Case Study

# Off-Site Real Time Sanitation Monitoring

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# Executive Summary

The Off-Site Real-Time Monitoring (OSRT) system is a unique and simple mobile-based initiative designed by Blue Frog Mobile Technologies Private Limited and initiated by Greater Hyderabad Municipal Corporation in 2010. OSRT system uses a combination of Global Positioning System (GPS) and General Packet Radio Services (GPRS) technologies through cell phones for managing civic amenities in five zones, 18 circles and 50 wards of Hyderabad city in Andhra Pradesh in a transparent and efficient manner.

Prior to the implementation, citizens had to call or visit Municipal Corporation's offices to register their grievances. Now with OSRT, citizens have easy access to civic authorities to register and resolve complaints. The GPRS technology allows cell phones to capture real-time images of public officials at work or work sites under inspection with the date and time of the picture as well as the stamp of latitude and longitude alongside the image, superimposed on a Google map layer. These images are instantly transmitted to a central server. There are several advantages to this process: a) Verification: citizens can verify every information as they have access to all information online, b) Transparency: The process has become more transparent and effective as public servants work processes are being cross checked and there is no scope of using one's own discretion to manipulate information, and c) Cost effective: Due to the use of visual images built on an open source interface like Google maps, the monitoring is highly cost effective.

This service is of great help to the citizen because they can file a complaint simply by texting a complaint to the civil servants and the concern civil officer attends the issue. Once the problem is solved, a snapshot of a resolved work is sent to the server and uploaded on the GHMC website. Apart from attending the civil duties, the system also keep tracks of the workers and their attendance which have improved from 85% to 98%. GHMC have recovered Rs. 38 lakh from contractors for various violations in the service level agreements such as irregular attendance, unattended bins, improper sweeping of roads, etc. This is a good initiative to bring down unhygienic situation in the country and should be regulated in several other parts of India.

# Methodology

The team used secondary research to gather information to document this initiative. They used online resources such as the GHMC website to understand the initiatives' objectives and newspaper articles to learn its impact to the waste management sector in Hyderabad. A pre determined questionnaire was prepared for the Manager of Blue Frog Mobile Technologies Private Limited to clear doubts on the initiative.

# Background

There was no proper mechanism to ensure clearing of city dump sites. The attendance of sanitary staff was poor and no work was being done. The vehicles that carried garbage from various households to the dump sites were outsourced and paid based on the number of trips it made. The in house vehicles were paid based on the consumption of diesel. Both these records were done manually and as a result there was no transparency in practice resulting in loss of money. To end this practice, Global Positioning System (GPS) technology based monitoring was adopted in 2006 to track the movement of vehicles and in 2008, Radio Frequency Based Identification (RFID) was integrated into the process to track vehicles entering/exiting the dump site. Finally in 2010, Blue Frog, a mobile applications development company won the opportunity to design OSRT monitoring system through open bidding process to achieve five main objectives:

a) Ensure cleanliness of city including remote areas
b) Leverage IT for civic services
c) To develop accountability mechanism
d) Ensure effective monitoring and planning
e) Empower citizens

GHMC claims to be the first corporation to use a real-time urban governance monitoring system at any level of government to attend to citizens' complaints and increase the efficiency of civic services.

| OSRT system is a set of solutions to track different activities of a Municipal Corporation. It consists of: | |
|---|---|
| **e-Bin** | The Sanitary Inspector will check for cleaned and uncleaned bins on daily inspection rounds and update reports using mobile device |
| **e-Attendance** | The Sanitary Inspection reports on work staff attendance on a daily basis |
| **e-Town Planning** | The City Planning Department conduct a monitory vigilance on the authorized and unauthorized constructions |
| **e-Works** | The work inspectors of concerned wards will monitor and record status and progress of various works in their wards |
| **e-Parks** | The Inspector visits the park and records the cleanliness and status of parks; and attendants available in park |

# Objective

- To improve the sanitary conditions and ensuring that the bins are cleared in time
- Ensuring that the time schedule is adhered for bin clearance by the pick up trucks
- Have a detailed report which will ensure proper payment and reduce false trip payments

E-Bin Update provides information on reporting the status of cleared and uncleared bin in the wards by the sanitary inspector. This provides valuable information to the department to plan proper route trips in that area based on the reports generated by the sanitary inspector to ensure proper lifting of garbage in that ward.

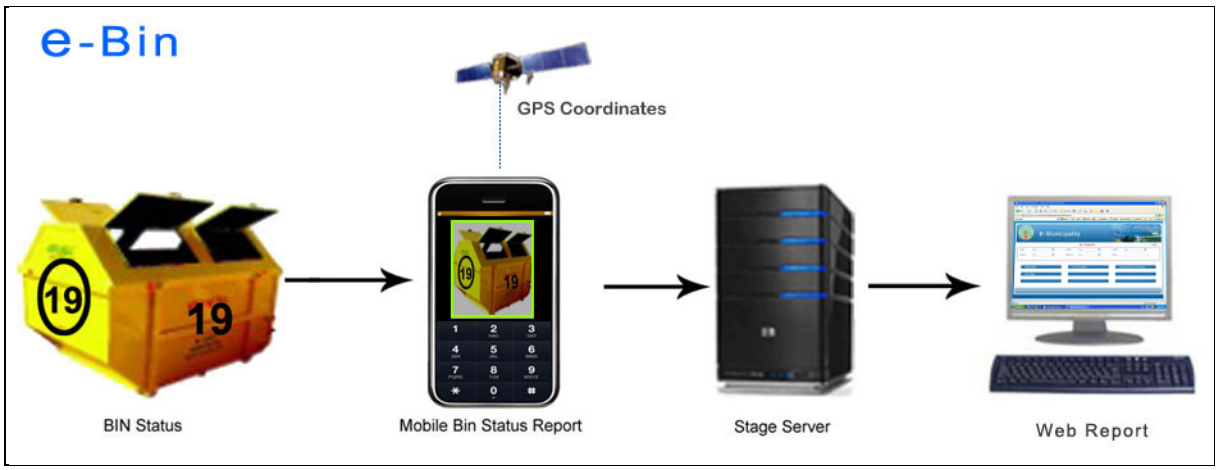



**Figure 1 Bin monitoring process in GHMC, Source: Blue frog mobile technologies pvt ltd**

# Programme Design

## Key Stakeholders

Bluefrog Mobile Technologies Private Limited was founded in 2007 and has expertise in Mobile, Wireless and N-tier Architectures; they develop programmes to benefit customers. Its vision is to enhance technology towards the requirement of Indian Mobile market with low GPRS penetration and Non User Friendly SMS services.

Greater Hyderabad Municipal Corporation (GHMC) is the urban planning agency in Hyderabad, capital city of Andhra Pradesh. It initiated OSRT monitoring system under the leadership of Commissioner, Additional Commissioner, and implementation on ground carried out by Corporation Engineers and received technical support from Blue Frogs.

## Process Flow And Technical Specifications

The OSRT monitoring system can best explained in three stages a) Inspection of dump sites b) Entering details of dump sites on mobile phone c) Uploading data on central server.

For administrative purposes, Hyderabad is divided into five zones, eighteen circles, and fifty wards. There are 4000 bins in total and 20,000 sanitary staff contractors employed to collect garbage and responsible for keeping the surroundings clean for citizens. Each ward is under the supervision of a Sanitary Inspector (SI) that is government employees and 50 such inspectors have been appointed for each ward.

The SI uses a mobile phone with pre-loaded information of the bin such as its identification number, geospatial information (latitude/ longitude), location and ward. On site inspection of dumpsites, mobile phone is turned for cross-verification. The mobile camera is turned on to match the bin location and when it's verified, the camera is opened to capture a site image. The image with all the information is uploaded on the GHMC server. Information such as bin's name, latitude and longitude details, time of image taken, clearance/ non-clearance of bins and stats of surroundings is entered and sent to the server. The table below lists the technical specifications used in the system:

| |
|---|
| Technology( Hardware, Software, Platform)-Nokia, C++, Symbian, J2EE |
| Feature List-Real time snapshots,<br>-Data compressing, decompression, image processing<br>-Integrated with GIS reporting tools |
| Hosting- Cloud computing with Wireless Transportless Security (WLTS) encryption and registered mobile phones only<br>- USERNAME AND PASSWORD FOR EACH TXN |
| Integration mechanism (with different mobile phones)- any mobile with GPRS and GPS features |
| Coverage area- 625 sq.km (GHMC area) |
| Installation procedure/technical requirements of the product/project-<br>Need only mobile phones with GPRS feature, connectivity and GPS<br>Client application can be downloaded and pushed to<br>Solution is available in public domain and can be accessed at http://www.osrt.in:8080/igms |

**Figure 1 Table 1 Source: GHMC ppt**

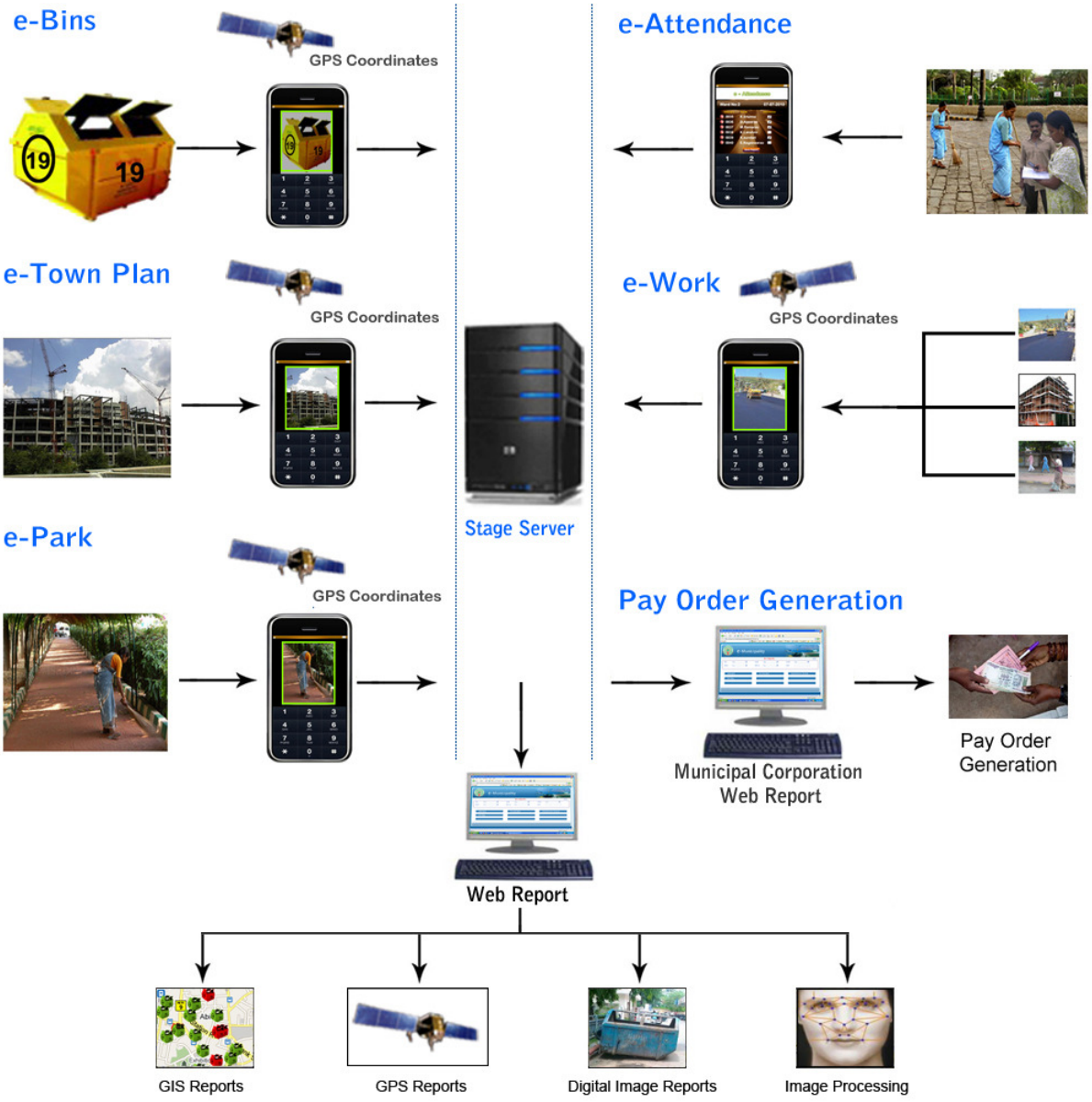
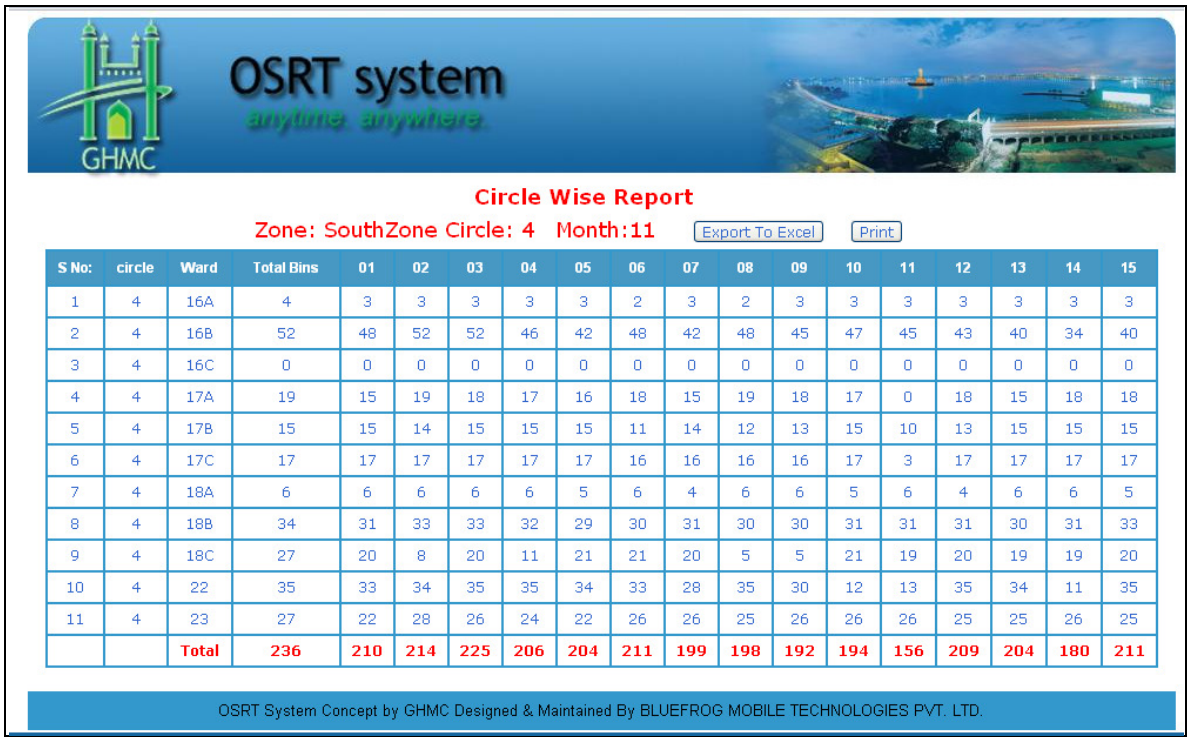



**Figure 2 OSRT monitoring processes for municipal corporation, Source: Blue frogs mobile technologies pvt ltd**




| S No: | circle | Ward | Total Bins | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4 | 16A | 4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 2 | 4 | 16B | 52 | 48 | 52 | 52 | 46 | 42 | 48 | 42 | 48 | 45 | 47 | 45 | 43 | 40 | 34 | 40 |
| 3 | 4 | 16C | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 4 | 17A | 19 | 15 | 19 | 18 | 17 | 16 | 18 | 15 | 19 | 18 | 17 | 0 | 18 | 15 | 18 | 18 |
| 5 | 4 | 17B | 15 | 15 | 14 | 15 | 15 | 15 | 11 | 14 | 12 | 13 | 15 | 10 | 13 | 15 | 15 | 15 |
| 6 | 4 | 17C | 17 | 17 | 17 | 17 | 17 | 17 | 16 | 16 | 16 | 16 | 17 | 3 | 17 | 17 | 17 | 17 |
| 7 | 4 | 18A | 6 | 6 | 6 | 6 | 6 | 5 | 6 | 4 | 6 | 6 | 5 | 6 | 4 | 6 | 6 | 5 |
| 8 | 4 | 18B | 34 | 31 | 33 | 33 | 32 | 29 | 30 | 31 | 30 | 30 | 31 | 31 | 31 | 30 | 31 | 33 |
| 9 | 4 | 18C | 27 | 20 | 8 | 20 | 11 | 21 | 21 | 20 | 5 | 5 | 21 | 19 | 20 | 19 | 19 | 20 |
| 10 | 4 | 22 | 35 | 33 | 34 | 35 | 35 | 34 | 33 | 28 | 35 | 30 | 12 | 13 | 35 | 34 | 11 | 35 |
| 11 | 4 | 23 | 27 | 22 | 28 | 26 | 24 | 22 | 26 | 26 | 25 | 26 | 26 | 26 | 25 | 25 | 26 | 25 |
| | | Total | 236 | 210 | 214 | 225 | 206 | 204 | 211 | 199 | 198 | 192 | 194 | 156 | 209 | 204 | 180 | 211 |



**Figure 3 Display of garbage collection report of 5 zones, 5 circles and 50 Wards online**

In case of any loopholes in performance, staffs are entitled to pay penalty. If sanitary staff contractors do not clear garbage bins and forget to take it to the dump yard or keep surroundings unclean, they are fined. SIs are also fined if there is absenteeism in reporting or any kind of negligence. This initiative has impacted the waste management scenario in the city and new set of changes has made the initiative successful. The GHMC estimates that dumper bin lifting for transport to transfer stations has increased from 76% to 98%, and that worker attendance has gone up from 85% to 95%.

Citizens can also make complaints and get the outcome using their cell phones. The complaint is text-messaged in by the citizen. It goes to the concerned ward officer and corporator (elected officials of the corporation). Once the fault is rectified, the status is uploaded and the report posted online. A message is sent to the complainant and the corporator. All complaints have to be attended to within 48 hours or the concerned official is fined.

The corporation has gone in for the public-private model by choosing a single vendor through a competitive bidding process, to deliver the system. Design and maintenance of the system was done by the Blue Frogs. The corporation invested Rs 48 lakh on the software package and Rs 15 lakh on cell phones; it pays Rs 2 lakh per month for GPRS connectivity. It charges a rental

on the cell phones it has given to the private garbage collector and has recovered Rs 24 lakh since the system was rolled out in August 2010. It has recovered Rs 27 lakh in fines.

OSRTS is a step towards ensuring transparency in its functioning and accountability among civic officials. Be it monitoring the status of sanitation, street lights, parks or various town planning activities such as checking for violations, building permits and other works, OSRTS generates real time reports to officials.

## Grievance Redressal Mechanism

Anyone accessing the portal can view all the bins at a glance on a geographical information system (GIS)-based interface and can check their status (cleaned, not cleaned or unattended), the accompanying image for proof. They can also report on faulty street lights and unkempt parks. Citizens can text a complaint on various civic services through SMS and the field staff concerned will attend to the problem within a day. Once the problem has been rectified, a snapshot of the completed work will be sent to the server and posted online. An acknowledgement of the complaint status will also be sent to the complainant via SMS.

The system allows several stakeholders to actively participate in the accountability process.

Apart from attending to civic duties, OSRTS is also being used to monitor the attendance of 20,000 sanitary staff contractors workers at multiple locations. It has replaced manual monitoring as its not feasible to control activities of a large area and OSRTS is the right solution because it is a real time automatic monitoring tool.

The photographs sent by the SI are matched against pre-fed images on a daily basis, and are also randomly verified by corporators. And by integrating OSRTS into the payroll and accounting software systems of GHMC, the corporation is now able to disburse wages and process payments to contractors more accurately. More importantly, credit goes to the transparency OSRTS brings, citizen complaints on the issues of sanitation and street lighting have also come down substantially after the system was introduced.

## Funding

OSRT is based on a public-private model and a single vendor was chosen through a bidding process to deliver the system. Design and maintenance of the system was done by the vendor called Bluefrog Mobile Technologies Private Limited. The corporation invested Rs 48 lakh on the software package and Rs 15 lakh on cell phones. It pays Rs 2 lakh per month for GPRS connectivity. It charges a rental on the cell phones it has given to the private garbage collector and has recovered Rs 24 lakh since the system was rolled out in August 2010. It has recovered Rs 27 lakh in fines for shortage in attendance, non-lifting of dumper bins and unswept roads.

## Impact

OSRT system, being used by the Greater Hyderabad Municipal Corporation (GHMC), has bagged the m-Billionth Award for South Asia 2011 under the m-Governance category. According to an official release by the GHMC, a Certificate was issued in recognition of the OSRT for developing and implementing the Real Time Monitoring System that offers a Unique Accountability Mechanism through mobiles.

The Department of Information Technology, the Government of India and the Digital Empowerment Foundation, and the Grand Jury of the m-Billionth award South Asia have recognized the Corporation as the winner of the award for the year 2011, under the category of m-Governance.

| *Uniqueness of the initiative* |
|---|
| • Is an accountability mechanism<br>• Built transparency in administration<br>• Provides real time information in solid waste management, urban planning, public works and street lighting to staff and citizens<br>• Provides real time images with geographical coordinates, date and time stamp<br>• Online information accessible to everyone<br>• Redresses citizens' complaints via SMS and instantly rectifies it<br>Source: GHMC PPT July 2011 |

## Enhancements

At present, staffs are manually verified and to avoid loop holes and obtain full work attendance, Blue Frog is in the process of designing Face Biometric Technology through which digital image of staff will be captured.

## Conclusion

The success of the initiative can be best summarised in the words of Dr Isher Judge Ahluwalia, renowned economist on his surprise visit to Hyderabad 2011. He commented " "Even as the wrongdoings in the telecom sector generate anger and dismay, Hyderabad's city governance initiative using mobile phones provides a breath of fresh air on what the telecom revolution can do for India. The Off-Site Real Time Monitoring (OSRT) system is a unique but simple mobile-based IT initiative which uses a combination of GPS (Global Positioning System) and GPRS (General Packet Radio Services) technologies through cell phones for managing civic amenities in the city in a transparent and efficient manner."

OSRT system has streamlined monitoring civic activities in five zones, eighteen circles and fifty wards. It has changed the overall situation of reporting sanitation updates in the city and there

is availability of authentic latest information on civic amenities which are useful in urban planning and development. OSRT has also addressed specific citizens' issues concerning sanitation, street lighting and building permits. Such an initiative should be integrated in the urban planning and development provision in all cities for optimum utilisation of civic amenities.

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*Documentation was created by Researcher,* ***Aditi Dayal***
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GHMC and Blue Frog power point presentations 2011

# Appendix A – Interview Questionnaire

**Background- Stakeholders and roles**

1. According to our research, the major stakeholders in this project are :
    a) Greater Hyderabad Municipal Corporation (GHMC)
    b) Blue Frog Mobile Technologies Pvt. Ltd,

i. What are their specific roles the project?
ii. Are there any other stakeholders? If yes, who are they? What are their roles and responsibilities?

**Evolution**

2. We understand that OSRTS project aims to regulate online monitoring of waste collection, sanitation, parks, street lighting and construction works in 50 wards, 5 zones and 18 circles in Hyderabad.
    i. Why was it conceptualised?
    ii. When did the actual implementation begin?
    iii. What are its objectives?
    iv. What are its advantages?
    v. Few challenges were faced such as
        a) Attitude of manages
        b) Non officials
        c) Governance procedures
        d) Workforce
        e) Unions
    vi. How were each challenge overcome?
    vii. What is the coverage plan in future?

**Workflow**

**3.** According to our research, OSRT monitoring system uses cell phone as a major component. GPRS technology allows cell phones to capture real-time images of public servants at work or public sites under inspection, with the date, time and location of the picture.

i. Explain the complete OSRTS process? What are its different stages?
ii. Who is responsible for inspection and reporting? Who trains them?
iii. Citizens can send a text to a concerned officer to complain regarding poor services.
iv. What is the procedure of registering a complaint?

v. How long does it take for GHMC to respond to a complaint?
vi. What happens after a complaint is registered?
vii. Is all this information tracked on the portal?
Who are supervisers, contractors and corporators? What are their respective roles?

**Technology**

**4.** OSRT system is based on GIS, GPS and GPRS technologies.
i. Who has designed the technology?
ii. What are its technical specifications?
iii. What technical products were utilised for this project?
iv. How was each technology used in the system?
v. Will there be enhancements made to the technology?

**Impact and Sustainability**

5. The goal of OSRT is to achieve
a) Citizen empowerment
b) Leverage IT for civic services
c) To develop a 360 degree accountability mechanism
d) Provide authentic information on various civic activities
e) Ensure effective monitoring and planning

i. Has it been successful in achieving all its goals? If not then, why?
ii. How has this system impacted the sanitation aspect of Hyderabad? Has it made real changes in cleaning the environment? If yes, then how?

6. How many human resources have been integrated in this project? Has there been an increase in the number since the initiative started?
**7.** How has the initiative sustained itself financially?
a. Is there a revenue generating mechanism? If not, then who is funding the project?

**Measuring success**

8. There have been several benefits of the project
a) Monitoring has become effective in aspects of town planning, street lighting, garbage management etc
b) Attendance of workforce has improved from 85% to 98%
c) Dumper bin lifting has improved from 76% to 98%
d) Contractual irregularities have stopped and Rs 73 lakhs recovered.

e) Demolished 50 unauthorised buildings
f) Filed 90 criminal cases against property owners for violating construction rules
g) Reduction in citizens' complaints
h) Generates real time reports
i) Provides information to citizens and non-officials

i. How has each of the benefit been achieved?

9. What are the innovative features of the project?

To what extent can this project impact waste management policy and be practiced in India?