1704.81	128.50	39033	37000	1702.74	117.51
2	NARAYANAPUR	06:00	1615.00	37.646	1611.89	33.40	52768	58761	1612.58	34.32
3	JURALA	06:00	1045.00	11.941	1037.29	7.68	121117	118862	1037.78	7.43
4	TUNGABHADRA	06:00	1633.00	111.507	1633.00	104.34	9508	8904	1633	111.5
5	SRISAILAM	06:00	885.00	263.634	885.00	263.63	129502	158008	884.4	260.31
6	NAGARJUNA SAGAR	06:00	590.00	408.237	589.80	407.53	144761	152168	588.7	404.21
	GODAVARI BASIN									
7	SINGUR	06:00	1717.85	29.910	1717.24	28.72	13805	386	1712.35	21.27
8	NIZAM SAGAR	06:00	1405.00	17.803	1401.25	12.77	5500	918	1395.25	7.02
9	SRI RAM SAGAR	06:00	1091.00	90.313	1091.00	90.31	89865	89865	1091	90.31
	PENNAR BASIN									
10	SOMASILA	06:00	330.00	73.898	309.66	40.88	6458	324	300.3	29.57
11	KANDALERU	06:00	278.89	68.030	236.98	22.31	0	1570	200.21	5.54
	OTHER BASINS									

Done | Trusted sites



Reservoir Status Information System

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StateHead

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Printview

Flow Particulars At Barrage Sites at 06:00 hrs on 28-09-2006

Barrage Name: S.A.C. BARRAGE DOWLAISWARAM

Name	Depth of Flow over Crest in feet	Discharge in Cusecs
Dowlaishwaram	9.70	160951
Ralli	9.60	98135
Maddur	9.20	50887
Vijjeshwaram	8.90	84191
Surplus Over crest		394164
Total Inflow		404964

Name	Discharge in Cusecs
Eastern Delta	4500
Central Delta	1800
Western Delta	4500
Industrial Discharge	0
Total Discharge into Canals	10800

Cumulative surplus into sea from 01-06-2006 : 4256.172 TMC

Barrage Name: PRAKASAM BARRAGE

Name	Depth of Flow over Crest in feet	Discharge in Cusecs
Prakasam Barrage	11.90	153235
Surplus Over crest		153235
Total Inflow		166973

Name	Discharge in Cusecs
Eastern Main Canal	6916
Western Main Canal	6522
Guntur Channel	300
Lift Irrigation Schemes	0
Total Discharge into Canals	13738

Cumulative surplus into sea from 01-06-2006 : 919.976 TMC

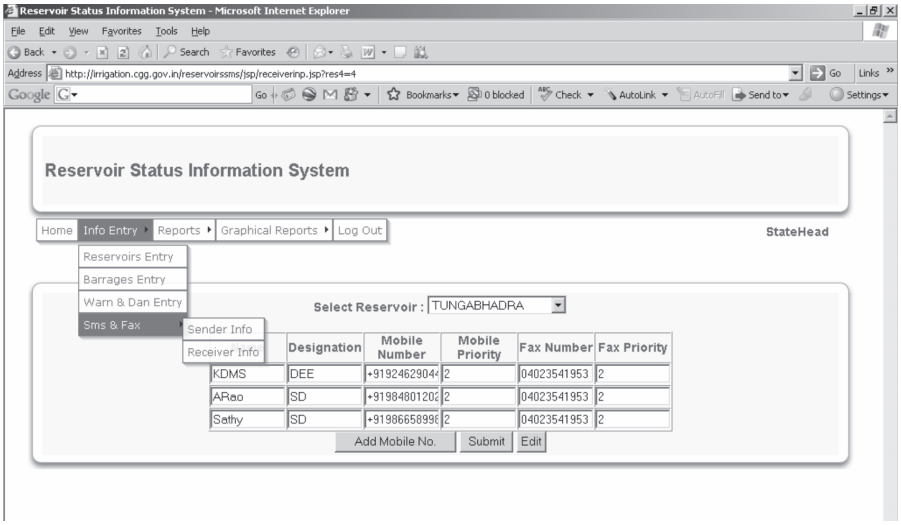
Barrage Name: GOTTA BARRAGE

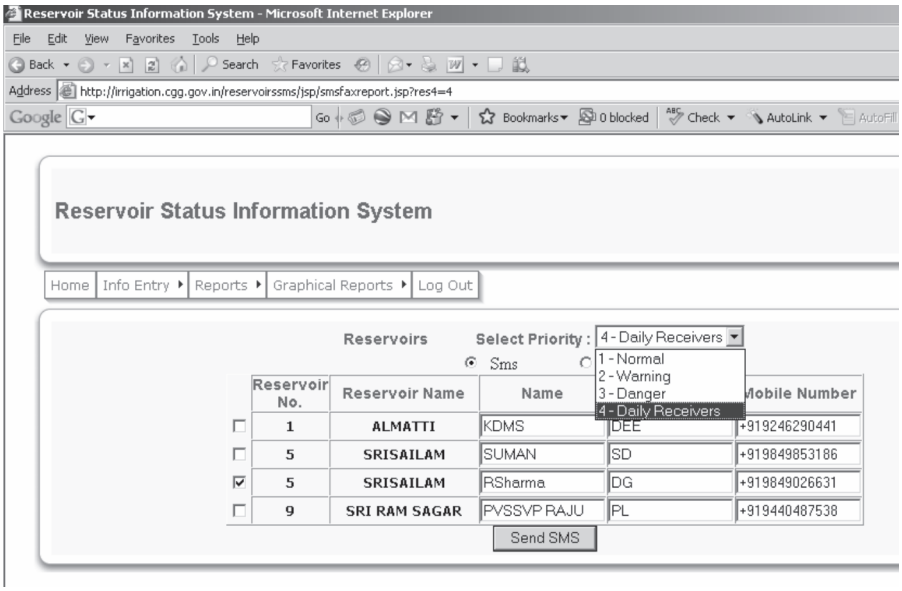
Name	Depth of Flow over Crest in feet	Discharge in Cusecs
Gotta Barrage	14.74	7157
Surplus Over crest		7157
Total Inflow		8943

Name	Discharge in Cusecs
Right Main Canal	348
Left Main Canal	1438
Total Discharge into Canals	1786

Cumulative surplus into sea from 01-06-2006 : 166.449 TMC

Done | Trusted sites





Conclusion

The package developed for reservoir level monitoring is now offering services to only major dams and barrages. It can be extended to medium projects also. The gauge reading at many locations of the canal can also be tracked using this system for operation and maintenance of canals. Mobile technology is an important communication tool and can be exploited effectively for such purposes.