



## Terms of Reference (TOR)

### Customization of Solid Waste Information System for the JSC-KRM

Ref. GZ-MDLF-262562-CS-CQS

#### 1. BACKGROUND:

The Palestine Liberation Organization, for the benefit of the Palestinian Authority, has allocated additional financing (AF) in the form of a grant in the amount of US\$2.00 million from the Global Partnership for Results-Based Approaches (GPRBA) and US\$ 1.25 million from the Partnership for Infrastructure Development Multi-Donor Trust Fund (PID-MDTF) to the Palestinian Authority (PA); for the Gaza Solid Waste Management Project (GSWMP), and will be executed by Municipal Development & Lending Fund (MDLF). MDLF intends to apply part of the grant for hiring a firm for implementing Customization of Solid Waste Information System for the JSC-KRM.

Designed with the main objective of improving solid waste management services in the Gaza Strip through provision of more efficient, environmentally and socially sound waste management systems, the Gaza Solid Waste Management Project (GSWMP) has been under implementation since 2014. The US\$29.43 million project funded by the World Bank and other development partners<sup>1</sup> is being implemented in Southern Gaza, which covers about 64 percent of the Gaza Strip's total geographic area. The project has financed the infrastructure for provision of solid waste services in this region including a new sanitary landfill and transfer stations and provided equipment and infrastructure to enhance secondary waste collection and medical waste treatment.

The project has supported the operationalization of the upgraded services being provided by the JSC- KRM and as part of this a contract for professionalization helped introduce standard operating procedures for implementation of the services. In addition, the project is supporting the development of an information system that will support management of the services. This will be done through the customization of model solid waste information system code developed by the World Bank for use by solid waste operators such as the JSC-KRM. This TOR is for the customization of this software for the JSC-KRM and roll out in the organization.

The Municipal Development & Lending Fund (MDLF), as the delegated implementation agency for the additional finance of GSWMP, is now seeking the services of a highly qualified IT and programming consulting firm to conduct a Customization of Solid Waste Information System for the JSC-KRM.

#### 2. OVERVIEW OF MODEL SOFTWARE FOR SOLID WASTE SERVICE MANAGEMENT:

The model system was developed by the World Bank in the form an open-source software/code that can be used by municipalities and service providers in managing solid waste operations. The system provides the basic modules needed for a municipality or other solid waste manager to undertake evidence-based decision making on solid waste services. The software code was developed by the World Bank and agreement will be made with the JSC and MDLF that includes provisions to allow it to be fully modifiable for use by the JSC and the World Bank takes no responsibility or liability in its use or customization

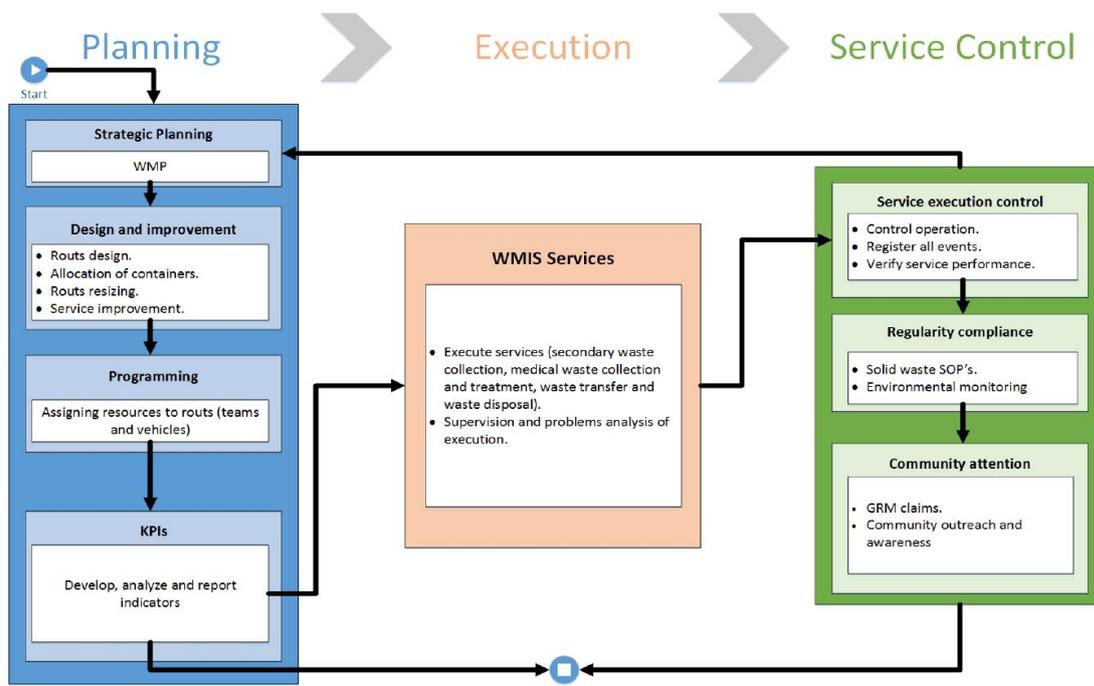
<sup>1</sup> Includes French Development Agency, the European Union, Islamic Development Bank, Government of Sweden and UNDP. At the time of the parent project preparation/approval in 2014, the expected financing envelope, that included Contingencies was US\$35.95 million. The current financing amount, adjusting for the actual donor and borrower contributions and an updated exchange rate (for EU-AFD portion financed in euros) is US\$29.43. Note that the Government of Sweden Funding is not included in this total number, as it being activated as part of this additional financing through the Partnership for Infrastructure Development -Municipal Development and Lending Fund (PID-MDTF).



including any errors, bugs or malfunctions that may come about during the process of customization or use. Any modifications or customizations of the code will be shared with the World Bank and JSC as part of this agreement.

**Services Covered:** The system supports the planning, execution and control of the following services being operated by the JSC: (i) secondary waste collection; (ii) medical waste collection and treatment; (iii) municipal waste landfill; (iv) waste transfer stations; and (v) waste transport.

**General support structure for service management:** The system supports these services through 3 main areas of management: (i) the **planning** of services from multi-year strategic planning, to design of the services and their day-to-day programming; (ii) the **execution** of the services by the drivers, staff and supervisors; and (ii) the **control** of the services where the operator evaluates the completion, quality and compliance of the services with standards and in response to citizen feedback.



### 3. OVERVIEW OF MODEL SYSTEM MODULES:

The IT system modules can be categorized into the following areas:

**Dashboard:** Introductory Dashboard providing the latest statistics and information for easy viewing and use.

**Service Planning:** Provides a multifunctional platform that allows the operator to undertake strategic planning, design and improvement of the services, and daily programming of the services.

**Strategic Planning:** Provides a platform to define a strategic plan including goals and targets and monitor the progress of that plan including system generated key performance indicators.

**Design and Improvement:** Provides a platform to improve the design of each of the services (secondary collection, landfill, medical waste collection-treatment, transfer station and transport). The user can



assign staffing, vehicles and equipment, design routes etc and view indicators on the performance of the service.

**Programming:** Provides a platform to develop and assign work orders for each service (secondary collection, landfill, medical waste collection-treatment, transfer station and transport) and maintenance, follow up on incomplete work orders and pending issues. The user can view indicators including the work orders and its pending issues.

**Service Execution:** Provides a platform for those executing the service work orders to view a work order along with compliance protocols (standard operating procedures, service quality, environmental and health and contract provisions) and report on status completion of the work order and any issues that were raised; and for the supervisor to report on compliance issues.

**Service Control:** A platform that allows review of the status of work orders, compliance with standards and procedures, and complaints received and their status for each of the services (secondary collection, landfill, medical waste collection-treatment, transfer station and transport).

**Awareness:** Allows the user to develop and monitor the implementation of a community awareness plan; gather and display information from crowd sourcing apps (such as litter reporting); and provide information from the system to the public website.

**Management:** Allows the user to input the basic information related to the departmental structure of the solid waste operator, human resources, contracts, entities served, equipment, fleet and other information that provides structural input to the system and allows the system settings to be modified.

#### 4. Scope of Work:

##### I. Installation and Initial Customization of Model Software:

The Consultant will install, populate the system with data and information of the JSC and undertake an initial customization of readily adjustable elements including, for example, aesthetics and format, input information requirements, displays, data presentation, and functions by roles based on the recommendation of the JSC. Annex 1 describes the types of customizations to be considered at this stage. JSC will provide a detailed list of the desired customizations to the consultant at the beginning of the assignment.

##### II. Development of Software APIs and Data Integration:

The model software is designed to accept data and communicate with other software systems used or to be used by the JSC in their operations. The integrations have not been developed and would need to be developed by the consultant. This task includes developing the appropriate APIs, integrating the data and communication functions to and from this software, and optimizing the use and sharing of each type of data based on the JSC business needs. Listed below are the anticipated software integrations that will need to be completed. **The JSC will provide a final, detailed list along with the information on the systems** at contract initiation.

- Budget software (Al-Aseel Accounting Software)
- HR software
- Weigh bridge software.
- Crowd source apps (e.g, openlittermap).
- Grievance Redress Mechanism of JSC (e GRM) web-based system.
- JSC External website
- External web-based requests by customers (e.g., hospitals for medical waste)



- Mapping-routing software (Google maps, openrouteservice.org or other).
- Data storage in cloud
- GIS system (ArcGIS)

### III. Development of Hardware APIs and Integration:

The consultant is also expected to develop the relevant APIs, integration of data and optimizing the use of the data from the following hardware devices. Annex 2 provides background information on the anticipated hardware integration. **The detailed specification of the hardware will be provided by the JSC upon contract initiation.**

- Mobile Phones- Android (integration with Mobile App)
- QR codes on trucks and code reader and integration with weighbridge software
- QR codes for bins integrated with Mobile App
- GPS system
- Flowmeter with microcontroller.
- PCs and system hardware.

### IV. Development of the Mobile App:

The consultant is expected to develop a mobile app compatible with android phones to be integrated in the system. **The detailed SRS will be provided by the MDLF and JSC at contract initiation.** The app would serve the following general functions:

- Bin monitoring - QR codes, manual inputs, GPS
- Weigh bridge and screening - QR codes, manual inputs, weigh bridge
- Fleet management - GPS, manual inputs.

JSC and MDLF will provide a detailed set of functionalities for this app at contract initiation.

### V. Module Rollout, Testing and Optimization:

For each module, once it is ready for testing, the consultant will undertake the following tasks:

- Convene users from the relevant departments and roles to test the application of the module
- Populating the system with the latest information and data.
- Undertake training and outreach on both business processes and accompanying IT processes.
- Provide on the job help and training.
- Monitor its use for a period of time.
- Get feedback from users and managers.
- Implement any necessary adjustments or additional customizations

### VI. Provision of final Source codes:

Documentation and training of system administrator on the customization: The consultant will provide documentation of the customization including: (i) Source codes; (ii) technical manuals; (iii) Operations manual; (iv) data base and storage access; (v) log in credentials; (v) updated SRS and SDD from the model software and mobile application to reflect the customization; (vi) traceability matrix and testing results; (vii) hardware specification and design including any codes.

### VII. Training of Administrators:

The consultant will train the following people on the system maintenance and use: (i) 'System Administrator' who will carry out the activity of installing, configuring, maintaining and monitoring the overall system use



and will serve as point of support for the management. Perform the activity of installing, configuring, maintaining and monitoring the system (both on-premise components and data center (preferably on cloud)). Responsible for applying security patches, upgrades as well as managing the data backup and restoration activities; (ii) 'Database Administrator' who will carry out the activity of managing, organizing and updating the database and all data storage sources (both on-premise and on cloud). The person will ensure that the data is up to date, clean and visualization-ready; (iii) 'Data Analyst' who will perform Visualizations, Reporting and Business Intelligence operations on behalf of JSC-KRM.

## 5. Contract Duration

This assignment is expected to be up to 5 months and all assignment tasks will need to be completed before end of June 2022. In order to optimize the short time frame for customization of the system, the consultant is expected to roll-out each module once it is available for use. Once the initial installation and customization is undertaken and while the mobile app and integration is ongoing, the consultant will roll-out the use, testing and further optimization of the system, module by module as each functionality is ready, keeping in mind the dependence of a particular module functions on the schedule for hardware procurement and optimization, software integration and mobile app development.

## 6. DELIVERABLES:

- Work plan
- Mobile app
- Initial Customized software code.
- APIs for software and hardware.
- Advisory support for module roll out, documentation and software code.
- Source codes and documentation for final customized system.
- Training of administrators
- Final report

There could be additional reports, which are not scheduled in the work plan but might be required in response to unforeseen circumstances. These could arise during implementation of the consulting services and, as such, could require immediate action by the client. The consultant should prepare such reports at the request of the client.

The language of all reports and correspondence shall be English. The consultant shall retain proactive communication with the Joint Service Council (JSC-KRM) and member LGU's to ensure effective transmission of all information and documents. MDLF will be responsible for coordinating main activities with the consultant, processing payments, and for acceptance of the deliverables, the consultant is requested to report to:

### **Mr. Nouredin Al Madhoun**

PDSU Manager

Municipal Development and Lending Fund,

Project Development & Safeguard Unit, Gaza Solid Waste Management Project

Daloul Building, 5<sup>th</sup> floor, Al Aqsa St., across from Barcelona Garden, Tal Al Hawa.

Tel: (08) 207-6001 | Fax: (08) 207-6008 | Mob: (059) 9 480-257

E-mail: [nmadhoun@mdlf.org.ps](mailto:nmadhoun@mdlf.org.ps)



The consulting firm should address any comments/requirements that could emerge from the Client (MDLF) and the World Bank on any of the deliverables within a maximum of one (1) week from receiving the comments

## **6.7. Selection of Consultants and Contract Type**

### **7.1 Selection of Consultants:**

Consultants will be selected in accordance with Consultant Qualification Selection (**CQS**) procedures in accordance with the World Bank Procurement Regulations for Investment Project Financing (IPF) Borrowers, dated July 2016, and revised in November 2017 and August 2018.

### **7.2 Contract Type:**

The contract shall be **Lump Sum Contract** and payments shall be linked to the outputs as defined by the tasks to be carried out as defined in this TOR. The consultant shall propose a detailed work plan describing the activities in detail and corresponding cost all inclusive.

The duration of the assignment shall be up to **Five (5) months** for all tasks. This duration do not include the client review and approval period.

## **7.8. STAFFING REQUIREMENTS**

The firm shall have a strong programming background and shall possess previous experience in software programming in at least Two (2) similar assignments equivalent in nature and complexity over the last ten years, (as consultant or sub-consultant) with experience in Middle Eastern Countries.

The Consultant shall provide the required staff and qualifications to manage all the different tasks of the assignment. The Consultant should specify their project management, methodology & approach. The section below specifies the key staff and qualification required to carry out this consultancy.

In addition to the key staffing requirement listed below, the Consultant is fully responsible to bring additional supporting staff to carry out the required scope of work on time, without requiring any additional fees.

MDLF reserves the right to reject and/or instruct removal of staff due to non-performance.

The consultant's team shall include expertise in the following key fields for the customization assignment:

#	Position Full time	Responsibility
1	Project Manager	Managing design and development phases of software development project. Initial technical experience in PHP Laravel, data base programming.
2	Mid-level programmer	Programming with PHP Laravel
3	Senior level programmer	Programming with PHP Laravel
4	Senior Android Programmer	Programming mobile application required via cross platform, Fleet, Bin management, Landfill
5	Junior Android Programmer	Assist in Programming mobile application required via cross platform, Fleet, Bin management, Landfill



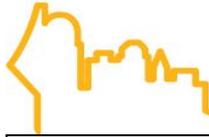
صندوق تطوير وإقراض الهيئات المحلية  
Municipal Development & Lending Fund



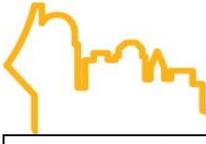


**Annex I: Types of adjustments to be considered as part of initial customization**

<b>System Module</b>	<b>Description of Module</b>	<b>Options for Customizations</b>
General	System wide applicability	<ul style="list-style-type: none"><li>- Access/permissions and display by user/role.</li><li>- Display aesthetics and format.</li><li>- Report production.</li><li>- Language settings and display.</li><li>- Document uploading in different screens.</li><li>- Date storage and archiving</li></ul>
Dashboard	Introductory Dashboard providing the latest statistics and information for easy viewing and use.	<ul style="list-style-type: none"><li>- Customizing content by user.</li></ul>
Service Planning-Strategic Planning	Provides a platform to define a strategic plan including goals and targets and monitor the progress of that plan including system generated key performance indicators.	<ul style="list-style-type: none"><li>- KPI display</li><li>- KPI format and settings</li><li>- Goals and weights-format</li></ul>
Service Planning-Design/Improvement	Provides a platform to improve the design of each of the services (secondary collection, landfill, medical waste collection-treatment, transfer station and transport). The user can assign staffing, vehicles and equipment, design routes etc and view indicators on the performance of the service.	<ul style="list-style-type: none"><li>- KPIs displayed</li><li>- Assignments related to the design and improvement.</li><li>- Descriptions, inputs for labelling (route, staff, etc).</li><li>- Data input experience.</li><li>- Landfill and cell capacity calculations and layering/workface monitoring.</li></ul>
Service Planning- Programming	Provides a platform to develop and assign work orders for each service (secondary collection, landfill, medical waste collection-treatment, transfer station and transport) and maintenance, follow up on incomplete work orders and pending issues. The user can view indicators including the work orders and its pending issues.	<ul style="list-style-type: none"><li>- KPIs displayed</li><li>- Categorization of work order types.</li><li>- Input information related to work order.</li><li>- Maintenance procedures.</li></ul>



System Module	Description of Module	Options for Customizations
Service Execution	Provides a platform for those executing the service work orders to view a work order along with compliance protocols (standard operating procedures, service quality, environmental and health and contract provisions) and report on status completion of the work order and any issues that were raised; and for the supervisor to report on compliance issues.	<ul style="list-style-type: none"><li>- KPIs displayed</li><li>- Inputs by user (Supervisor, driver, operator, manager).</li><li>- Optimizing information and interface for SOP, service quality, env/health and contractual compliance.</li><li>- Input parameters- information for service execution.</li><li>- Survey inputs- optimizing input information, user and application to different services.</li><li>- Weight bridge screening parameters (landfill and transfer station).</li><li>- GPS and work order status displays- dashboards.</li><li>- Maintenance and fuel interface optimization.</li></ul>
Service Control	A platform that allows review of the status of work orders, compliance with standards and procedures, and complaints received and their status for each of the services (secondary collection, landfill, medical waste collection-treatment, transfer station and transport).	<ul style="list-style-type: none"><li>- Display and information on daily work order closure screen.</li><li>- Service by service display and information on work order and pending issues.</li><li>- Inputs by service control personnel and communication with programming.</li><li>- Compliance monitoring display.</li><li>- Compliance input information and format.</li><li>- GRM- complaints information and format</li><li>- Automated response formats.</li><li>- GRM KPIs</li><li>- Integration of GRM complaints with</li></ul>

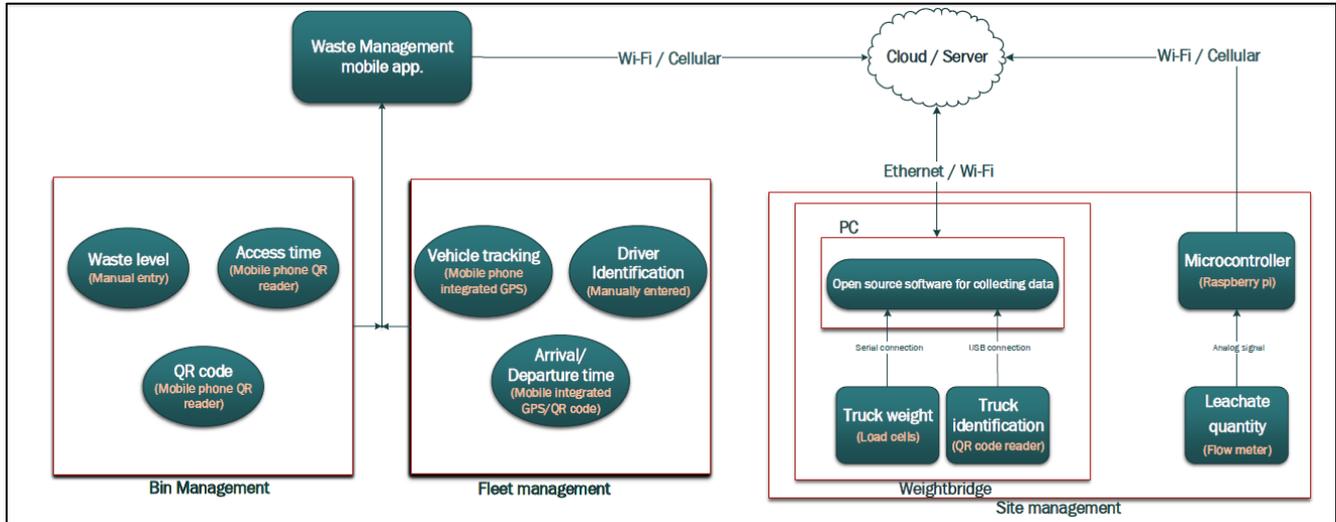


System Module	Description of Module	Options for Customizations
		<p>pending issues and programming stage.</p> <ul style="list-style-type: none"><li>- Report generation and format.</li><li>- Verification procedures and linkages to KPIs and compliance monitoring.</li></ul>
Awareness	<p>Allows the user to develop and monitor the implementation of a community awareness plan; gather and display information from crowd sourcing apps (such as litter reporting); and provide information from the system to the public website.</p>	<ul style="list-style-type: none"><li>- Community awareness activity format and goals etc.</li><li>- Format and display of crowd source app (s)</li><li>- Inputs, options and display for information link for public website.</li><li>-</li></ul>
Management	<p>Allows the user to input the basic information related to the departmental structure of the solid waste operator, human resources, contracts, entities served, equipment, fleet and other information that provides structural input to the system and allows the system settings to be modified.</p>	<ul style="list-style-type: none"><li>- Pricing profiles</li><li>- Categories and information for departments, entities, contracts, maintenance providers, human resources, containers.</li><li>- Categories and information for vehicles and equipment and inventory items</li><li>- Optimization of interface for inventory management.</li><li>- User control and other settings.</li></ul>



## Annex 2: Summary of Proposed Hardware Customization

Overview of proposed system hardware integration



### Container and fleet Management

Android mobile phone will be used to acquire data for both container and vehicle management. A mobile phone will be provided for vehicles' drivers. The Android mobile specification is shown in [Error! Reference source not found. Table 2](#). A waste management mobile app has to be developed to handle all the data.

#### 1 Container management,

There are three types of waste containers used in Gaza strip as detailed in the Appendix. The recommended system can be applied to all containers type.

The filling level of waste containers, locations of container and time and date of collection are required.

The main objective of monitoring the filling level is to replace the fixed emptying schedules with one that only target full containers. this will increase efficiency through avoiding unnecessary emptying and runs, thus saving time and money

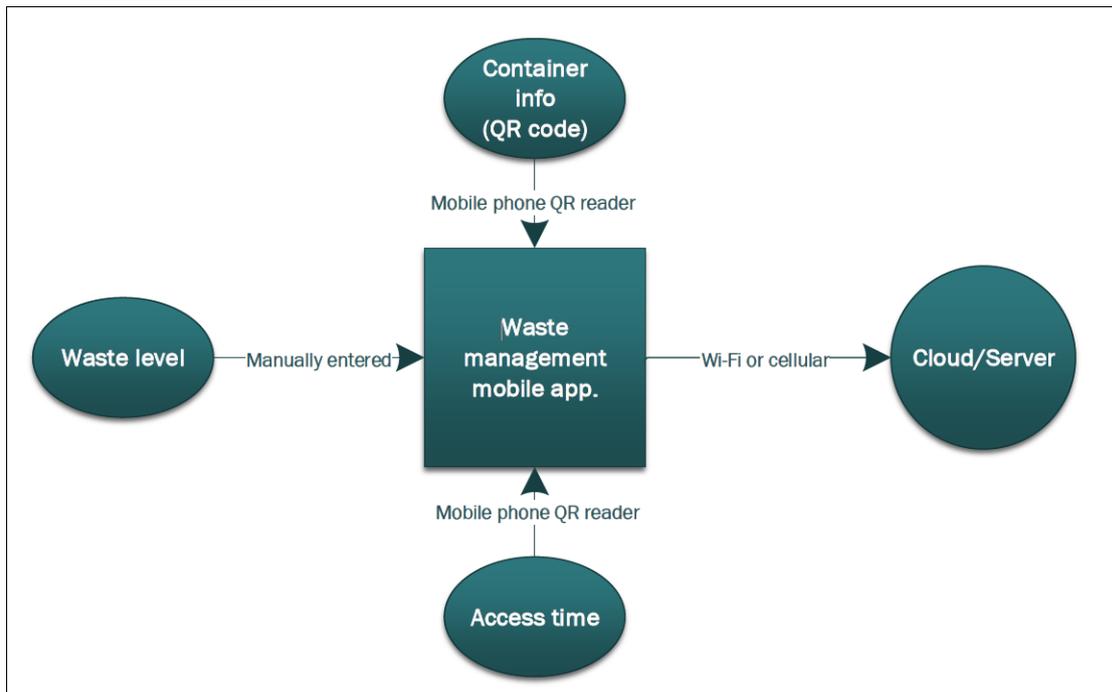
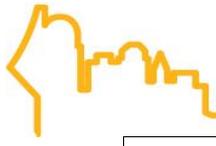


Figure 1, block diagram for bin management

Filling level will be logged in manually by the driver. Marks will be fitted to the containers. After consulting with Joint Service Council for Solid Waste Management in Khan Younis, Rafah and Middle Governorates (JSC-KRM), it was concluded that 50% increment will be implemented where below 50% the bins will be considered empty. The driver will choose between empty, 50%, full and over capacity

Container information is stored on a unique QR code specified for every container. The info will include location, container type and number. QR codes are easily generated with all required information. QR code will be scanned using smartphone. Container data and time and date of collection is feed to the management system app.

Because of the hazardous environment, QR will be printed on an aluminium plate as shown in [Figure 2](#).



Figure 2, QR code nameplate



## 2 Fleet management,

Three main types of vehicles are used in collecting waste in Gaza strip are shown in the table below. Pictures for an example of these vehicle is shown in [Error! Reference source not found.](#) Figure 3

Table 1

	Vehicle type	Numbers
1	Tipper crane	10
2	Compactor	7
3	Roll on/off	3



Figure 3 types of vehicles are used in collecting waste in Gaza strip, from right to left Tipper crane, Roll on/off and Compactor

The two input that are needed for fleet management are **vehicle monitoring, vehicle ID and arrival and departure time.**

The Vehicle ID will include vehicle's municipality, registration plate, type. QR code nameplate will be fixed on the vehicles to store all the required information

The driver will start his shift by logging into the waste management app using his username then scan the vehicle to register what vehicle he will be driving for his collection tour.



Tracking system will be developed as part of the waste management app. The tracking system will use the GPS module inside the mobile to track and hence monitor the vehicle. Yearly map subscription will be required for the tracking system.

The arrival and departure time will be logged using both the GPS signal and the vehicle QR scan (before the start of the shift and weighing process).

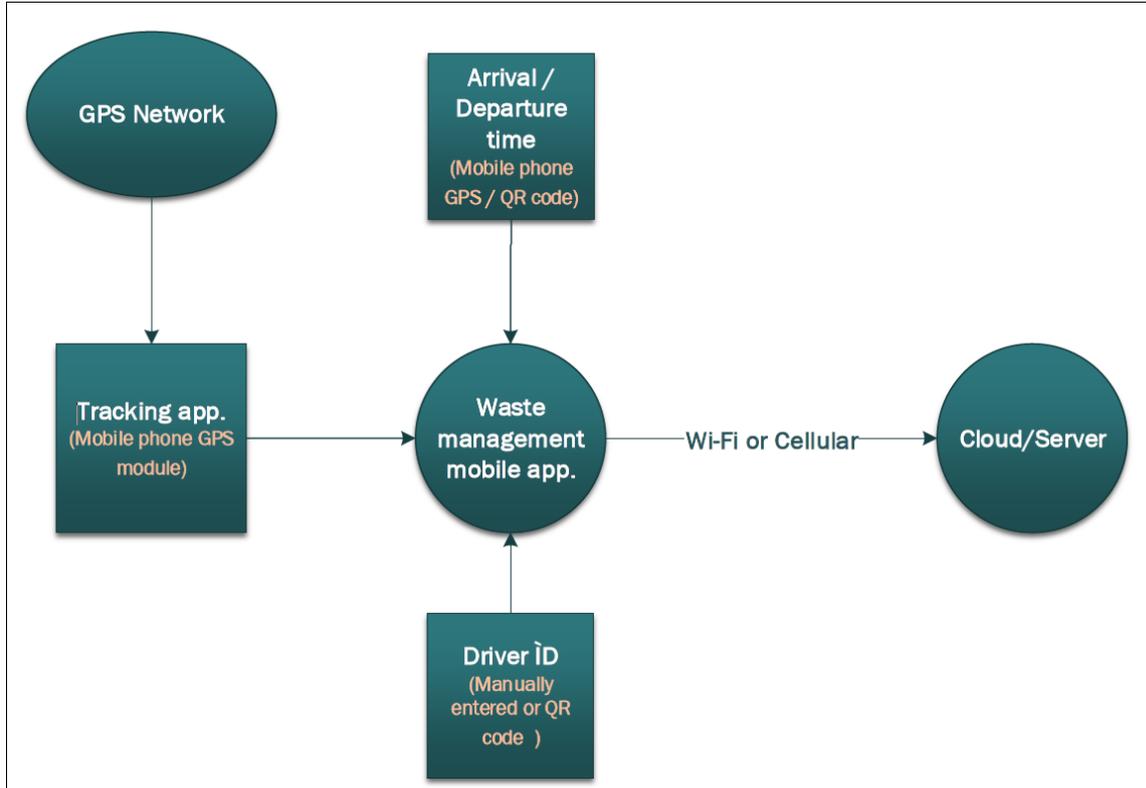


Figure 4, block diagram for fleet management



## Land fill management

### 3 Weighing bridge

Each waste vehicle that comes to the landfill is being weighed to know the exact waste-load weight. Weighing system that is currently installed includes all the setting up to serial port as shown in the Figure below. The data are currently recorded manually from the weighing bridge indicator.

Vehicle ID and mass reading of the weighing bridge will be acquired by the management system. The Vehicle ID is scanned from QR code nameplate that is fitted to the vehicle by the weighing bridge operator using a mobile QR scanner.

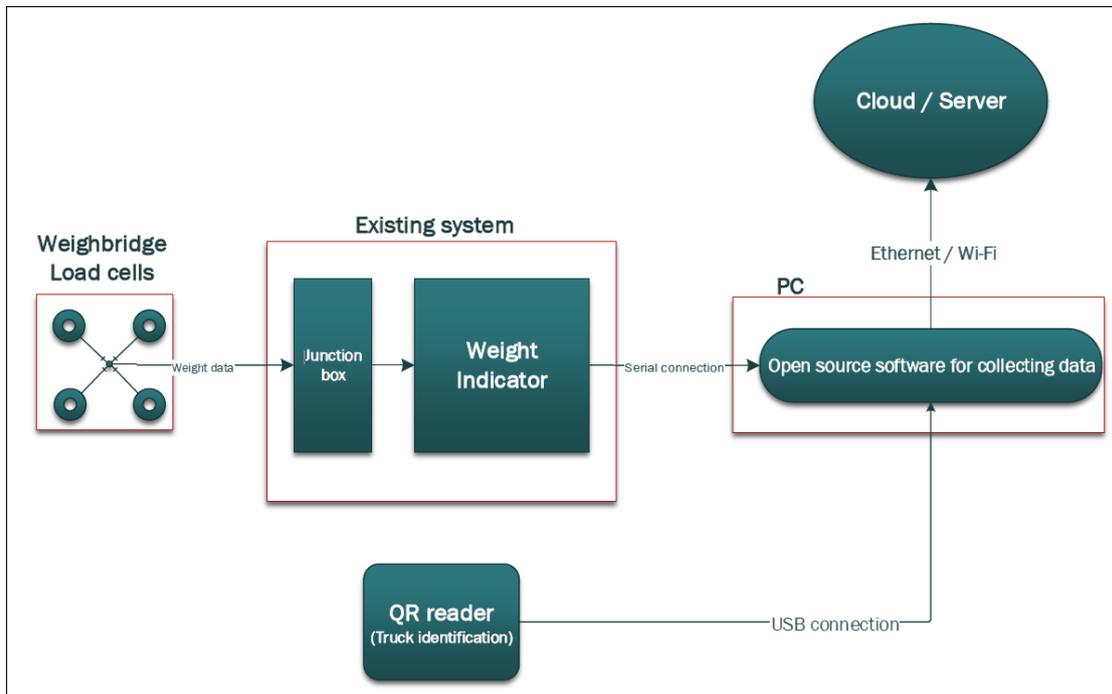
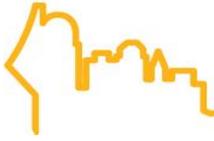


Figure 5, block diagram for weighing bridge DaQ system

The vehicle will advance to the weighing bridge. The mass reading will be recorded and saved on the operator PC through the serial port and a software that will be developed to acquire data. The mass data as well as the vehicle ID data will be saved in a format that the waste management software can use.



#### 4 leachate lagoon monitoring:

A flow meter reading is registered manually every day in order to know the daily amount of squeezer has been plumbed from burying cells to the leachate lagoon.

The already installed flowmeter produce 4-20 mA output current as indicated in [Figure 6, Plug connection for the current flowmeter](#). 4 mA represent zero flowrate and 20 mA represent maximum flowrate. A DaQ system was designed to transfer this data into the management system. The management system will also be able to change sampling rate.

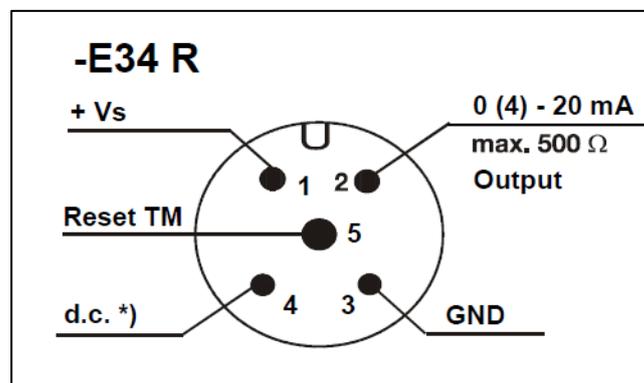


Figure 6, Plug connection for the current flowmeter

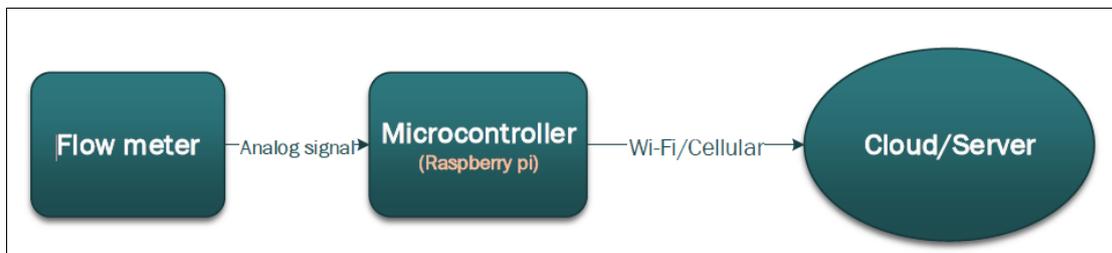


Figure 7, block diagram for flowmeter DaQ system



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