A User Guide

Sanitation Mapper

A free, simple and **powerful** mapping tool   BETA

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1.0 Introduction to the Sanitation Mapper

The Sanitation Mapper is a free and simple monitoring tool designed to generate powerful maps showing the status of sanitation interventions. Based on a Microsoft Excel spreadsheet, it instantly converts sanitation survey data into Google Earth compatible maps without the need for complex GIS software or an internet connection. These maps can be saved as images for printing or inclusion in reports. The Sanitation Mapper is aimed at local government planners and water, sanitation, hygiene field practitioners working on district, sub-district and village level sanitation programmes.

1.1 Benefits of using the Sanitation Mapper

- Requires minimal training
- Its free
- User-friendly
- Can be used offline in the field without an internet connection
- Generates a wide variety of different maps
- Can be configured to work in different countries
- Can be customised to analyse different indicators
- Analyses shape data as well as point data
- It is compatible with other national and international level mapping tools

1.2 Output

The maps generated by the Sanitation Mapper can be viewed in Google Earth, which can be downloaded for free from the official Google Earth website http://earth.google.com/

Google offer a version of Google Earth that can be installed without the need to reconnect to the internet during installation. This version can be downloaded once and installed without an internet connection: http://dl.google.com/earth/client/advanced/current/googleearthwin.exe

The Sanitation Mapper is compatible for use with PCs running Windows 98 or later. **If using Excel 2007 please save as compatibility mode with Excel 2003 or see section 7.1**

1.3 Use of the Sanitation Mapper

Generally speaking, Sanitation Mapping may serve a variety of functions from local level planning to national level advocacy and sector performance monitoring. Sanitation mapping data can be used for measuring, mapping and monitoring service sustainability, equity and inclusion, financing, planning, and monitoring and evaluation.

1.4 The Sanitation Mapper process

Field data collected using paper data collection formats with GPS devices, or using smartphone applications, can be analysed using the Sanitation Mapper. The software has been designed to analyse data collected at an infrastructure level, such as public communal latrine facilities in dense urban areas, and also to analyse data collected at a community level, where taking the GPS coordinates and details of each latrine would be enormously resource intensive and make little sense.

Once the collected data is encoded into a PC the information can be easily transferred into the Spreadsheet Mapper, which can be used to generate a range of mapping options. Each mapping option can be customised to align with your dataset and analysis criteria. The maps generated by the Sanitation Mapper can be visualised in Google Earth or simply output as a Jpeg image file.

Figure 1: The Sanitation Mapping Process

2.0 The Sanitation Mapper explained

The Sanitation Mapper software consists of 1 spreadsheet and 3 supporting folders. The spreadsheet refers to each of the supporting folders when generating a map and these must always be kept within the same directory folder.
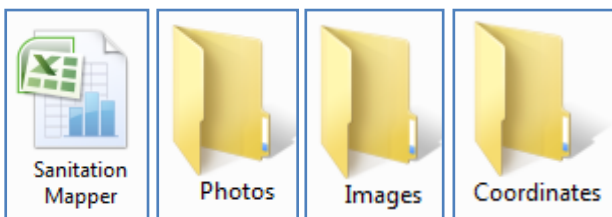

Figure 2: The elements of the Sanitation Mapper

2.1 The Photos folder

Photographs taken of a community or latrine can be saved into the Photos folder. The Sanitation Mapper will include the photos to the Google Earth maps, so that each individual latrine can be seen during analysis within the Information Bubble.

To use the Photos folder simply store in the photographs in the Photos folder and reference the latrine with the correct photo ID in the Sanitation Mapper's data sheet in the following format '*nameofphoto.filetype*', for example 'Facility37.jpg'

2.2 The Images Folder

Each map will be generated with a title and a key which are automatically generated by the Spreadsheet Mapper. The format, such as text, colour, details and icons, can be defined by the software user through the Controls sheet of the Sanitation Mapper. Please do not edit the Images folder.

2.3 The Coordinates folder

The Sanitation Mapper can generate maps with data analysis at administrative boundary level as well as geo-referenced point data.
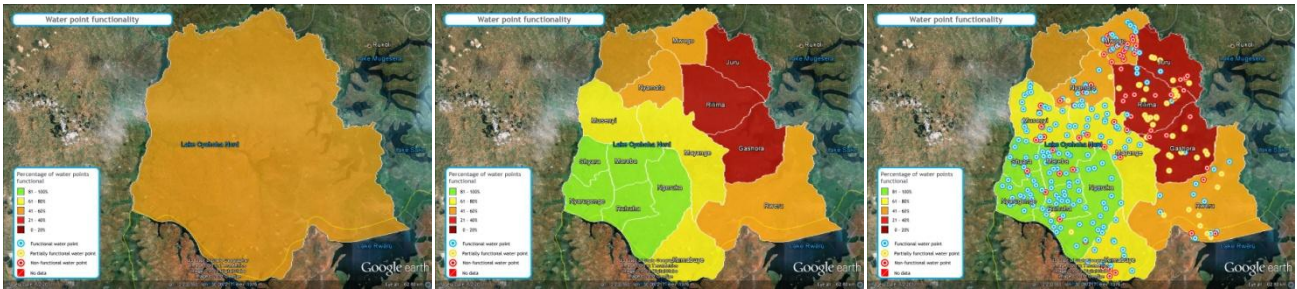
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Figure 3: Analysis at Area boundary 1, Area boundary 2, and infrastructure point

The Sanitation Mapper can be configured to work anywhere in the world and the admin boundaries need to be configured only once. For further information on configuring boundaries please visit www.waterpointmapper.org

2.4 The Sanitation Mapper spreadsheet

The Sanitation Mapper has been developed as a data analysis tool to provide a spatial output for both project monitoring and sector performance monitoring initiatives.

The Options worksheet was be used to select the type of map, choose the mapping options such as output format, and select to generate the map. The mapping options are divided into Village maps and Latrine maps. The options refer to the separate data entry sheets, for area based and point based analysis.

Figure 4: The Options sheet

Data collected can be encoded into either the Village data or Latrine data worksheet. If you have collected geo-referenced information about each latrine you should use the Latrine data sheet, and if you have a data inventory with village or community as the smallest unit of analysis you should encode to the Village data sheet.

Figure 5: The Village and Latrine data sheet

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The Sanitation Mapper has been designed to be fully customisable. As a user you can change the ways maps are created and control the format of the mapping output. To define and alter the way maps are generated you will need to navigate the Options sheet.

Village data maps

Improved Sanitation

Parameters (%)		Shape colour	Icon	Sphere colou
1	20		images/ICONBurgundy.p	
21	40		images/ICONRed.png	
41	60		images/ICONOrange.png	
61	80		images/ICONYellow.png	
81	100		images/ICONGreen.png	
0	0		images/ICONNoData.png	

Open defication

Parameters (%)		Shape colour	Icon	Sphere colou
1	5		images/ICONGreen.png	
6	10		images/ICONYellow.png	
11	20		images/ICONOrange.png	
21	30		images/ICONRed.png	
31	100		images/ICONBurgundy.p	
0	0		images/ICONNoData.png	

Latrine data maps

Improved sanitation coverage

Shape parameters (%)		Shape colour	Options	Icon	Sphere colour
0	20		Improved	Images/ICONBlue.png	
21	40		Not improved	Images/ICONRed.png	
41	60		No data	Images/ICONNoData.	
61	80				
81	100				
0	0				

People per Latrine seat

Shape parameters (%)		Shape colour	Quintile	Icon	Sphere colour
1	19		<1	images/ICONBlue.png	
20	39		1-2	images/ICONYellow.p	
40	59		>2	images/ICONRed.png	
60	79				
80	100				
0	0				

Figure 6: The Controls sheet

3.0 The mapping options

The Sanitation Mapper includes a sample dataset collected in Dhaka city, Bangladesh, during the pilot testing of the software. This data can be used to test the tool and become familiar with its functions and capabilities.

The Options datasheet is protected and you will not be able to edit the sheet – it is only possible to select the mapping options, define the outputs and choose to include a sphere of influence, and click to generate a map.

3.1 Step 1: choose a mapping option

There are 6 Village, or area-based mapping options and 7 Latrine, or infrastructure-based mapping options. The Village maps options can be used to analyse the dataset in the Village data worksheet. Likewise the Latrine maps options can be used to analyse the information stored in the Latrine data worksheet.

Step 1: choose a mapping option

Village maps	Latrine maps
○ Improved Sanitation	○ Improved sanitation coverage
○ Open defication	● People per Latrine seat
○ Prevalence of child diarohea	○ Hygiene Analysis
○ Safe disposal of child faeces	○ Menstural Hygiene Facilities
○ Disability inclusive facilities	○ Disability inclusive facilities
○ Village level Hygiene Analysis	○ Faecal waste management
	○ Adequacy Of Payment

To select the map you wish to generate simply click on the radio-button beside the name. You can only select 1 map at a time.

3.2 Step 2: options

The Sanitation Mapper can generate map files suitable for viewing as simple Jpg files or as interactive Google Earth files.

Step 2: options

Choose the mapping output and if you want a sphere surrounding each latrine:

☐ Google Earth file
☐ JPEG

Radius (m)

☐ Access distance sphere   1000

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The Google Earth files include all the inventory data saved within each infrastructure point or village icon as well as area based analysis on administrative boundaries, whereas the Jpg files only show the area-based analysis.

To select either output simply click in the tick-box beside the desired option.

The Sanitation Mapper can also generate a sphere of influence surrounding each infrastructure or village point. To add the sphere just tick the box 'Access distance sphere' and define the sphere's radius in meters. (Note: this option only applies to maps generated for Google Earth)

3.3 Step 3: generate map

Following completion of Step's 1 and 2 you can click the button GENERATE MAP and the Sanitation Mapper will compile the map file to your specifications.

Step 3: generate map

GENERATE MAP
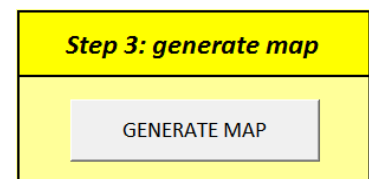
You will next be presented with a dialogue box asking you to save the mapping file. You will not be provided with an option for the filetype. If you chose a Google earth file the filetype will be 'KML' and if you chose JPEG the filetype will be 'JPEG'.

By double-clicking on either of the maps will open them. Viewing the JPEG map will be loaded into Windows Photo Viewer. Clicking the KML file will automatically load Google Earth software and zoom down into your map.

Map of latrine users.kml
Map of latrine users.jpeg
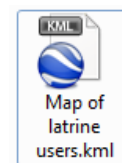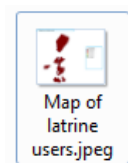
Google Earth file   JPEG file

4.0 The data sheets

4.1 Village data

Sanitation data collected from sampled household surveys can be analysed at community level. A GPS reading from somewhere within the community is required for the analysis and on the map output you will see 1 icon per community.

The Village data sheet can be used to enter household survey data or consolidated village level data.

Any column headings can be changed either into a different language or to record a different parameter. Similarly columns can be added or deleted without affecting the software functioning. However, if a core column that is used in map generation is removed or changed the tool will not function correctly.

For example, removing the settlement population column will prevent the tool from generating a coverage based map, which requires the area population for the coverage calculation. However, in renaming the settlement population column to 'sub district' will not affect its functioning.

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Drop-down lists have been added to several of the columns for ease of data entry. To change the options for the drop-down lists please see the section below explaining the Controls worksheet.

GPS: latitude and longitude
The latrine coordinates should be entered into the spreadsheet in [Decimal Degrees](#) (DD). Coordinates entered in alternative geographic coordinate systems, such as Degrees Minutes Seconds (DMS) will not be represented on the map output.

Location information
The Sanitation Mapper produces analysis for area data on two administrative levels, such as district and sub district. The spreadsheet's supporting folder 'Coordinates' must be configured to work in an area – please see Section 8. The exact names, with exactly the same spelling, of the areas configured must be used in the location details columns (Column G and I). This enables the spreadsheet to link your dataset with the relevant boundary files saved in the Coordinates folder, so that when compiling a map there can be area-based analysis.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Village ID	Village Name	Village Population	Village Longitude	Village Latitude	Admin 1 Name	Admin 1 Population	Admin 2 Name	Admin 2 Population	Name of the HH Head	Number of Men in HH	Number of Women in HH	Number of Children in HH	Physical Disability number in HH

4.2 Latrine data
Sanitation data collected from latrine surveys can be stored in the Latrine data worksheet, which works in the same functionality as the Village data sheet.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Project ID	Latrine ID	Improved Status	Level	Longitude (decimal degrees)	Latitude (decimal degrees)	Population of city/town	Ward	Ward population	Settlement name	Settlement population	Community name	Community population	Number of people served

5.0 The Controls sheet
The Controls sheet is designed as the area for editing the Sanitation Mapper content and output. The worksheet can be used to:
- Create new mapping options
- Edit the indicators analysed
- Define the percentage quintiles
- Edit drop-down lists for datasheets
- Select colours for icons, area boundaries and access distance spheres

These mapping controls follow the same format and are divided into Village data maps and Latrine data maps, referring to the separate mapping options and datasheets.

5.1 Village maps
Each of the Village mapping options on the Options sheet has a corresponding table in the Controls sheet. Any changes to the table will be replicated in both the Options sheet and the Village data sheet.

Village maps
- ◉ Improved Sanitation
- ○ Open defication
- ○ Prevalence of child diarohea
- ○ Safe disposal of child faeces
- ○ Disability inclusive facilities
- ○ Village level Hygiene Analysis

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All of the data in the Controls sheet tables can be edited. The parameters, shape colour, icon and sphere colour can all be determined by the user. Also the title of the mapping option can be edited here. Any changes to Control sheet tables are also replicated in the titles and keys of the mapping outputs – both the Google Earth and Jpeg maps.

The Sanitation Mapper analysis at an area level, such as a district, is based on the percentage of entries achieving a positive entry. For example, Figure 7 shows Improved Sanitation table. The analysis is at 2 area levels, such as district and sub district, and village level. Area analysis controls are the 'Parameters (%)' and 'Shape colour'. The Village, represented on the map as an icon, can be defined by the 'Icon' and 'Sphere colour'.

Improved Sanitation				
Parameters (%)		Shape colour	Icon	Sphere colou
1	20		images/ICONBurgundy.p	
21	40		images/ICONRed.png	
41	60		images/ICONOrange.png	
61	80		images/ICONYellow.png	
81	100		images/ICONGreen.png	
0	0		images/ICONNoData.png	

Figure 7. Village level mapping Control sheet table.

Parameters and shape colour

Choose the parameters as percentage by entering numbers into the fields. The percentage here refers to the percentage of sanitation facilities recorded as 'Improved'. We have suggested that between 1-20% of latrines improved should generate a Burgundy coloured area – the district or sub district, and opposite, the areas with between 81-100% of latrines reported as Improved will generate a Green district or sub district shape. Change the colours by using the Fill Colour function in the Font section of the Home Tab in Excel.

Icon

The Village mapping outputs will have an icon for each village. Any icon in the supporting folder Images can be used and other images can be added to the folder.
The 'Parameters (%)' column is used to define the percentages. The entry in the icon folder determines what icon appears on the map when a village has the corresponding number percentage.

Using the example in Figure 7, of the total latrines surveyed in a village, if 25 percent are recorded as improved the icon for the village will be Red (between 21-40).

Sphere

Each village can appear with a surrounding sphere of influence, which can be selected and a radius set in the Options sheet. The opaque colours of each sphere can be changed using the 'Sphere colour' field in the table.

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5.2 Latrine maps

The Latrine mapping Control tables work in the same way as the Village map tables, with the addition of a list called 'Options'.

The Options list populates the drop-down list for the options in the Latrine data sheet. There are a total of 6 options and each can be assigned a colour and a sphere colour.

Improved sanitation coverage					
Shape parameters (%)		Shape colour	Options	Icon	Sphere colour
0	20		Improved	Images/ICONBlue.png	
21	40		Not improved	Images/ICONRed.png	
41	60		No data	Images/ICONNoData.png	
61	80				
81	100				
0	0				

Figure 8. Latrine Control table.

6.0 The Google Earth maps

After data has been entered into the Village or Latrine data sheet, the Controls sheet has been configured to your mapping requirements, and you have navigated the 3 steps of the Options sheet ending with selecting the Generate Map button, you will be have created your map.

When choosing to generate a Google Earth file a KML filetype is created. The following steps detail the process for opening and understanding the Google Earth map.

1) Double click on the KML file. Google Earth will launch automatically. If you have not yet installed Google Earth please visit the website http://earth.google.com/
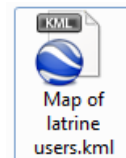
Figure 9. Google Earth.

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2) Google Earth will project your data as a layer on the satellite imagery and automatically zoom into the area of your dataset. The map will appear in the Places panel under the Temporary Places folder on the left side of the screen.

   The map file will have a name, such as 'People per latrine seat map'
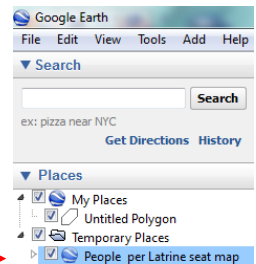
3) Each map generated by the Sanitation Mapper has 3 layers (2 area and 1 point). Click the small white arrow beside the map to expand the layers.
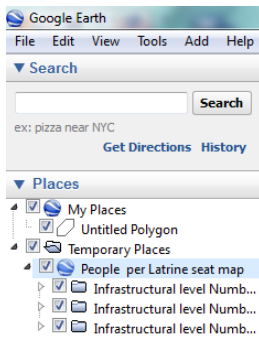
In the first folder is stored all the geo-referenced points

In the second folder is stored the admin 1 boundaries

In the third folder is stored the admin 2 boundaries
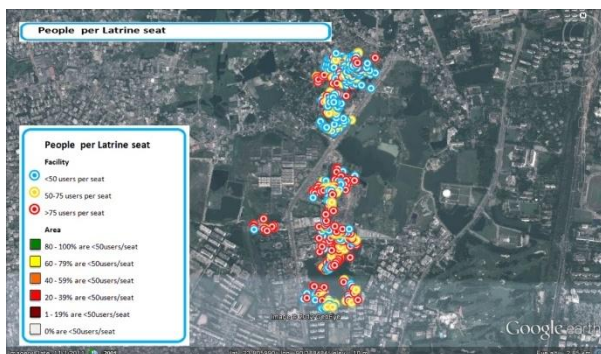
The geo-referenced point layer displays each of the latrine (or village) icons.
The example shows blue, yellow and red icons for latrines.
Blue: latrine seat with less than 50 users
Yellow: latrine seat with 51-75 users
Red: latrine seat with over 76 users
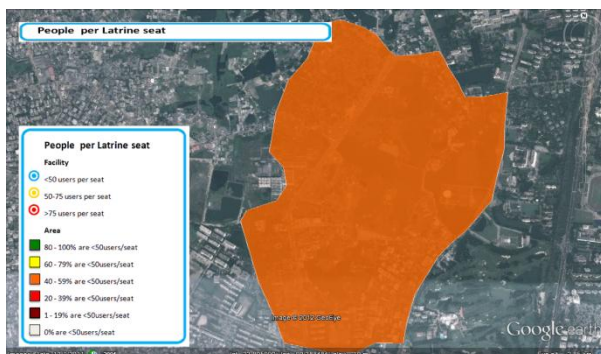
The larger admin boundary layer can be used as a district or ward boundary.

In the example shown we have created a polygon (using the Google Earth function) for Ward 15, Dhaka, Bangladesh. Analysis of the mapping indicator is the percentage of latrines across the area with positive entries in the dataset.
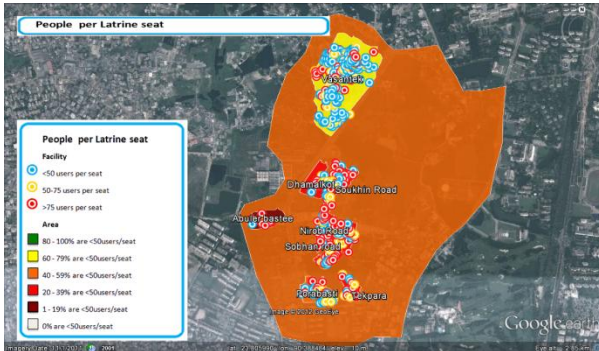
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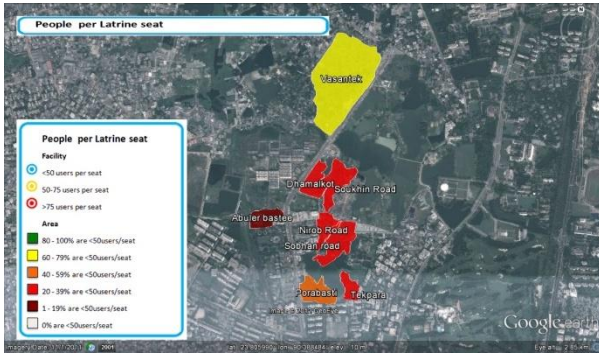
The smaller admin boundary layer can be used for sub district or settlement boundaries.

The example shows the 8 low-income settlements within Ward 15, Dhaka. Each settlement is analysed separately and disparity between the sanitation situation is highlighted.

All three boundaries can be visualised together. The example shows the number of people per latrine seat, analysed at a ward level, across 8 settlements, and at each individual latrine in the settlements.

The map can be used for targeting of investments towards settlements and areas with the poorest improved sanitation levels.

Each sanitation facility icon, or village icon, holds all the information stored in the inventory.

If you include a photo in your Photos folder it will also appear when you click on a latrine icon, providing there is a link in the datasheet Photo column.

6.1 Saving maps to reports

The following instructions detail how to use Google Earth to save images and insert into reports.

1) Position the map on the screen so you can see the area you wish to capture

2) Select File, Save, Save Image

3) In the 'Save as' dialogue box choose a name and place to save the Jpeg image. Click 'Save'.

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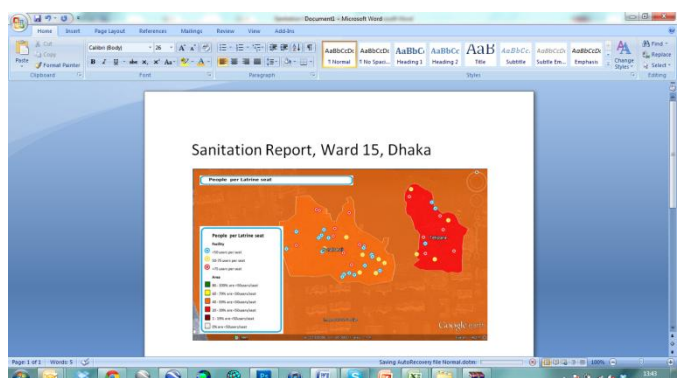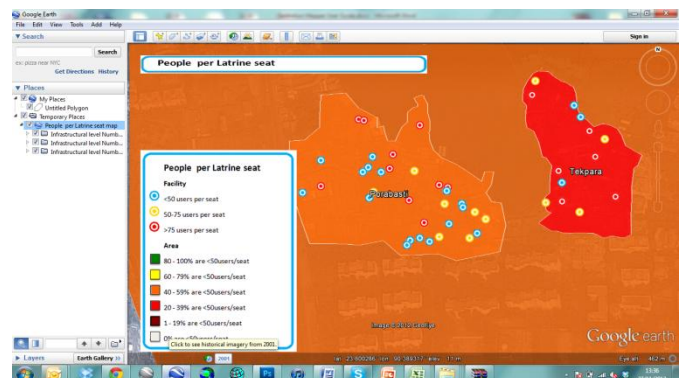
4) Open a new word document or your report. In the Insert tab choose Picture. Find your saved Jpeg file and click Insert

6.2 Printing the maps

To print the image saved in Google Earth you can use the steps:

1) Double-click on the saved image (.jpg) file. This will automatically be opened in Windows Photo Editor.

2) Select Print from the toolbar options.

Google Earth software includes many functions for creating, editing and saving spatial data. For further instructions on Google Earth see some of the many tutorial blogs on the internet and at YouTube videos. Some popular examples:

- http://www.google.com/earth/outreach/tutorials/index.html
- http://support.google.com/earth/bin/answer.py?hl=en&answer=176576
- http://www.google.co.uk/earth/learn/beginner.html
- http://www.youtube.com/watch?v=RYapu-TDW30

7.0 The Jpeg maps

After data has been entered into the Village or Latrine data sheet, the Controls sheet has been configured to your mapping requirements, and you have navigated the 3 steps of the Options sheet ending with selecting the Generate Map button, you will be have created your map.

When choosing to generate a Jpeg map a .jepg filetype is created. The following steps detail the process for opening and understanding the Jpeg file.
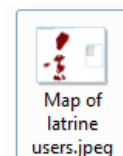
1) Double click to open the Jpeg file

2) The file will automatically open in Windows Photo Viewer

3) Point data and district data are not yet represented on the Jpeg map. We are presently working on this so check periodically for updates.

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4) The map can be printed directly from Windows Photo Viewer. Printing instructions can be found in section 7.3 Printing the maps

8.0 Configuring the Coordinates folder

The Sanitation Mapper spreadsheet has 3 supporting folders; Images, Photos and Coordinates. The Coordinates folder must be configured to enable area-based analysis. Configuration of political administrative boundary shapefiles is therefore essential to obtain the best results from the Sanitation Mapper.

A wealth of free, publically available shapefiles can be downloaded from http://www.diva-gis.org/Data.

The Sanitation Mapper is a simple tool and cannot utilize complex shapefile formats. We must therefore take the following steps to convert the shapefiles into simple textfiles that Microsoft Excel can manipulate and use for map generation.

The Sanitation Mapper uses the Decimal Degrees (DD) geographic coordinate system format.

8.1 Converting shapefiles into KML files

Your shapefiles need to be converted into KML files. This process can be done using the following software:

- Google Earth Pro
- ArcGIS

8.2 The Coordinates folder explained

The following three textfiles hold the instructions for boundary information:

District_boundary .txt   Subdistrict_boun dary.txt   Subdistrict_name .txt
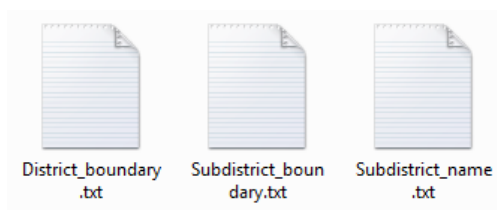
The content for the *District_boundary.txt* file includes a list of the larger administrative boundaries with their boundary coordinate information. Each larger administrative boundary, such as a district, will appear in the following format:

- Name ; coordinate , 0 , coordinate , 0 , coordinate , 0 , coordinate , etc
- District1;90.627334,12.3689323,0,90.234532,12.3454322,0,90.234345,12.2342345,0
- District2;90.231112,11.2345342,0,90.232431,11.9867786,0,90.653434,11.5342445,0

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The content for the *Subdistrict_boundary.txt* file includes a list of the smaller administrative boundaries with their boundary coordinate information. Each smaller administrative boundary, such as a sub district, will appear in the following format:

- Name ; coordinate , 0 , coordinate , 0 , coordinate , 0 , coordinate , etc
- SubDistrict1;90.627334,12.3689323,0,90.234532,12.3454322,0,90.234345,12.2342345,0
- SubDistrict2;90.231112,11.2345342,0,90.232431,11.9867786,0,90.653434,11.5342445,0

The maps outputs can include the name of each sub district. To enable this function the *Subdistrict_name.txt* file must be populated with the names of each smaller administrative boundary and one coordinate in Decimal Degrees.

- Name;coordinate
- SubDistrict1;90.386286,23.804037
- SubDistrict2;90.389185,23.800369

8.3 Converting KML files into textfiles

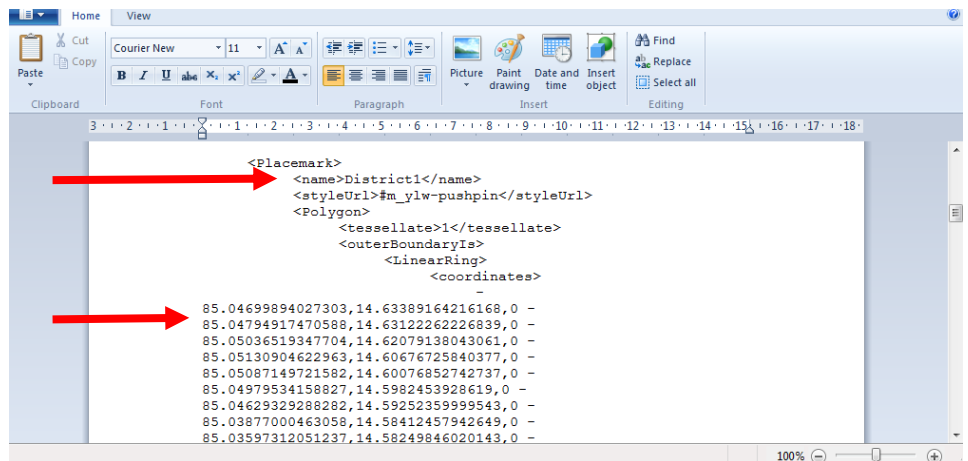The following steps can be taken to convert the admin boundary files from KML format into textfile format.

1) Right-click on the KML file and choose 'Open with'
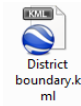
2) Select to open with WordPad
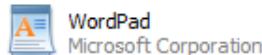
3) In WordPad you will see the coding for the KML file. Scroll down until you see the name (<name>District1</name>) of your area followed by a string of coordinates:

4) Copy both the name and entire string of coordinates to the clipboard (ctrl+C)

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5) Open the *District_boundary.txt* file and paste (ctrl+V) the boundary name, followed by a

semicolon (;) and then the string of coordinates
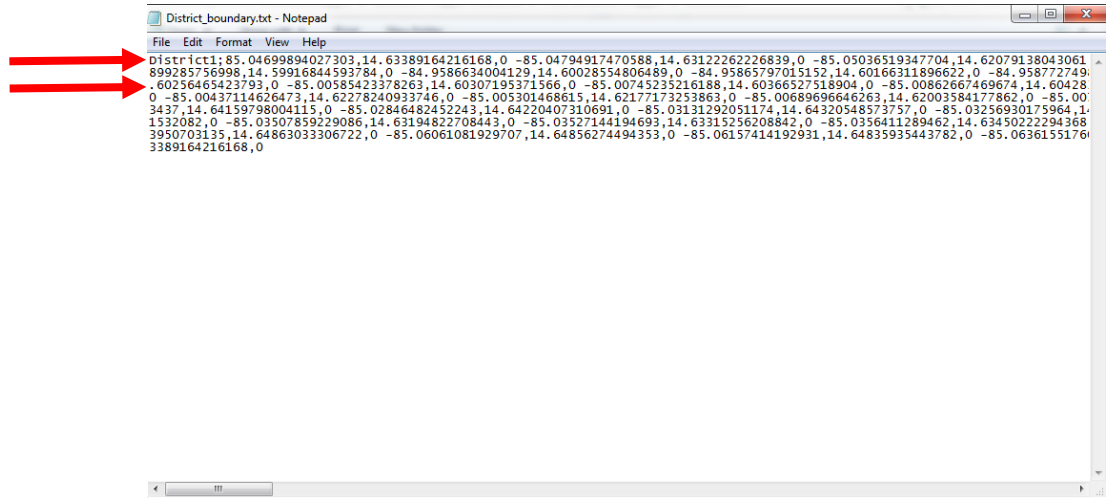
6) Repeat steps 4 and 5 for each of the larger administrative boundaries

7) Repeat steps 1 to 5 for the smaller administrative boundary files, inputting the names and coordinate strings into the *Subdistrict_boundary.txt* file


6.4 Converting KML files into textfiles

For each of the smaller administrative boundary names to appear within their respective boundaries you must

1) Open the smaller admin boundary KML file in Google Earth
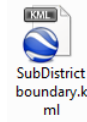
2) In the Places panel of Google Earth expand the smaller

admin boundary file and select one of the <u>polygon</u>

shapes. You should then see the boundary shape

appearing as a layer on the satellite imagery.
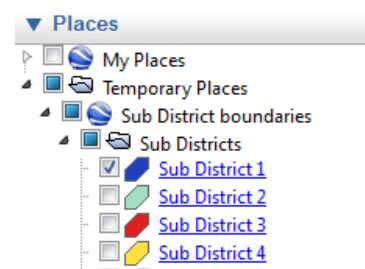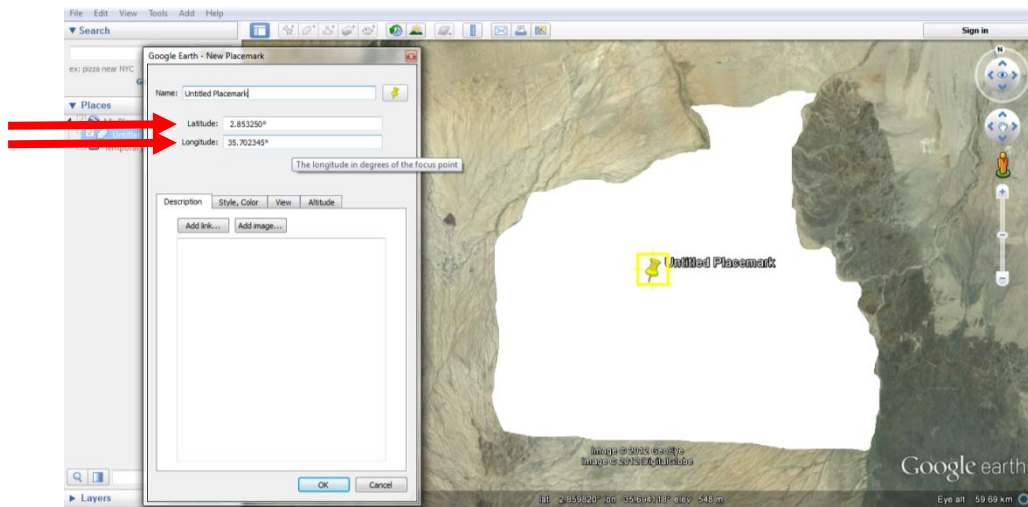

3) In the Google Earth toolbar, select the 'Add placemark' icon

4) Move the yellow pointer around to select the location for the area name

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5) Copy the Longitude and then the Latitude from the New Placemark dialogue box

6) Paste the Longitude and Latitude into the *Subdistrict_name.txt* file, following the name of the smaller area boundary and a semicolon. For example;

- Name;coordinate
- SubDistrict1;90.386286,23.804037
- SubDistrict2;90.389185,23.800369

Note: the spelling of district boundaries and sub district boundaries in the Coordinates folder must be an exact match with the boundary names in the Excel sheet.

Joseph Pearce, WaterAid

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