Introduction to geospatial data management and technologies for Health Programs training workshop - Timor Leste

GPS Essentials – Installation Guide and SOP

1. Introduction

GPS Essentials is a free application available for Android-based devices with a built-in GNSS receiver.

It is an alternative to dedicated GPS devices (Garmin eTrex for example) when collecting geographic coordinates because it complies with the required minimum specifications:

1. Allows for setting the following specifications:
    a. Position format: hddd.ddddd
    b. Map datum: WGS84
    c. Map Spheroid: WGS84
    d. Distance and speed: metric
2. Provides coordinate readings with at least 5 decimal digits to reach a level of precision down to the nearest meter.
3. Displays the following information together with the reading:
    a. Number of received satellite signals.
    b. Accuracy measure

The information presented in this document has been extracted from volume 2.4.2 of the Health GeoLab guidance to improve the management and use of geospatial data and technologies in health [1].

2. Installing GPS Essentials

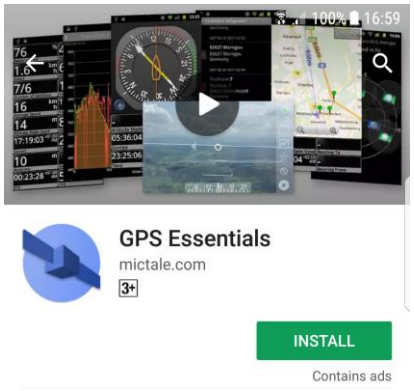
The following minimum device specifications are required to install the GPS Essentials application on your android device:

1. At least Android 4.4
2. More than 512 Mb of RAM

To install GPS Essentials on your device:

1. Go to Google Play Store and search for *GPS Essentials*.

2. Click on the *Install* button.



[1] https://www.healthgeolab.net/DOCUMENTS/Guide_HGLC_Part2_4_2.pdf

3. Standard Operating Procedure (SOP) and Data Collection Form

It is critical to follow defined steps captured in a Standard Operating Procedure (SOP) for the entire data collection and verification process to collect geographic coordinates in the field for geographic features such as a health facility, health facility, village,...

GPS Essentials contains several modules but only two of them are necessary for collecting GNSS-based coordinates following the SOP presented in this document:

1. Settings

2. Satellites

While the SOP presented here has been designed to collect the geographic coordinates of an health facility, both the SOP and the corresponding data collection form can be adjusted to be applicable to other type of geographic features.

Please note that the example used in the SOP corresponds to a fictive health facility i and that the field numbers correspond to those used in the Health GeoLab guidance mentioned here above (some fields have been removed for the present exercise).

The following documents are needed to implement the SOP as part of Exercise 1:

- Paper version of the data collection form (Annex 1)
- Health facility information from the master list (Slide presented during the training)
- Min/max coordinates for the administrative division in which the health facility is located. Here is an example of a table providing such values (Note: Please use the table reported on the slide presented during the plenary for the purpose of the exercise):

Village track	Min Latitude	Max Latitude	Min Longitude	Max Longitude
Kyun Ta Peit	19.6	19.8	96.1	96.2

SOP to be followed for Exercise 1:

Please fill the data collection form (Annex 1) as follows once arrived in front of the health facility for which you need to collect the geographic coordinates:

1. Section 1 - Name and code of the health facility as per the master list:

   1.1 Write the official name of health facility as per the information provided on the exercise slide in field 1a;

   1.2 Write the official code of the study site as per the information provided on the exercise slide in field 1b;

   Example: The example below illustrates how the information for Ramu Upazila Health Complex (a fictive health facility) should be entered for these two fields in the form (*Note: use the information provided on the slide during the plenary for the exercise*):

1a. Name of the health facility as per the master list	*Ramu Upazila Health Complex*
1b Code of the health facility as per the master list:	S T S 0 2 3

2. Section 2 - Address and location of the health facility:

   2.1 Write the street name and number of the study site in field 2a. No other information (such as the name of an administrative division) should appear in this field.

   If the study site is in a place for which there is no street name or/ number then "NA" (standing for "Not Applicable") should be entered here.

   Example: The figure below illustrates how the information for Ramu Upazila Health Complex is entered in the fields 2a of the form (*Note: use the information provided on the slide during the plenary for the exercise*):

2a. Building number and street name	*National road 1*

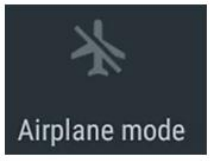
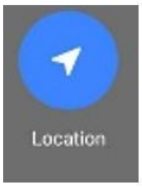
   2.3 Use the information from the administrative divisions master list to enter the information for fields 2b to 2e).

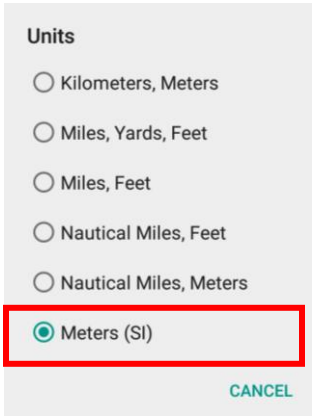
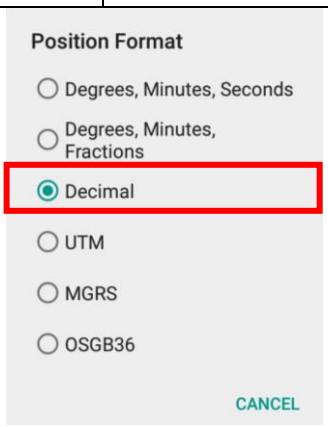
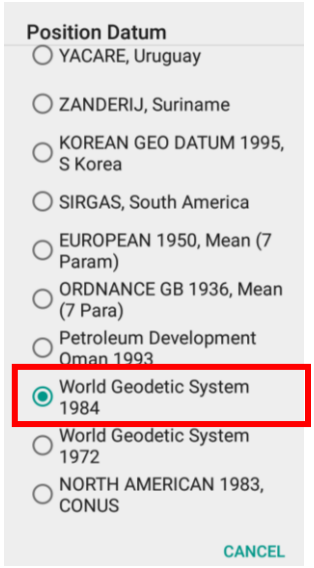
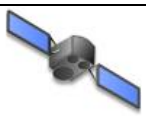
Take care to ensure the correct spelling and code are used (including the "0" at the front of the code in some cases).

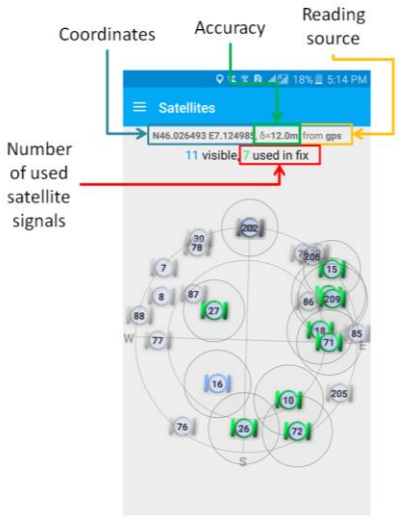
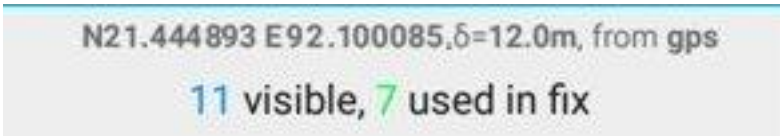
Example: The figure below illustrates how the information should be entered for Ramu Upazila Health Complex in these fields (*Note: use the information provided on the slide during the plenary for the exercise*):

2b. Name of the Province as per the official master list:	Chittagong
2c. Name of the District as per the official master list:	Cox's Bazar
2d. Name of the Sub-district as per the official master list:	Ramu
2e. Code of the Sub-district as per the official master list:	2 0 2 2 6 6

3. Section 3 - Geographic coordinates of the infrastructure:

Step	Action	
3.1	Once you have arrived at the place to be located: - Find an open space - On your Android device: a. Activate the Plane mode b. Turn the location option on c. Open the GPS Essentials application.	a)  b)  c)

3.2	Go to the "Settings" page through the icon presented on the figure on the right and fix the settings for the following 3 components as presented in the figures below: • Units => Meters (SI) • Position Datum => World Geodetic System 1984 • Position Format => Decimal	 Settings
	  	
3.3	Go back to the "Main menu" page and click on the "Satellites" Icon presented on the side here.	 Satellites
3.4	Move to the point to be located and stay on the same spot for at least 1 minute (depending on the hardware of your Android phone/tablet) to allow for the best reading possible.	

3.5	Make sure the reading is taken by the GPS receiver and not a nearby wifi connection (element in orange on the image in the right) and then wait for GPS essential to take a reading with: - At least 4 satellite signals to be used in the fix (element in red in the image) - The accuracy reading to be below 15 meters (green element in the image)	
	In the example shown below, the accuracy is 12 meters with 11 visible satellite and 7 used for the coordinates => this is a good reading! 	
3.6	Once the accuracy value is below 15 meters with at least 4 satellite signals, take a screenshot of your phone screen showing the satellite page of GPS essential with: - the number of satellite signals and accuracy - the latitude and longitude shown on the screen	
3.7	Verify that the coordinates on the screenshot are within the Min-Max range of latitude and longitude for the administrative division in which the study site is located using the list of Min-Max Coordinates (Note: provided on the slide presented during the plenary for the exercise). In the example used above, the Ramu Upazila Health Complex located in Ramu Upazila has latitude: 21.44489° and longitude: 92.10008°. These values are correctly within the Min and Max latitudes and longitudes for this Upazila. If this is the case, check the "Yes" box in field 3c and go to the next step. If this is not the case, meaning that the coordinates fall outside the ranges:	

Upazila_code	Upazila_Name	Min Latitude	Max Latitude	Min Longitude	Max Longitude
22266	Ramu	21.27760	21.61280	91.98990	92.25740

3c. Coordinates falls within the min/max lat/long values	*Yes* [X] *No* [ ]

<table>
<tr><td></td><td>
- Verify again the units of the device (step 3.2)
- Take a new reading (steps 3.3 to 3.7)

If the coordinates continue to fall outside the ranges:

- Write “Coordinates fall outside of the range” in field 3h as per the following example and continue the process using the coordinates in question:

<table>
<tr><td>3g: Comments regarding the GNSS based coordinates</td><td>Coordinates fall outside the ranges</td></tr>
</table>
</td></tr>
<tr><td>3.8</td><td>Write down the final number of satellites signals and accuracy measure from the screenshot (from step 3.6) in fields 3a and 3b as presented here:

<table>
<tr><td>3a. Number of satellite signals received</td><td>0 7</td></tr>
<tr><td>3b. Accuracy</td><td>1 2 . 3 metres</td></tr>
</table>
</td></tr>
<tr><td>3.9</td><td>Write the coordinates from the screenshot with 5 decimal digits in fields 3d and 3e of the form (use the N (North)/S (South) and E (East)/W (West) options to indicate the cardinal directions of the reading). Then complete field 3f with the location where you took the reading. If option 2 was checked in field 3f, write the details of the location in field 3g as per the example below:

<table>
<tr><td>3c. Coordinates falls within the min/max lat/long values</td><td>Yes X No</td></tr>
<tr><td>3d. Latitude (Decimal degrees):</td><td>(N) S 2 1 . 4 4 4 8 9</td></tr>
<tr><td>3e. Longitude (Decimal degrees):</td><td>(E) W 0 9 2 . 1 0 0 0 8</td></tr>
<tr><td>3f. Waypoint (Circle one option)</td><td>1. At the location
(2.) At a nearby location (for example, at the gate, in a park or communal space)</td></tr>
<tr><td>3g: Comments regarding the GNSS based coordinates</td><td>Coordinates collected in a parking lot 50m away from the study site</td></tr>
</table>

Note: As much as possible, waypoints should be at the location being mapped – “1. At the location”
</td></tr>
</table>

3.10	Write down any other comments you might have about the reading in field 3g (Put "None" if you don't have any)
3.11	Complete fields 3h to 3j of the form (data collector full name, data collection Date (dd/mm/yyyy) and phone brand and model
3.12	Check the content of the form once again and complete any remaining fields

Annex 1 - The data collection form when using GPS Essentials in Exercise 1

SECTION 1 NAME AND CODE OF THE HEALTH FACILITY AS PER THE MASTER LIST

1a. Name of the health facility as per the master list	
1b Code of the health facility as per the master list:	☐☐☐☐☐☐☐☐

SECTION 2 ADDRESS AND LOCATION OF THE HEALTH FACILITY

2a. Street name and number	
2b. Name of the Municipality as per the official master list:	
2c. Name of the Administrative Post as per the official master list:	
2d. Code of the Administrative Post as per the official master list:	☐☐☐☐☐☐

SECTION 3 GEOGRAPHIC COORDINATES OF THE HEALTH FACILITY

3a. Number of satellite signals received	☐☐
3b. Accuracy	☐☐.☐ metres
3c. Coordinates falls within the min/max lat/long values	*Yes* ☐ *No* ☐
3d. Latitude (Decimal degrees):	N S ☐☐.☐☐☐☐☐
3e. Longitude (Decimal degrees):	E W ☐☐☐.☐☐☐☐☐
3f. Waypoint (Circle one option)	*1. At the location* *2. At a nearby location (for example, at the gate, in a park or communal space)*
3g: Comments regarding the GNSS based coordinates	
3h: Data collector full name	
3i: Data collection Date (dd/mm/yyyy)	
3j: Phone brand and model	