

# Environmental Sanitation Management Information System - ESMIS

## 1. What is an ESMIS?

ESMIS is a web-based information management system, through which most of the existing environmental sanitation and development information related to the services provided by the LAs are included. The proposed ESMIS is expected to provide a tri-partied interactive base for the system operators, and activity managers (officials of the LA) and the service receivers (citizens) of the selected LA areas. The information will be provided, retrieved, updated and verified by both the service providers and the receivers.

In the Initial stage, the system will be developed as a GIS database which will include basically the road inventory of the pilot area.

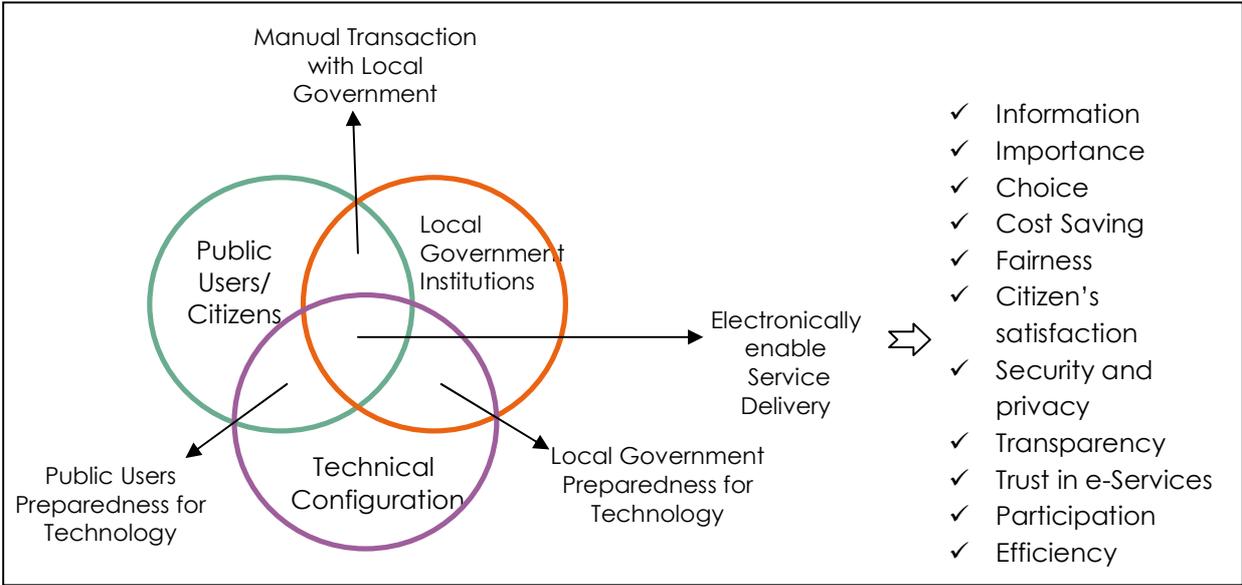


FIGURE 1: CONCEPTUAL DIAGRAM OF HOW ESMIS WORKS

## 2. Who are the partners and their roles in preparation of ESMIS?

There are four key partners for developing the ESMIS. The close interaction between these parties including the fifth party (other third party institutions) will enable the smooth implementation of ESMIS.

No	Partners	Roles
01	University of Moratuwa	<ul style="list-style-type: none"><li>- Development of ESMIS</li><li>- Test Run of the ESMIS</li><li>- Training the LA staff for the using and maintaining the ESMIS</li><li>- Troubleshooting and</li><li>- Assist to Maintenance of ESMIS</li></ul>
02	Ministry of Urban Development, Water Supply and Drainage	<ul style="list-style-type: none"><li>- Peer review and giving feedbacks/ comments</li></ul>
03	Urban Development Authority	<ul style="list-style-type: none"><li>- Peer review and giving feedbacks/ comments</li><li>- Implementation of ESMIS in collaboration with the University of Moratuwa</li></ul>
04	Gampaha and Moratuwa Municipal Councils	<ul style="list-style-type: none"><li>- Assist the UoM team by providing available information</li><li>- Appointment of a working group to assist the developing of the ESMIS</li><li>- Allocation of resources for the implementation of ESMIS</li><li>- Implementation of ESMIS</li><li>- Maintaining the ESMIS</li></ul>
05	Other third party institutions	<ul style="list-style-type: none"><li>- Assist the UoM team and MCs by providing available information</li><li>- Peer review and giving feedbacks/ comments</li></ul>

### 3. What are the key components?

The following are the integral parts that should be there to develop the ESMIS.

01	Software	GIS Interface	- Quantum GIS (QGIS)
		Web Interface	- OpenLayers, Geo Server, Ubuntu Server
		Database Development	- SQL, HTML, PHP
02	Hardware	Web Server	- SLT server Space
		Personal Computers	- Computers with internet connection
		Mobiles/ Tablets	- The access to update and refer to the ESMIS will be configured
		GPS/Smart Phones	- Data collection devices
03	Data	GIS Layers	- Polylines (roads, waterways, distribution lines, drainages, etc...) - Polygons (land use, building footprints, zones, administrative boundaries, etc...) - Points (solid waste collection locations, dumping sites, places of public interest, etc...)
		Image Data	- Satellite images (04 bands/ 08 bands) - Google images (03 bands) - Arial photographs - 1:10,000 survey maps
		Photographs	- Geo-tagged photographs
		Other data layers prepared in the different software	- SQL databases - AutoCAD Layers (maps)
04	Human resources	Trained Technical Officers of MCs	- As key persons to carry out further developments and maintenance work of the ESMIS
		Trained focus group of people among general public	- To aware others about the system and to update data

## 4. The ESMIS development process

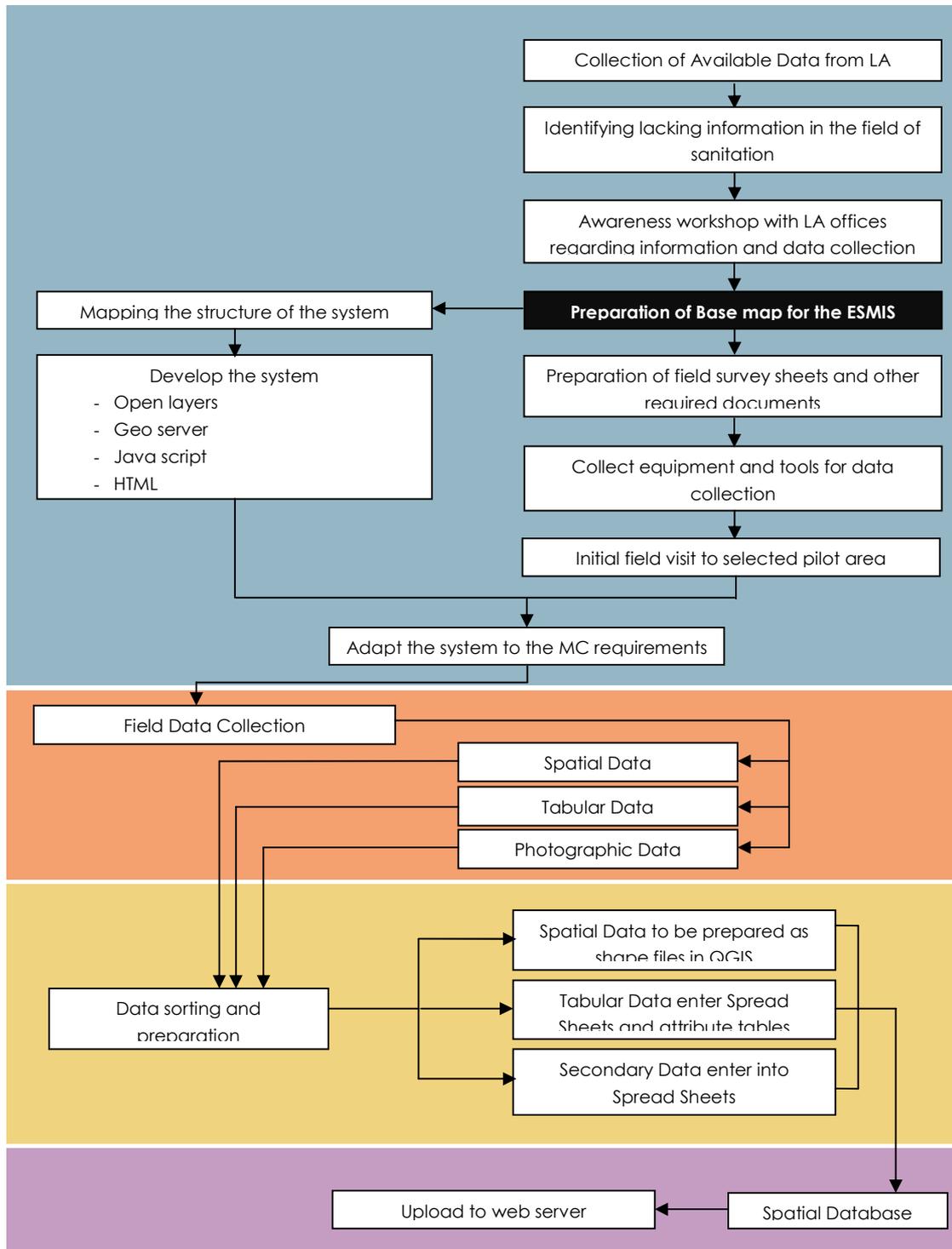


FIGURE 2 : ESMIS DEVELOPMENT PROCESS

## I. Data Collection

A Survey team consisting of trained Technical Officers from the Municipal Councils monitored by the university staff will be sent to the field with necessary equipment for data collection. Data will be recorded in a specific format as the team is trained to collect the data in an effective way to be stored in a database. Team will be aware about data types and database before they go to the field. At the end of every day GPX data in the GPS Handheld receiver and photographs in Digital camera will be copied to laptop computer and saved inside separate folders named using GPS/Digital camera unique code and date.

### Equipment/Tools

- GPS Handheld Receiver(Unique code will be given to each receiver)
- Laptop Computer
- Digital Camera(Unique code will be given to each camera)
- Field data collection sheets
- Location map with approximate project locations

### GIS Data

Following GIS data will be collected from the field

Structure	Geometry	Method
Road section of a main road	Point	Mark GPS position of starting point of the main road (Road Inventory form –Start Way point No).
	Line	Start GPS track and continue till the end of the road section and record Track No(Road Inventory Form-Track No)
	Point	Mark GPS position of end point of the main road and record Waypoint No (Road Inventory form –End Way Point No).
Road section of by roads	Point	Mark GPS position of starting point from the main road (Road Inventory form –Start Way point No referencing to the track no of the main road).
	Line	Start GPS track and continue till the end of the by road section and record Track No(Road Inventory Form-Track No)
	Point	Mark GPS position of end of the road section and record Waypoint No (Road Inventory form –End Way Point No).
Bridge	Point	Mark GPS position of the Approach point of the Bridge and record way point No (Bridge Inventory form-Approach Way Point No)
	Point	Mark GPS position of the Departure point of the Bridge and record way point No (Bridge Inventory form-Departure Way

		point no)
Culvert	Point	Mark GPS position of the center point of the Culvert and record way point No (Culvert Inventory form-Way point no)

### Map data

Points, polygons, poly lines are the features of shapefiles that will be used as map data. Downloaded google images, 3 band aerial photographs from google or updated multi spectral satellite images, geotagged photographs are included in the database as base maps according to different purposes. Output map types will be in .shp format and it will be converted into different other formats according to the requirements.

## II. Database development

Collected spatial and other data will enter using different software packages and converted into various formats in order to create interactive maps. Q-GIS platform will be used to enter spatial data and create maps. Non spatial data will be entered to the database using Spread Sheets, MySQL etc.. For this purpose few members from LA will be given a training by the staff of the University of Moratuwa and in the first phase it will be monitored by the university staff.

All the citizens are eligible to retrieve data from the system but there will be authorized people who can only enter and edit data.

LA officers can log into system and they are authorized to prepare maps and use information for different purposes and if they have legal powers they can share those thematic information with general public. There will be two different user interfaces for these users as login pages.

User can load different shape files such as roads, buildings, land use etc.(figure-3.)Once the layers are loaded in to the interface it looks like as follows (figure-4).

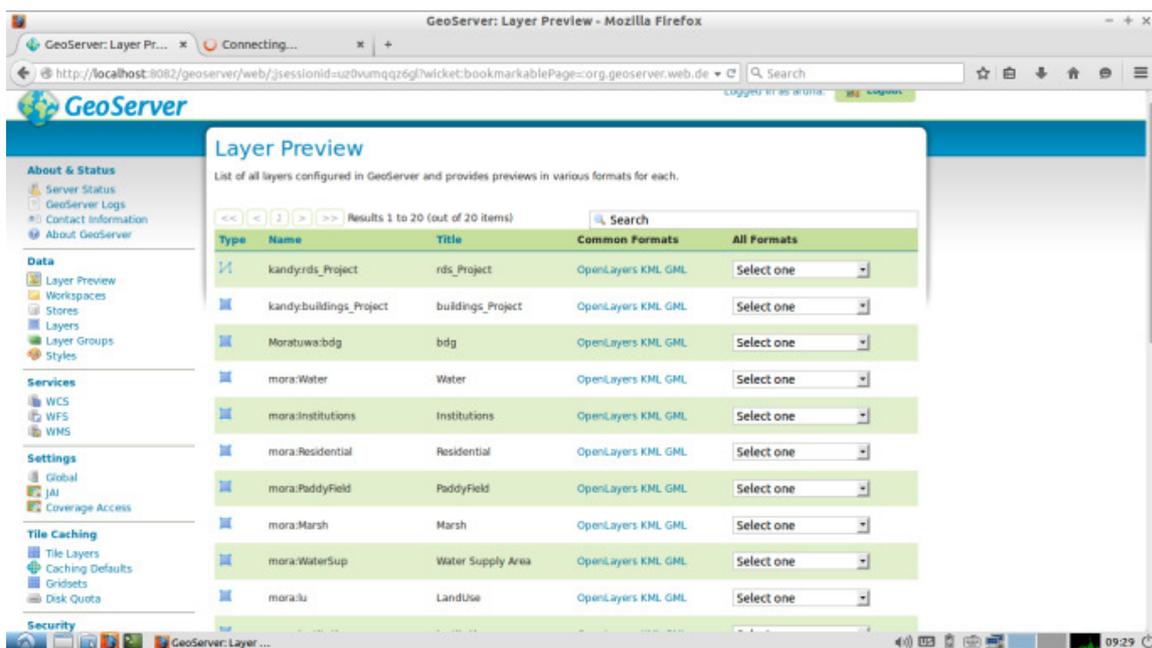


FIGURE 3 : AVAILABLE SHAPE FILES LIST

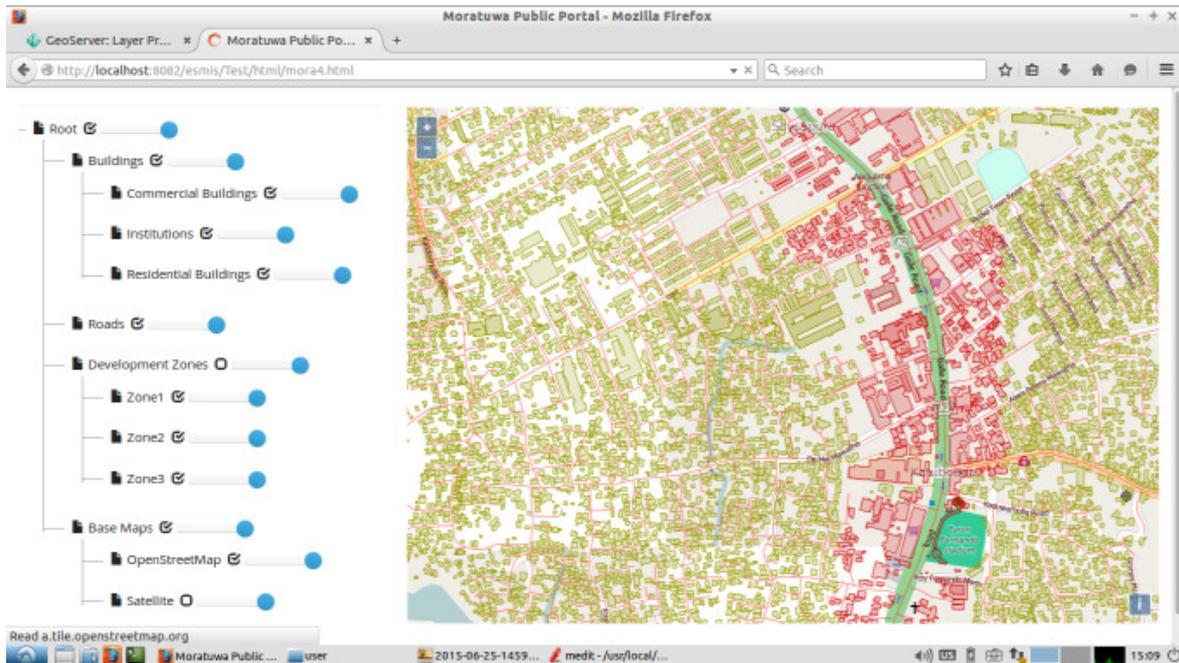


FIGURE 4 : SHAPE FILES AFTER LOADED IN TO INTERFACE

## 5. How it works?

System includes a sever consists of large number of data which will act as a bridge to link the public and municipal officers. In the user's end they will connect with the server via Web Interface or a Mobile App. Users can feed data if they are authorized and all citizens can refer information back. Online transactions for tax payments will also expected to include into the system in further steps. Different ways citizens can access the information is divided into four major categories; Interactive Map, Application Forms, Payment Gateway and Complaints/Inquiries/ Suggestions.

There should be a separate server for installed and maintained for this and first proposal is to obtain a server space from University server and to maintain it by university staff since it is easy for the team to handle when it is installed within the university. The other option is to reserving a server space from SLT (Sri Lanka Telecom) Server system and annual fee will be paid for them for maintenance. Considering the convenience and effectiveness second option is selected after having a discussion with LA staff.

Server consists of spatial data stored in the database. this spatial database will be maintained using QGIS and MySQL.

Data that users feed will refer, updated and analyzed by the municipal officers. It will also be dome through the same user interface (Web Interface or a Mobile App). They will use spatial data in the database for map preparation using different analysis tools for required purposes.

Public/ Citizens		Server		Municipal Council/ LA	
<b>Interactive Map:</b>	Development regulations, Ownership of properties, Status of payment of municipal taxes, etc..	<b>Spatial Database:</b>	Household Data Sanitary Data Income Data Complaint Data Plans Service Delivery	<b>Spatial information:</b>	Thematic maps such as; Location of garbage dumping sites Stress areas Tax payers status Distribution of sanitary facilities,etc..
<b>Application Forms:</b>	Building applications Reservation for Municipal Facilities				
<b>Payment Gateway:</b>	Payment of taxes Payment for reservation of municipal services Payment of fines	<b>Maintenance:</b>	QGIS MS Access database	<b>Analysis:</b>	Interface enable with analysis tools
<b>Complaints/ Inquiries/ Suggestions:</b>	Public nuisance Public participation Hazardous situations				

## 6. Implementation

### I. Test run and troubleshooting

Formulation of the ESMIS is carrying out by the staff of University of Moratuwa with the feedback of the stakeholder working group of municipalities. After the formulation, a test run will be carried out at the end of August to a period of two months. Feedback from the stakeholders and troubleshooting will be noted and the system will be developed accordingly.

### II. Maintenance and Monitoring

- As the server space will be provided by a network provider, an annual rental will be paid by the local authorities for the continuation of the system.
- A training will be provided for the local authority staff who are engaged with data entering, validating and system updating by the staff of University Moratuwa.
- Maintenance of the system will be carried out by the University of Moratuwa at the initial stage where the local authority staff will be trained for the long term maintenance.
- The ESMIS will be monitored periodically by the Urban Development Authority and the University of Moratuwa.

## 7. User manual

User manual to be prepared as a guidance, generally for municipal council officers to use the system at the first stage. They will be guided to enter update data in this stage.

Two target group of officers from MCs will be identified; first group as general users of the system for data entering and updating, second group as the officers with good technical knowledge

and, officers with web and programming based knowledge. Further, the second user manual is expected to be introduced for the second target group of officers after handing over the entire system to the MC in order to maintain the it and to give a comprehensive knowledge on how the system has developed, how to customize it according to their changing requirements and regarding troubleshooting.