पटना स्मार्ट सिटी लिमिटेड
پٹنہ اسمارٹ سیٹی لمیٹیڈ
PATNA SMART CITY LIMITED

Patna Smart City Limited

C.I.N: U93000BR2017SGC036222, e-mail- patnasmartcity.psci@gmail.com/ psci-bih@gov.in

Letter No. / पत्रांक : 1037

Date / दिनांक : 07/06/2019

Inquiry Regarding Rate of ISWMS Items/Software Application

Patna Smart City Limited intends to frame proposal including estimates for implementation of ISWMS in association with Patna Municipal Corporation for which rates of the followings are requested from interested Manufacturer/ Agencies/Dealers/Venders/Resellers who may or may not be prospective bidder for said work.

Bill of Quantity

Sl. No.	Item	Nose (A)	Unit Rate (B) In INR	Total (C=A X B)
1	RFID Tags	3,00,000		
2	RFID Reader Hand Hold	380		
3	SWM Solution	As per scope of work, refer annexure		
4	Mobile Application	As per scope of work, refer annexure		
5	User Charge Collection System	As per scope of work, refer annexure		
6	Volume Sensors	250		
7	GIS Route Map of Patna Municipal Corporation Area	As per scope of work, refer annexure		

The rate should be quoted and sent either by e-mail or to be under signing during office time in the office of Patna Smart City Limited within 15 days.

This note is may not be taken as NIQ OR NIT for award of work.

07/06/19

Chief Executive Officer
Patna Smart City Ltd.
-Cum-
Addl. Municipal Commissioner

Annexure

Scope of Work

The Solid Waste Management platform proposed includes RFID's and Volume sensors installed in garbage bins to automatically monitor the status and transmit that information ICCC. The ICCC in turn should process the data and allow the Supervisors and Operators to monitor the status real time and schedule an on-demand cleanup as recommended by MUNICIPAL CORPORATION. The platform should have event generation capabilities that notify the Supervisors and Zonal Officers and the Commissioner through Mobile App, when garbage bin is filled up. In addition, the SWM also allows better inventory maintenance and reduces wastage of trips of the vehicles. The garbage sensor devices should be mounted on the top of the bin and looking in to the bin, it utilizes ultrasonic to measure the garbage level in a bin. SWM consists of three parts, the sensor web service which allows the users to view the real time status of the in each ward and receive notification on critical (both mobile and web). In addition, the application should provide a historical view of the data from all the deployed like the cleaning pattern and the timing. This will also allow us assess the efficiency of the concerned departments. MSI has to procure and install RFID's and volume sensors. The network connectivity has to be planned and implemented to share the Smart Elements information to Command Control Center for further processing. It is Sis responsibility to procure RFID readers, Smart phones and thumb readers as mentioned in the RFP. MSI should use the Smart elements and geo fence and geo tag them it with GIS Maps.

The successful bidder has to integrate its own solution with existing SWM System & Vehicle Tracking System. The Vehicle/Location tracker should also be geo fenced and will be used for route optimization of garbage collecting vehicles. Grievance application should be part of the Mobile App and the app should be City GIS Maps. KPIs for Solid Waste Management System

1. The Smart Solid Waste Management System shall enable the level of solid waste, recycled waste, to be remotely monitored using wireless sensors installed inside the waste bin.
2. Registration/Geo-tagging and smart monitoring of all garbage bins and points.
3. RFID based system shall allow real-time tracking of waste collection system efficiency
4. Registration/Geo-tagging and smart monitoring of all Temporary Transit Station (TTS).
5. Smart mechanism for registering, monitoring and efficient and quick redressing of citizen grievances. 6. Implement a GIS/GPS enabled Solid Waste Management System to automate the entire process including online tracking of waste collection vehicles, their routes, and temporary transit stations (TTS) and attendance of public health workers.
6. Web based monitoring of each type of waste disposal separately.
7. Is solid waste collected properly from the bins?
8. Is the weight of the waste correct?

9. Tracking of solid waste with necessary checks-and-balances.
10. Process management of people, vehicles and other components involved to be monitored.
11. Daily, weekly, monthly reports on item-wise, dept. wise and activity wise details and the Consolidated Report generation on solid waste management site activity through the Command and Control Center should be made available with the real time captured data.
12. Decision support system that monitor process compliance, efficiencies and SLA monitoring shall be part of the project.

Functional Specifications for Solid Waste Management System

1. The solution shall be based on open source technology.
2. The solution recommended should comply with standards and guidelines of Govt. of India and Govt. of Bihar.
3. The solution must have role based access and management according to the rules of PMC/PSCL.
4. The solution must have the ability for logging, audit, and tracking of any changes carried out on the database. Only authorized users according to their use rights may make entries to the database.
5. The solution should support N-tier architecture 6. The solution must support Single-Sign On facility
6. The solution should support PKI based Authentication and Authorization, in accordance with IT Act 2000, using the Digital Certificates issued by the Certifying Authorities (CA).
7. The solution must maintain Interoperability Standards ensuring that the Software developed is easily integrated with the other Software
8. The architecture should be scalable (cater to increasing load of internal and external users and their transactions) and capable of delivering high performance
9. The solution must follow stringent security features such as:
    - The security services used to protect the solution shall include: Identification, Authentication, Access Control, Administration and Audit and support for industry standard protocols.
    - The solution shall support advanced user authentication mechanisms including digital certificates and biometric authentication.
    - Security design should provide for a well-designed identity management system, security of physical and digital assets, data and network security, backup and recovery and disaster recovery system.

- The solution should provide for maintaining an audit trail of all the transactions and should also ensure the nonrepudiation of audit trail without impacting the overall performance of the system.
- The overarching requirement is needed to comply with ISO 27001 standards of security.

10. The solution must be compliant with latest versions of Industry Standards such as W3C specifications, Information access/transfer protocols SOAP, HTTP/HTTPS, etc.
11. The required application must be made scalable and robust. It should be designed and developed in such a manner so as to allow integration with other applications in future if necessary.
12. The application should be able to integrate with SMS Gateway, Payment Gateway, Handheld PoS Devices, SMTP, RFID Tracking and Boom Barriers, CCTVs and live video streaming.
13. MSI has to get the application security audited by the CERT-IN empaneled Security Agencies.
14. MSI has to address all the compliances raised by the Security Agency and handover the security audited certificate before hosting.
15. Solution should provide GIS based interface to view all the bin points, at a glance, on location basis and bin Points locations should be integrated with digital images.
16. GIS system shall have the required layers such as Zone, Circle, Ward and Locality Temporary transit locations.
17. Design the web based GIS application denoting all the graphical locations.
18. Collect and configure the Geo-Locations as per the project requirement.
19. Design the Geo-fencing reporting portal
20. The GIS system should be web enabled and reporting should be role and right based.
21. Development of GIS system with spatial Database and integrate with the Data captured above for geographic queries and normal data queries.
22. GPS tracking of the waste pick up vehicle for real time tracking.
23. The application software should have facility to read / integrate / capture the GPS data of the vehicle.
24. Different kind of MIS report shall be generated from the application software for vehicle tracking.
25. Route Optimization which shall help in reduction of trip time, fuel saving and serving more locations.
26. Manage routes and vehicles dynamically through an automated system.
27. Efficient monitoring and management of waste collection bins.
28. Ensure complete coverage of door to door and community collections served by vehicles.
29. Monitor and track other municipal corporation vehicles under Solid Waste Management Dept.
30. Record history of vehicle routes, attended sites and other details.

31. Radio-frequency identification (RFID) devices with vehicle and RFID tagging of Bin to ensure serving by requisite vehicle.
32. Volume Sensor based bin to indicate maximum utilization status and trigger vehicle pick up.
33. Shall be integrated with Waste treatment plants to receive details of waste transit.
34. Alert / Alarm management - Real time management of missed garbage collection points.
35. Monitoring & Reporting Application - reports of vehicles, garbage collection status, bin status etc.
36. Mobile Application - Development of mobile application in open source platform for each application module is also proposed:
    - Should include Grievance redressal module and ability to capture and upload image of related complaint or grievance.
    - Should have the capability to be integrated with other mobile applications related to PMC activities.
    - App must also have the functionality to enable supervisors, transporters and other appropriate concerned officials to update the status of their activities.
    - App should send GIS location. Date: Time with Biometric details/Photos to control center which will be authenticated through registered mobile number of supervisors.
    - Capture images of Bin Points and transmit to the central server with text, image and GPS data such as date and time. Latitude and Longitude as per the schedule given by PMC.
    - App must enable the sending of related SMS when required.

Components of the proposed architecture

Details and role of the components of the expected solution architecture will be as follows:

a. **RFID**

Only Households/Properties of MUNICIPAL CORPORATION will be installed with an RFID tag to identify each object associated with the tag. Each tag will contain a unique identification code. This will help in the tracking of the bins individually. The RFID readers will be installed in each vehicle which will read the radio frequency signals of the tags installed on the bins from which the garbage is collected. The information pertaining to the collection of the garbage and the garbage bins being covered will be sent to the tracking device for creating the reports about the bins covered by the garbage collection vehicles giving the identification code of each bin being covered.

b. **Information transmission**

The information will be collected by the tracking device and this information will be sent to the tower using the GPRS signal for the transmission of the information. The GPRS tower will

communicate with the data center using the transfer protocol to transfer the information collected from the various vehicles. The MUNICIPAL CORPORATION data center will be equipped with the database server and the application server to collect the data and to produce the reports. The central server will also have digital maps which will allow seeing MUNICIPAL CORPORATION user about the location of the vehicles on that map. The MUNICIPAL CORPORATION data center will post the information over the internet which will then be visible to the MUNICIPAL CORPORATION users through mobiles or computers.

All the information will now be available over the internet and physical checking will be eliminated. The routing can now be given to the drivers using this system and tracking can be done automatically instead of having multiple check points.

Functional Specifications- Vehicle and Bin

1. Web Based Vehicle Tracking and Monitoring Application customized to meet the functional requirements of the solution is envisaged.
2. System shall use the Automated Vehicle Locator Management System of the Intelligent Transport Management System with customized dashboard specific to monitoring and tracking of solid waste management activities.
3. Ensure complete coverage of door to door and community collections served by vehicles.
4. The waste collection vehicles shall be fitted with RFID readers. RFID readers identify the RFID tags installed in each of the collection and household/properties which read the RFID details. This data shall be transferred through the GPS device unit having GSM/GPRS connectivity. RFID readers shall be integrated to the vehicle GPS device unit to achieve this functionality.
5. City map provided by the MUNICIPAL CORPORATION/PSCL or Goggle Map shall be used for mapping of all smart elements in the city.
6. Weight and Volume sensors shall be placed at the fixed location over Bin. When the volume of occupancy (waste) reaches to a particular threshold value, an alert/SMS shall be sent to control center which then shall send the information to nearest vehicle for pick-up.
7. Volume/Fill level sensors can be either Ultrasonic or IR based to allow the system to identify the fill level and empty levels in a percentage basis and thereby garbage collection can be scheduled as a function of fill levels at different locations in the city.
8. This system shall be integrate with the RFID system, weight and volume sensor system for bin collection management.
9. Alert / Alarm management - Real time management of missed garbage collection points.
10. Application shall be hosted in the Intelligent Command and Control Centre (ICCC). The application shall leverage on the advanced GPS and GIS technologies for route scheduling, route monitoring, reporting and providing a quick dashboard.

11. Monitoring & Reporting Application - Reports of vehicles, garbage collection status, bin status etc.
12. The platform shall have built in security for data capturing and transfer including devices used i.e. restricting to the authenticated devices only.

Functional Specifications- Fleet Management System

1. System shall facilitate data transfer through GPRS enabling the update of status by the designated compactors/ tippers/ other vehicle operators on waste pick-up from bins.
2. Application must enable the monitoring of transit system of transport of Municipal Solid Waste (MSW) from designated areas at all wards to Temporary Transit Stations (TTS), transport of Solid Waste from designated areas to treatment centers, transport of waste from TTS to Solid Waste Treatment Centers or any other existing/ or any other process envisaged for the future to transport waste to treatment centers.
3. Waste Treatment entry/exit stations shall be installed with RFID Readers, License Plate Image Capture Camera (ANPR, Fixed Box and PTZ) to be integrated with a local controller and workstation. If such elements/system already exist in treatment center, System shall have the capability to be integrated with them or to receive/collect necessary data as per the PMC requirements.
4. Application must enable integration with RFID Readers, Weight/Volume Sensors and Cameras installed at Waste Treatment Centers.
5. Waste carrying Vehicles/Trucks shall be fixed with RFID Tags to enable their reading at the entry/exit stations of the Waste Treatment Plants.
6. System must enable the tracking of vehicles' their inward/outward movement, weight of solid waste transported to Solid Waste Treatment centers and transfer the same to the central control center without any ability to change the data locally.
7. All the data shall be stored locally for a min. period of 60 days including the video and images captured.
8. Application must enable integration with SMS gateway to facilitate update of status as well as notification through SMS.
9. System must enable the capturing of GIS information of the TTS and Treatment centers by geo fencing of the same.
10. Geo tagging of all designated areas in all wards by which the latitude and longitude details are reflected in the module pin pointing the location of the Areas or Households. All the properties are to be codified before geo-tagging with a facility for future scalability (PMC may provide unique identification number for all Households/Properties.
11. System must also enable the highlighting of the routes covered by the compactors/ tippers/ other vehicles involved through GIS mapping.

12. System should consider possibility of uploading of a picture/Video (taken through phone or Vehicle attached Cameras immediately after unloading the bin and cleaning the surrounding of the bin) of the unloaded waste bin to ensure that the waste from the particular bin has been lifted.

Functional Specifications- Attendance Monitoring System

1. GPS based mobile device shall enable PMC field staff to register their attendance (with date/time stamping).
2. The system shall periodically track the location of the staff through their GPS based mobile device and shall map (On City Map provided by MUNICIPAL CORPORATION or Google Map) it in the system with the pre-defined area coordinates.
3. Application should include the facility of handling the biographic details of all field level employees (both contractual and permanent) or should include the facility to be integrated with Aadhaar or any other system for authentication.
4. The attendance data must be captured daily either through biometric devices/special handheld devices/ Facial Attendance system or supervisor certification. The handheld devices shall be able to click photos for photo based attendance along with location and time details.
5. The device shall feed the data through GPRS/GSM network to ICCC for report generation and alerts. This attendance data should be integrated with the HR system of PMC as applicable.

Functional Specifications- SLA Monitoring System

1. The system must enable the mapping of the existing Service Level Agreement with all the involved stakeholders for the solid waste management.
2. The system should map the payment and penalty calculation as specified in the SLA.
3. Should interact with the other relevant modules to calculate correct remuneration and penalty as per the prevailing contracts.
4. System should be made configurable to enable the modification of rates of penalty and payment if needed.

Functional Specifications- Grievance Registration & Monitoring System

1. This system should facilitate the registering of grievances and complaints.
2. System should reflect the hierarchy of PMC for escalation of grievances for redressal.
3. System should have full redressal workflow management system with auto escalation of grievances as per set time period & escalation hierarchy.
4. System should be made fully configurable to set up desired levels of escalation hierarchy as well as configure the time period for escalation.

5. System must integrate with SMS gateway to enable the notification of status through SMS.
6. System must also integrate with Simple Mail Transfer Protocol (SMTP) to facilitate notifications to involved stakeholders/ parties through email.
7. System must enable the capture of the complaints of the citizens through call-center as well as through the web-application.
8. System should generate unique compliant ID to enable tracking.
9. System should provide status update in the web-portal to enable tracking of complaint/ grievance status by the citizens.
10. System must enable the capture of images through mobile app for registration of complaints and grievances by concerned citizens.
11. System should facilitate Citizens complaints through SMS and its tracking.
12. System should generate a system based complaints reports and their status on daily basis.

Technical Specifications of Solid Waste Management System (SWMS):

Technical Specifications- RFID Reader Handheld

Dimensions	162.5*80.0*14 mm or Industry Standard
Weight	550g or Industry Standard
Display	5.2" IPS FHD 1920x1080
Keypad	4 front keys, 1 power key,2 scan keys, 1 multifunctional key
Battery	Main battery: Li-ion, rechargeable, 4000mAhPistol battery: Li-ion, 2600mAh
Sensors	Gravity sensor, light sensor, proximity sensor
OS	Android 6.0
CPU	Cortex-A53 Quad-core 1.3GHz
RAM + ROM	2GB+16GB
Operating	-4oF to 122oF / -20oC to 50oC
Storage Temperature	-40oF to 158oF / -40oC to 70oC
Humidity	5%RH - 95%RH non condensing
Drop	Multiple 1.5m/4.9ft drops
Tumble	1000 x 0.5m/1.6ft falls at room temperature
Sealing	Host IP65
Radio Frequency Band	2G:850/900/1800/1900MHz 3G: 850/900/1900/2100MHz 4G: B1, B3, B5, B7, B8, B20, B40
WLAN	IEEE802.11 a/b/g/n, 2.4G/5G dual-band, internal antenna
WPAN	Bluetooth 4.0, BLE
CAMERA	13MP Autofocus with flash
Development Environment	Software Development Kit
GPS	GPS/AGPS, GLONASS, BeiDou; internal antenna
RFID	UHF, Circular polarization (3dBi), 1W (30dBm, +5dBm to +30dBm adjustable)
NFC	13.56MHz
Other Features	IRIS, 20-40cm Range

Technical Specifications-RFID Tag

1. The tag shall be anti-metal, and can be mounted on the metallic surface.
2. The tag shall be high temperature resistant and shall be capable of withstanding harsh or challenging conditions.
3. The tag shall have long read and write distance.
4. The tag shall be durable, reusable.
5. The frequency range of the tag shall be between 865~867MHz.
6. The tag shall support operation mode of Fixed Frequency or FHSS Software Programmable.
7. The tag protocol shall be ISO 18000-6C & EPC CLASS1 GEN2.
8. The tag memory configuration shall be EPC: 96bit (H3) and User: 512bit (H3).
9. The tag material compatibility shall be metallic and non-metallic substrates.
10. The read range (m) on metal surface shall be max. 7.5m for Fixed Reader and max. 3m for handheld reader.
11. The Mounting of tag shall be of screw, rivet, superglue, ribbon, double faced adhesive tape type.
12. Tags shall be IP 68 rated.

MIS Report Generation (Customizable)

a) System should be able to create a Master Data Management module (Any kind of report based on the proposed solution should be customizable using this module)

b) MIS should be able to generate revenue reports Citizen wise, zone wise, ward-wise, vehicle wise, time series wise, transfer station wise, route wise. Comparative analysis and reports between above mentioned data points.

c) MIS should be able to generate the amount of waste collected Citizen-wise, zone wise, ward wise, vehicle wise, time series wise, transfer station wise, route wise. Comparative analysis and reports between above mentioned data points.

d) MIS should be able to generate reports w.r.to driver / agency attendance, performance, payment, number of requests addressed by Citizen and unaddressed, time to address. Comparative analysis and reports between above mentioned data points.