SGHU 2552
Introduction to Geographic Information System

Chapter One

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Content

- Background of GIS
- GIS definitions
- GIS: Geographic Information Sciences
- Components of GIS
- Conclusion

Background to GIS

- What GIS can do?
- How it works?
- Questions on GIS?

Plan?
Spatial data?
Attributes?
Satellites?
Image?

Map?
Digital map?
Other formats?

HAVE YOU HEARD ABOUT GIS?

Today's requirement?

Something to ponder

What do people search everyday?

- Place to eat?
- Place to visit?
- Where's the hospital?
- Our friends houses
- Wedding place

Its about location; how to know? Viewing?

Asking about locations?

Query (we ask)

Simple Query

Where's the restaurant?

Which shopping complex?

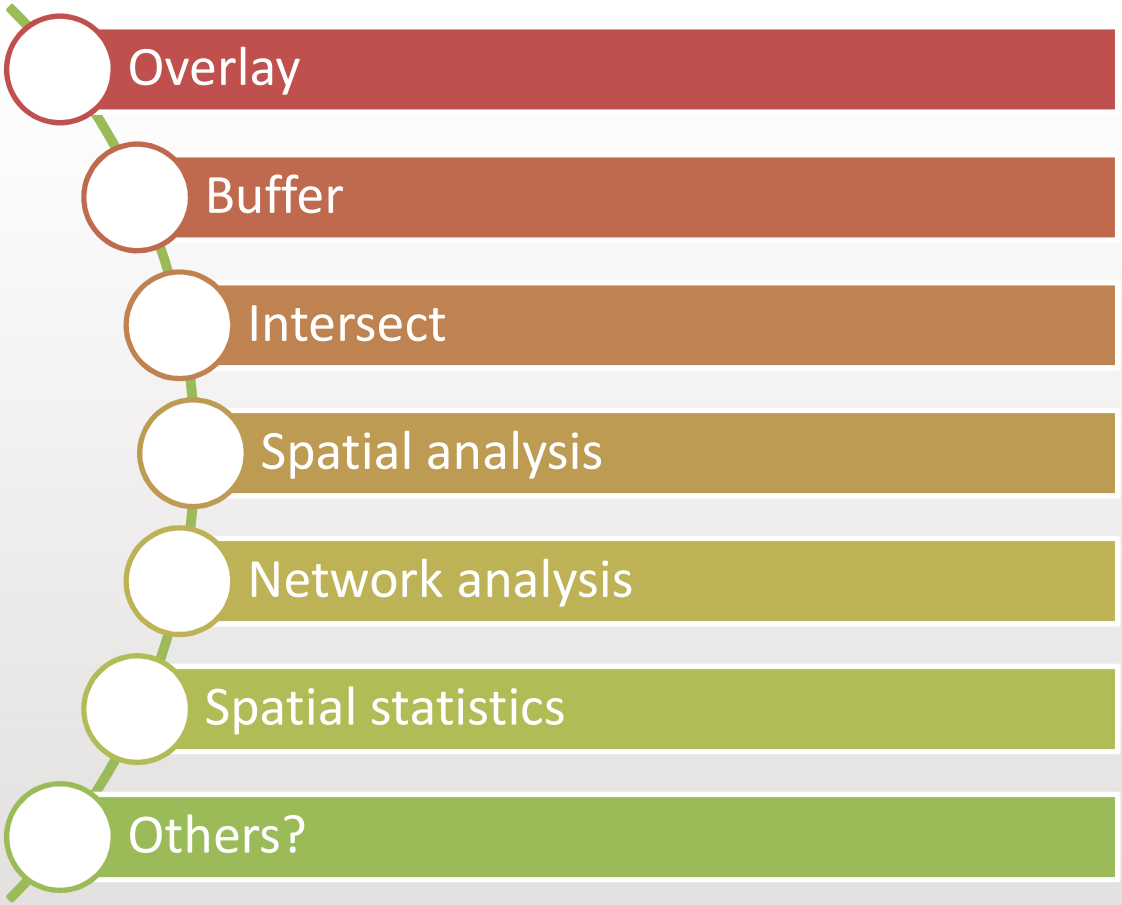
Complex Query

Where's the place will be affected when is flood?

Where's the highest population density in Johor Bahru's area?

How to answer the complex query?

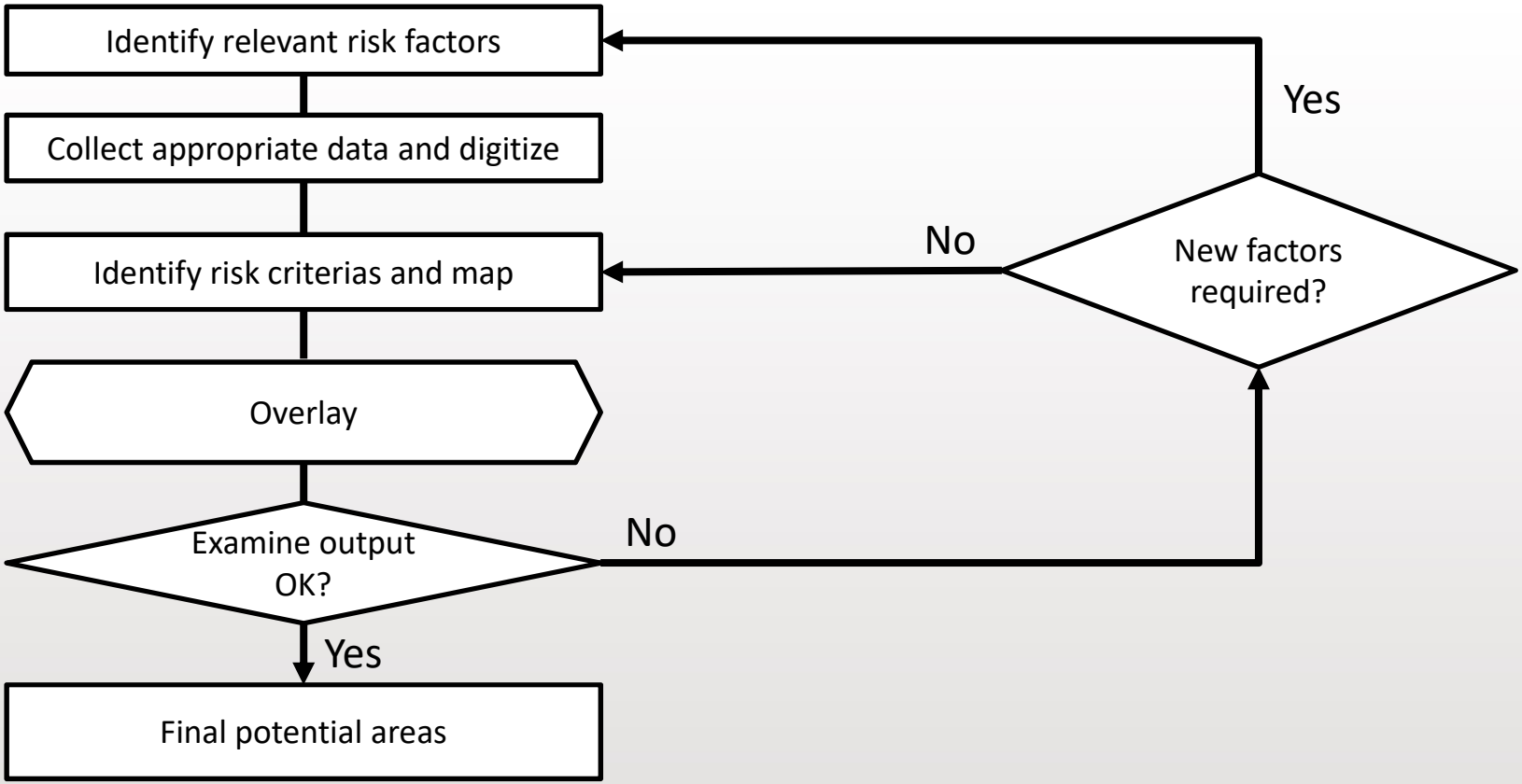
- **Via having spatial analysis such as;**

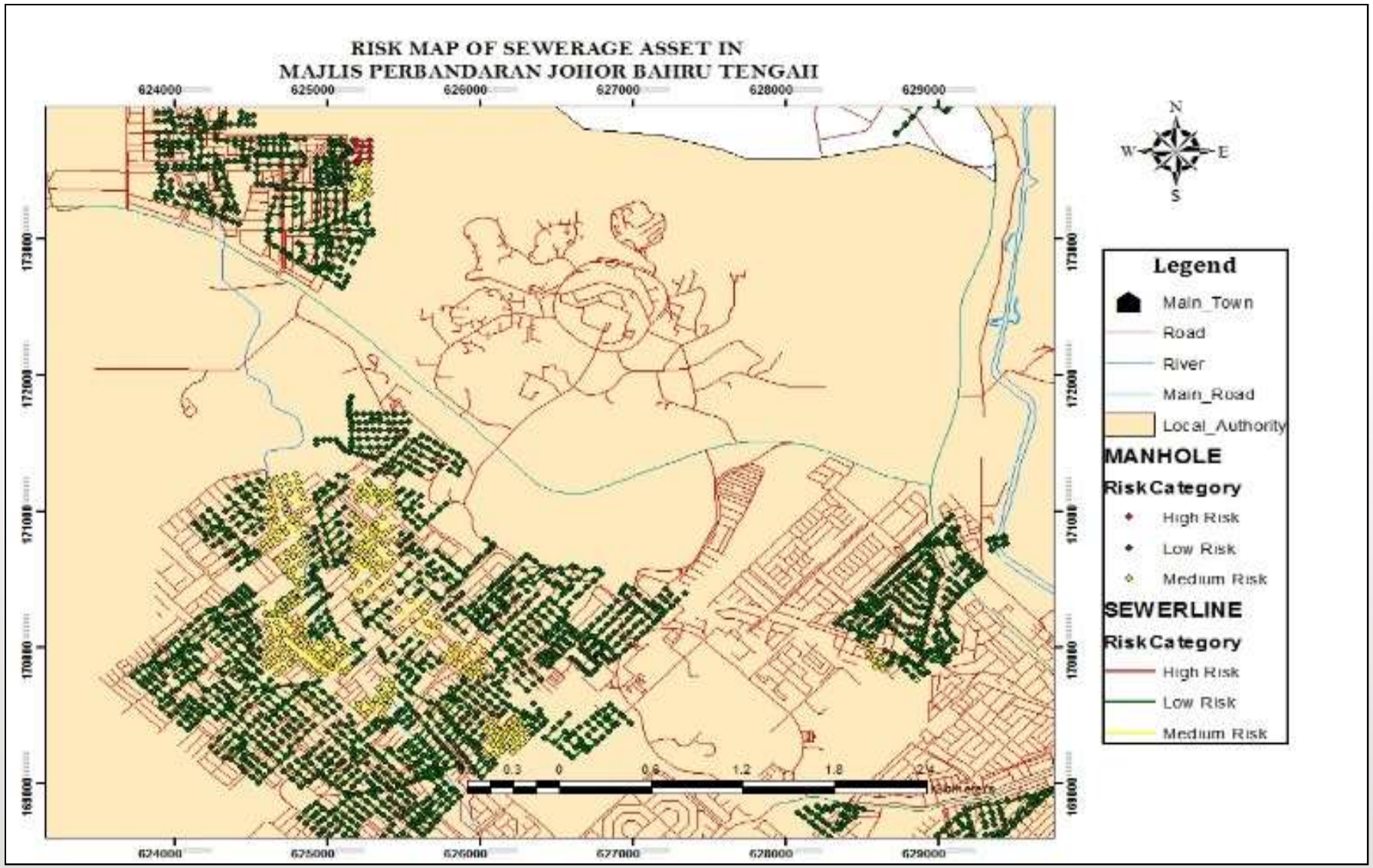


CASE STUDIES

Searching for sites

- **Example of searching for utilities that have risk**




RISK MAP OF SEWERAGE ASSET IN
MAJLIS PERBANDARAN JOHOR BAHRU TENGAH
624000
625000
626000
627000
628000
629000
173000
172000
171000
170000
169000
N
W
E
S
Legend
Main_Town
Road
River
Main_Road
Local_Authority
MANHOLE
Risk Category
High Risk
Low Risk
Medium Risk
SEWERLINE
Risk Category
High Risk
Low Risk
Medium Risk
0.3
0
0.6
1.2
1.8
2.4
kilometers

GIS DEFINITIONS
GIS COMPONENTS

GIS definitions

- Some of the definitions;
  - Terry and Rhind, 1989; "**GIS** is a **computer system** that can **hold** and **use data describing places** on Earth's surfaces"

(cont.) GIS definitions

- Burrough, 1986; "a **set of tools** of **collecting**, **storing**, **retrieving** at will, transforming and displaying **spatial data** from the **real world** for a particular set of purpose"

GIS Definition (cont…)

- In general, GIS cover;
  - **Computer system**; hardware, software, appropriates procedures
  - **Spatially referenced** or **geographical data**
  - **Management** and **analysis tasks**

GIS should be able;

Quick and easy access to large volumes of data

- Easy and fast

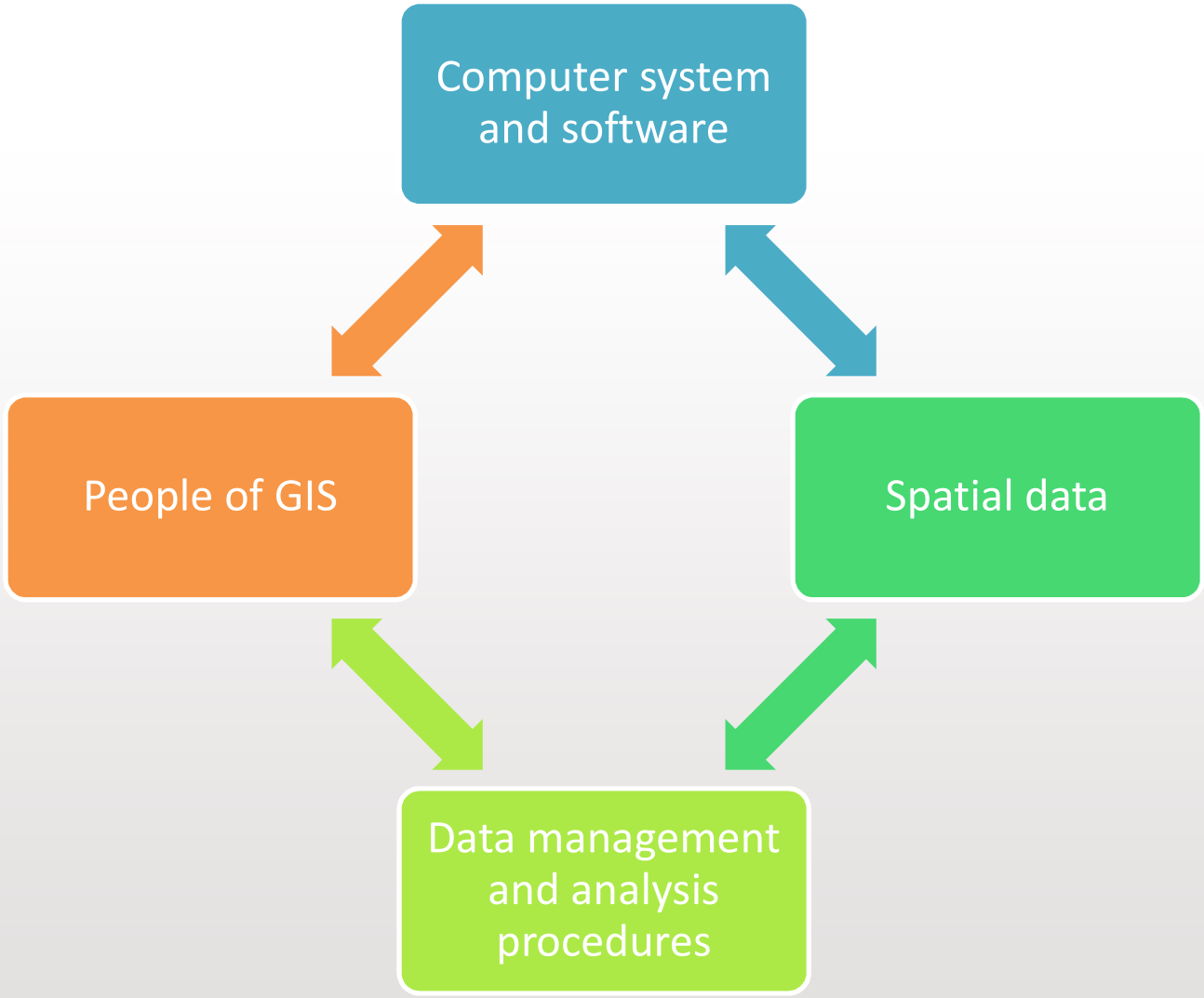
Have capabilities of;

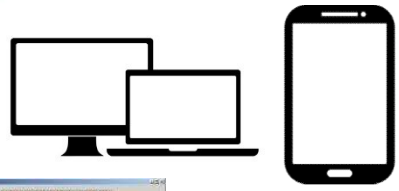
- Select detail by area or theme
- Link or merge data with other set of data
- Analyse spatial characteristic of data
- Update data quickly and cheaply
- Model data and access alternatives

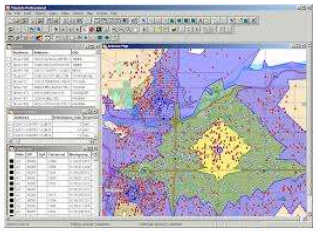
Output capabilities;

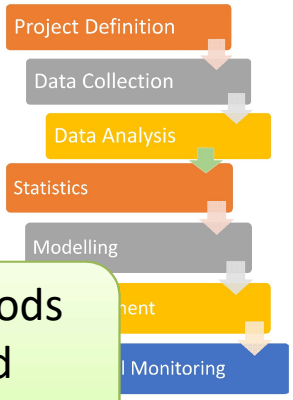
- Maps, graphs, lists, summary statistics

Components of GIS









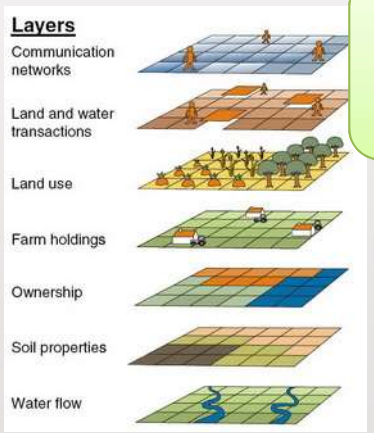
Hardware and Software

Methods and Procedures

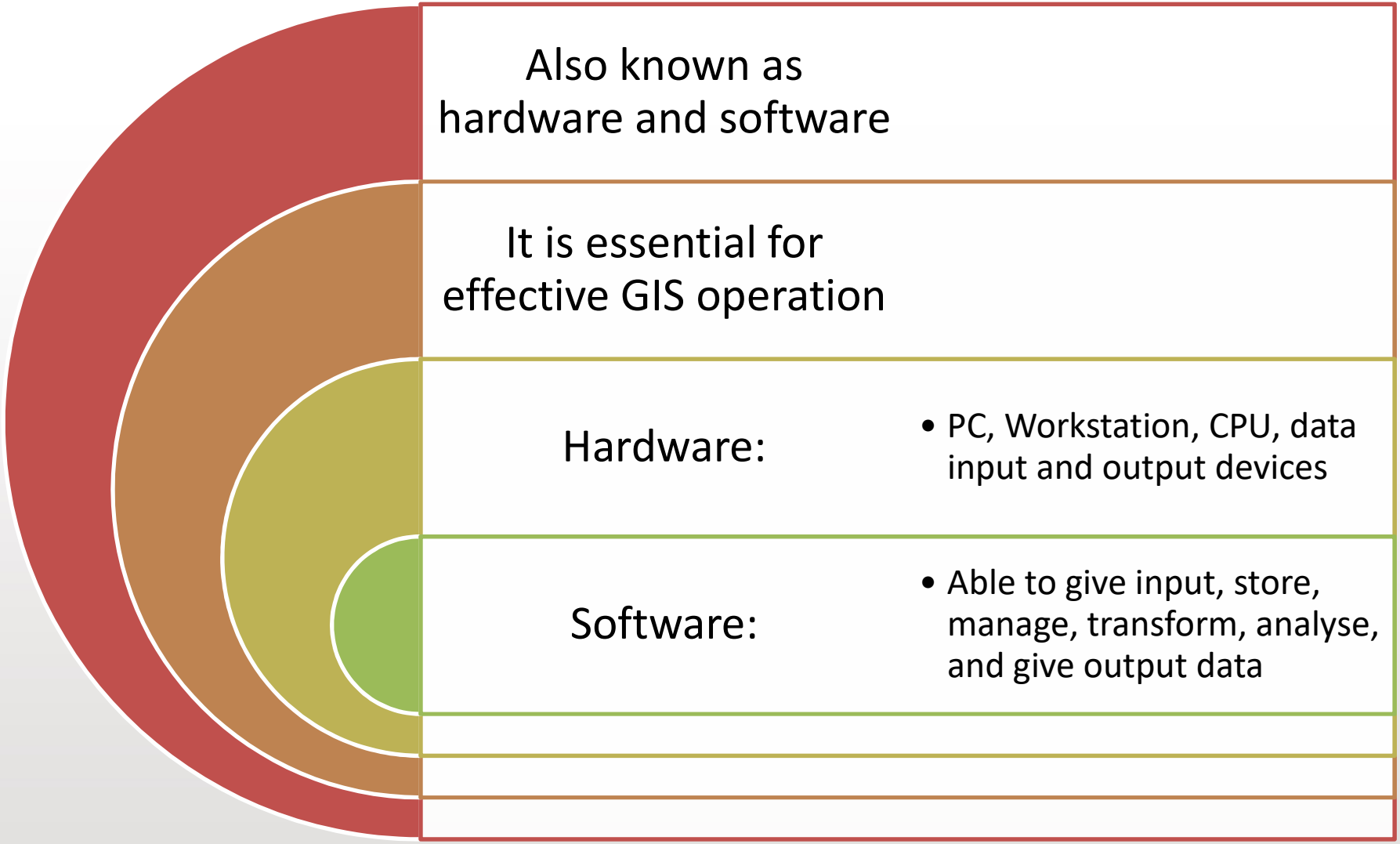
GIS components

Spatial data

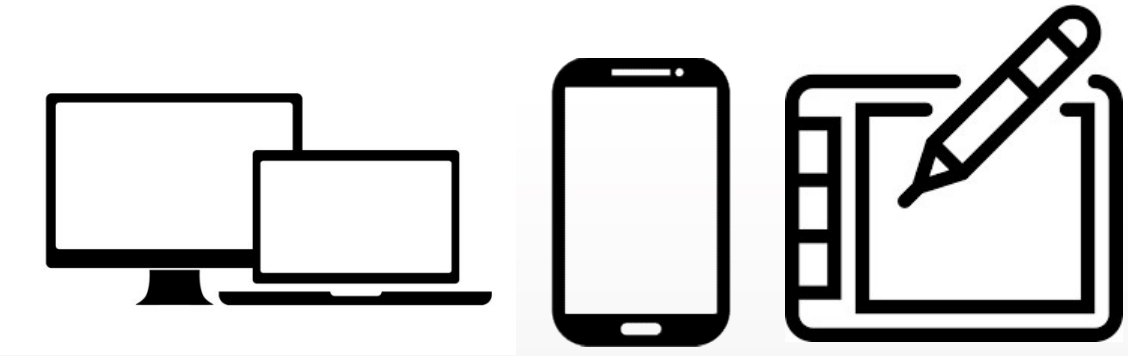
People



1. Computer system and software



Computer system and software (cont...)



- Able to handle data input (GPS, drawing, etc..)
- Able to process spatial data
- Able to view output

1SPATIAL

ESRI

QUANTUM GIS

AUTODESK

INTERGRAPH

- Input
- Analyse
- Transform
- View in real time
- Internet access

2. Spatial data

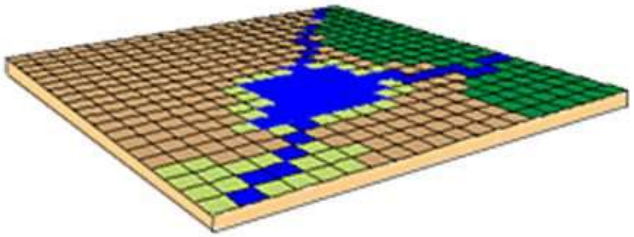
- **Spatial data have information about;**

- Positions
- Connections with other features (topology)
- Details of non-spatial characteristics

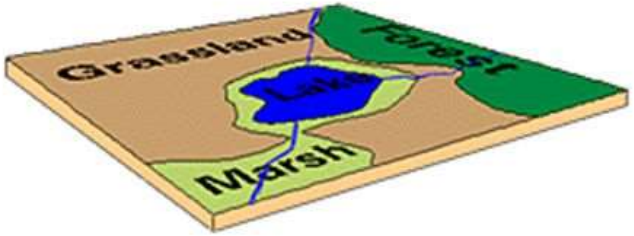
How to "digitally" show the real world?

DIGITAL SPATIAL DATA

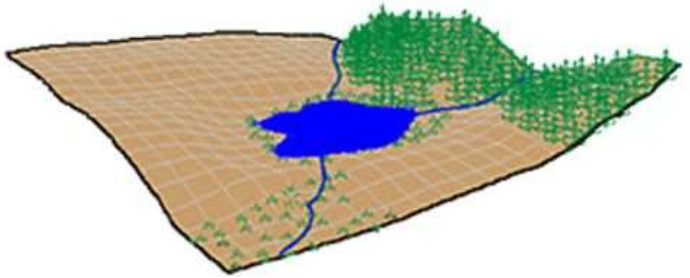
- RASTER →



- VECTOR →



- Real World →



Source: Defense Mapping School
National Imagery and Mapping Agency

Spatial data (cont…)

- Spatial referencing; flexible and lasting reference system
- Data model
- Need simplification (generalization) based on scale and other factors

Spatial data (cont…)

3 basic spatial data types;

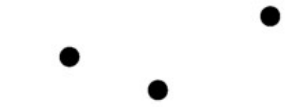
- Point
- Line
- Polygon/Areas

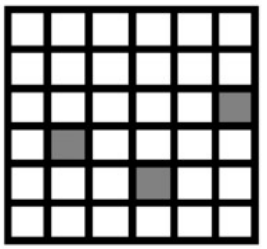
Data model

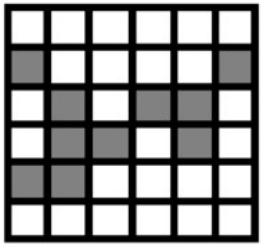
- Raster (grid or tesseral)
- Vector
- Others; Laser scanning, 3D, etc..

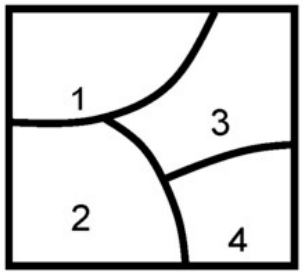
Spatial data model and data types

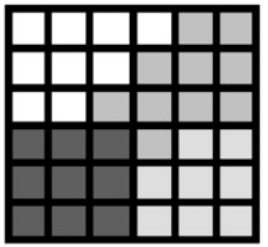
Feature Type	Vector Model	Raster Model
Point Feature	Building	
Line Feature	Road	
Area Feature	Land-use	











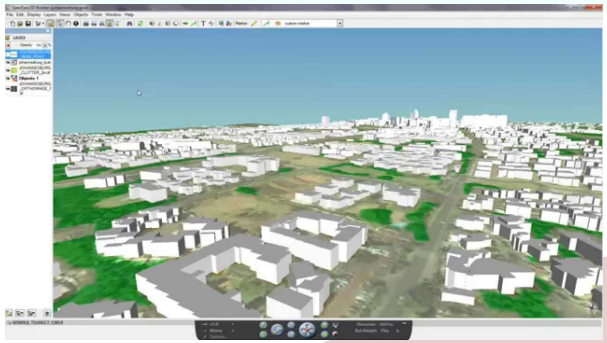
Source: Heywood et al, 2002

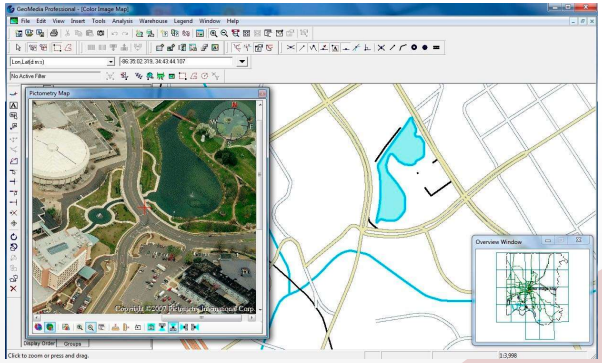
3. Data management and analysis procedures

Management of spatial data for;	• Spatial data input, storage, management, transformation, analysis and output
To facilitate storage, organization and retrieval of data using database management system (DBMS)	• DBMS: set of software to manage spatial and non-spatial data • DBMS support multiple users and database

Data management and analysis procedures (cont…)

- Transformation: changing of map projection from sources
- Able to handle layers of spatial data
- Able to visualize the spatial data; incorporate with cartographic design





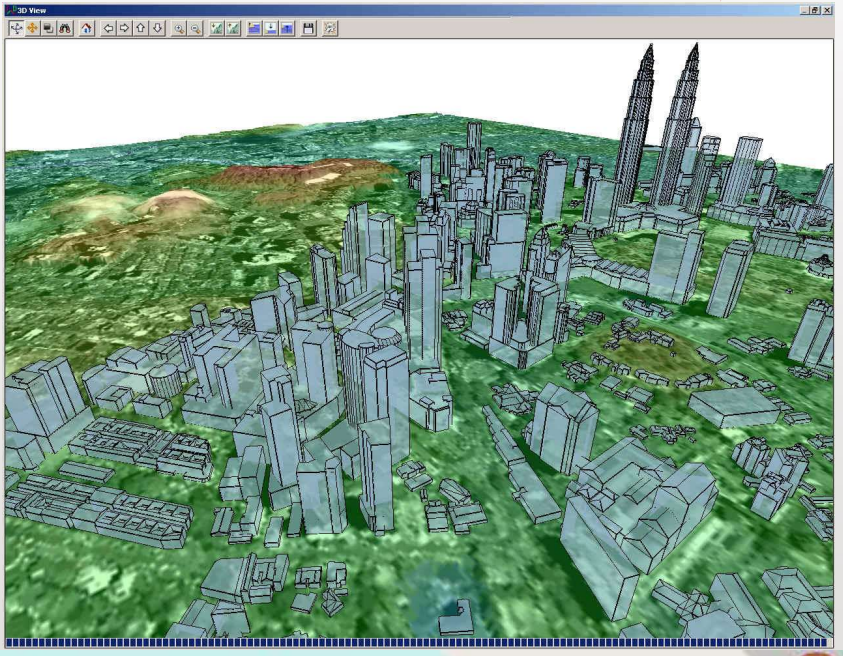
Produces output

Analysis

Visualization

Spatial management

Spatial data input



4. People and GIS

People to plan, implement, and operate

Involved

- Small to International community

GIS People interaction

Small applications

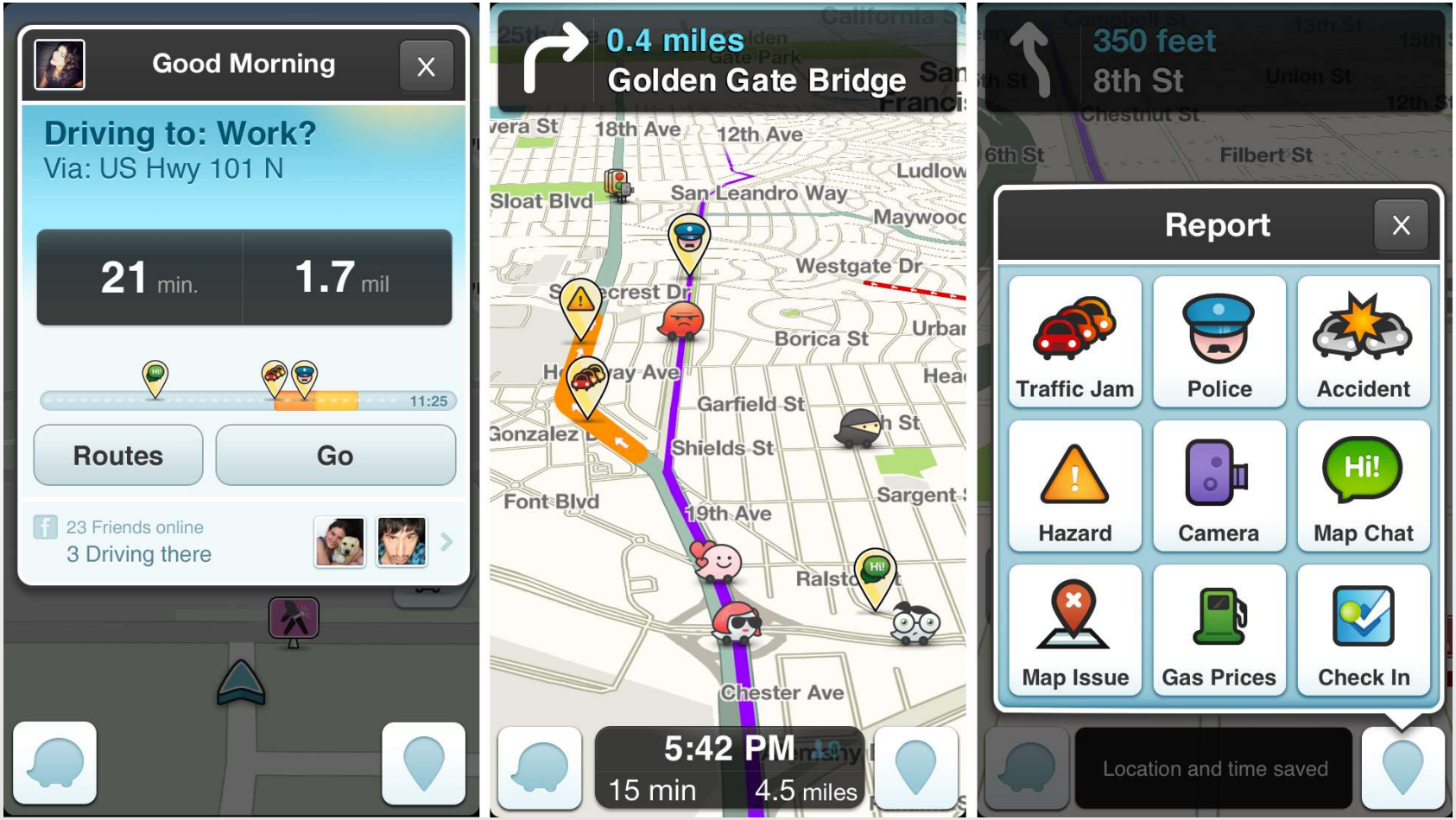
International community

Conclusion

GIS been widely used and have been established, but people didn't have knowledge about it.

GIS is combination of Science, Art and Technology

GIS and the future?



Source: Waze

GIS and the future?

Zoomed out view of the Pokémon GO Game Map

Zoomed in view of player with a Squirtle that just appeared

Squirtle encounter screen

Source: Pokemon Go

Terima kasih~

Reference

- Coppock, J. Terry, and David W. Rhind. "The history of GIS." Geographical information systems: Principles and applications 1.1 (1991): 21-43.
- Burrough, Peter A. "Principles of geographical information systems for land resources assessment." (1986): 54-54.
- Ian Heywood, Sarah Cornelius and Steve Carver, 2002, An Introduction to Geographical Information System, Prentice Hall