

# Using the QgisODK Plugin

## A brief tutorial

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## 1 Summary

Designing a participatory GIS study requires a detailed understanding of the problem and its breakup into different kinds of questions that would be asked of the participants. Most surveys use a mix of group interviews, map drawing and targeted interviews using pre-designed forms.

The objective of this tutorial is to equip you to be able to design and conduct the different surveys and to collate the information into a single complete map of the area.

## 2 Identifying the problem

Poor sanitation and contaminated water supplies are leading to a multitude of health issues in villages across India. This is particularly evident in rural and per-urban areas where there are few municipal arrangements for waste disposal and where rules and procedures are often ignored.

This problem may be looked at from many angles. For example a health worker may be more interested in documenting the impacts on health, while someone in WASH would be more interested in design and use of toilets. However, both need a quantification of the problem itself. For example in the case of solid waste:

1. Where is the problem more acute.
2. Where is the source of the waste.
3. What is the composition of the waste, i.e. what proportion is recyclable, de-composeable and how much of it is toxic to the environment.
4. Who contributes most to the waste.
5. What are the measures taken to limit waste production.
6. What is the infrastructure/facilities available for managing solid waste....

A similar list can be drawn up for any of the "problems" we seek to study.

Spatially explicit and data centric approaches measure this problem slightly differently than others. The major differences are:

1. Coordinates (GPS locations) of observations are taken. Therefore the query always has a "where" element.
2. Observations are quantified using a range of measurement techniques and, if available, other sensors. For e.g. the camera on a cell phone can be used to collect information about the volume and composition of solid waste (using tools such as [imageJ](#)).
3. Data is integrated with other sources of information, particularly those which are spatially explicit.

Another advantage of using spatially (and temporally) explicit data collection methods is human resource management. A well designed survey can have protocols built in which make it difficult for the observer to "fake" data. For example, the observer may be provided with a pre-configured tablet or smartphone where the permissions are pre-defined and a form designed to report metadata along with it. The metadata is non-editable by the user and includes locations and timings. Photographs taken by the device can be pre-configured to include coordinates (geo-coded) and time stamps.

Below is a summary of the major types of problems (solid waste was discussed earlier) with reference to WASH that are faced in Morattandi village. The FERAL campus is located at the outskirts of Morattandi. Questions that are presented here are just examples are need to be refined and fleshed out further.

## 2.1 Open defecation

A significant proportion of the village continues to defecate in the open. While for some, this is not an option, for many it is simply a preference. Questions we could ask?

1. How many people defecate in the open?
  - (a) Age groups.
  - (b) Gender.
2. Where do they defecate?
  - (a) What is the area covered.
  - (b) What is the approximate density of faeces per unit area?

## 2.2 Poor drainage

Regardless of season, but particularly evident in the monsoons, is the poor state of drainage and liquid waste management in the village. There are puddles of water, often mixed with garbage and faeces along streets, roads and empty plots.

1. What is the source of this water?
2. What is its quantity from various sources?
3. Where are the outlets?
4. Where are the designated drainage areas if any?
5. What are the obstacles preventing it from draining to its designated area?

## 2.3 Lack of WASH infrastructure

Infrastructure or the lack thereof is often singled out as the primary cause for poor management of waste in a given area. This is, however, not always the case and, more importantly, it is often dependent on the wealth of a given household. In other words, poorer households often have less access to facilities such as toilets and piped water and often cannot afford to construct soak pits or septic tanks.

1. What is the status of public infrastructure in Morattandi?
  - (a) Water supply.
  - (b) Drains.
  - (c) Waste disposal areas and facilities.
2. What proportion of households have sanitation related infrastructure?
3. Where are they located?
4. What are the bottlenecks in building infrastructure in Morattandi?

## 3 Designing the survey

Once you have developed a list of questions for the selected problem, it needs to be fit into a structure which is compatible with the GIS file format. For this tutorial we are using the ESRI shape file format which uses **dBASE (DBF) files** for storing attributes. Shape files and DBF files have certain constraints which we need to factor in. The major ones are:

1. Attributes can only be attached to one geometric object. This is not strictly correct but using multi-geometry objects makes things complicated.
2. One layer can only have one kind of geometry (point, line or polygon).
3. If two kinds of observations have the same geometry - they need to be on separate layers. This is because you can only attach one attribute table to a geometry. So if have point files for say, houses as well as for garbage dump points, you will probably need very different attributes attached to them.
4. Photographs cannot be inserted. However file names can.
5. Data has to be stored in a flat file. Again, there are ways of overcoming this but they can be complicated.

### 3.1 Dry run

Lets start by creating a very simple form, uploading it to GoogleDrive or Ona and then populating it with data. We will all create the form but you will use the one I created as the blank form in ODK for this exercise. That way we can see what happens when it is populated by many people.

Table 1: Attributes for the shapefile.

Name	Type	Size
ID	Integer	10
object	Text	20
photo	Text	200

1. Create a new point layer in Qgis (Ctrl+Shift+n) and add two attributes to it:
2. Now go to the properties of this layer and set it as follows:

Table 2: Settings for the fields in the property tab.

Id	Name	Edit Widget	Alias	Type	Type Name	Length	Precision	Comment	WMS	WFS
0	id	Hidden		int	Integer	10	0	Unique ID	X	X
1	name	Text Edit		QString	String	80	0	Name of head of HH	X	X
2	photo	Photo		QString	String	200	0	Photo filename	X	X

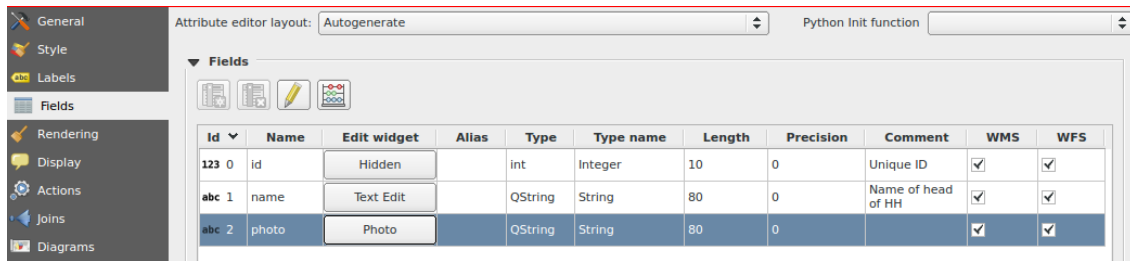


Figure 1: Screenshot of field properties.

3. Now click on the QgisODK button, or right-click the layer and select "export ODK form". It should look like the image below.

Now modify it as follows:

Lets take a look at what we've done.

- (a) The checkbox in the "enabled" column indicates whether the said field should be turned on in the form. We've left the "id" field disabled because this will be filled automatically. All others are enabled.
- (b) "map to" indicates which field in the attribute table the ODK form should be linked to.
- (c) "label" is the label attached to the field so its easier for the observer to follow.
- (d) ODK type is the type of field that the ODK form should be using. This should be automatic.
- (e) "hint", you can add a hint for the observer if you like.
- (f) "required" determines whether the observer will be forced to fill in the specific field or not.
- (g) "default" is the default value to be assigned to the field.

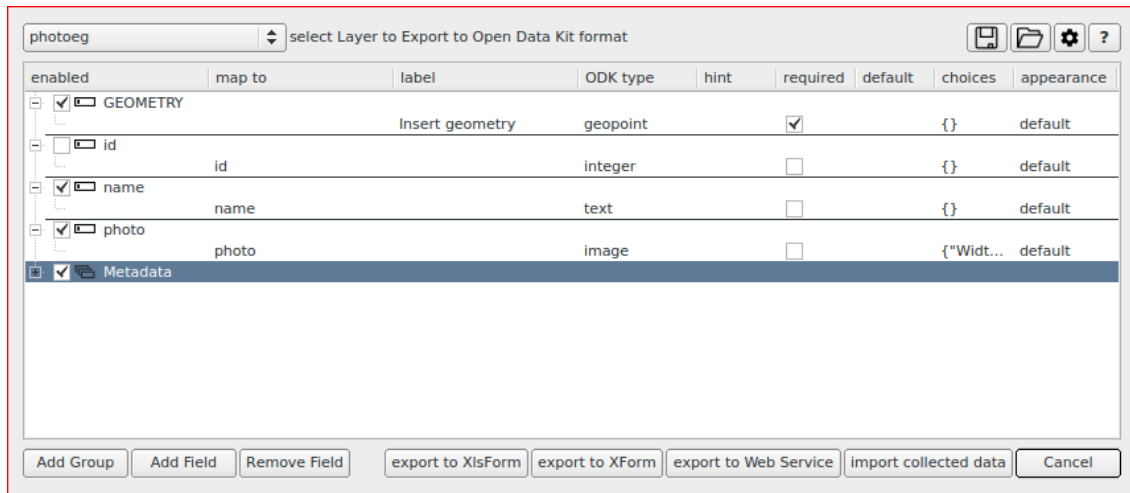


Figure 2: Exported ODK form.

Table 3: Setup for ODK form.

enabled	map to	label	ODK type	hint	required	default	choices	appearance
X	GEOMETRY	insert geometry	geopoint		X		{}	default
	id	id	integer				{}	default
X	name	Name of head of hh	select one	pick one	X		{"Puddle": "Stagnant water", "Poop": "Defecation", "Swaste": "Garbage"}	default
X	photo	Take photo	image		X		{"Width": 600, "Height": 400}	default
X	Metadata				X			default

(h) "choices" allows you to provide pre-entered values for the observer to choose from. This is very helpful in structuring a survey. In this case, we want to ensure the pictures are of either solid waste, defecation points or stagnant water.

4. Save the form. There are various ways to do this:

- (a) Hit the save icon and save it as a java script file.
- (b) Export to an xlsForm which can then be manually modified on GoogleDrive [as shown here](#).
- (c) Export to an xform xml file.

5. Finally we need to upload this to a server.

My experience has not been so great with Ona- probably a network issue, however GoogleDrive appears to work well enough. We will therefore use the latter.

- (a) I have, for this workshop created and shared a folder with you.
- (b) Set up the GoogleDrive as follows:

Field	Value
google drive login	[shaded]@gmail.com
data collectors emails	[shaded]@gmail.com
folder	QgisODK
data collection table ID	
notifications?(YES/NO)	NO

Figure 3: Set up GoogleDrive

- i. (Replace the shaded area with your email ID). Note: I've set the notifications to "No" to avoid getting unnecessary emails. In the real world, I'd create a new Google account for the survey and have the email notification enabled to keep track of the data. Click on OK when done.
- ii. You can add the emails of persons you want to share this form with here if you like. You can also do this directly on GoogleDrive. Add multiple email IDs by separating each with a space.
- iii. Now, ensure you're on-line. Then, click on the "export to Web Service" button. This should bring up the authentication screen to allow QgisODK to access GoogleDrive. Once you've finished the authentication, the form should be uploaded.



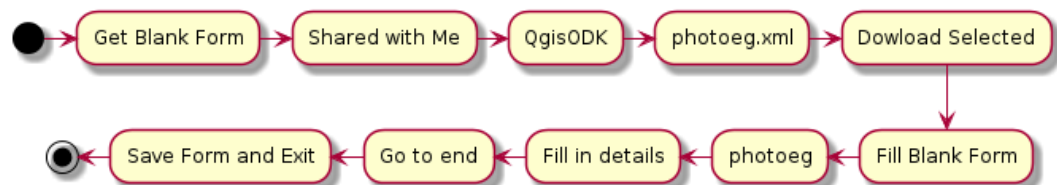
### 3.2 Using the form

This exercise is for your smartphone or tab. The objective is to download the form that was designed, use it to collect a few observations and upload the results onto the server. You should have the location and data turned on for this exercise.

1. Set up the server so its looking for GoogleDrive.



2. Get the blank form and submit some data.



3. Send the filled form.



4. Download the data and view in QGIS

Once all observations have been uploaded to GoogleDrive, we can download all the data as a single file. All it requires is to click the "import collected data" button on QgisODK. A dialog box opens listing all the available data. Select "photoeg" click "OK". You now have the choice of creating a new file (suggested) or merging this data onto an existing shapefile. See the [QgisODK tutorial](#) for detailed steps.

### 3.3 Final survey design

As the final exercise, you need to design your own survey. We will do this as a group exercise.

1. Each group needs to select one person who will be the administrator. The administrator will need to create the GoogleDrive connection and share it with the other team members.
2. Your question list needs to be discussed carefully. Make it as structured as possible and use the ODK form designer's group function to organise the questions into logical pages.
3. Each group needs to pick a different but complementary objective. For example group 1 could do a household survey while group 2 could do a mapping of problem spots.

It is highly advisable that data collection is preceded by a dry run of the form you generate. This will almost always result in improvements in the form and tweaks in the methods, as it is nearly impossible to factor in all likely outcomes of a survey. For e.g. while doing a dry run of this form, it occurred to me that we need to ensure that all photographs taken have a scale reference so we can do area/volume calculations on them while processing the data.

Here is a sample form that I had generated, the first table is the GIS shapefile, the second is the ODK form. You can download the json file from [here](#).

GIS Attributes	OpenODK
id,N,10,0	ID of household
hno,C,10	id,N,10,0
hhead,C,80	h_no,C,10
adultsm,N,2,0	h_head,C,80
adultsf,N,2,0	adults_m,N,2,0
childm,N,2,0	adults_f,N,2,0
childf,N,2,0	child_m,N,2,0
nmtoilet,N,1,0	child_f,N,2,0
typtoilet,C,20	Sanitation infrastructure
numbath,N,1,0	nm_toilet,N,1,0
watsource,C,20	typ_toilet,C,20
sump,N,1,0	num_bath,N,1,0
liqdispos,C,20	wat_source,C,20
numbins,N,1,0	sump,N,1,0
wstesegg,N,1,0	Sanitation practices
wstdispos,C,20	liq_dispos,C,20
admdefec,C,20	num_bins,N,1,0
adfdefec,C,20	wste_segg,N,1,0
chmdefic,C,20	wst_dispos,C,20
chfdefec,C,20	ad_m_defec,C,20
wldsegg,N,1,0	ad_f_defec,C,20
wldtoilet,N,1,0	ch_m_defic,C,20
wldsokpit,N,1,0	ch_f_defec,C,20
wldcmpost,N,1,0	Willingness to adopt measures
hsephto,C,200	wld_segg,N,1,0
tltphto,C,200	wld_toilet,N,1,0
smpphpto,C,200	wld_sokpit,N,1,0
	wld_cmpost,N,1,0
	Observations
	hse_phto,C,200
	tlt_phto,C,200
	smp_phto,C,200

## 4 Resources

1. Shared google drive for the workshop.
2. QgisODK plugin.

3. [Tutorial for the QgisODK plugin](#) by the developer - will be used for basic form design and an XLSFORM creation.
4. [Tutorial on using ODK with Google Drive](#). We will be using this in combination with the QgisODK plugin.
5. [Participatory GIS manual](#) by FERAL. Out dated in terms of software but still useful for the description of the techniques.
6. [Open Data Kit to convert xlsforms to xml \(xforms\)](#).
7. [More information on xlsforms](#).

## 5 Appendix

### 5.1 Manual GoogleDrive forms

Sometimes, it is difficult to get the form export on QgisODK to work - this is usually when the internet connection is poor. There are various ways to overcome this problem.

1. Install an offline form processing package [such as those described here](#).
2. Install your own ODK Aggregate server.
3. Learn how to use the XLSforms and follow the steps below. This allows you to use GoogleDrive even though the editing of the forms is done offline. Of course, the built in form editor on QgisODK is probably the best way to build the XLSforms. More instructions on using the XLSforms are provided [here](#). The flowchart below is based on [this tutorial](#).

