AKARA RESEARCH & TECHNOLOGIES
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Final Report

GIS Linked Asset Inventorising

Of

Public Sanitation

At

Municipal Corporation of Shimla

September 19, 2014

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List of Abbreviations

Asset Management System	ASM
City Sanitation Plans	CSP
Complaint Management System	CMS
Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH	GIZ
Differential Global Positioning System	DGPS
Global Positioning System	GPS
Information and Communications Technology	ICT
Ministry of Urban Development	MoUD
Municipal Corporation of Shimla	MCS
National School Sanitation Initiative	NSSI
National Urban Sanitation Policy	NUSP
Public Toilets	PT
Public Toilets Management System	PTMS
Relational Database Management System	RDBMS
State Sanitation Strategies	SSS
Support to the National Urban Sanitation Policy	SNUSP
Under Ground Drainage	UDG

Chapter 1: Project Background and Review of Current Data System

1.1 Background

In 2008, Ministry of Urban Development (MoUD) approved the National Urban Sanitation Policy (NUSP) with the aim to improve the sanitation situation in urban areas of India. NUSP is based on the 74th Constitutional Amendment Act (1992), which aims to strengthen Urban Local Bodies (ULBs). The policy designs and supports implementation of sanitation strategies for better, cleaner and safer cities. Particular focus has been given to improvement of hygienic conditions for the urban poor and for women by applying cost-efficient technologies.

Deutsche Gesellschaft für internationale Zusammenarbeit GmbH (GIZ) had embarked upon a programme, "Support to the National Urban Sanitation Policy" (SNUSP). Under this programme, GIZ supports the Ministry of Urban Development, Government of India (MoUD) in its various policy guidelines, particularly the NUSP. The core activities supported by GIZ are the preparation of State Sanitation Strategies (SSS) in partner states and the National School Sanitation Initiative (NSSI). The City Sanitation Plans (CSP) form an integral part of the SSS. Under the CSPs, GIZ provided insights on the demand for public sanitation services leading to achieving open defecation free status in 6 cities.

Given the increasing demand for such services and city's single handed inability to cater to service provision (lack of skills, financing constraints, service level, etc.), cities are attempting different engagement models. As such, this project envisaged the establishment of an asset management system that facilitates informed decision-making and dissemination of public toilet services, on a timely basis.

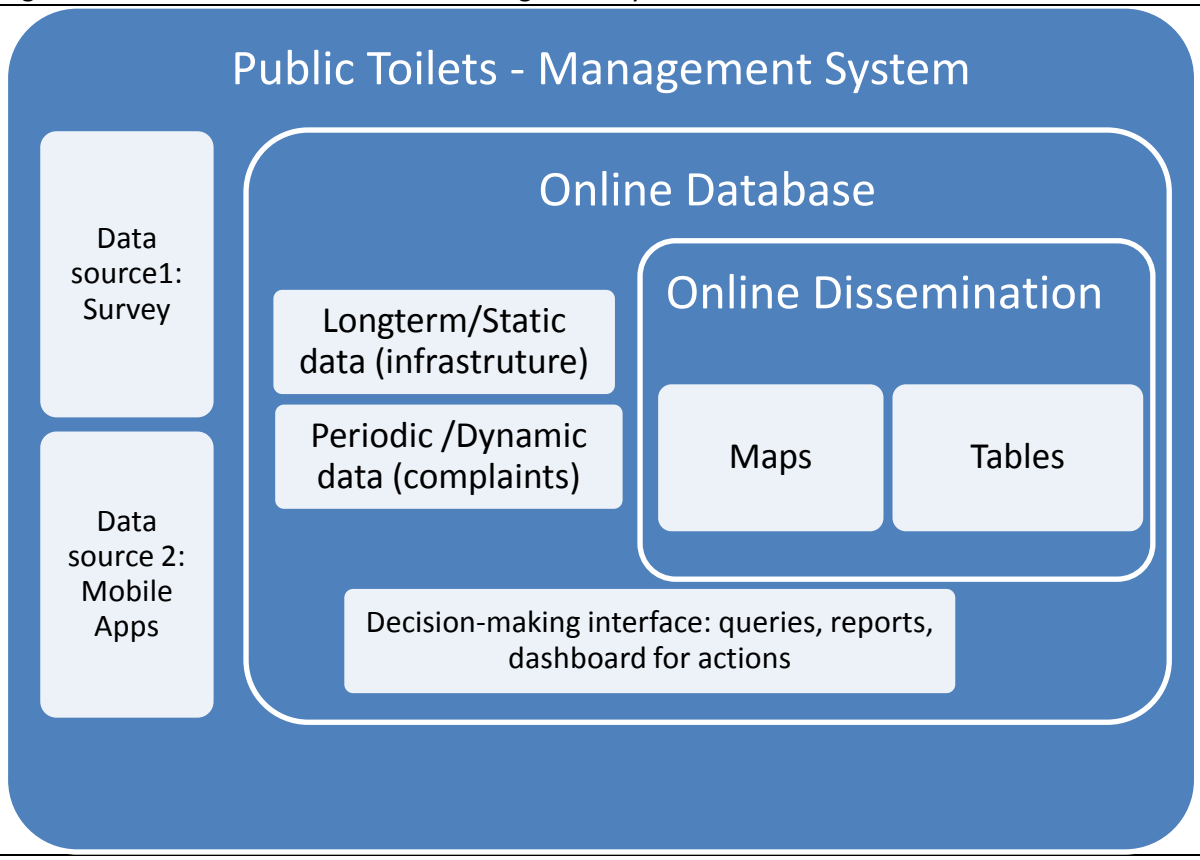
Current management practices in most urban local bodies are dependent on data that is static andlargely incomplete. Importantly, the missing data invariably pertains to the demand side; moreover, there is a huge time lag in information flow across the management structure. In such a scenario, the asset management system with an objective to improve data dissemination (in a map-based platform), that is easily shared across the management structure, is a timely effort. Realising the importance of timely dissemination and escalation of data related to complaints, the project envisaged creating a mobile application that can provide timely sharing of complaint related data from the field and also enable forwarding/escalating the issue to the right line department for action. Thus, the project envisages creation of an online data management system, with features to view the information disseminated on the map of Shimla, with facilities to view, update and manage data on a periodic basis.

This report presents a detailed note on the current system as it exists in the Municipal Corporation of Shimla (MCS) and its limitations, the detailed outline of the proposed system including its components, the tools to collect and disseminate data, and the requirements (including the training requirements) to integrate the system as the official data management system for MCS.These are presented in 4 broad chapters with specific tasks outlined.

In the records of MCS, there are 162 Public Toilet (PT) facilities. Of these, 8 have been dismantled as per the official records, while 3 others are non-functional; 4 additional toilets have been sanctioned to be dismantled, while 5 others are in repair. It is at this juncture that the MCS, a region with high floating population, has embarked upon the mission to strengthen the PT facilities in the region.

1.2Scope of the Project: The project has four parts. The first is to review the current data management practices for the administration of PTs in MCS. We already have a framework of data management system that is required to be put in place for effective decision-making. The study seeks to juxtapose the existing data management structure at MCS with this framework to see the gaps, and build a robust system for better decision-making. The framework is as follows:

Figure 1: Framework of Public Toilets Management System



The second part is to build an online database system with all the required datasets, query and retrieve features, integrated with available online maps in open-source platforms; there are also provisions tor the designated authorities to engage in asset management of the PT with respect to emerging needs on a periodic basis. We also have a mobile application developed that can populate real-time data onto the database from the field. The third part is to populate the database by acquiring the relevant data. For this purpose, a detailed survey instrument was developed, tested and deployed through a survey team; a provision in the PT management system is created to enter the collected data through a web interface. We also collected available data in the forms of maps from MCS. The fourth part is the training and capacity building at the MCS to enable the team to manage the PT administration in the region through the new system. A training module is developed for this purpose.

1.3. Dimensions of public toilet management

Building upon the scope of the project, we first determine the dimensions of the Public Toilet Management System (PTM), grouped around 6 broad themes. The characteristic feature is that the database structure of

the PTMS is designed to systematically obtain the relevant information under these themes and sub-themes; this finally enables decision-making (Figure 2). These themes are

1. Categorisation of the PT: The categories could be based on type of users (for instance whether the toilet is only for male or both the gender), extent of privacy for the users (for instance, availability of change rooms for women), sense of safety for the users (proximity to wine shop/forests and availability of emergency phone numbers), usability (whether it is open or closed down/dilapidated, timings of operation) and revenue generation (user fee collection, revenues from advertisement etc)
2. Infrastructure: The database has to reflect the extent of infrastructure, its ownership, process of rehabilitation, availability and scope of support services and the human resources responsible for it and the overall management of the infrastructure.
3. Usage: An important dimension of a given PT is its user profile, which could be totally unique in comparison to other PTs.These could be characteristics of users, footfall at various time-zones, and user fees paid.
4. Maintenance: Maintenance is indeed an important dimension of PT management, as many research and analysis have shown that most public services have been rendered unusable as a result of poor maintenance. This has both relevance on the cleanliness and environmental issues.
5. Gender issues: One of the major concerns of PT system in India has been the inadequacy of quantum and quality of PTs for women. We include this as an important aspect of the PT management to understand the gender disparity.
6. Spatial setting: The key differentiating feature of the PTMS proposed is an online GIS linked system of asset management. Therefore spatial features of latitude, longitude and altitude are databased, along with pictures.

Figure 2: Dimensions of Public Toilet Management System

1.4. Systems Approach to Data Management and Dimensions:

The PT management system (PTMS) has a comprehensive approach that provides for exquisite control for management, flow of data that facilitates timeliness and comparison across locations, showcases deficiencies or gaps, facilitates actions on key issues.

The base of the PTMS (as given in the pictorial snapshot in Figure 3)is the 6 broad dimensions explained in section 1.3. The constant interflow of data from these dimensions captured in the database through the interface, namely the mobile app and in case of changes to any of the dimensions – new additions or modifications which are captured through appropriate tools in the inventory management system, is captured and disseminated for decision-making.

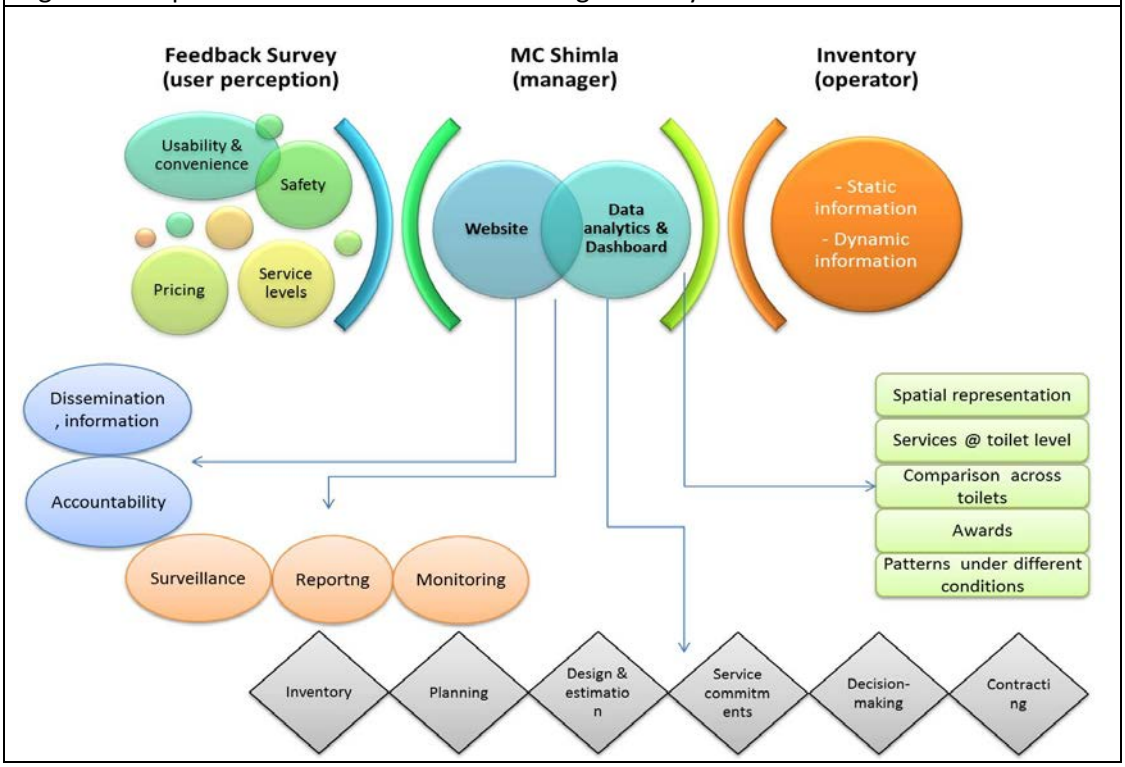
The website supported by data analytics and map-view of query results as well as the dashboard (that reflects information on quality, complaints, feedback on safety and pricing) is the top-end of the system and acts as tools for inventory/asset management in the PTMS. The dashboard helps in

- monitoring of services,
- induce actions to be taken by the right departments at the right locations,
- Escalation of persistent problems over time to higher authorities

As such periodic data is documented there is scope for better rewards mechanisms through a comparative structure across toilets on specific parameters. The common framework of information dissemination through the website facilitates accountability. As can be seen in forthcoming chapters, the systems

approach followed in this project first starts with creating of database with all the fields to capture the required information that facilitated decision-making, and accountability. We also create the necessary applications – both web application (for static or long-term data) as well as the mobile app for data generation (for dynamic data). The following section explains the flow-chart followed in terms of building such a PTMS.

Figure 3: Snapshot View of Public Toilets Management System



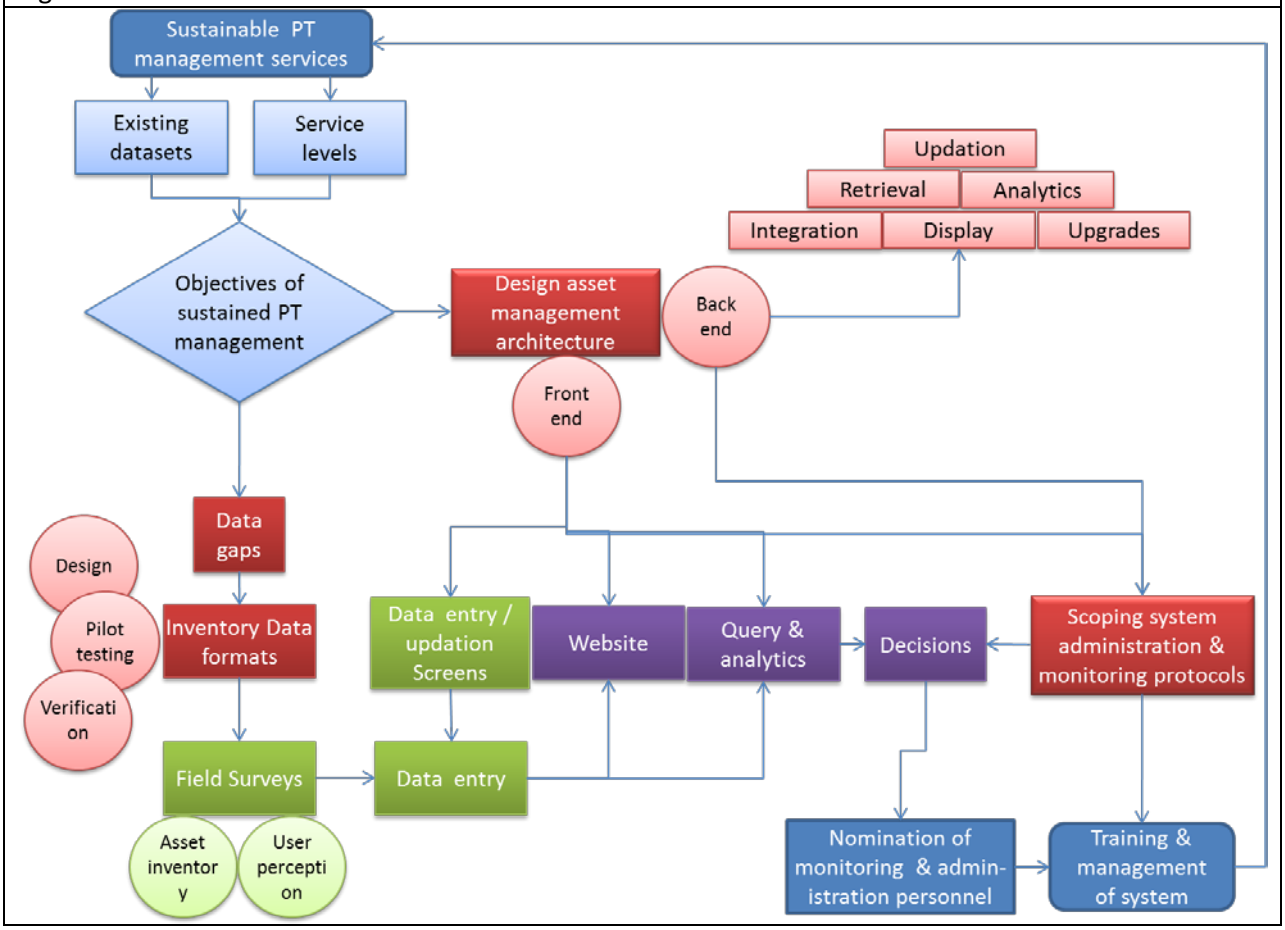
1.5. Flowchart of Activities in Establishing PTMS: Figure 4 gives the flowchart of activities for establishing the PTMS. As with any e-governance framework, there are three aspects of flow of activities. One is the technical aspect of building the information and communications technology (ICT) based interfaces for the PTMS, complete with the overall architecture and infrastructure (hardware – server space, mobile phones and software – database, front-end tools, maps, web-interfaces, mobile application). The second is the governance aspect, namely determining the datasets/indicators to be collected, determining the architecture for decision-making supported by relevant sets of data, and more importantly the human resources part.

1.5.1. Technical aspects: The steps here are to build the design of the asset management architecture. The front-end of the system is the modules to enter data for given login restrictions, view information, run queries/reports and analyse results. A map view is also facilitated for results, and thus requires integration thematic maps available on MCS in relative sectors to be loaded as inputs. The back-end of the system is the database and the processing where the analytics are driven.

1.5.2. Governance aspects: The steps here are to first determine the broad framework of data needs for a complete PTMS, and review the current data management practise at the administration. This gives us the base to create the framework to build the questionnaire for data collection on each toilet. Essentially two

types of data are collected – first is a census of all toilet locations, and the existing inventory of infrastructure and resources as it exists. The second is the sample data from users across MCS.

Figure 4. Flowchart of activities for PTMS



The Data sheets for collecting the inventory data and the design of the data management architecture are determined based on the objectives of sustained PTMS. After the questions are designed, the survey instrument is piloted for a test survey at some locations. After verification of the data, the questions are reviewed and updated. The final questionnaire is given to the field staff, trained completely and the data collection exercise is begun.

On the other hand, the same questionnaire that is finalised after the pilot study is used to build the database architecture. A set of query and report modules are finalised based on inputs from the resources in the governance aspect. Once the data is collected, it is entered through the data entry schema developed by the ICT team and forming part of the website.

The further step is to build a decision-making framework where the people involved from the administration are empowered to use the data with the analytics. A complete training module is used to train and empower the administrative staff at different levels.

Chapter 2

Review of Current Management System of MCS

And

Overview of Comprehensive Asset Management System for Public Toilets

2.1. Study of Current Data Management System

The current data management system at the Municipal Corporation of Shimla features a set data and maps collated as a result of various efforts including the City Sanitation Plan. The data on the website holds a static map in pdf format. The pdf map does not offer scope for interactive data display. The website does not have data related to various categories of public toilets (PT), a query or reporting feature on the toilets, the footfall details and other infrastructure related details. A data gathering exercise is inevitable to undertake any planning of PT facilities under this scenario, as the existing website is not designed to portray live data. There is also no mechanism to collect, collate and disseminate real-time data, for instance, of complaints.

The administration has a set of data on the PT in terms of the address, and its categorisation. The overall inventory is limited to 3 parts, namely:

1. Identity of toilet
2. Availability of assets
3. Maintenance contract name & availability of rooms for cleaners/attenders

The maps have been developed fairly accurately including the existing toilet locations. The data is stored in spreadsheet format. The maps are stored both as Acrobat PDF as well as shape-files in AutoCad.

Annexure 1 gives the details of the PT as given by the MCS as a printed format before the project commenced. List below gives the list of details available for each toilet. It can be seen that the information is not sufficient for conducting a periodic analysis of the public sanitation system in the Municipal Corporation of Shimla.

List of data available for each toilet in the spread=sheet format in MCS:

1. Ward number
2. Name of the property
3. Location
4. Category of location (core or non-core area)
5. NO. of gents outlets, with breakup on urinals

6. No. of women outlet
7. Availability of bathrooms
8. Organisation that maintains the toilet
9. Availability of attendance room
10. Availability of Attenders room.

As mentioned earlier, currently the Shimla City Sanitation Plan (CSP) is a major source of information on the sanitation sector for the city. The CSP provides geo-referenced data and maps. However, these are in print/pdf format. These cannot be used directly for analytical purposes or overlaid with other dynamic data for decision-making.

The following maps are available in the CSP:

1. Shimla administrative map with ward boundaries
2. Water supply map including source and distribution network
3. Sewerage network map including disposal system
4. Storm water drain network map
5. Solid waste management network maps including disposal system
6. Existing public sanitation locations
7. Map of regions with different access to toilets
8. Open defecation locations.

The following list of maps in digital format (shapefiles) were given:

1. Drainage network
2. Water supply network
3. Water supply feeder lines
4. Nallah
5. Sewerage network

These shapefiles have been loaded in the database and disseminated in the website as maps. The dissemination of the maps has been done as given by the MCS. It is realised that the accuracy of the shapefiles generated by MCS could be improved by reworking it with the help of cartographers. These layers can be reloaded into the database once the accurate drawings are completed. The database has been designed in such a way as to reflect the maps immediately.

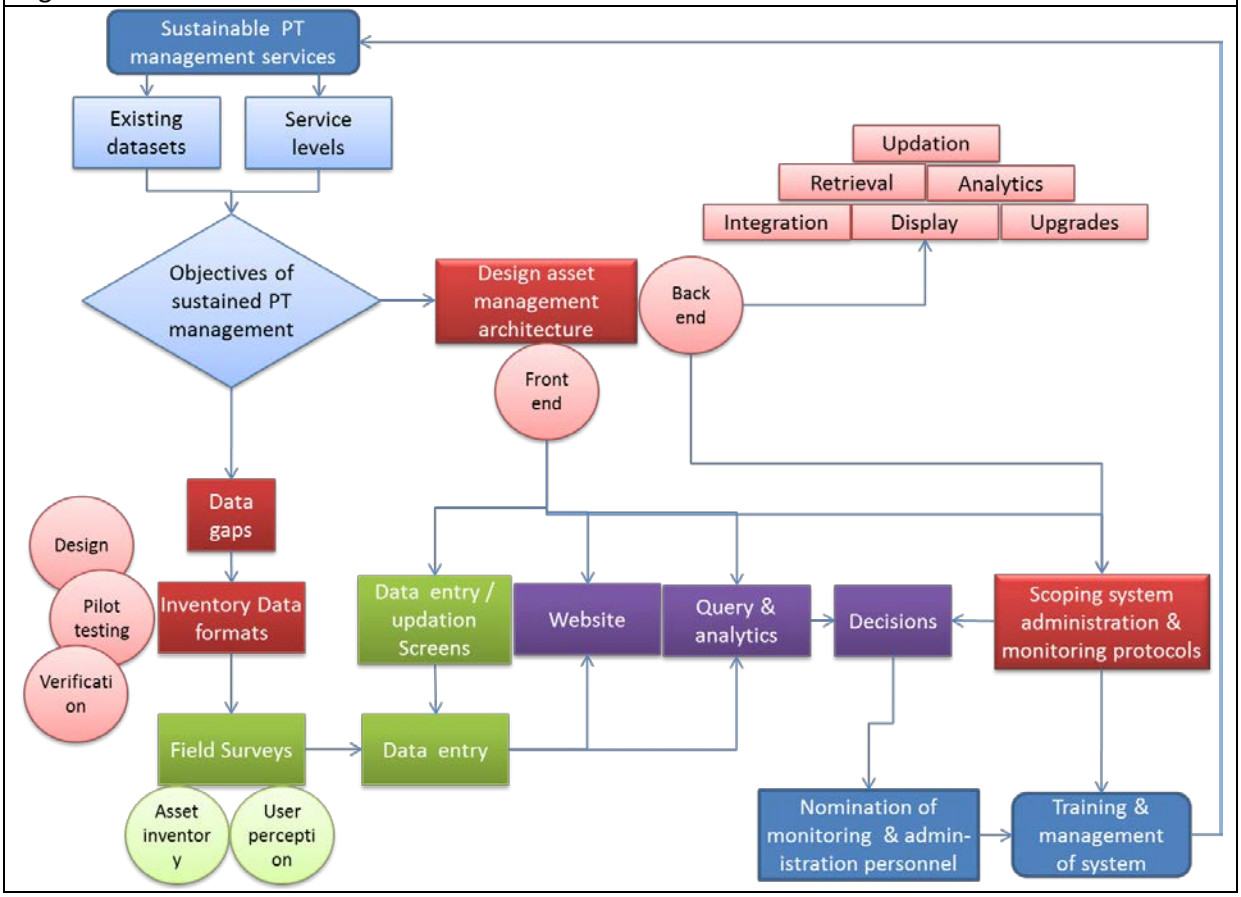
2.2. Outline of the computer architecture requirements for accommodating an asset management system

Figure 5 gives the overall flowchart of the project. Essentially, this project envisages creation of a framework of information and communications technology (ICT) tools based architecture that accommodates an asset management system designed to enable informed decision making. Based on this framework, we can then look at the gaps in the existing system and present the case for the need for this system.

Framework of a GIS linked Asset Management System:The framework of the envisaged asset management system has the following features:

Resource inventories: Any decision support system commences with the creation of resource inventory. "Resource inventory" refers to the set of public sanitation facilities created in Municipal Corporation of Shimla. The locational reference (latitude, longitude) of each PT facility is tagged in the database. Data on The resource inventory includes all the features of the toilet and its existing condition, as also the average footfall at various time intervals.

Figure 5: Flowchart of PTMS



Map layers: The resource inventory and data are to be linked to map layers as points, polygons or lines.

Query and report formats: The system would be designed to perform queries on various parameters. The results of the queries could be seen on the map. The queries and reports, interplayed with thematic maps can bring out spatial dimensions of public sanitation, the gaps and the requirement in a given region.

Data updates: The system will have the facility to update the data on a periodic basis, as maintaining the periodicity of information is the sine qua non of any information system that aims support decision making.

Monitoring platform: The key parameter that ensures sustainability of any system is monitoring. The proposed system has a built in monitoring platform in the form of complaint management system (CMS). The CMS has been designed with the objective of providing a tool for escalation mechanism of un-addressed complaints.

The conceptual role of online GIS in this system is to support decision making for government officials by serving various real time statistics as thematic maps. For instance, it helps provide user-defined classification for establishing resources management plan conducted by government officials of the Sanitation/Healthcare department.

Gaps in the existing system as a "data management system":

1. The data being held in spreadsheet format, does not support decision-making and analysis.
2. The maps are not integrated with the database.
3. There is no web-based dissemination of the existing data.
4. The system does not have a data entry/edit module.
5. The system does not have a complaint management module.

Therefore the new system for PT management in Shimla proposed to address these gaps with a dynamic interactive map. Chapter 4 (Task 4 output) of this report has a detailed technical note on the systems architecture.

2.3 Level of Online Dissemination Expected for PT in Shimla

Discussions were held with Shimla Municipal Corporation and GIZ on the requirements for online dissemination. During the discussions the administration had indicated the following requirements in terms of online dissemination of data on PT:

1. The data management system to be available online with map features
2. The system should have login credentials and for the right logins, provide features to add/delete/modify details. It should be also possible to add new locations to the online map through the system
3. The system needs to have query features with the output linked to maps on run time.
4. There should be a robust complaint management system
5. Contract details of each toilet in terms of its infrastructure to be available in the database format

Following this, it was decided to build a database based on a inventory sheet for each toilet, grouped under the following heads:

1. General details related to location, ward, approach, construction year, availability of land etc
2. Nature and extent of infrastructure available in terms of number of units for each category of asset
3. Details of toilet usage patterns, timings, fees paid etc
4. Availability and source of water
5. Emergency issues and their handling
6. Sewerage and waste disposal
7. Electricity connection, usage
8. Details of the caretakers
9. Gender related issues
10. Monitoring of services
11. Location specific data (latitude, longitude and altitude) and pictures

Annexure 2 provides a sample report of a select toilet.

To conclude, we propose a completely new system, with online database which can be updated on a regular basis and also propose to collect the data first hand from the field visiting each of the individual PT. This system will be supported by a mobile application which helps in updating the dynamic data such as complaints. The data will be available online, and the query/report will be shown on map. Such a facility will help in decision-making.

It is however to be noted that such a system would require a focused training for the officials at MCS in terms of:

1. Using the system for decision-making
2. Using the system for adding, modification and deletion of records
3. Using the mobile application
4. Using the complaint management system as a reporting tool and quality management with escalation mechanisms.
5. Most importantly, train the system administrator in MCS in terms of handling the database, emergencies and creating backups of data on a regular basis.

Chapter 3

Validation of Completeness and Quality of Data

3.1 Features of database on PT facilities in the Database

This section reviews the data sections that are captured for each toilet. There are two levels of data that are generated for any given PT facility. The first is the existing features of the toilet including its geographical location, extent of infrastructure, designed level of facilities and human resources to man the facilities, including the timings. The second aspect is the dynamic nature of how the toilet is perceived by the users from a demand perspective.

For instance, the following data as taken from thePTManagement System's (PTMS) online report feature is a part of static data:

Figure 6. Sample data from the PTMS

A. Details on toilet units and improvement required

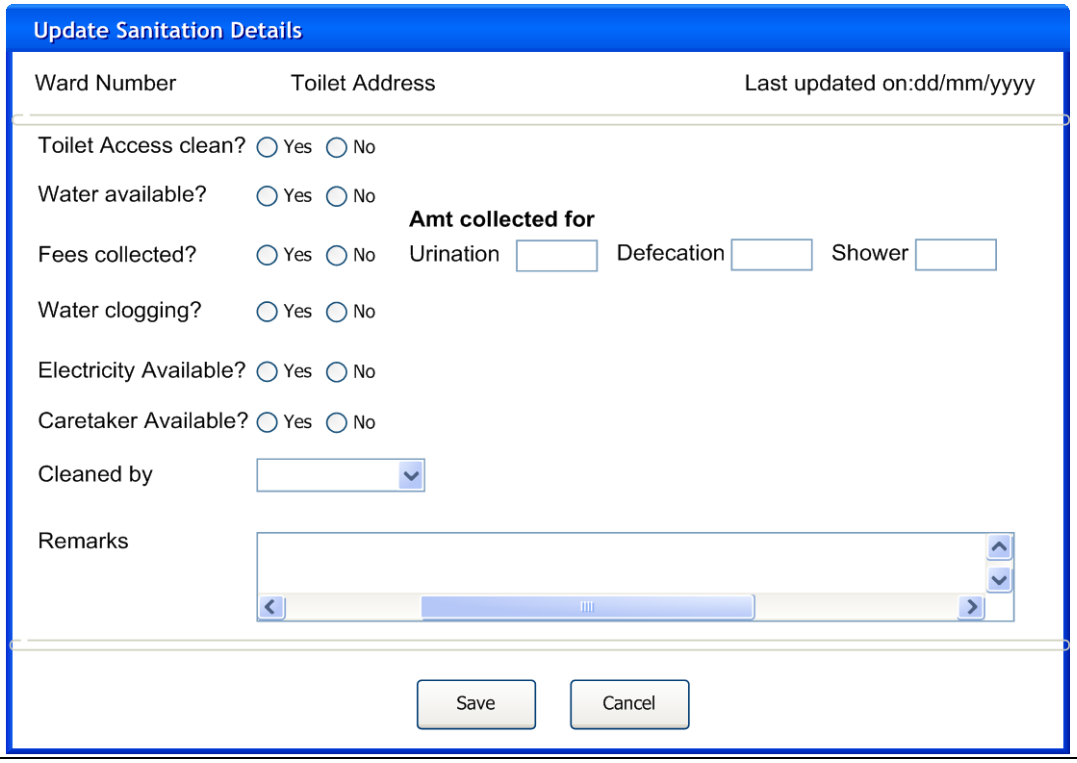
Components in Gents Toilet	Existing (in numbers and status)
Gents Urinals	0
Gents Toilet	3
Bathing cubicles	0
Hand wash basins	0
Floor Type	Tiles
Doors	3
Mirrors	0
Lighting fixtures	0
Taps	0

Now the above data is useful in planning what features need to be added here to the toilet. It is also useful in grouping the toilets based on a given criteria (which is beyond clusters and is particularly useful for management) such as List of toilets with space for advertisement. If a policy decision is taken on this aspect, it is easy to immediately see the impact of the decision and the locations where the impact will be felt. On the other hand, the dynamic data relates, as explained earlier, to issues that may change over time or due to exigencies such as electricity failure etc.

The proposed system of data management has the facility to update data on a regular basis through a mobile application, and the data is sent to the database in the server on a run time basis. A separate map-page is developed to display this data; though the database is the same which holds this dynamic data for each toilet, the tables are different, but linked through the common id for each toilet which is unique.

A snapshot of this data captured in the database is given below:

Figure 7. Dynamic data captured from Mobile App in the database



3.1.1 Infrastructure related information: This section captures the details of the PT facility in terms of its infrastructure. In the database, it is then possible to look at the locations with most infrastructure and usage, and then decide on the unmet demand and invest on increasing the infrastructure either in the existing location(s) or create a new location. The following table gives a detailed outlay of the infrastructure information sought to be databased:

Table 1. Infrastructure Detailsof PT Facility Captured in the Management System: Part A		
1. Type of Toilet (Circle correct option)	a. Public	b. Community
2. Entrance 2.1 Common entrance for Gents and Ladies Separate entrances for Gents and Ladies 2.2 Is there a main door for the toilet: Yes No 2.3 Are there separate door for A. Gents toilet entry Yes/No B. Ladies toilet entry Yes/No 2.4. Are the main door working condition? Yes/No 2.4.1 If No, Identify the issues (tick all that apply): a. Door broken b. No latch		

c. Door is stuck and not-moving
3. Floor and roof **3.1** Type of floor: a. Mosaic b. Tiles c. Cement d. Others (specifiy) 3.2 Condition of the floor (tick all that apply): a. Good condition b. Broken/cracked c. Uneven surface d. Tiles/flooring has come out 3.3: Type of roof: a. Cement ceiling b. Tile c. Asbestos d. Others (specify) e. No roof 3.4: Condition of the roof: a. Good condition b.Leaking c. broken/damaged c. Needs full repair

4.1No. of Toilet units	a. Gents-toilets: a.1: Fully working condition a.2: Units broken a.3: Unit Doors without latch: a.4. Unit doors not closing a.5. Units without doors	b. Gents - urinals: b.1: Fully working condition b.2: Units broken b.3: Units pipes broken	c. Ladies toilets c.1: Fully working condition c.2: Units broken c.3: Unit Doors without latch: c.4. Unit doors not closing c.5. Units without doors

4.2 No. of bathing units	*Gents:*	*Nos.*	*Ladies:*	*No.s*
4.2.1: Bath facilities (click all that apply)	*Shower* *Tap and bucket*	*No.s* *No.s*	*Shower* *Tap and bucket*	*No.s* *No.s*
4.2.2. Bath conditions	*Shower working* *Shower not working* *Without doors* *Doors not closing*	*No.s* *No.s* *No.s* *No.s*	*Shower working* *Shower not working* *Without doors* *Doors not closing*	*No.s* *No.s* *No.s* *No.s*
4.3 No. of washbasins	*Gents:*	*No.s*	*Ladies:*	*No.s*
5. Lighting availability	*a. Gents*		*b. Ladies*	
6. Caretaker room	*Available*		*Not available*	
7. Size of toilet	*Length*	*Breadth*	*Wall height*	*Total built area (sq ft)*
8. Painting	*Fresh and neat*	*Needs full painting*	*Needs painting with plastering*	*Needs partial painting*

9. Advertising Area *(Indicate availability & area in sq. ft)*
a. Bill board : Available Yes/No If yes, Area in sq ft:
b. Outside wall : Available Yes/No If yes, Area in sq ft:
c. Side wall : Available Yes/No If yes, Area in sq ft:
d. Any other : Available Yes/No If yes, Area in sq ft:
e. If yes for “d”, specify area type

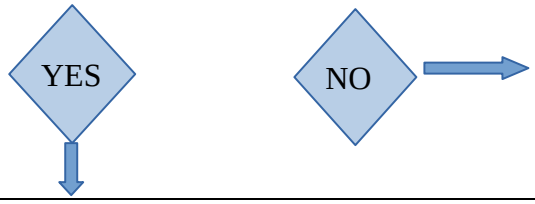
The next part of the infrastructure related information (Part B) as in the following table gives the details of ownership of the asset, the responsible entity for its overall operation, maintenance and upkeep, availability or non-availability of sewerage and waste disposal mechanisms, the type of mechanism and

availability of water facilities. These are important information to be databased to assist planning of not just the creation of a facility but also in terms of planning the future maintenance of the infrastructure with a view of the support infrastructure such as drains, pipelines etc that would need to be put in.

<table>
<tr><th colspan="2">Table 2.Infrastructure Detailsof PT Facility Captured in the Management System: Part B</th></tr>
<tr><td>1. Owned by
1.1: Government:
1.2: Private (Name) _____
1.3: NGO (Name) _____</td><td>2. Operated & Maintained by
2.1: Government:
2.2: Private (Name) _____
2.3: NGO (Name) _____</td></tr>
<tr><td>3. Water Availability Status (Enter Details)
3.1: Timings (day/hours)
3.2: Seasonal Variation (Specify)
3.3: Source of Water (Specify)
3.4 Storage availability
5. Access from the nearest road (in mts)
6. Condition of the approach road
7. Distance from nearest PT complex (mts
8. Additional land available around the toilet and extent (sq ft)</td><td>4. Sewerage & Waste disposal (Circle Correct Option)
4.1: Connectivity to Underground Drainage (UDG) System/On-Site Treatment
No specific mechanism
4.2: If not connected to sewer network, distance from network (in meters) _____
4.3: If septic tank, frequency of cleaning tank (number of times/month)_____</td></tr>
</table>

3.1.2. Information on usage: This forms the base of demand assessment for a given PT. It also provides a key governance aspect as it is normally seen that a section of PT facilities are found to be put into different usages other than for PT facilities. It is also imperative to database if the usage is for a specific set of people or universal. The following table gives the details obtained on this aspect.

As can be seen immediately, this table portrays the demand side of the management issue, and at the same time, some areas of supply failure; for instance, the question if the toilet is being USED as a toilet really (question 1). This drives the management to understand the choice of the location more critically, whether there was a felt need, or is it a governance issue of not maintaining the facility as it should be for public use.

Table 3. USAGE DETAILS					
1. Is the Toilet being USED as a toilet?					
			1.2.1: What is toilet used for: _____ 1.2.2: How long has the toilet not been in use ? ____ months		
2. Does toilet cater to both Ladies & Gents?			**Yes** **No**		
3. Toilet timings:	*Jan – Mar*	*April – June*	*July – Sep*	*Oct – Dec*	
Open: _____ Close: _____ (Specify AM/PM)			(Verify – Signboards in & Outside)	a. Yes b. No	
4. Is usage fees collected for using facilities (Circle correct response, ask caretaker) a. Yes b. No.					
4.1: If usage fee collected then apart from immediate payment			**4.3: Amount collected in INR**	**Particular**	**Amount**
Is any other mode available: a. Yes b. No				Urination	
4**.2: If Yes in 3.1, Select type(s)**: (a) Monthly Card, (b) Weekly card				Defecation	
4.3. Are there any default in payment of user charges? Yes/ No				Shower	
(c) Random Donation, (d) State Sponsored, (e) Others					
4. Does the toilet complex have a sign board? Yes/ No. 4.1. Does the sign board mention the user charges? Yes/ No					
5.Is the caretaker using the space for any commercial activity like advertising? Yes/ No. 5.1. Is there any possibility of using space for advertising? Yes/ No 5.2.If so, what is the space available for advertising? ____ sqft					
6. Foot-fall (Daily)	**Morning**	**Fore-noon**	Afternoon	Evening	
Male (Toilet)					
Male (urinal)					
Female (Toilet)					
7. Foot-fall (seasonal variations)	Jan – Mar	Apr – Jun	Jul – Sep	Oct - Dec	
Daily number of visitors (average)					

The above is also followed up by databasing the nature of users and their broad profile. Combined, these have implications on the type of contracting given for the toilet management and also the costing features.

Table 4. USER DETAILS OF THE FACILITY			
1. Circle the users using the toilet: a. Tourists b. Slum c. General d. Commercial			
2 Is daily use record maintained: a. Yes b. No			
3. Circle time of day when usage peaks: a. Morning b. Afternoon c. Evening d. No fix peak hours			
4. Verify & Note the type & number of toilet			
Indian toilet (Nos) western toilet (No.s) Tap available inside toilet, Yes/No Mug & bucket Yes/No No. of toilets without Mug/Bucket		Indian toilet (Nos) western toilet (No.s) Tap available inside toilet, Yes/No Mug & bucket Yes/No No. of toilets without Mug/Bucket	
Type	**Number for Women**	**Number for men**	
a. Pit Latrine			
b. Pour & Flush			
c. Flush Toilet			

3.1.3: Details of specific inputs: Water, electricity: This gives details of the supply and status of specific inputs such as water and electricity. Water is a key component in cleanliness and actually realising the goal of complete sanitation. Similarly electricity is a related issue as it has direct consequence on water availability and security of users. In terms of management, this gives a control at situations of specific risk/failure, to reach alternative arrangements at the specific locations. The following tables give details of information collected on this aspect.

TABLE 5. WATER AVAILABILITY STATUS	
1. Physically Verify and Circle Availability of Water at the complex: Is Water Available? Y / N	
1.1: Following information is taken only if Water is <u>AVAILABLE:</u>	
1.1.a Frequency of water Supply (Circle) a. 24 Hours & 7 days a week b. Hours/Day _____	1.1.b Is there seasonal variation in availability a. Yes Details:_____ b. No
1.2: Following information is taken only if water is <u>NOT AVAILABLE:</u>	
1.2.a: If unavailable correct status for non-availability: a. There is no Water. b. Water obtained & stored inside the Complex?	1.2.b: Take following in case of b option for 1.2.a a. Water collected from _____ b. Who collects water _____ d. How many times a day water is collected: ___

2: What is toilet Usage Pattern during periods of water scarcity: a. Same, No Difference b. Lesser people

TABLE 6. WATER CLOGGING PROBLEMS					
1. Is there a water clogging problem inside and/or outside the toilet complex? a. Yes, both b. Yes, inside c. Yes, outside d. No					
2. How long has the problem persisted	(write no. of days)	**2. Has a complain been registered?**	2.a: Yes 2.b No If yes, when _____ & To Whom _____	**3. Time taken to fix the problem (If applicable)**	(write no. of days)

Table 7: ELECTRICITY DETAILS	
1. Does toilet complex have electricity? a. Yes. b. No	**2. Electricity Availability :(circle correct option)** a. 24 Hours, 7 days a week b. Hours/day _____
3. Electricity is used for (circle correct options): a. Lighting b. Water Sump c. Cleaning	
4. Who pays for the electricity: a. Urban local body b. Contractor	

3.1.4 Caretakers and Cleaners: Human resources are the key to the ultimate success of any public service delivery and as such the issue of caretakers and their management becomes an imperative for the better results in the PT management. It is important that our system also brings a database on the human resources namely the caretakers. The following table provides details of the caretakers for each toilet to achieve better management practices for the PT.

TABLE 8. DETAILS OF CARETAKER					
1. Is there a caretaker for the Toilet? a. Yes b. No					
2. Count & Gender of Caretakers			**3. Who employed the caretaker?** _____ Describe process of employment _____ _____		
Total	**Male**	**Female**			
4. Shift timings of caretakers: (note separately for each person) Caretaker 1: Caretaker 2 Caretaker 3: Caretaker 4:					
5. Salary details of caretaker (s): (note the monthly salary and frequency of payment)					
	Monthly Salary (Rs.)		**Frequency of payment**		
Caretaker 1			a. Daily	b. Weekly	c. Monthly

Caretaker 2		a. Daily	b. Weekly	c. Monthly
Caretaker 3		a. Daily	b. Weekly	c. Monthly
Caretaker 4		a. Daily	b. Weekly	c. Monthly

6. Who is responsible for cleaning the toilet a. Caretaker b. Cleaners

6.1. No. of times toilet is cleaned per day: _____

6.2 Cleaning time each day: Morning Forenoon Afternoon Evening

6.3 Is there a cleaning timesheet/record sheet issued?

8. Number of cleaners employed for cleaning: _____

8.1 Is mechanised cleaning practised

9. Is there a complaint redressal mechanism available (telephone numbers, who to contact etc.)

a. Yes. b. No

3.1.5 Gender Issues: Many studies have highlighted the issue of lack of adequate toilet facilities for women in public spaces. It is important to also look at issues of safety and ease of reach in planning for PT facilities for women. The database collects the following information for the department to take active decision on promoting gender equanimity in sanitation usage.

In our earlier studies in Chennai and in Tirupathi where a similar system has been developed, Akara team had interacted with the women entrepreneurs and shoppers. The outcome was that the urban regions has schemes that focused on creating financial inclusion tools to make the women participate in the market as entrepreneurs and leverage any skill they may possess like tailoring or even leverage the market opportunities for trade such as eateries, flowers and vegetables. However, there is a huge health cost on these efforts, as there are no PT that women could use in these market places. On occasions, women entrepreneurs would have to walk back home particularly in the most profitable evening periods, away from the site of their trade, just to use a toilet facility. Our efforts in Chennai and Tirupathi showcased large spaces with absolutely no PT or facilities with women usage, in regions where there was high intensity of small vendors, many of whom are women. Our intention in Shimla was to put a measure to this issue, in relation to the quantum of inventory available in the city for men.

TABLE 9. GENDER RELATED		
1. Is there a female caretaker for the Toilet?	a. Yes	b. No
2. If yes, what is the timings: a. Full time	b. Part-time (if Part time, specify time)	
3. Is there a prominent display of help-line number in case of emergency for women		
4 . Is there bins for disposal of napkins		
5. Is there private space for dress changing?		

6. Is the toilet location close to

   a. Forest/fields
   b. Bar/Wine shops

The above questions are important on their own and also in relation to providing safety for women in public places. Particularly in a region like Shimla which has a blend of high population of women both as workers, shoppers, and tourists, it is imperative that the safety and comfort of women and those with children is given priority. In cases of emergencies, a well-equipped and clean toilet can support many of the temporary exigencies women could face, including small things like changing of napkins. It is imperative that in such conditions, the infrastructure and service provision of the toilet need to be appropriate for women.

Here we have given three indicators for measuring gender inclusivity in PT, using a technique used in development economics to showcase underdevelopment within groups, or non-inclusivity of development achievement in a given region:

a. Gender gap in numbers (Total number of toilets for women minus total number of toilet for men) as a percent of total available toilets including urinals: This indicates how much the deviation is in terms of quantum of toilets available for women, compared to men.

b. Gender gap in locations: (total number toilet locations for women minus total number of toilet locations for men) as a percent of total number of toilet locations including urinals. This indicates the number of locations where there is availability of toilets for women, compared to men. This indicator is helpful in understanding the gender gap in numbers as mentioned above, in terms of whether this gender gap is uniformly across the region (wherever toilets are located) or just in terms of specific locations where there are more toilets for men.

c. Gender sensitivity: Number of toilets with female caretakers as a percent of total number of toilets. This indicates the sensitivity in terms of providing the required services to support women in the toilets, and also a measure of providing security and feel of comfort for the women.

3.1.6 Details of geography, appearance and location: These details are critical given the fact that the reporting is not just tabular but also in the format of map, given online. With data including photographs being possibly uploaded on a timely basis, new management models can be created with the new PT management system. The tables below give the details of data collected under this category.

TABLE 10. GEOGRAPHY AND APPEARANCE
Georeference ID
Latitude
Longitude
Altitude
Picture 1: Front view (with sign)
Picture 2: Back-side view
Picture 3: Inside toilet (for each toilet unit and urinal)

Picture 4: Approach to women entry
Picture 5: road to toilet, the road and street light
Picture 6: advertisement board if any
Picture 7: information board on prices
Picture 8: storage tank and wastewater outlet

Location:
Ward Number & Name:
Nearest landmark
Brief Description: (4 -5 sentences and photographs):
Construction year
Constructed by
Is the toilet visible from

- Main road
- Lane from the main road
- From an elevation

Is there a signboard for public leading to the toilet from the main road: yes/No
Is the access to the toilet clean: Yes/No

The above feature is quite useful in providing map-view of the spread of toilets, along with other features such as roads, landmarks and ward boundaries. However, the significance is much pronounced when we facilitate queries and the output of these queries can be seen both as tables (that simply list the satisfying records) as well as on a map. This can help us to group the toilets beyond the cluster approach that usually is followed. An instance is given below based on the data collected from the field.

The picture depicts the snapshot of results from a query on selecting toilets with advertising space. Now 43 toilets are there which have advertising space. Suppose there is a policy on advertising and the management wants to look at this as a group, this query helps the case.

Figure 8 Snapshot of Query Output – Tabular View

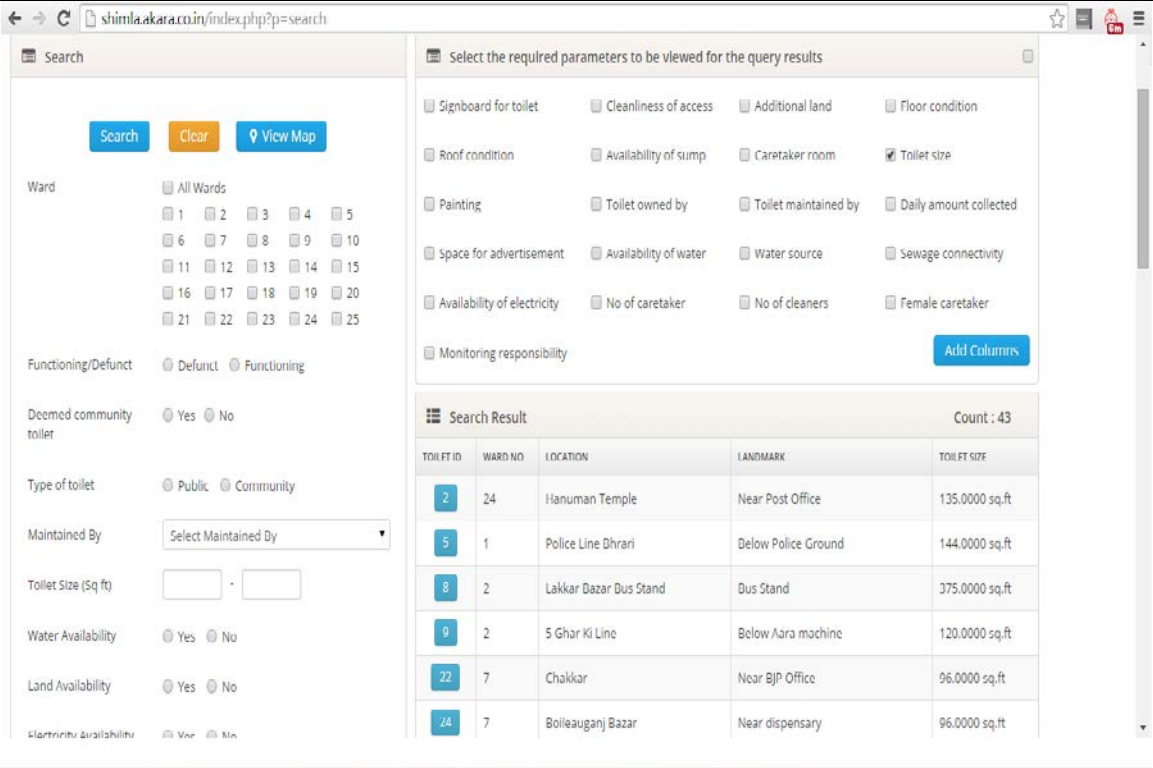
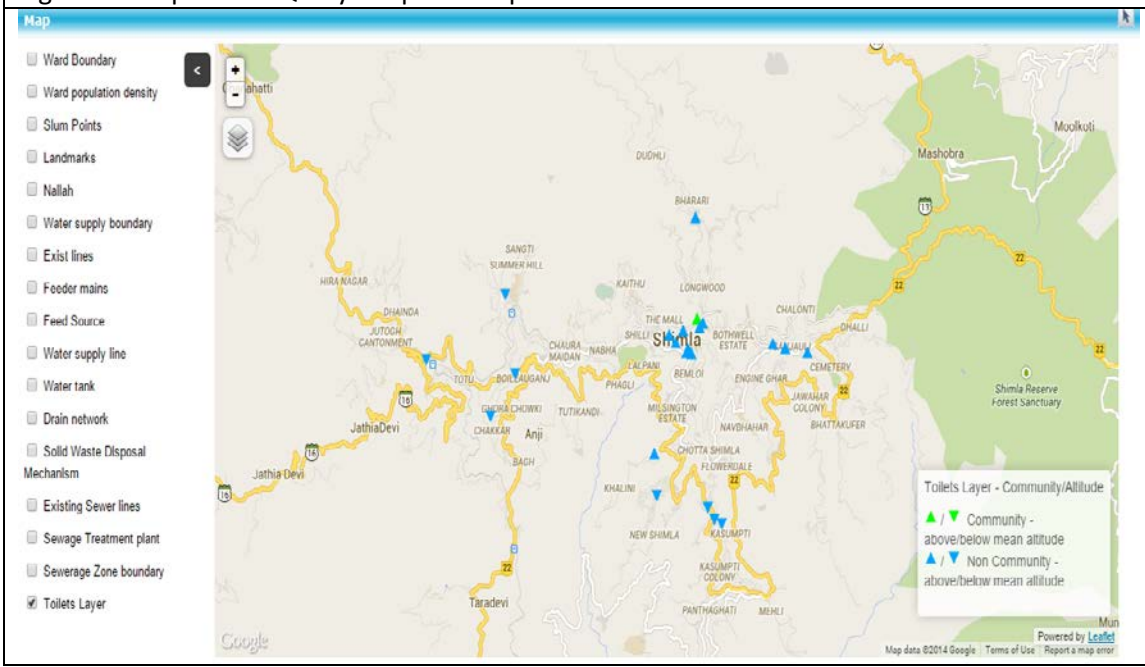


Figure 9. Snapshot of Query Output – Map View



Moreover, the same result is available as map too, as shown above, where the 43 toilets are shown on the Map of Shimla.

3.2: Current data system at MCS: It has been mentioned earlier that the current data management system falls short of providing an adequate base for decision-making. The details held in the database in the format of spreadsheets are as follows for each ward:

Table 11. Spreadsheet Data Currently Held by MCS		
Sl No	Details related to PT facility	Remarks
1	Name of the property	Whether PT/urinal
2	Location	Not the address, but a common landmark or street
3	Gents	Number of facilities for gents
4	Ladies	Number of facilities for ladies
5	Urinals	Number of urinal facilities
6	Maintained by	Which is the agency maintaining the PT (MCS/NGO)
7	Category	Restricted area/unrestricted area
8	Attendant room	Room available or not for caretaker
9	Space for attendant room	Whether space is available for constructing attendant room

Apart from the above details, we are also provided an overall table with the following information:

Tale 12. Summary Sheet of PT in MCS	
Status heads of MCS Toilets	Data
Total number of toilets	162
Toilets under repair	5
Toilets to be dismantled	4
Toilets dismantled	8
Toilets non-functional	3
Toilets with attendant room	9
Toilets without attendant rooms	133
Toilets with space available for Attendant rooms	33

3.3: Limitation of current information system for decision-making: It is evident that the above information hardly allows decision-making particularly in the context of dynamically changing situation. Second, it is not giving the details related to the quality of services, or of the demand side of the picture. The details in the summary sheet are static and a survey has to be done every time the data is required for decision-making. It is important to note that the items in summary sheet, such as “toilets dismantled” – do not provide for their breakup in terms of wards or regions.

The limitation in the current information system is both in terms of available data as well as in terms of break-up of the relevant information to clearly identify/pinpoint the toilets where action has to be taken. In a fully integrated data management approach provides the facility to view related data on a single platform which facilitates better analysis of correlations and exceptions. The table below gives the details of the related data which can be viewed along with the toilet related data through the database system; the important aspect of the development is that, as can be seen from the table, much of the data is available

with the MCS. These are purely in the form of information, outside of the realm of a "database". The new database management system facilitates better leveraging of available information.

Table 13. Map Layers and Their Source for Viewing Along with PT Data		
Sl No	**Layers in the map website**	**Source**
1.	Ward boundary	Shape files received from MCS
2.	Slum points	Shape files received from MCS
3.	Drainage lines	Shape files received from MCS
4.	Sewer lines	Shape files received from MCS
4.	Nalla lines	Shape files received from MCS
5.	Water supply lines	Shape files received from MCS
6.	Water tanks	Shape files received from MCS
7.	Commercial area	Streets to be marked by survey team
8.	Tourist areas	Points to be marked by survey team
9.	Open defecation	
10.	Sanitation	Points to be marked by survey team

The other data that is currently not in the domain of MCS's existing system is the dynamic data – or data that changes over time due to usage or external factors. These are electricity availability, working of bulbs, water taps, cleanliness, availability of water, attendance of caretakers/cleaners. These issues need to be reflected into the system as "data". Due to the dynamic nature of these type of information and the fact that such information can be felt only at the specific PT, the PTMS carries a module to update the dynamic data on a periodic basis and reflect the same in a dashboard.

3.4 Deepening the demand-side understanding – perception survey: The data collected in the asset inventory provide a detailed understanding of the supply side, and a brief overview of the demand side. We need to deepen the understanding from the demand side, for which a perception survey was executed. The entire questionnaire is presented as **Annexure 3** with this report. The perception survey obtains the following type of information from the respondents:

3.4.1. Profile of the respondent: This includes the gender, age, residential status, employment status, purpose of visit, regularity of visit. The local residents are asked question related to presence of PT in the place of their work, whether this was a regular usage for them, and the distance/time they have to travel (in case they were regularly using this facility) from the place of their work. This helps us to understand the general type of users of a particular PT. This helps in formulating user communities, pricing, type of amenities and even a new location where the toilet may have to be put up. The snapshot of these questions is given in table 14 below.

Table 14. Snapshot of General Questions and Identity

1. Date of interview:
2. Place of interview:
    a. Location of toilet
    b. Ward Name, Number
    c. Nearest Landmark
3. Gender of respondent
   (*Note: in case of FGD write down, number of male and female respondents*)
    a. Male
    b. Female
4. Where is your place of residence
    a. Shimla town
    b. Other (please state)
5. Employment status
    a. Unemployed
    b. Employed. Please specify
    c. Retired
    d. Student
    e. Other
6. Where is your place of work located?
    a. Name of establishment
    b. Street Name
    c. Nearest landmark
7. What is your frequency of visiting public toilets in the city
    a. Every day
    b. 3-4 times a week
    c. Once a week
    d. Time-to time
    e. Rarely
    f. Cannot say
8. Is there a public sanitation facility near your work place?
    a. Yes
    b. No
    c. Not aware

9. If yes, please mention the street where this facility is located

10. If yes, is this facility is a
    a. Toilet complex
    b. Urinal

11. Reason for using this public latrine
    a. No facility at home/office
        i. Are you a regular user of this particular toilet: Y/N
        ii. If yes, since when have you been using this toilet:
            1. No. of days/weeks/months/years
    b. Working in this area
        i. Are you a regular user of this particular toilet: Y/N
        ii. If yes, since when have you been using this toilet:
            1. No. of days/weeks/months/years

c. Visiting this area
d. The toilet/urinal near my place of work is not convenient to use
    i. Please provide reasons why
e. Other (describe)

3.4.2. Perceived profile of the toilet: The distance travelled by each user to the PT from the place of work/visit, payment made for usage, waiting time for using the facility, perception of cleanliness, availability of water, availability of other amenities, quality of the available infrastructure and amenities, behaviour of the caretakers, and specific complaints related to the toilet, their willingness to pay for better services.

Table 15. Questions to Estimate the Perceived Profile of the Toilet

1. How far did you have to walk/commute to use this toilet complex:
   (Note: interviewer to provide all options, user to choose what is most appropriate)
    a. Number of minutes
    b. Number of kms

2. Has the price you have to pay for using the public toilet changed over time
    a. No
    b. Yes (provide details)
    c. Do not remember

3. In which area is there an urgent need for constructing a public sanitation facility?

4. Should this be a toilet complex or a urinal?
    a. Toilet complex
    b. Urinal

5. What is your overall opinion of urinals?
6. Any other comments
7. How long did you have to wait to use the toilet?
    a. N0 wait
    b. Less than 5 minutes
    c. 5- 10 minutes
    d. More than 10 minutes

8. How much do you pay for using the toilet?
    a. No user fees at all
    b. No user fees for urination
    c. User fees for toilet
    d. User fees for shower

9. During this visit, what did you use the toilet complex for?
    a. Urinal
    b. Toilet
    c. Shower
    d. Urinal and toilet
    e. All of the above

f. Other (specify)

10. Please provide details on the condition of this toilet complex (circle as appropriate)
    a. Cleanliness: good/fair/poor
    b. Privacy: good/fair/poor
    c. Amount charged: correct/too much

3.4.3. Perceived profile of PT facility in the city: A set of questions to the respondents to reveal their opinion generally on the public sanitation facility in the city. Particular focus is given to their opinion on the usability, availability and sufficiency of PT facilities for women and the aged.

Table 16. Snapshot of Questions to Estimate Perceived Profile of PT facilities in the City

1. What type of toilet do you have in your home (if applicable)
    a. Western toilet
    b. Indian toilet – Flush
    c. Pour and flush latrine
    d. Pit latrine
    e. Other

2. What type of toilet do you prefer in public toilet complexes:
    a. Western toilet
    b. Indian toilet – Flush
    c. Pour and flush latrine
    d. Pit latrine
    e. Other

3. Are you satisfied with this public toilet complex
    a. Very satisfied
    b. Satisfied
    c. Dis-satisfied
    d. No opinion

4. If no, please rank the reasons for lack of satisfaction (1 to 5)
    a. Urinals/toilets/showers are dirty
    b. There is no water
    c. There is water logging
    d. There is a foul smell
    e. The condition of the complex is dilapidated
    f. There is no privacy
5. What three changes are urgently needed to improve condition of the toilet complex:
    a.
    b.
    c.
6. Are you willing to pay more money for better conditions and services
    a. Yes
    b. No
7. If yes, would you be willing to pay the following for each of the improvements
    a. Re 1 : Y/N
    b. Re 2 : Y/N

c. Re 3 :Y/N
d. Re 4: Y/N
e. Re 5: Y/N

8. Do you think that use of facilities in the toilet complex should be free for everyone?
   a. Yes (who should go free)
   b. No

9. Questions to Women Users
   a. Did you feel the approach to the toilet complex safe Yes…….No……
   b. Did you notice the sign-boards clearly Yes…….No……
   c. Did you feel adequate privacy in the toilet facility Yes…….No……
   d. If No, which areas do you think needs improvement?
      i. Approach
      ii. Entrance
      iii. Doors
      iv. Roofs
      v. Walls
      vi. Lightings
      vii. Source of water

   e. Did you find garbage bins inside the women area for disposal of napkins

10. Do you feel there are adequate public toilet facilities for women in Shimla?
    a. Yes No
    b. If No, can you specify which areas more facilities are needed?
11. What measures do you feel applicable to improve safety of women using public toilets?

3.4.4. Sample survey: The perception survey was conducted based on a sample survey. The following methodology was adopted for the sampling procedure.

Two general approaches to sampling are used in social science research. With probability sampling, all elements (e.g., persons, households) in the population have measurable opportunity of being included in the sample, and the mathematical probability that any one of them will be selected can be calculated. Non-probability sampling refers to any sampling method where some elements of population have no chance of selection or where the probability of selection cannot be accurately determined. It involves the selection of elements based on assumptions regarding the population of interest, which forms the criteria for selection.

Approach to sampling:

Essentially the objective is to obtain a sense of what the users feel about the access and quality of PT facilities in the city. The target population is the users of the toilet either residing in the city or visiting the city as a tourist/business. In this study, the approach is non-probability sampling, in the sense that we cannot determine the probability of a user in the city or a tourist getting selected in the interview. This is because a user (regular/occasional) may or may not be in the sample during the day of survey. However we have used the following approach in terms of addressing the issues related to variance across the sample:

- We have all the wards covered in the sample.

- Per ward the target sample is 31, with about 45 to 50 percent women in each ward for all wards above 1000 footfall per day.

- The total sample size is 600, about 1% of the average daily footfall of all toilets in Shimla based on our survey.

The assumption is that since the survey is about user experience of the toilet, it may not vary across the users in the same location during the time of interview. What could vary is the user expectations, suggestions, particularly across the type of users. These can be captured in the sample in each ward.

Chapter 4

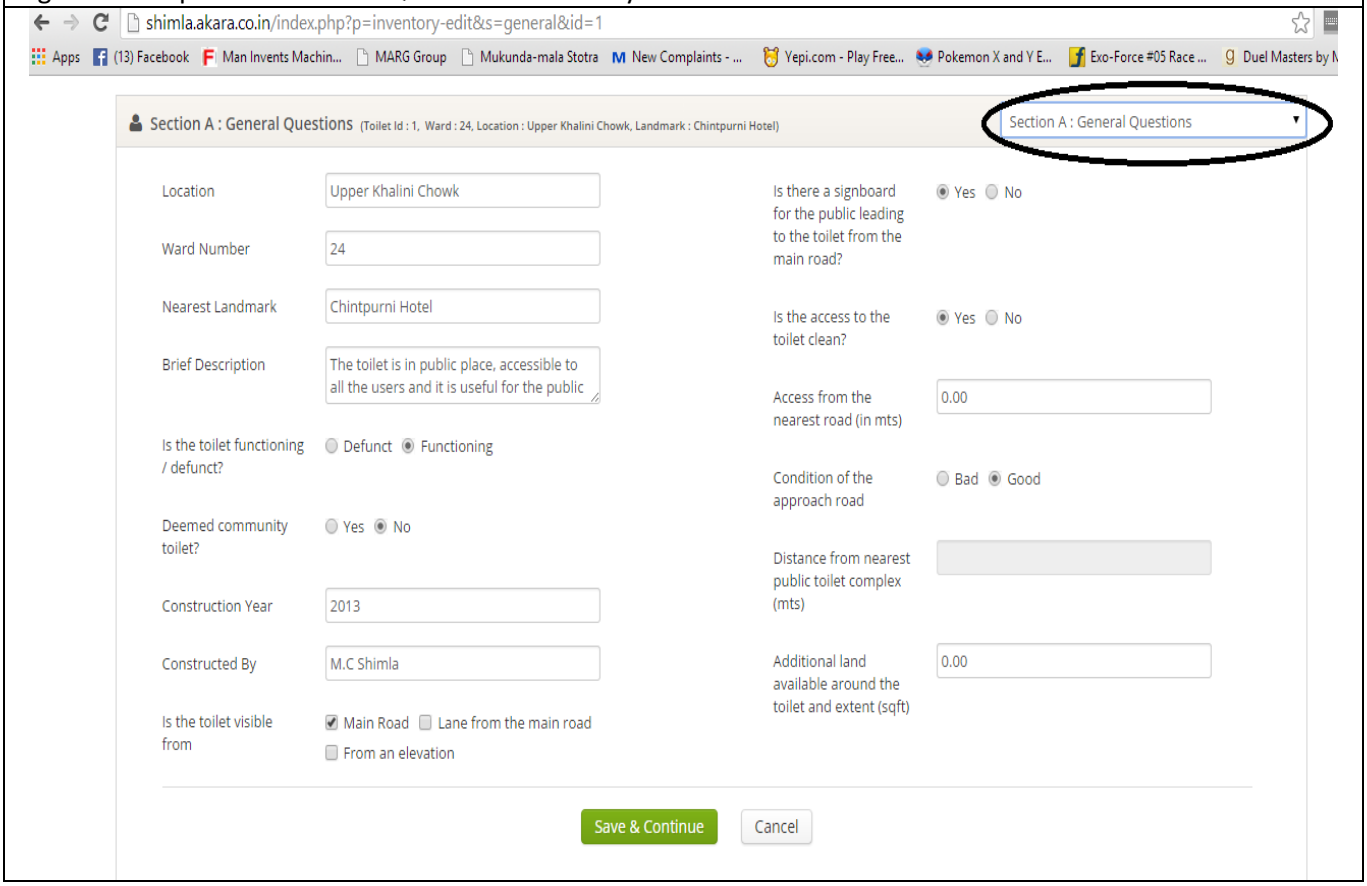
Physical Inventory of Public Toilet Facilities Currently in Use and Managed in Shimla Municipal Corporation

4.1 Data collection: Once the set of data to be collected for each toilet was finalised the team undertook field visit to each PT location. Initially, the data collection format was tested by two sets of independent "field testing" of the questionnaire. The field testing resulted in further fine-tuning of the questions, and also the database. Thereafter a detailed survey in each of the PT facility was undertaken to obtain the details. Random verification was executed by the supervisors during and after the survey to ascertain quality.

4.2 Data entry: Data entry is carried out through a web-application, which is inherent in the database management system. In the system, the user has the facility to choose the required segment of data for the selected PT and fill in these details. The screen can be used, with adequate login and security authentication, for data editing/modification. The screenshot of the data entry module is presented below; as can be seen in the snapshots the user has the facility to choose the section for which the data needs to be entered:

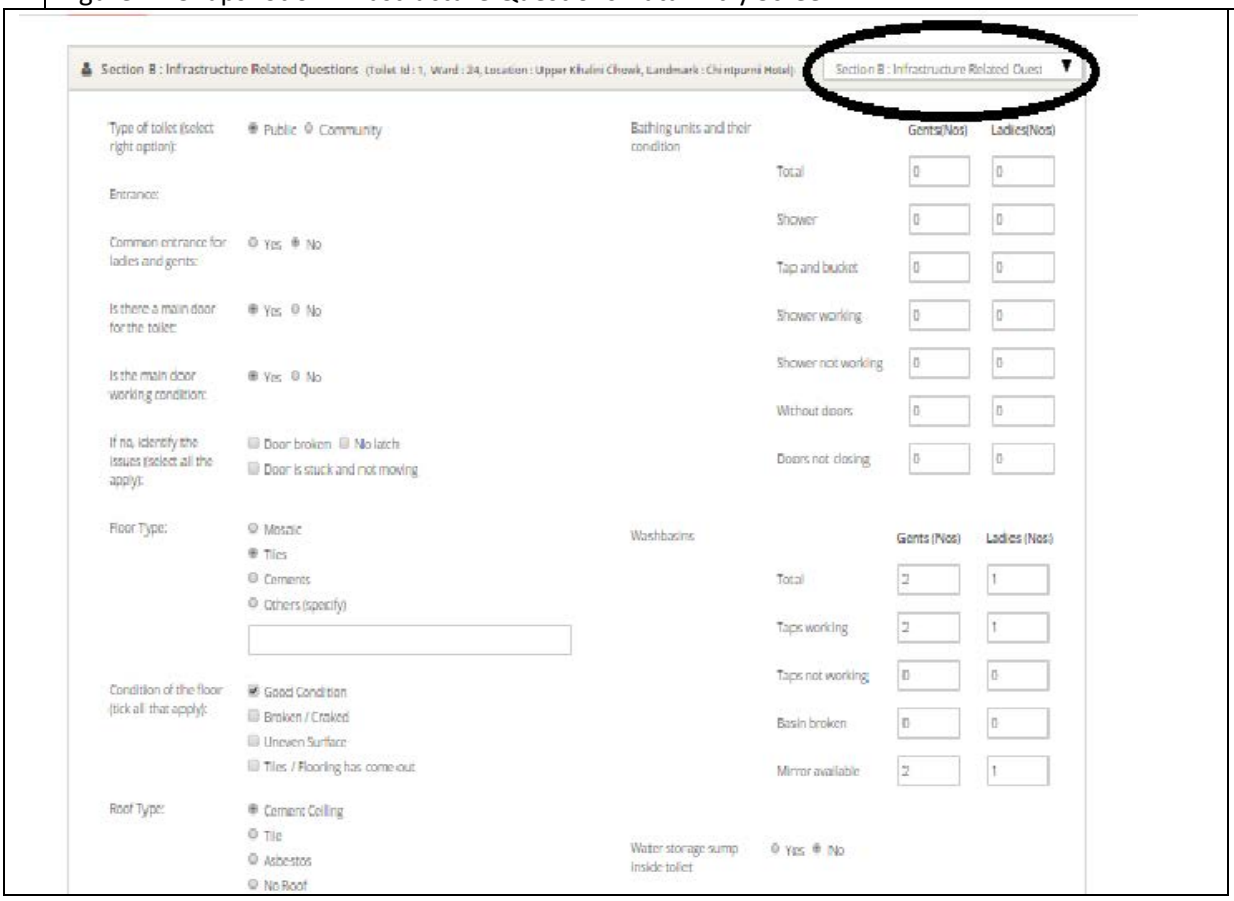
A. This snapshot shows the set of general questions related to the specific toilet.

Figure10. Snapshot of General Questions Data Entry Screen



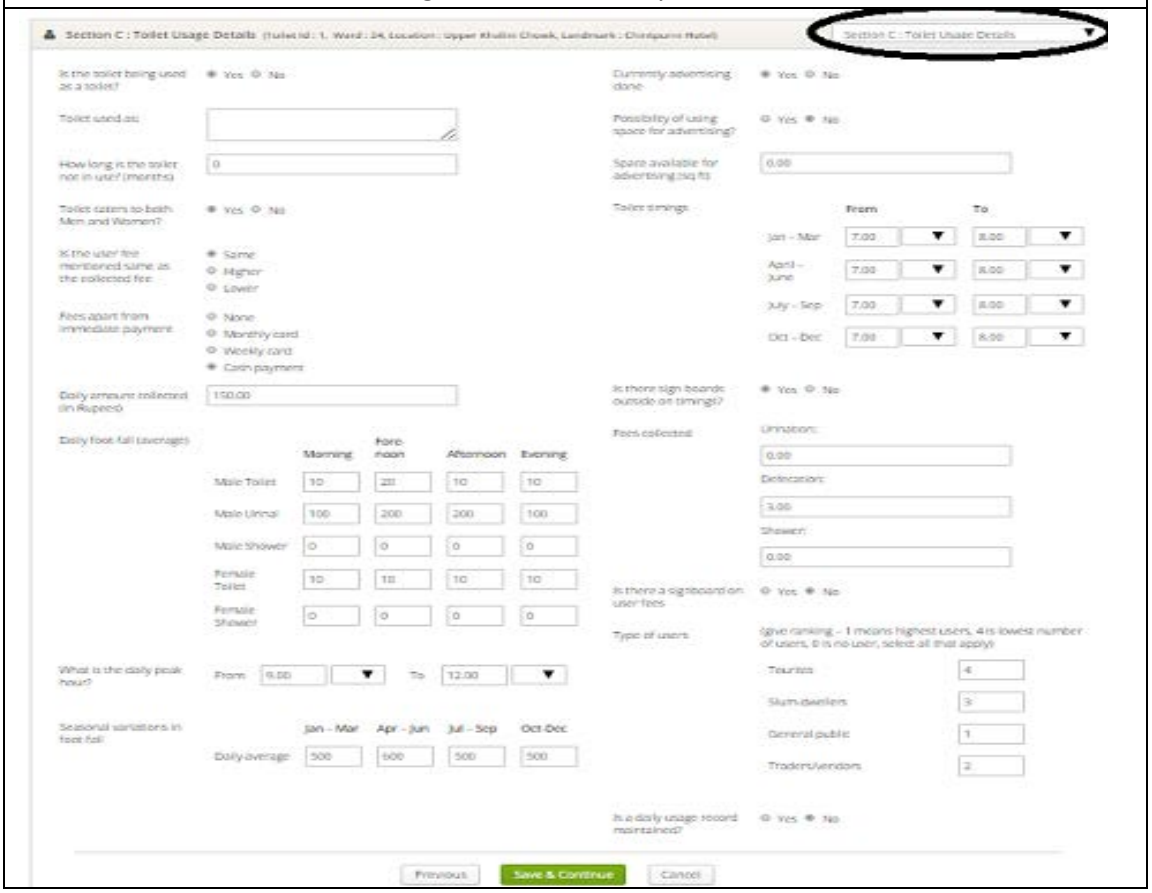
B) Infrastructure Related Questions: To have basic information about the toilet like no of urinals, showers, type of toilet, etc are being discussed in this section.

Figure11. Snapshot of Infrastructure Questions Data Entry Screen



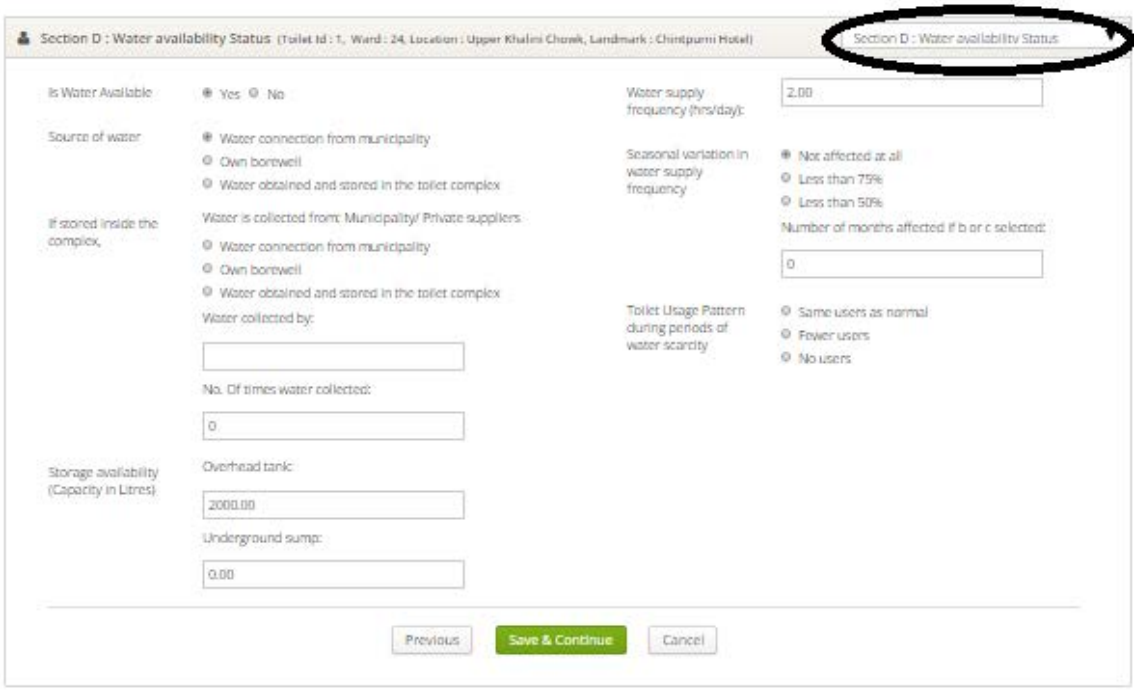
C) Toilet Usage Details: How the toilets are being used currently, toilet timings, whether any scope of revenue generation from the toilet can be implemented are discussed in this section.

Table 12. Questions for Toilet Usage Details Data Entry Screen



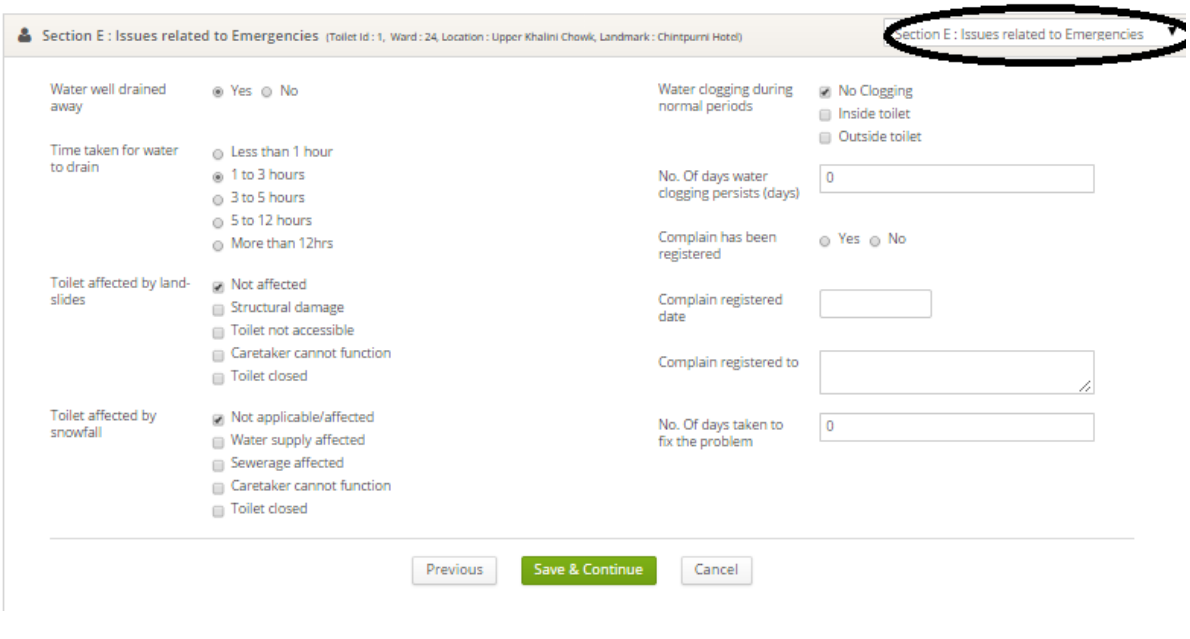
D) Water availability Status: This section highlights about the water availability in the toilets, source of water, usage pattern.

Figure 13. Snapshot of Data Entry for Water Availability Status



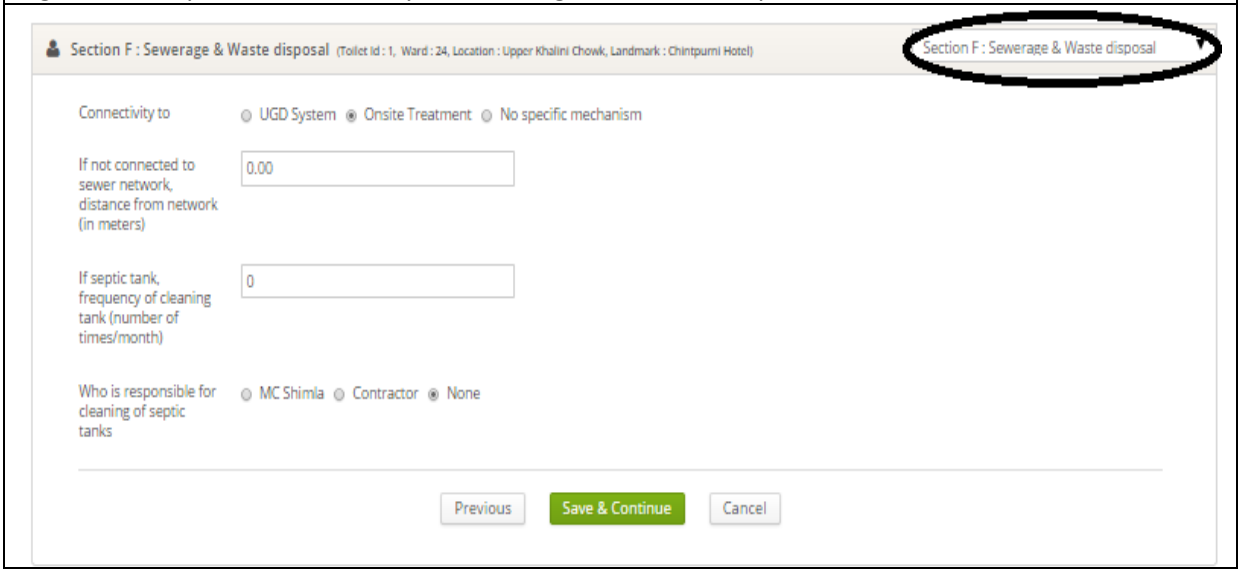
E) Issues related to Emergencies: This section focuses on rainy/landfall times how the toilet is getting noticed by the municipal corporations. If so, how things are being addressed.

Figure 14. Snapshot of Data Entry for Issues Related to Emergencies



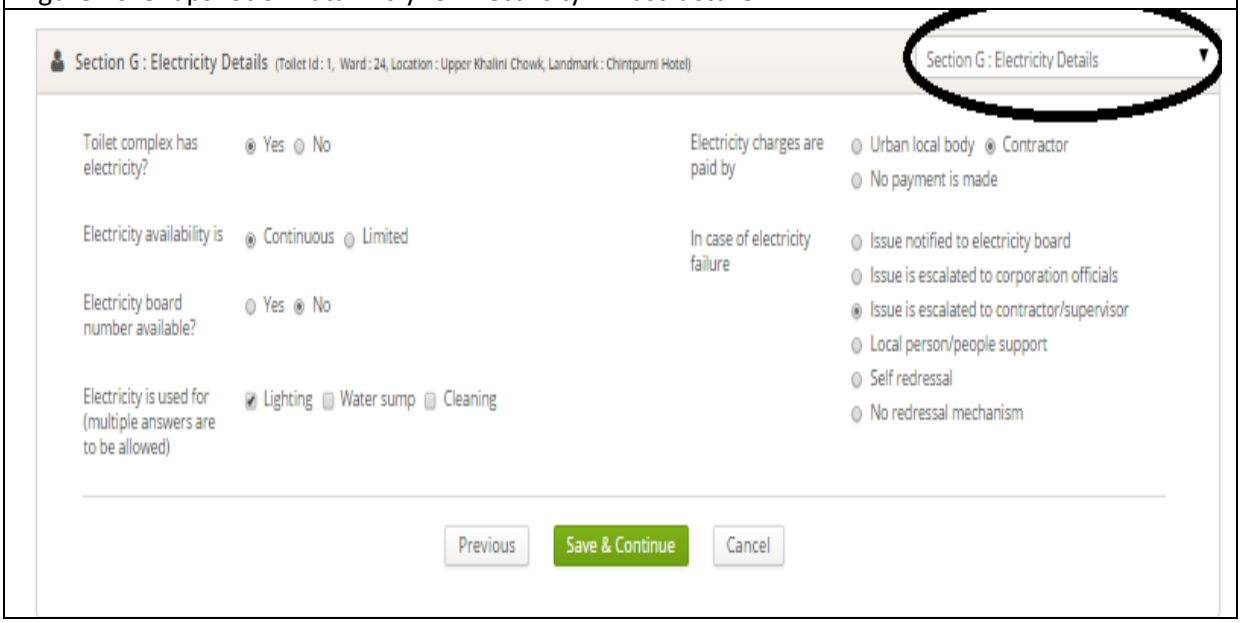
F) Sewerage & Water Disposal: How water being drained from the toilets is being taken care is being discussed in this section.

Figure 15. Snapshot of Data Entry for Sewerage and Water Disposal Status



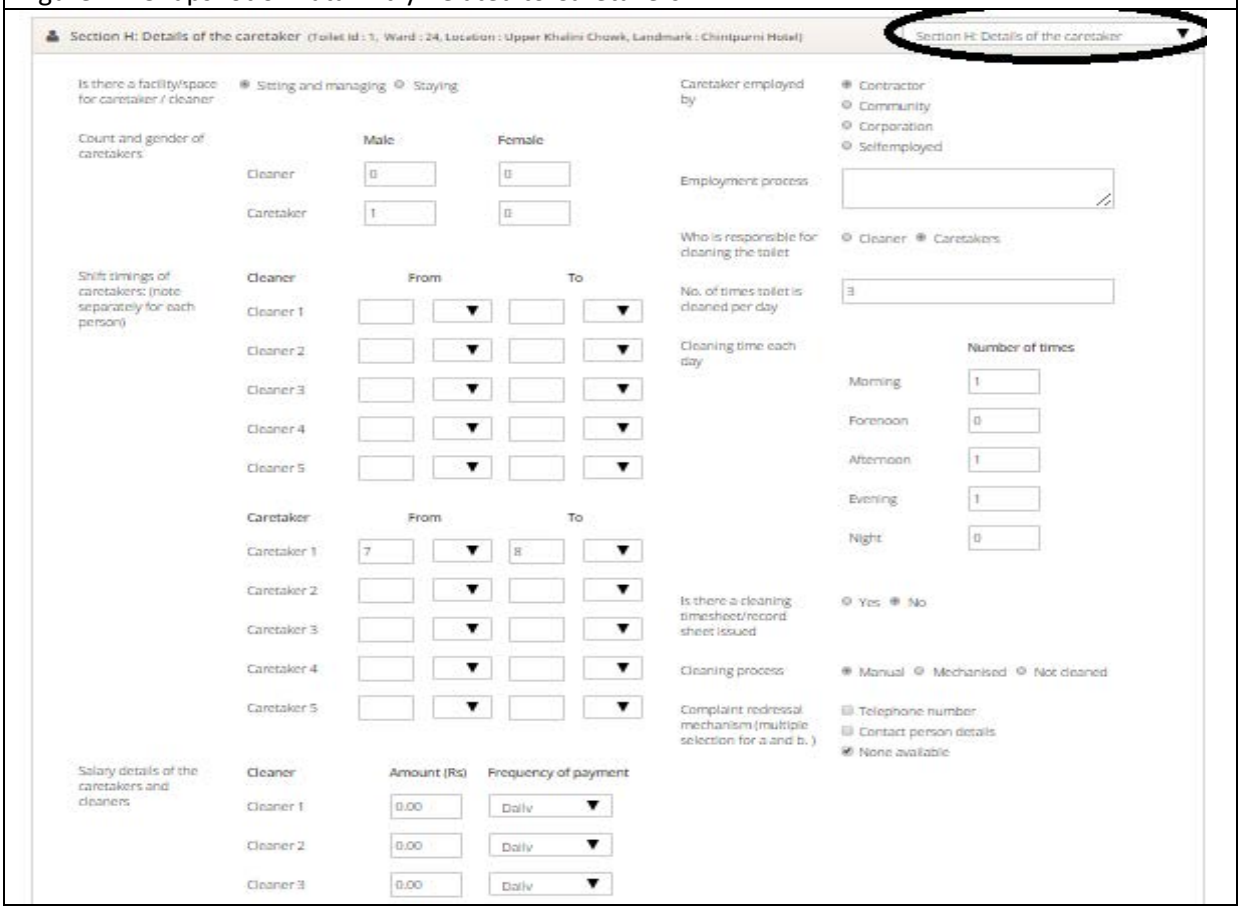
G) Electricity Details: All power related issues like electricity charges paid by authorities, failure of electricity etc are highlighted in this section.

Figure 16. Snapshot of Data Entry for Electricity Infrastructure



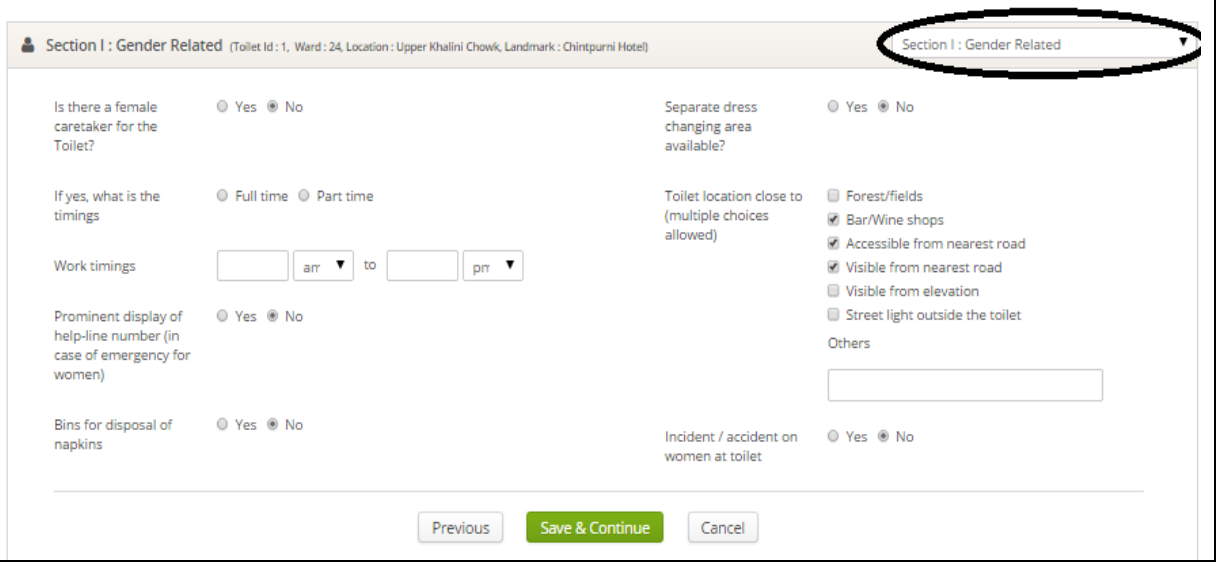
H) Details of the caretaker: This section gives details about the caretaker/cleaner of the toilet, his/her remuneration, employment details, work timings, salary etc.

Figure 17. Snapshot of Data Entry Related to Caretakers



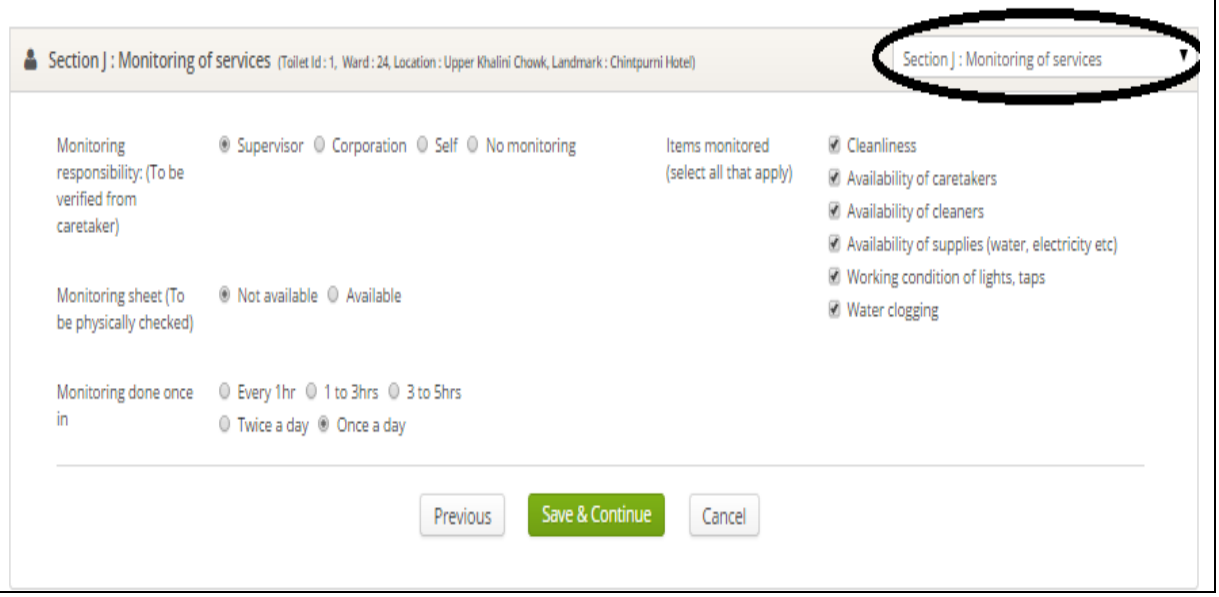
I) Gender related: Focussed on female section, this section has been framed. Highlights details about the caretaker gender, proximity of the toilet from the main area etc.

Figure 18. Snapshot of Data Entry for Gender Related Information



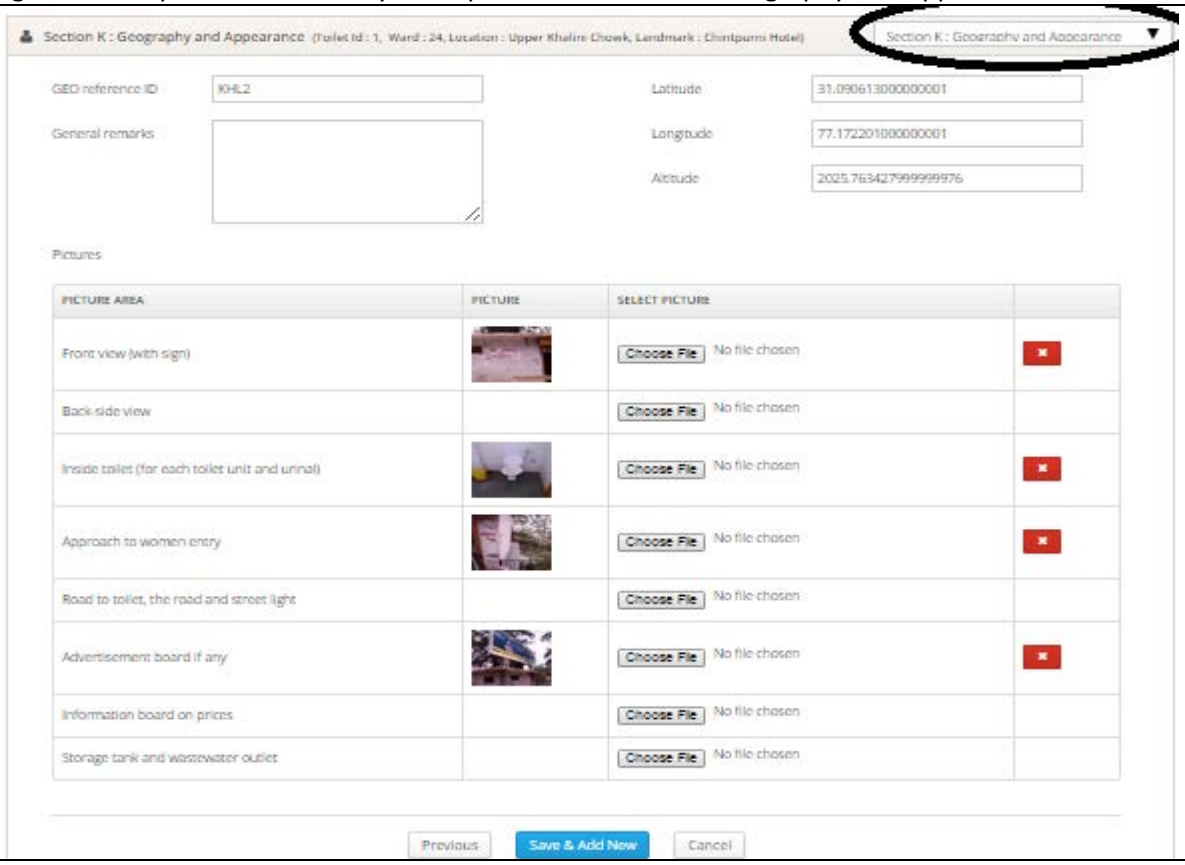
J) Monitoring of Services:

Figure 19. Snapshot of Data Entry for Services Monitoring



K) Geography and Appearance: This section has the facility to upload pictures, as evidence of the conditions of the toilet.

Figure 20. Snapshot of Data Entry and Upload of Pictures for Geography and Appearance Module



4.3. Inventory of PT in Shimla: The ICT team had developed a database with the required fields in MySQL, available online. The front-end was developed using PHP. Simultaneously the field staff, with the active support from GIZ and MCS officials, had collected the relevant data for all the PT facilities. These data were keyed in using the above mentioned template to create the database of Inventory of PT in Shimla.

4.3.1. Online database: The database is organised in the backend of the web application, in the server. A database is a collection of tables, held in relation to each other, linked through certain fields (data headings) that are common across tables. Each table has a unique id called the primary key. Since these tables are related to each other through the efficient use of the primary keys, the system is called a relational database management system (RDBMS). This facilitates the powerful queries and reporting. The locational identity (latitude, longitude and altitude) of the toilet is also held as fields in the database.

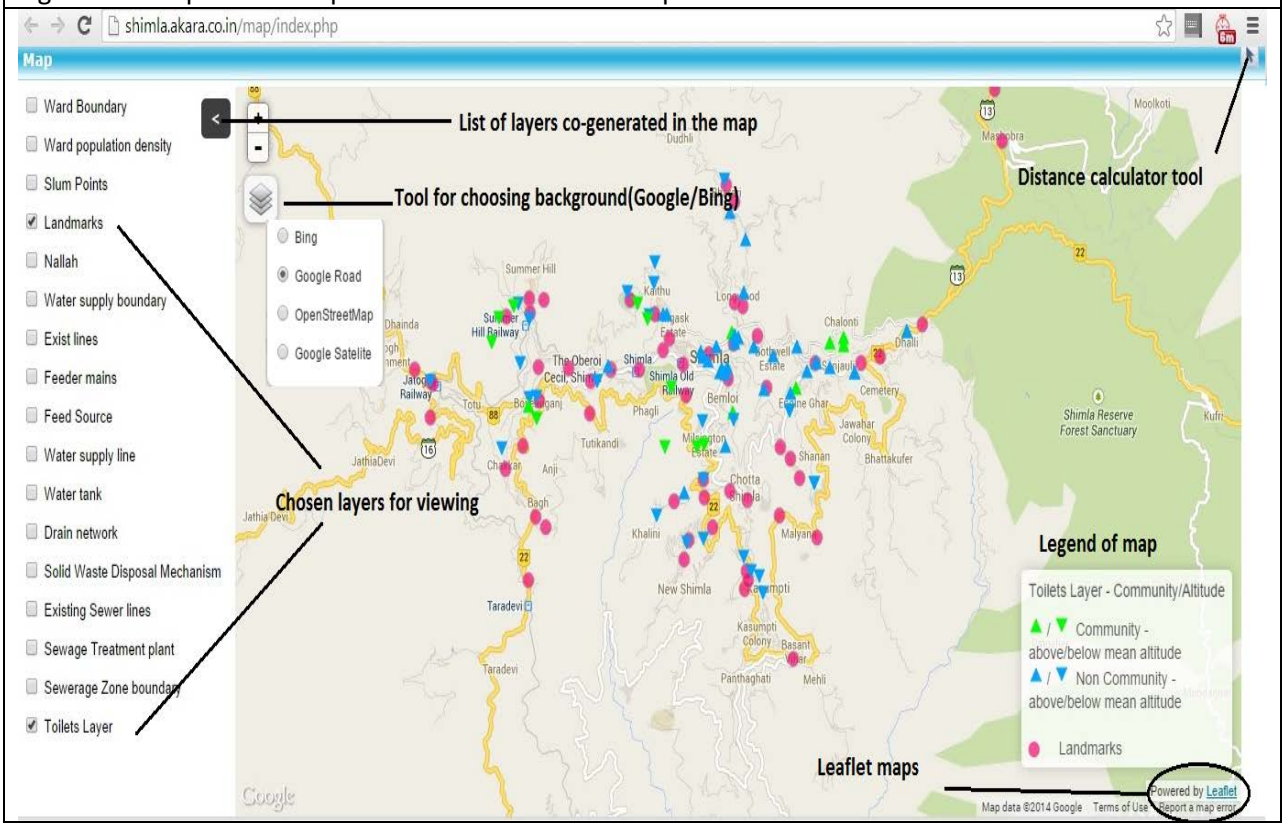
4.3.2. Retrieval of data from database: Since the data is organised as tables in the back-end, the report is also in the form of table, which can be extracted into spreadsheets such as MS Excel. We have also facilitated a viewing and saving of a two page report of each toilet in pdf format that is convenient for printing. The two page pdf is enclosed as **Annexure 2**.

4.4 Distance travelled by users through perception survey: For each toilet location, a sample survey was undertaken as mentioned in section 3.4 of this report. The sampling exercise is as explained in section 3.4.4.

4.5 Geotagging of PT locations: The team used Garmin GPS equipment to obtain the geotags of each location. These were loaded on the database, along with other attributes of the toilets. The automated system provides for new locations to be added, including the geo-tags.

4.5.1 Three components of geo-tag: The geotag details for each location are: latitude, longitude and altitude. In municipal regions such as Shimla which are located in hills, altitude becomes an important issue; for instance, there could be two locations in the same latitude longitude, but the altitude could be different leading to different issues in reaching of services. We have used different icons to represent toilets at an altitude above A snapshot of the map output with the option is given below.

Figure 21. Snapshot of Map View of PT and Related Aspects of Sanitation in PTMS



The utility of geo-referencing the database is evident in the above pictorial snapshot. For instance, the red dots indicate the important landmarks, consequently with considerable footfall, in the MCS region. This layer, seen along with the map layer of existing toilet locations, shows the regions of probable demand that are excluded from the supply of PT facilities. There could be some errors due to the hilly terrain of the region, and also because of the fact that our exercise has used Global Positioning Systems (GPS) equipment. Using DGPS (Differential Global Positioning System) equipment that are highly advanced provide very accurate locational identity. ***It has to be reiterated here that the system is equipped fully to leverage any future improvements in technology to get more accurate georeference points.*** This is because, the database has the facility to update the geo-codes. The map just reflects the data in the database. So when the current data is replaced with more accurate data when it is feasible, any errors could be removed.

4.5.2. Base map options: As can be seen from the above snapshot picture of the map generated online, the web application provides a facility to view the map in different base maps. We have included four popularly available opensource online maps, namely Google Roads, Google Satellite, Bing and OpenStreet Maps. However, it has to be noted that the Shimla map with the details of various layers (shapefiles and associated datasets) are interacting with the online map provided by “Leaflet”. The leaflet is superimposed on the web platform on any of these four maps which are used as base layers. The advantage in this system is that the data integrity is protected, as we do not share the data with Google or other entities developing and providing the base map of the underlying geography. The snapshots below provide three different base layers for the same map, at the same zoom-in level.

Figure 22. Snapshot of map with OpenstreeMap base layer for Shimla:

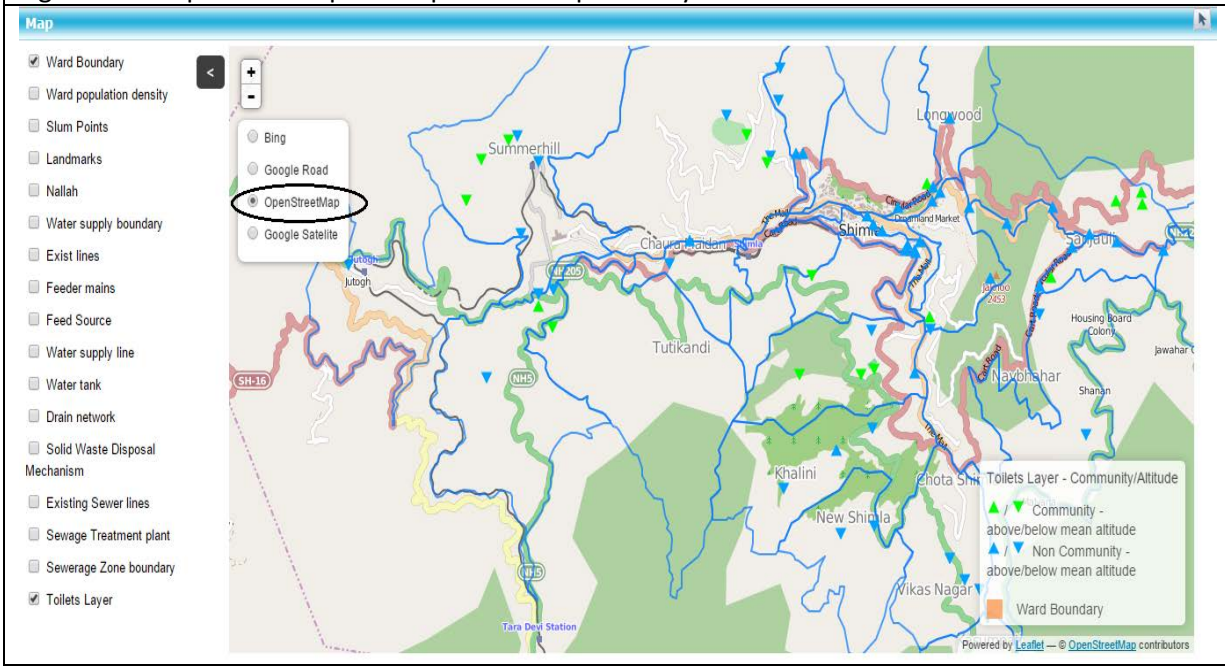


Figure 23. Snapshot of map with Google Roads base layer for Shimla:

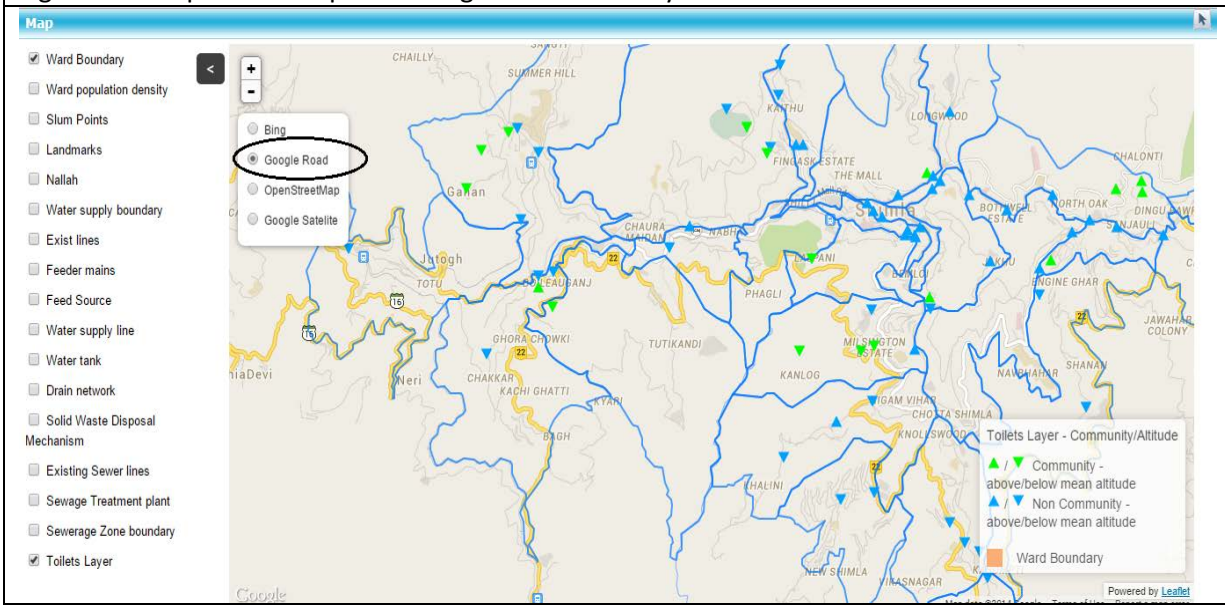
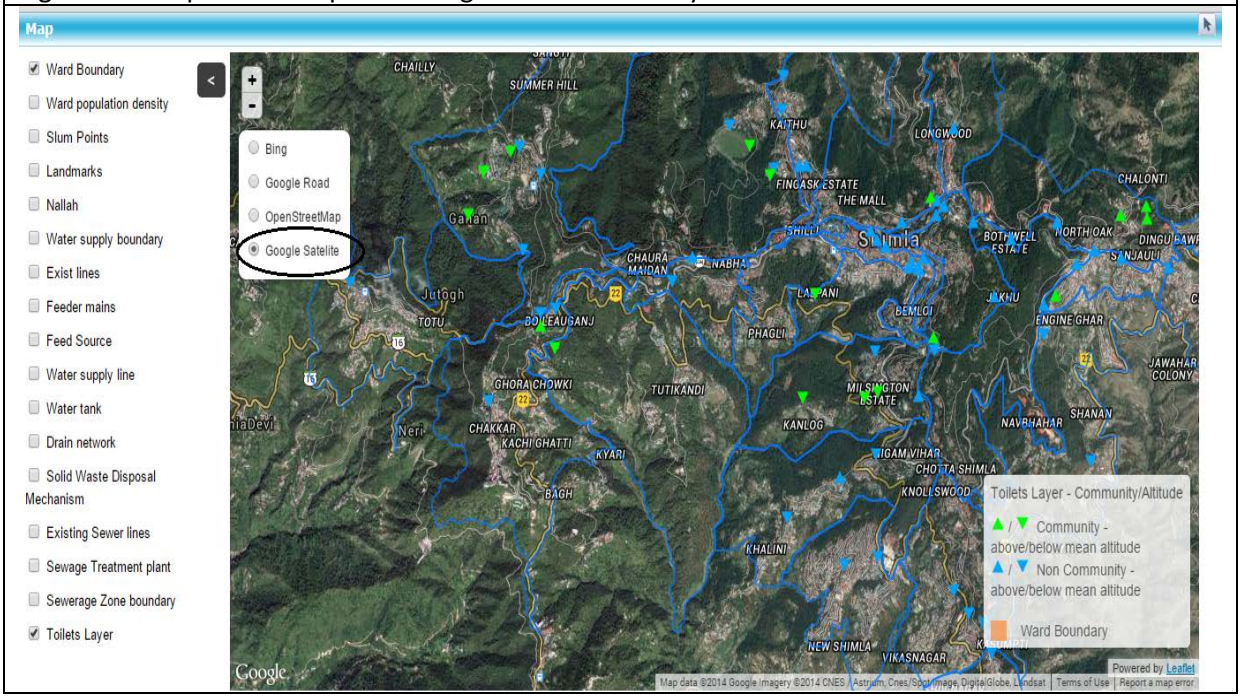


Figure 24. Snapshot of map with Google Satellite base layer for Shimla:



Thus, in this system, it is possible to leverage third-party tools which showcase a number data that is crowd-sourced in an open-source atmosphere without losing the integrity of the data from MCS.

4.6. Addressing the gaps in the PT Management system: This section outlines how the newly developed GIS linked database management system addresses the gaps identified in the current system of data management at MCS.

4.6.1. Features in the newly developed GIS linked database management system: The system has features allowing the user to collect, collate, view, process/query, and visualise the geo-referenced information in meaningful ways. Thus it paves way for meaningful interpretation of the relevant information. Since the geo-referenced data is digitized and linked to online maps, updating and editing of maps is faster and it is possible to keep the maps dynamically updated. It is also possible to add different layers such as forests, roads, markets, land-marks and water bodies for thematic views and analysis.Moreover, it is also possible for the Health Department of MCS to selectively share information which can be viewed on maps for the public/tourists through its website.

4.7 Asset Management System: The asset management system (AMS) is an integral part of the management system, which goes a long way in bridging key information gap, particularly the ones related to quality, maintenance and impacts the reach of public sanitation facility to the citizens.

There are 4 aspects of Asset Management Systems, namely inventorising, planning of services, decision-making on management and monitoring.

Inventorising is the step wherein the database is first created and the latest inventory of all assets related to the PTs, their locations, and the resource persons were captured and input as data. Planning of services is through the tools the website using the analytics tool to understand specific needs. Based on the analysis, and supported by the map-view of data decisions are taken. Next is the monitoring of services and quality of the assets. This is executed through the complaint management system.

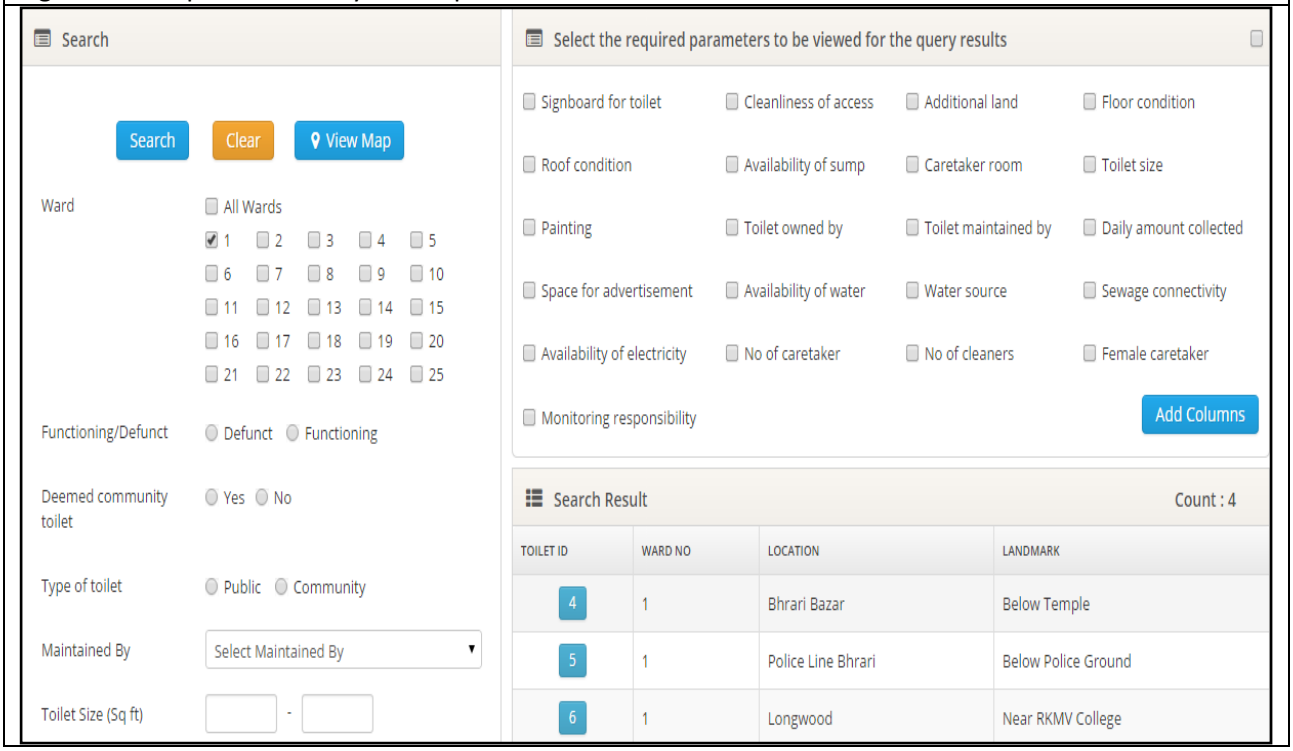
4.7.1: Components of web based GIS linked resource inventory: Following components are the integral part of the web based GIS linked resource inventory:

4.7.1.A. **Resource inventories**: Any decision support system commences with the creation of resource inventory. "Resource inventory" refers to the set of public sanitation facilities created in Municipal Corporation of Shimla. The locational reference (latitude, longitude) of each PT facility is tagged in the database. Data on The resource inventory includes all the features of the toilet and its existing condition, as also the average footfall at various time intervals.

4.7.1.B. **Map layers**: The resource inventory and data are to be linked to map layers as points, polygons or lines.

4.7.1.C.Query and report formats: The system would be designed to perform queries on various parameters. The results of the queries could be seen on the map. The queries and reports, interplayed with thematic maps can bring out spatial dimensions of public sanitation, the gaps and the requirement in a given region.

Figure 25. Snapshot of Query and Report Formats in PTMS



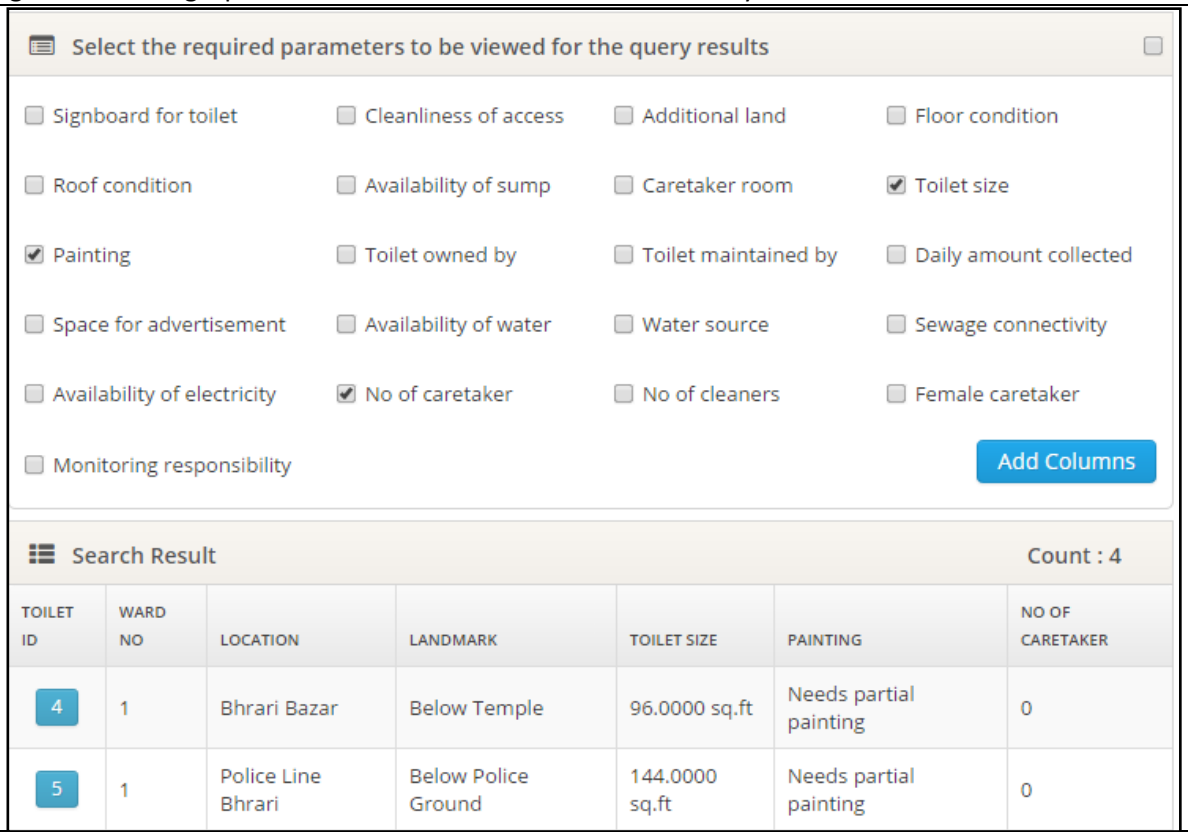
a. Search button – the user has to enter / select suitable input parameters to query and select search button to view the result

b. Clear button – will clear all the entered input values and the result values for the user to choose new input for new search.

c. Result Grid – Will display the resultant toilets with details – toilet id, ward number, location and landmark. On click of the toilet id, one page report will be displayed for the selected toilet. The user can save or print the one page report

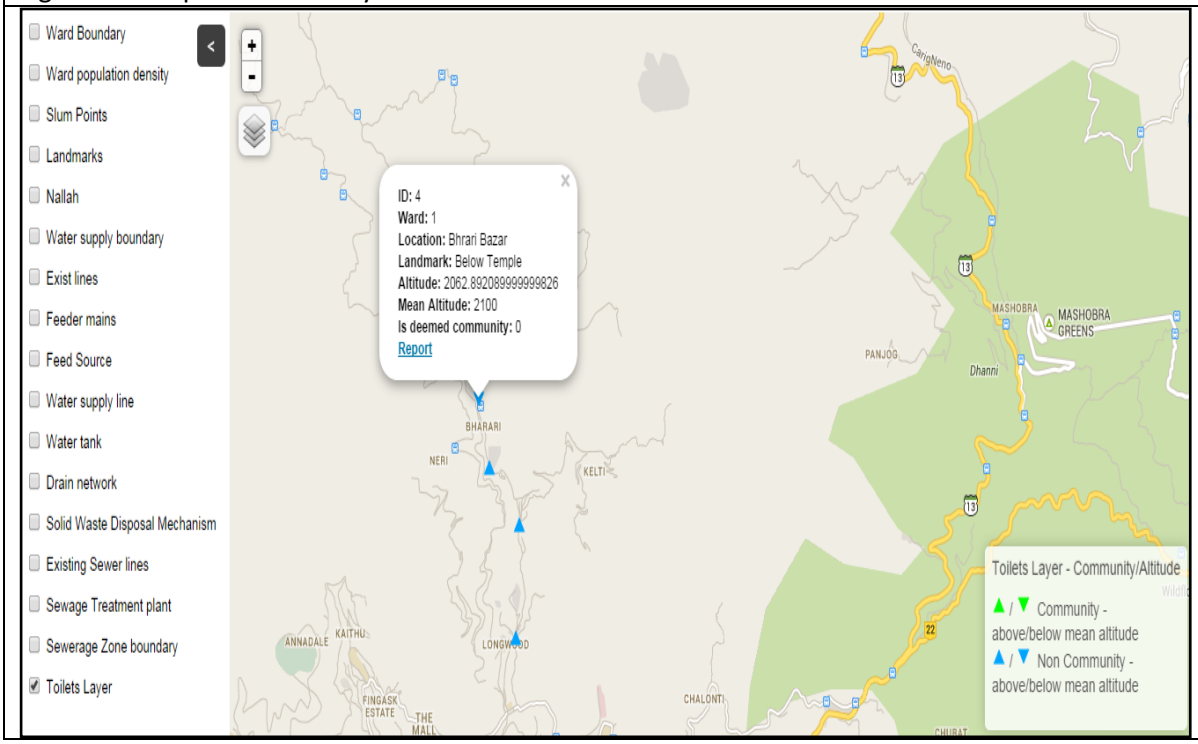
d. Add Columns – Apart from the 4 columns in the result grid (toilet id, ward number, location and landmark), the user can also view the values of other fields that are displayed at the right top. The user can choose one to many values and on click of Add columns, the values of the selected options will also be displayed in the result grid. Example of Add columns is shown in the screen below.

Figure 26. Adding Optional Parameters to be Viewed with Query Results



e. View map – The result can also viewed in the map. The toilets which appear in the result grid will be displayed in the map using the latitude and longitude available for the resultant toilets. Each toilet will be depicted as Triangle and on click of triangle; few basic details of the toilet are displayed in the popup. Report link in popup will display all the details of the toilet from Section A to K.

Figure 27. Map View of Query Results



4.7.1.D.Data updates: The system will have the facility to update the data on a periodic basis, as maintaining the periodicity of information is the sine qua non of any information system that aims support decision making.

4.7.1.E Monitoring platform: The key parameter that ensures sustainability of any system is monitoring. The proposed system has a built in monitoring platform in the form of complaint management system (CMS). The CMS has been designed with the objective of providing a tool for escalation mechanism of un-addressed complaints. The CMS has been explained separately in detail in this section.

The conceptual role of online GIS in this system is to support decision making for government officials by serving various real time statistics as thematic maps. For instance, it helps provide user-defined classification for establishing resources management plan conducted by government officials of the Sanitation/Healthcare department.

4.8. Software Features in GIS linked Website: The overarching objective of the website with database and maps on the available public sanitation inventory in Municipal Corporation of Shimla (MCS) is to provide a platform to that can at any given instance help make informed decisions on the management of public sanitation facilities. To achieve this broad objective, Akara Research & Technologies (ART) will develop and deploy the website with the following software features:

1. ***Addition of Records***: Data on sanitation facilities related to the entire infrastructure and its location can be added into the database (database to be created and deployed with pre-determined parameters related to the toilet inventory). The website is so designed as to reflect the newly added location in the map as soon as the geocodes are entered into the database.

2. ***Modification of data***: There will be features to modify the data related to toilet and its infrastructure, based on credentials achieved through login criteria. Such modifications can be recorded for future reference as date and time of modification and the level of authority that achieved the modification. This modification feature is useful in situations where, for instance, existing toilets are given additional facilities or its advertising features/revenue has changed.
3. ***Deletion of records***: There will be a facility to delete the records based on login credentials. There will be a feature to view deleted toilet records for future reference, though this will not be displayed in the current toilet inventory. This will be a useful feature in municipal asset management as the land technically is owned by MCS.
4. ***Map layers***: A list of layers are generated in open-source GIS and loaded onto the website. The layers from the City Sanitation Plan have been digitised for this purpose.
5. ***Query and Reports***: The website will feature a unique query and report module. This would facilitate the administration to take informed decisions on the management of PT in the city.
6. ***Dashboard for complaint management***: This will be given as a separate link in the website wherein the administration at the relevant levels will have the ability to view complaints raised from the field through an Android based mobile phone application regarding issues facing the toilet. The details of the complaint management system (CMS) are presented in Part C.
7. ***Dynamic Map view of query, report, and CMS:*** Each report/query output will be facilitated with tabular output as well as map-based display.

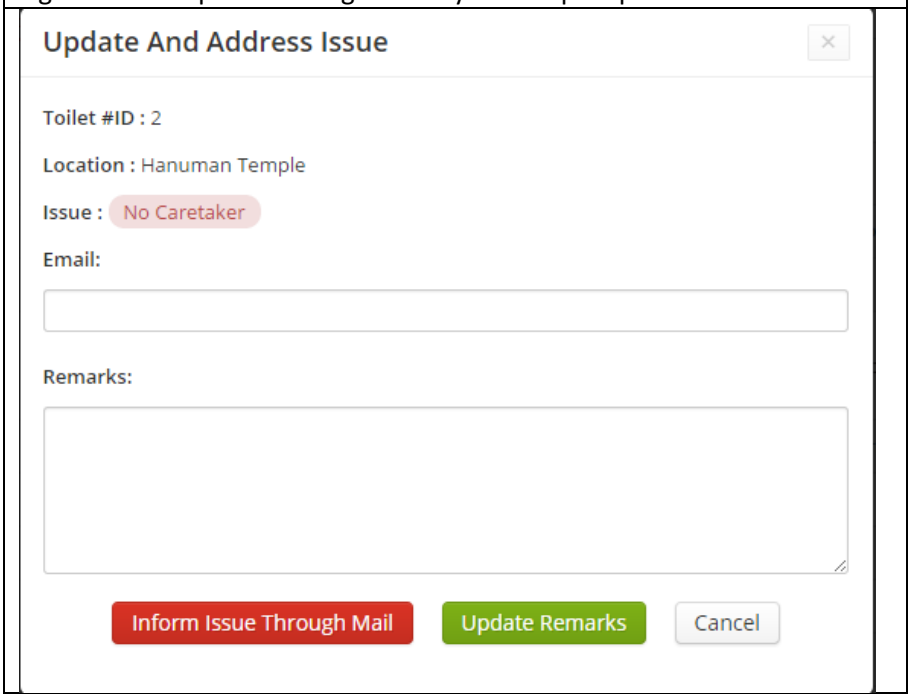
The source of information for the Complaint Management System (CMS) is from the field, through an Android application which will be deployed by Akara, and can be downloaded and installed in mobile phones of the inspectors. The application is downloaded from the AMS website. Any phone with Android operating system of 4.2.1 Version or above can load this application.

Data on key parameters that are by nature dynamic and requiring constant attention can be observed from the field and sent to the CMS. This can be used for self-reporting by the operators/contract care-takers.

The CMS has been designed such that it enables better decision-making on dynamic data; the dashboard discussed below gives the details on how it can be used by decision-makers. Together, with the CMS and the Inventory Management System, the new application provides greater control and paves way for informed decision-making.

A snapshot view of this complaint management system is given below:

Figure 28. Complaint Management Systm Snapshop

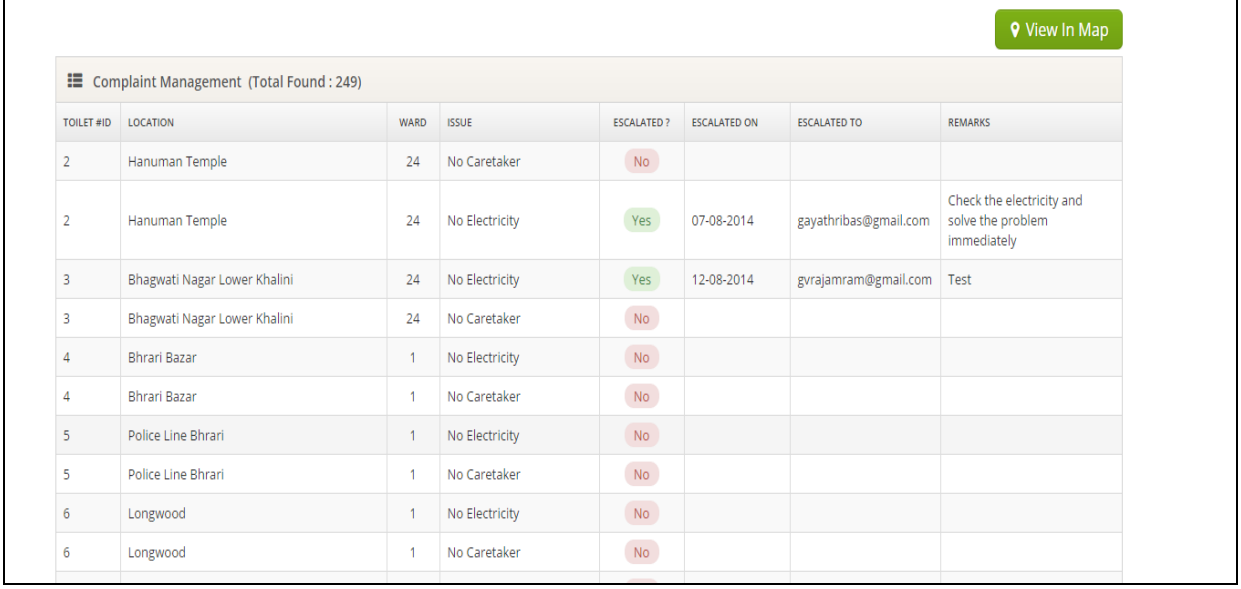


The data uploaded in this Mobile app as shown above comes as a data in the CMS and collated to be viewed for all toilets where there are complaints.

The dashboard has three layers in terms of complaints management.

1. Database reflecting the complaints/issues raised from the field through the Android Application: At any given point of time, the issues shown as complaints will be given as a tabular display, as given below

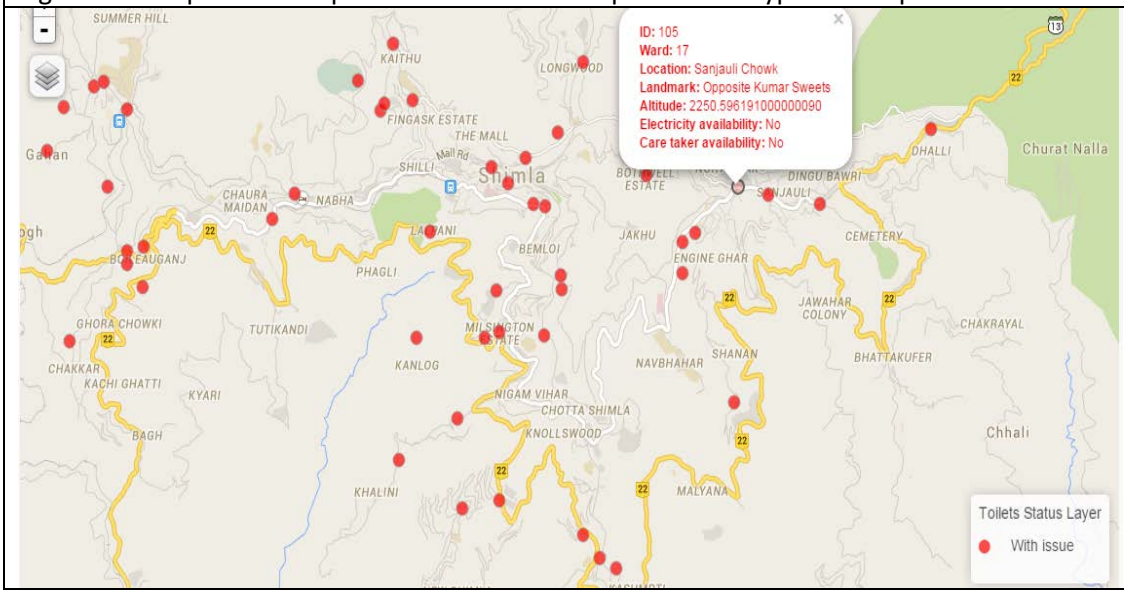
Figure 29.Snapshot of Dashboard on CMS – Actions for Sustained Management of PTs



TOILET #ID	LOCATION	WARD	ISSUE	ESCALATED ?	ESCALATED ON	ESCALATED TO	REMARKS
2	Hanuman Temple	24	No Caretaker	No			
2	Hanuman Temple	24	No Electricity	Yes	07-08-2014	gayathribas@gmail.com	Check the electricity and solve the problem immediately
3	Bhagwati Nagar Lower Khalini	24	No Electricity	Yes	12-08-2014	gvrajamram@gmail.com	Test
3	Bhagwati Nagar Lower Khalini	24	No Caretaker	No			
4	Bhrari Bazar	1	No Electricity	No			
4	Bhrari Bazar	1	No Caretaker	No			
5	Police Line Bhrari	1	No Electricity	No			
5	Police Line Bhrari	1	No Caretaker	No			
6	Longwood	1	No Electricity	No			
6	Longwood	1	No Caretaker	No			

2. The dashboard also will have a facility to manage the complaints response. The system shall provide the option of directing the right department/officials to act on the complaint through either SMS or by email or both. There will be a provision to write a short message. As can be seen in the table above, there will be an option to escalate the issue to a higher official if the situation is not rectified.
3. Map view of locations with complaints/unresolved issues.

Figure 30. Snapshot of Map View of PTs with Complaints and Type of Complaint



4.9 Mobile based application for data acquisition and integration: It is imperative to update periodically, some fields related to sanitation, to improve the maintenance and quality of toilets. The caretaker of the toilet who is responsible for the toilet should be able to update the fields so that based on the update; the municipality officers would take necessary action to facilitate the usage of toilets. It is not possible to use the web application through PC in every toilet and so it is proposed to develop an android application, where by the responsible person of the toilet would use Mobile phone to update the fields. Each caretaker of the toilet will be provided an Android mobile phone and using this, the user will be able to update the fields.

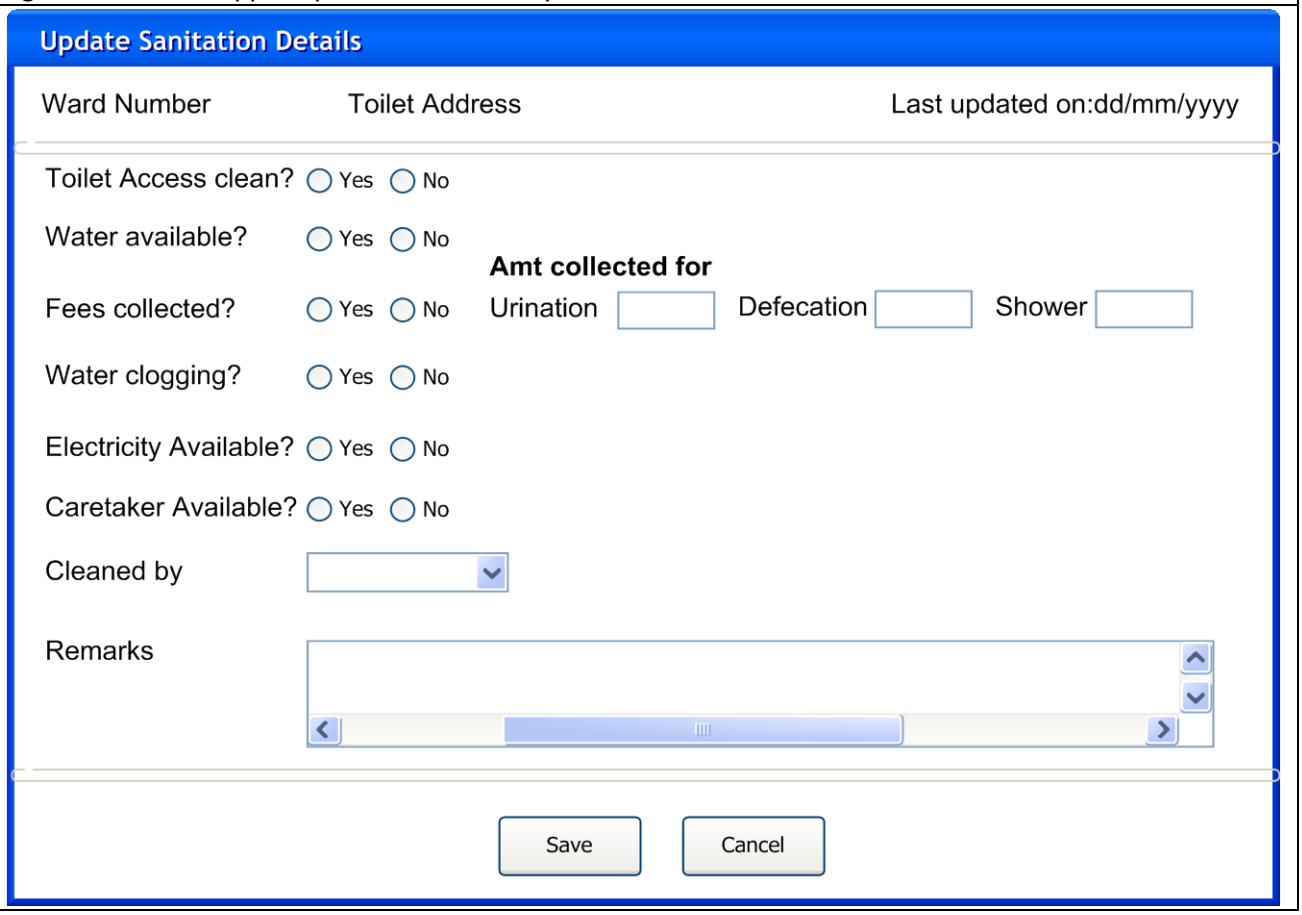
The mobile application will be available as link in the MCS sanitation website and the user can click to download the application in the respective mobile. After download, it will be automatically installed in the mobile and the application will be available as an icon in the Android screen. The user has to tap the icon to use the android application.

4.9.1: Home page of Mobile app: The home page will contain the title and the logo of the MCS sanitation as in the web application. When the home page is tapped, the sanitation list will appear to update the toilet details.

4.9.2: PT list: All the toilets that are available in the database will be listed with ward number and location/address. The user has to tap the right record to update the details.

4.9.3: Update records: The screen appears when a record is selected from the sanitation list page. By default, the ward number, address/location and the last updated date should be displayed for the selected toilet. The snapshot picture below gives a look-alike of the Mobile app for updating the records:

Figure 31. Mobile App Snapshot for Data Entry



- Toilet access clean, Water available, Water clogging, Electricity available, Caretaker available – for these fields, the user has to select yes / no. There is no default value and if only yes / no is selected, that field will be updated in the database. If yes/no is not selected for any of these fields, no updated will be made for these fields in the database for the selected toilet

- Fees collected – if the option selected is yes, then the user can enter the amount collected for urination, defection and shower and the amount should be mandatory. Else it is not applicable/not mandatory. Only if yes / no option is selected, the field will be updated in the database.

- Cleaned by – The possible values are Cleaner, Caretaker. The user can select a value. It is not mandatory. If value is chosen, the field will be updated in the database

- Remarks – the user can write details about the toilet, it is not mandatory. If any remarks is made, that will be updated in the database

- Save – the values of the fields are updated in the database and the screen will be closed. The list screen appears to choose other toilet

- Cancel – the screen will be closed and list screen appears.

4.10. Data Validation by MCS: The MCS team had independently undertaken an effort to verify the data collected by the survey team on the inventory, which reported a list of errors. These were related to wrong entries for specific toilets and in 3 locations the geo-reference were missing.

4.10**.1. Source of error and error rectification:** It has to be noted that the errors were in comparison with the data on the excel spreadsheet. Before using this for verification, the excel spreadsheet was sorted on certain parameters and there were some miss-matches. This had altered the excel file on some of the records which resulted as errors. Akara team had re-evaluated the survey data based on the printout which were used to obtain the survey data directly with the database. This review had showcased that there were no errors in the database. A fresh set of data from the database is submitted separately in spreadsheet format on this front.

4.10.2. There were three locations for which the geo-reference codes were not uploaded at the time of MCS verification, which showed as “no-data” or error in the MCS data validation. The geo-reference data have been added for these locations and the database is complete on all respects

Chapter 5

Design of Online Data Management System for PT and Documentation

5.1 Objective: The objective of the project is to develop an online web application to maintain the details of PT that are available in Shimla Municipal Corporation. The database will be useful to improve the sanitation in the area and also gives information / idea for the officials to make policy decisions in improving the sanitation facilities. The technology based monitoring system will be helpful to implement quick strategies in the sanitation / hygienic conditions.

5.1.1 Purpose: The Municipal Corporation of Shimla has proposed to improve the sanitation facility and maintain / improve the quality of sanitation services for the public. Therefore, Akara Research and Technologies Pvt Ltd propose software system to assist the officials in the implementation of good and quick sanitation services in the specified area.

5.1.2 System overview

- To store macro and micro details of each toilet
- To store the data in normalized structure and disseminate the data through web application.

5.1.3 Overall Description The overall objective of the website with database and maps on the available public sanitation inventory in Shimla Municipal Corporation (SMC) is to provide a platform which would help to make proper decisions on the management of public sanitation facilities. To achieve this broad objective, Akara Research & Technologies (ART) will develop and deploy the website with the software features.

5.1.4. System Interfaces

This system will have two parts, namely:

1. Web Portal – Used to manage the inventory of Shimla municipal sanitation. Portal has the option to search for the toilets based on criteria and the same displayed in map. Location of the toilet are gathered using a GPS and the data are uploaded to the portal by uploading the GPX file
2. Mobile application – Used to enter the issues found in each toilet location

User Interfaces

The web portal user interfaces has to be access through a specific URL. Based on the Login credentials the screens should get displayed. The possible user types are admin and field officers.

The Mobile application user interface has to be in such a way where the entire available sanitation inventory gets listed. The user can select one toilet and update the issues.

A user interface is needed to update the GPS locations for the toilet, where the user can upload the GPX file.

Hardware interfaces

The following hardware interface are needed

- Hosting space
- Data base server
- GPS device
- Mobile device

Software interfaces

The following software interface are needed

- Domain name
- Apache Server (Webserver)
- PHP 5.3 or above
- Mysql 5 or above
- Android device for the mobile application

An API service call will be used, which will interact between the mobile application and database

Communication Interfaces

The web portal and the mobile application will communicate with the database through the internet connection.

5.1.5 Memory Constraints

To access the web portal the user system should have at least 2GB of RAM

5.1.6 Site Adaptation Requirements

To update the GPS location and GEO Reference ID is used as the key reference. So the reference entered in the GPS device for a location should be same in the Toilet inventory and unique. If the references are wrongly updated in the web portal then the GPS location will not get synced.

5.1.7 User characteristics

There are three types of users that interact with the system

- Admin, Has access to all the available functionalities
- Field Officers, Option to update / add complaints using the Mobile application
- Data entry operators, Has access to data entry screens

Constraints, assumptions and dependencies

- For both web portal and mobile application, internet is a constraint.
- GPS devices need to be used to get the correct location of the toilet location is a constraint and dependency

- To use the mobile application it has to be android mobile device and it should have the option to access the internet
- Mobile application has a dependency on the web portal from which the data are fetched.

5.1.8 Specific requirements

Functional requirements: Data on Toilets, Shape files for GIS mapping

***Logical database requirement*:** PHP and MySQL Database

***Software System requirement*:**

- Domain name
- Hosting space with PHP and MySql database
- Android Mobile (Display 5" / 7", OS 4 and above)

5.2 Implications for Shimla State E-Governance Initiatives

From the discussion held with the IT department at MCS, it is seen that a majority of the applications currently being used are in Microsoft Windows platforms; even the major servers run on Windows platform which are used for websites of the government departments. There are considerable maintenance costs associated with such proprietary software in terms of licences and expiry of software versions. Open source software systems provide the government with considerable freedom in terms of "vendor neutrality" for its service delivery. Realising this, the National Informatics Centre (NIC) has directed government departments to move towards open-source development. As such we envisage that the proposed sanitation information system with geo-referenced data can be a good starting point for the State administration to move towards building an e-governance platform on open source software architecture.

However, in order to integrate data from other platforms into the sanitation system, there needs to be a conscious and continuous effort. This could be achieved through an annual maintenance contract with a service provider. A detailed note on the current system pertaining to the public sanitation is presented next in this report.

5.3 System Integration at MCS: The ultimate objective is the seamless integration of the new system in the MCS own efforts of e-governance platforms. Already the State government of Himachal Pradesh is supporting such initiatives at the urban local bodies. Our discussion with the officials of the State IT Department indicate that the state government supports the initiatives at the ULBs to strengthen the systems level approach in providing last mile service delivery to the citizens using latest technology. The important steps to take in this respect is to communicate the overall need for the system, the detailed requirement set, and the complete system with the codes, to the IT Department. The department carries out the system audit and the system analysis. Thereafter it facilitates creation of web space and other relevant infrastructure for the IT platform.

The following are the system level requirements:

1. Server space: Space of 2GB immediately needed. It could be gradually grown to 5GB over the next couple of years based on usage and records of complaints maintained etc, particularly photographs.
2. Open source software: Web server : Apache, PHP and MySQL database
3. System administrator (MCS Staff)
4. Website (third party service provider has been appointed. A separate site has to be incorporated; name of the site and space to be decided),
5. Requirement for complaint management system (CMS):
    a. Mobile phones with android app for the toilet inspectors (numbers to be decided)
    b. 3G connection for the mobile phones
6. Requirement for addition /modification of future toilets into the system
    a. GPS equipment that generates altitude, latitude and longitude (the GPS device need to interact with minimum of four satellites for generating geo-reference points. This is because of the hilly terrain, and the resultant curvature and margin of error in plotting)
    b. Computer system with internet connection to open the application and add/modify data on inventories
7. Security audit: Security audit of the entire inventory management system is to be obtained from the Department of Information Technology, Government of Himachal Pradesh.
8. Testing and Quality Control: Continuous monitoring of the system for quality control is required. The above steps in monitoring the data flow are also essential components of quality control. The testing could be taken up once the new contracts are issued for the toilets in the current financial year, as this will be a key point when the long-term data will be changed first.

5.4: Integration of Dynamic Data with inventory database: The Mobile app is fully integrated with the database of inventory created in the first step. Now the list of toilets as indicated in section 4.3.2 above is drawn during run-time from this database. This implies that:

- Any new addition of toilets in the database, once the toilet is created and added, the Mobile App will reflect the added toilet also in the list.

- The changes in the mobile app reflect also in the database, and in the complaint management system.

- In case a toilet is deleted for some reason, the list in the Mobile app will not show that toilet again (until it is added back)

5.5: System administration: There are always issues and risks related to software maintenance in e-governance projects of this nature. We have minimised the risks and also the maintenance load. The following details help understand the overall framework to handle risks:

5.5.1: System administrator: There will be a requirement of a systems administrator. The system administrator will be trained on all aspects of the software and the database. A graduate in computer applications – probably already in the roles of the Municipal Administration – could be entrusted with the responsibility. The system administrator will work on mainly the following work:

1. Database maintenance: The chief responsibility is to maintain the data with proper backup on a weekly basis. In case there are any system failures or website crash, the data will be recovered

from this backup. The backup will be in a local harddisk with full security features as designed by the Municipal Corporation in its usual policy framework. As such, the already appointed system administrator is in best position to handle this function with the legal/administrative authority.

2. Reports: The system already has reporting features; these can be viewed by anyone with the appropriate login credentials. However the system administrator can proactively send reports to key officials for better dissemination.
3. Memory check-up: Since the data is dynamically flowing on a periodic basis, there could be situations of memory constraint. In such situations the system administrator could work with the designated authority in the MCS and the Department of IT of Government of Himachal Pradesh to add memory space in the website.
4. Reinstallation of software applications: Unforeseen circumstances may force crashing of website. The system administrator will be well trained to reinstall the entire application in the webserver along with the databases. A backup of the entire application and the databases will be made available in a hard disk at the MCS with adequate security features.
5. It is the responsibility of Akara Research to train the system administrator on these aspects.

5.5.2: Software updates: The entire application has been developed in open-source software. There are no requirements of any purchase of external software applications or databases for this purpose. Consequently software updates are not foreseen. Only in special cases where some functionalities are added by the MCS, these have to be added to the existing software application.

5.5.3: Vendor neutrality: It follows from 4.5.2 that the MCS has complete vendor neutrality in the future updates. Akara Research will submit the entire sourcecode in DVD to facilitate this.

5.6. Version Upgrades: The proposed PTMS is the upgraded version of the PTMS executed for Tirupathi Municipal Corporation. Particularly the features related to Gender Gap are newly added to this version. Similarly, Akara Research is involved in developing additional modules as required based on interactions with the civil society, administrations and the experts in the sector. Also, usage of the proposed PTMS by the MCS will throw up more requirements/suggestions by the users. These could be added in the successive version after complete documentation. The pricing of such a version will depend upon the extent of manpower required to add the features.

5.7. **Perspectives of Cellular Connectivity for Mobile Phones**: The preferred type of connection for the mobile phones wherein the mobile app is loaded is 3G. All major network service providers of India – Bharat Sanchar Nigam Limited (BSNL), Airtel, Vodafone are operative in Shimla. The estimated cost per connection for the mobile phone in 3G is Rs. 850/- per month. A 5 day testing of the Mobile App developed was found to run well using the BSNL and Vodafone network. Other mobile connection had difficulty of access in certain pockets. In case 2G connectivity is used, the system is slow in updating the records. This will unnecessarily hamper the mobility of the staff and could result in delay of reach of data, which is essentially what the PTMS is trying to address.

5.7.1 SMS Based Reporting: While technically this facility is feasible to be built, there are additional costs involved in terms of handling large data flow into the server from the public. Secondly, the SMS based updates will not be able to send location details and photographs. Hence the system has been developed without the SMS based data updating feature.

Chapter 6

Training: Requirement and Training Component

A detailed training manual has been prepared and submitted separately with this report. First and foremost, it is imperative that the administration is sensitised to the requirement of the system. The first step of the process is therefore to provide the details of how the proposed system is designed to help the administration manage the PT in MCS. Essentially, e-governance programmes succeed when the human element is properly and adequately recognised. The PTMS has to be positioned to enable the human element in administration and not as a threat or replacement of human resources. The focus is ultimately on decision-making and the PTMS is enabling this decision-making process to be more informed, timely, results oriented and targeted at the right location.

This sensitisation will also include showcasing the gaps in information system as it exists today for effective decision-making and the possibilities with the new PTMS which not only facilitates decision-making with information but also enables the data generation process itself.

The training is proposed in terms of:

1. **Training for System Administrator - login credentials for the appropriate users**: This is the role of the system administrator, with the approval from the higher authority. The protocols to be maintained will be determined as per the e-governance policy of MCS under the overarching guidelines provided within the Shimla State Policy. The systems administrator role is a crucial one and therefore it would require that he/she has a full understanding of the proposed system.
    - The system administrator will involve with the Akara Research team during the process of integration as this itself would be a major activity that involves step by step guidance as the integration takes place.
    - The process involved shall be documented by the system administrator during this process of system integration. The components (hardware and software) of the PTMS shall be enlisted and the inter-relationship between these will be explained during this process
    - Once the installation/integration with MCS website is completed, the system administrator will be presented the full set of architecture on a DVD along with the tables, shapefiles, codes etc.
2. **Training for Officials –**
    a. **Using the modules to add, modify, delete records**: Once the login credentials are created and the designated users are identified, the training is given on various aspects of the software application, namely the modules to add data, modify data and delete records.
    b. **Using the GPS device to upload geo-reference for new toilets**: Each time a new toilet is added, the geo-codes of the toilet has to be created and added into the database. This will automatically result in showcasing the new toilet in the map of Shimla. This part is an important aspect of the training provided.
    c. **Using the search and report functionalities**: This module is the key to enable decision-making. The details of using the query and report modules, taking the data in tabular format to be exported into a spreadsheet or document file.

d. **Training on component on CMS**: The CMS is the component of that actually determines the sustained realisation of the objectives of the PTMS. As such it is imperative that the usage of the mobile application at the level of the inspectors, contractors is ensured with full training. The usage of the dashboard and the system to escalate the complaints is provided to the authorities responsible for trouble shooting.
e. **Data backup, and software installations**: This module is provided for the system administrator. This will help the PTMS to sustain in situations of memory shortfall in the server, the requisite procedures to be followed to integrate the back-up database if the software has to be reinstalled, and the processes to be followed to take regular backup of data.

3. **Requirement from MCS**: In this context of detailed training requirement, it is imperative upon the MCS to draw a list of the administrative staffs requiring training. It also has to identify the system administrator.

The training manual and the presentation used to provide the training are enclosed as Annexure 4 and Annexure 5.