Introduction to GIS
GIS and SedNet Training

Phil- WAVES

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Outline of presentation

1. Learning Outcome
2. Geographic information
3. Geographic information technologies
4. Geographic information system
5. Geographic information science
6. Relevance to Phil-WAVES
7. Summary

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Leaning outcome:

1. define basic terms associated with geographic information including " technologies, systems and science

2. explain why geographic information systems are important

3. explain why a science of geographic information is needed

Geographic information

Geographic information

- is information about places on the Earth's surface

- knowledge about where something is

- is knowledge about what is at a given location

Example:

- Detailed:
  - Locations of all buildings in the city
  - Individual trees in a forest
- Coarse
  - Climate in a large region
  - Population density of an entire country
- *varies Geographic resolution

Geo Information
Characteristics

- **often "relatively" static**
  - ➢ don't change rapidly
  - ➢ can be portrayed on a static paper map

- **voluminous data**
  - 1000 GB = 1 TB of data is sent from a single satellite in one day
  - 1 GB data is needed to describe the US street network

Geographic information **Technologies**

- Technologies for collecting and dealing with geographic information
  - GPS
  - Remote sensing
  - Geographic information system

GI Technologies
Types
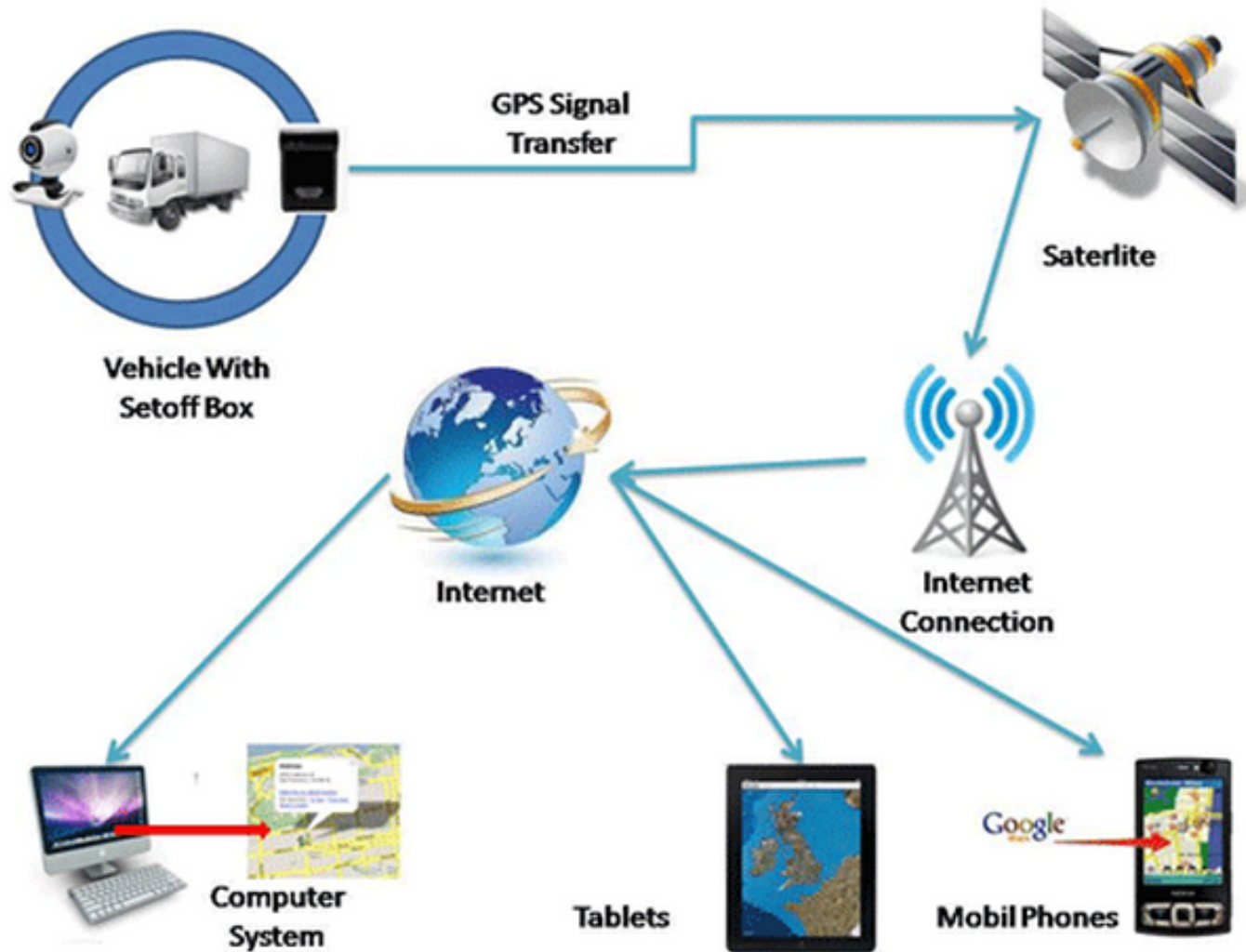
1. Global Positioning System (GPS) -

   ■ Earth-orbiting satellites

   ■ Measuring earths position

   ■ received by electronic devices

   ■ expressed in Lat and Long

   ■ Eg. GLONASS
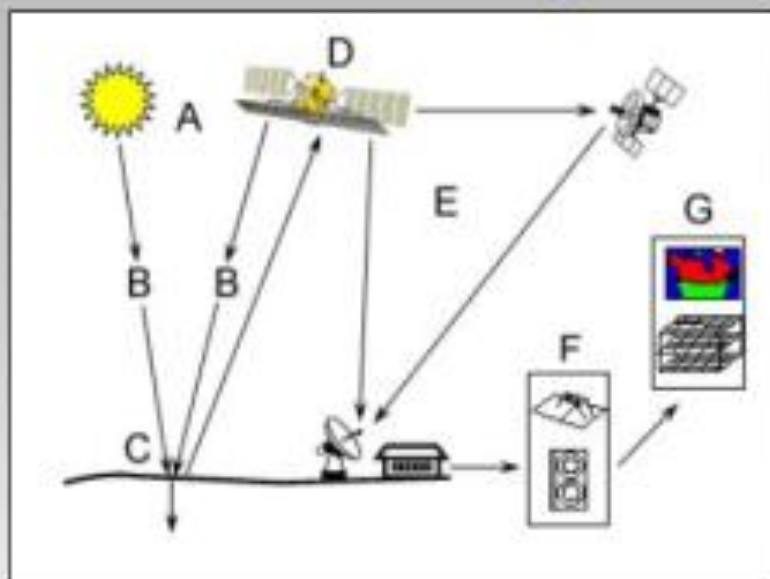
GPS

.......GI Technologies
Types

2. Remote sensing

   - Earth-orbiting satellite

   - Captures info about the surface and atmosphere below

   - Uses EM spectrum

   - EM transmitted to receiving stations

   - Transformed

   - Dissemination as digital images

RS

Remote Sensing Process

- Energy Source or Illumination (A)
- Radiation and the Atmosphere (B)
- Interaction with the Target (C)
- Recording of Energy by the Sensor (D)
- Transmission, Reception, and Processing (E)
- Interpretation and Analysis (F)
- Application (G)

Canada Center for Remote
(accessed June 2

…….*GI Technologies*
# **Types**

3. Geographic information system (GIS)

- computer based system capable of capturing, storing, analyzing and displaying geographical reference information (USGS 1997)

- a system for input, storage, manipulation, and output of geographic information

Geographic Information System

GIS components

People

Software

Methods & Procedures

Five Parts of a GIS

Hardware

Data
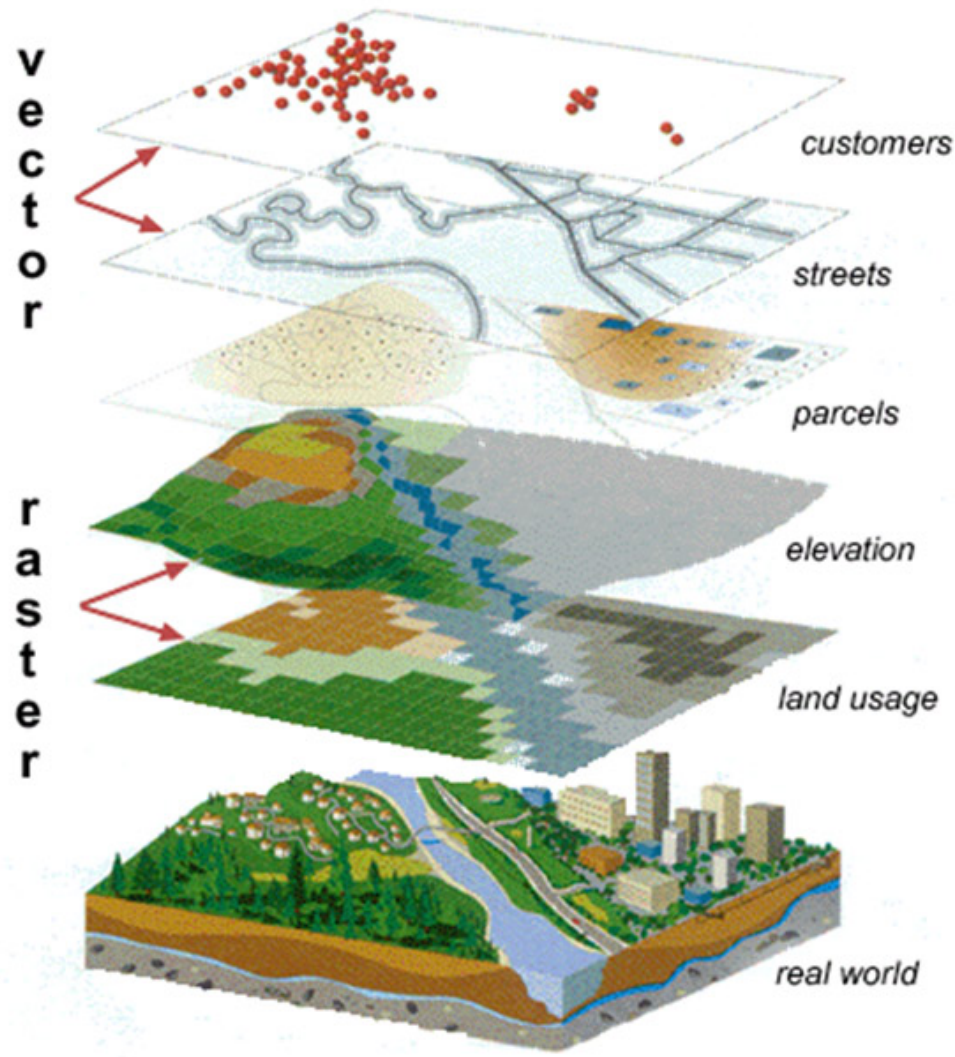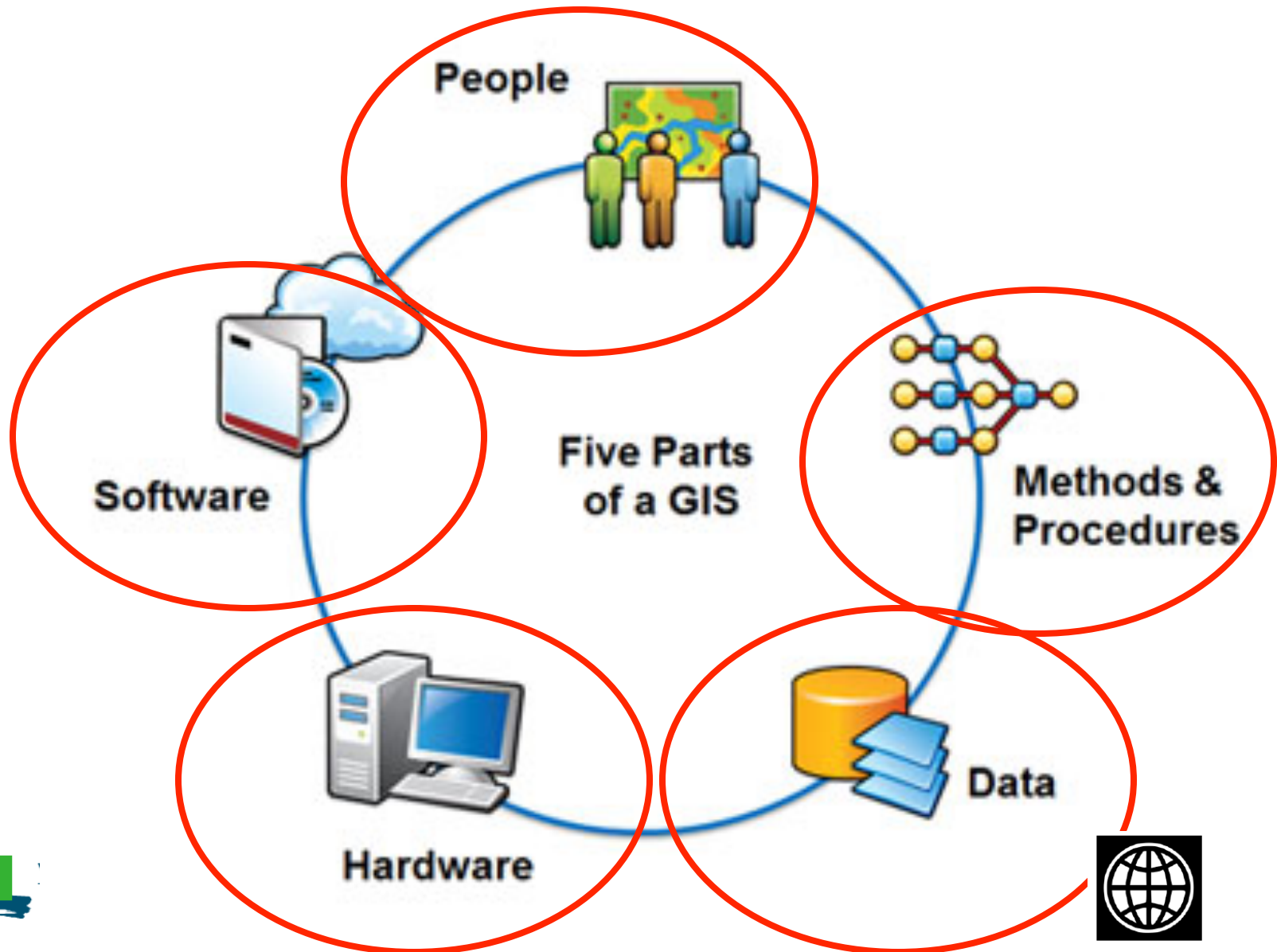
Why computer based?

- why use computers to handle information?

- easy to store, retrieve, query, manipulate, send, receive, copy, display...

- most of these things can be done by hand, but only slowly

- paper maps are difficult to handle, store, send,receive, copy...

- GIS makes all of these operations easier today, all kinds of information are being handled in computers

- good to have one place to go for all kinds of information

- one system (the Internet) used to send, receive all kinds

What does GIS looks like?

- Real application
  - With the 5 components mentioned earlier

- Software
  - a type of software sold by a software developer
  - Open source software (SAGA or Quantum)

GIS Applications

- Mapping locations
- Mapping quantities
- Mapping densities
- Finding distances
- Mapping and monitoring change

Much sophisticated functions:

- Utility companies

- Transportation

- Farming – precision agriculture

- Forestry

- Hydrogeology

- **Ecosystem services mapping and valuation**

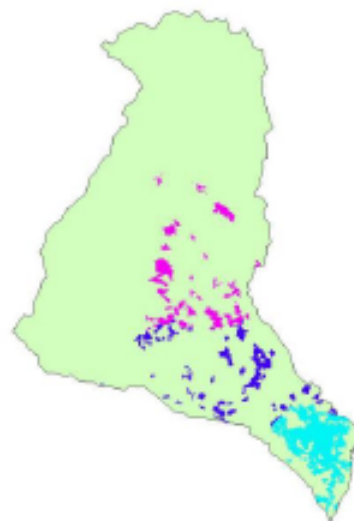 - **Mapping and monitoring change**

  - **Requires human expertise**

Figure 9 Coconut production (copra) tons ha⁻¹yr⁻¹
Value
High : 1.45
Low : 1.24

Figure 10 Paddy rice production (palay) tons ha⁻¹yr⁻¹
Value
High : 4.78
Low : 3.89

c)

d)
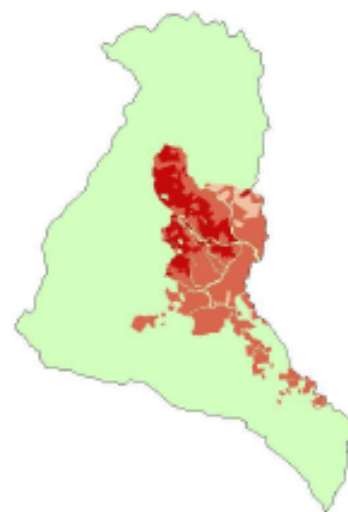
Figure 11 Palm oil production (fbb) tons ha¹yr⁻¹
Value
High : 0.78
Low : 0.39
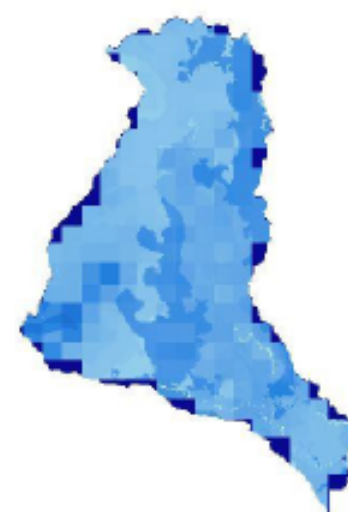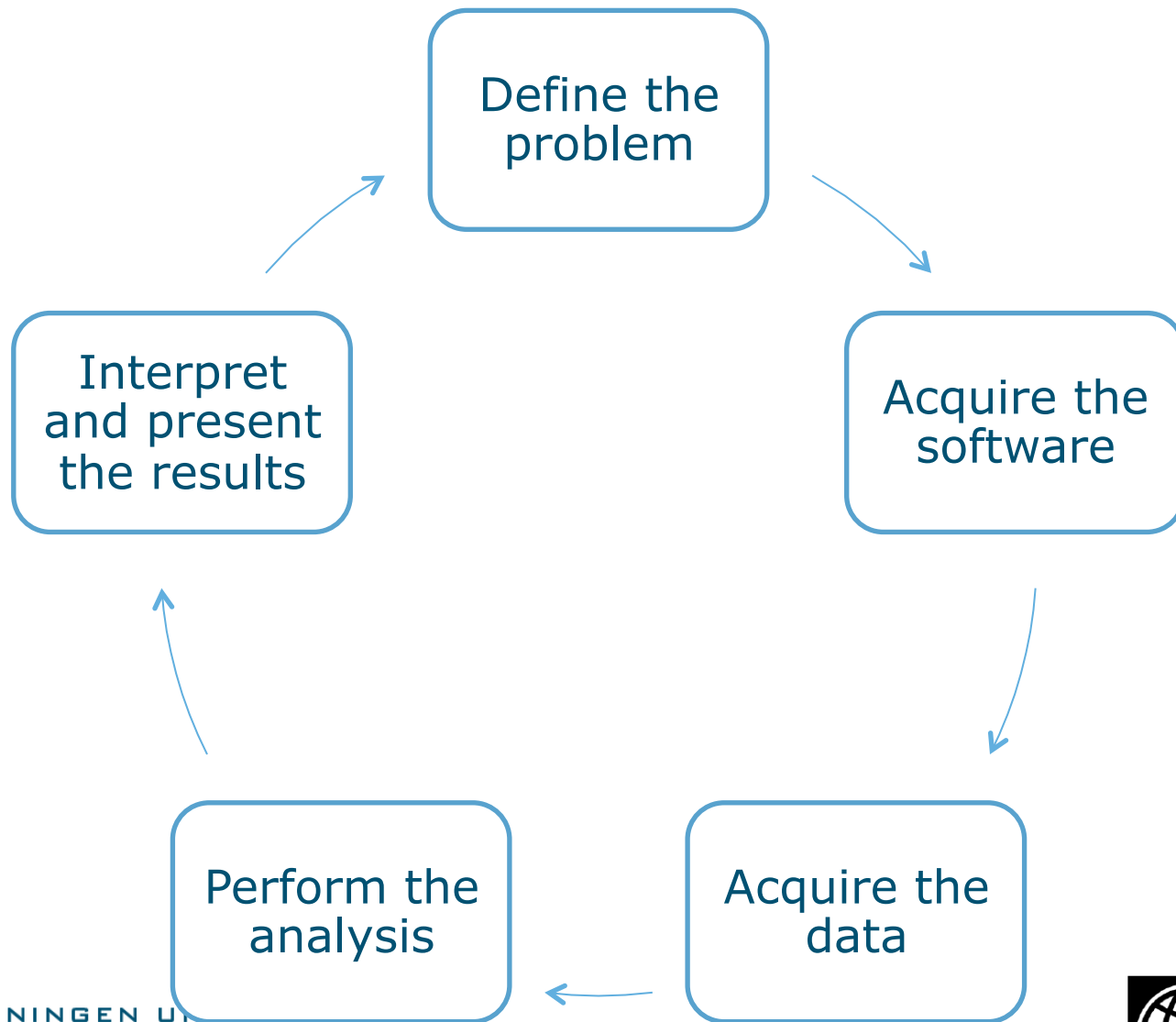

Figure 12 Water Yield (mm yr⁻¹)
Value
High : 304
Low : 0

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Process involving GIS

Geographic information science (GIS)

- is the science behind the technology considers fundamental questions raised by the use of systems and technologies

- is the science needed to keep technology at the cutting edge

- Multi-disciplinary field
  - cartography, geodesy, photogrammetry
  - **Environmental Science**
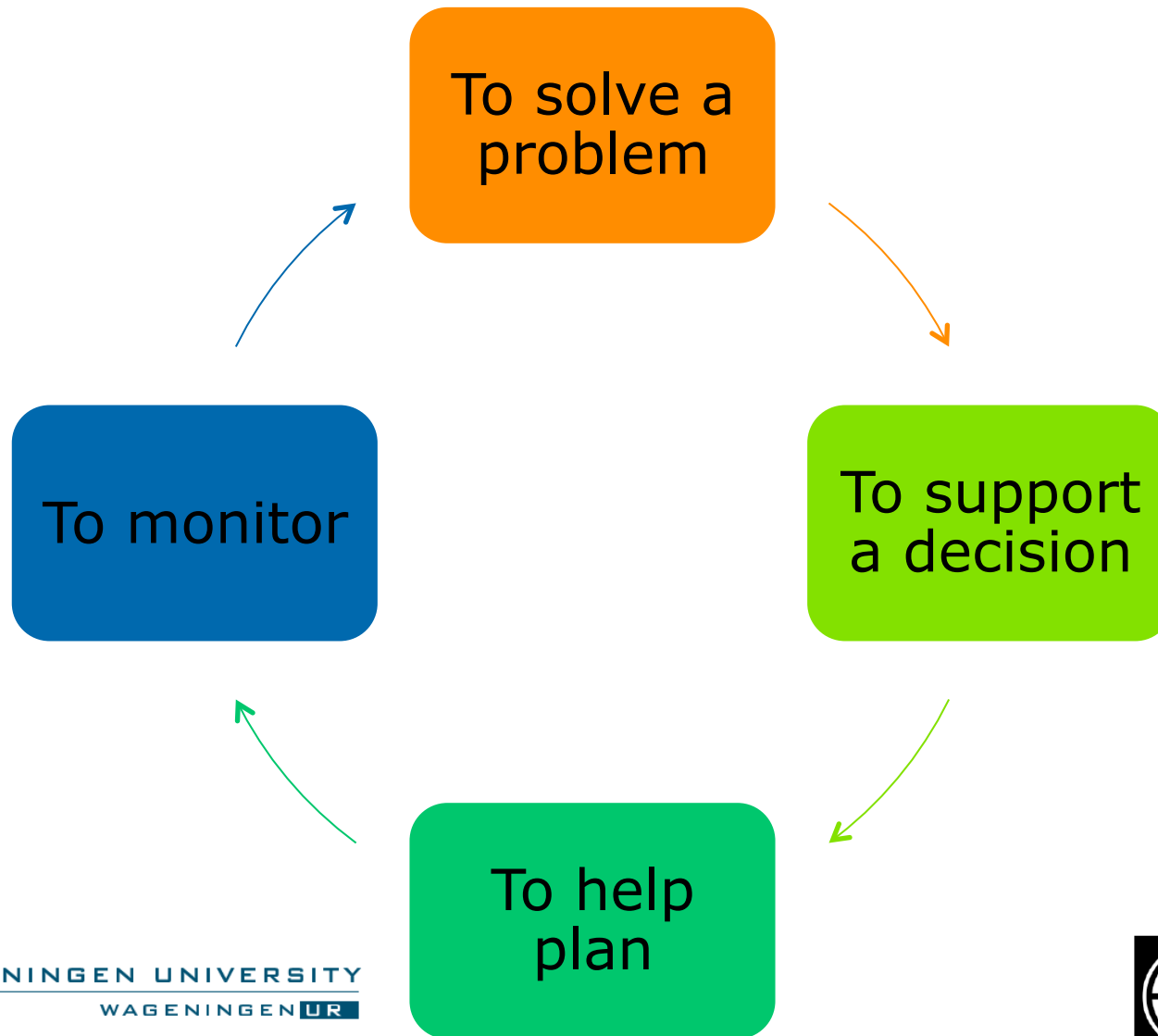 - **Ecosystem Accounting**

Why the Science

- how to assess a representation

- how to measure its accuracy

- how to measure what's missing, its uncertainty

- how to express these in ways that are meaningful to the user

- how to describe them in documentation

- how to visualize them

- how to simulate their impacts

GIS Relevance to Phil-WAVES

Summary

- geographic information is information about places on the earth's surface

- geographic information technologies include global positioning systems (GPS), remote sensing and geographic information systems.

- geographic information systems are both computer systems and software

- GIS can have many different manifestations

- GIS is used for a great variety of applications

- geographic information science is the science behind GIS technology

Questions????