Environmental Data Management Best Practices

Geospatial Data Collection
Field Hardware

This document reviews the key considerations for field hardware with respect to GIS applications. Project specifications and department information technology (IT) considerations are also presented to help select the right tool for the job.



Overview

Field data collection is a vital component for building and maintaining a GIS project. The Data Collection Consistency subtopic sheet discusses the rationale for acquiring data using accurate field methods. This document discusses the best practices for geospatial data collection hardware that are used by field personnel. Digital solutions allow for near real-time communication between the field team and the geospatial database. To support field data collection, careful selection of the hardware used by the field teams is necessary. Some questions that help with selecting the correct hardware include:

- What are the project accuracy requirements for locations of observations?
- What type of data is being collected?
- Are there any specialized measurement tools (for example, cameras, thermal sensors, laser distance measurer, air quality monitors, moisture meters) that need to directly interface with the geospatial data collector hardware?
- What is the data backup protocol?
- Does data collection need to be provided in real-time to the geospatial database?

Hardware

Field hardware to support GIS tasks must be able to interface with global positioning system satellites (GPS) to accurately determine the location of the device and the observations of the field user. This can be an integrated GPS antenna or an external antenna either hardwired to the user interface component or communicating via wireless or Bluetooth. If elevation data are part of the project field data collection, then a consistent height of the GPS antenna will be required. This can be achieved by mounting the GPS antenna on a rod with a known length.

If data being collected include text and numerical values that are manually entered, then the field device should have at least one of the following:

- Screen large enough to use a gloved finger to enter data while still reading the data input prompts
- Stylus for interfacing with a screen keyboard

- Physical keyboard for data entry

For external sensors, the sensor should either be capable of hardwired connection to the user interface component or wireless communication to the data collection hardware. All communication protocols should be tested and confirmed to work under expected data collection conditions—for example in a vehicle, beneath tree canopy, or in the vicinity of other operating wireless equipment. Specific to GPS signal loss in certain environments, a laser range finder should be evaluated if offset coordinate data collection could be used to provide better GPS signal strength.

Data Storage

The data collected during field collection must reside on the device until it can be transferred to the GIS. If real-time data transfer is identified as a project need, then the hardware must be able to support a constant communication. A cellular data connection or satellite data connection in addition to Wi-Fi will be necessary. If real-time data transfer is not required by the project, then data may be stored on the device until a later time. This can be internal or removable memory. Removable memory allows for data recovery if the device suffers a battery or physical failure.

If video or photographs are collected during the field data collection, the average file size should be evaluated and the data storage on the device should be verified to be sufficient for a full day's worth, if not the duration of a field event, of data collection.

Scalability and Deployment Considerations

Based on the needs assessment for field data collection, a GPS-enabled smart phone may be a suitable field data collection device. In general, the scalability of field data collection hardware is based on the number of field staff required to complete the project on time and licensing for the software on the device(s).

When determining the appropriate GIS field hardware include the IT staff in determining what resources are available and security requirements that the device will need. Further description of consistency in data collection and other considerations for data processing and evaluation are outlined in the Data Collection Consistency subtopic sheet.

Resources

Related links:

- Hardware vendors listed below are not an endorsement of their products but a reference to begin finding hardware providers:
    - https://geospatial.trimble.com/GIS
    - https://leica-geosystems.com/en-us/products/gis-collectors
    - https://www.getac.com/us/products/tablets/ux10/#overview/
    - https://help.fulcrumapp.com/en/articles/5445927-comparing-bluetooth-gps-devices