What is GIS?

Learing Outcomes

- Explain what GIS is
- Give examples of the applications of GIS
- Outline the characteristics of GIS
- Describe how the real world is represented in GIS
- Provide examples of the analysis GIS can perform
- Know where to find more information about GIS

Introduction

- Location
  - Where is ...?
- Patterns
  - Traffic flow
  - Crime distribution
- Trends
  - Population movement
  - Forest clearance
- Conditions
  - Where can i find a house within 1Km of a school?

Where are there > 100,000 potential customers within a 5Km radius of a railway station?

Implications

If I locate a waste dump here what will the impact be on the local community?

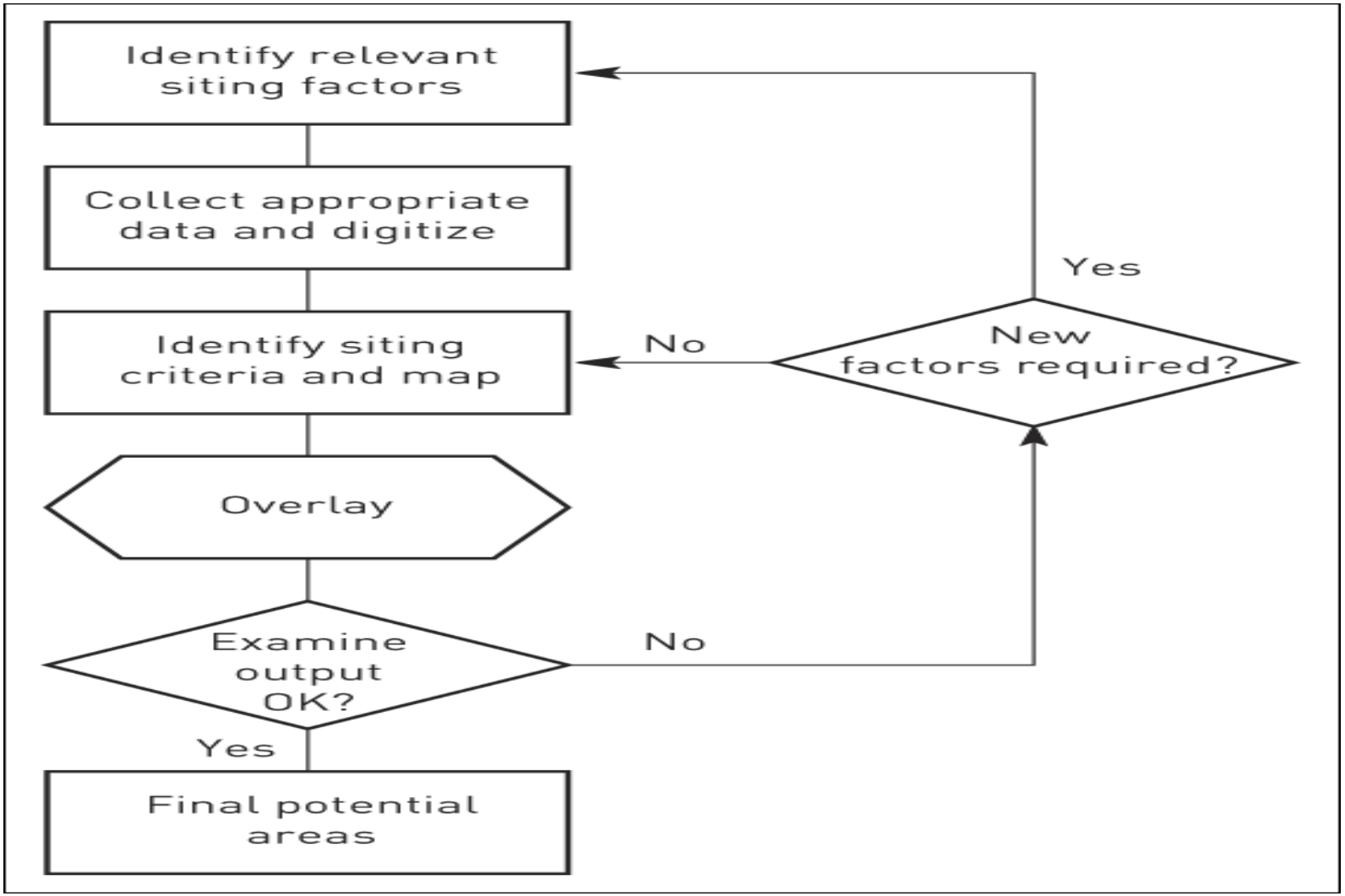
What savings would be gained by choosing this route over an alternative?

Case Studies

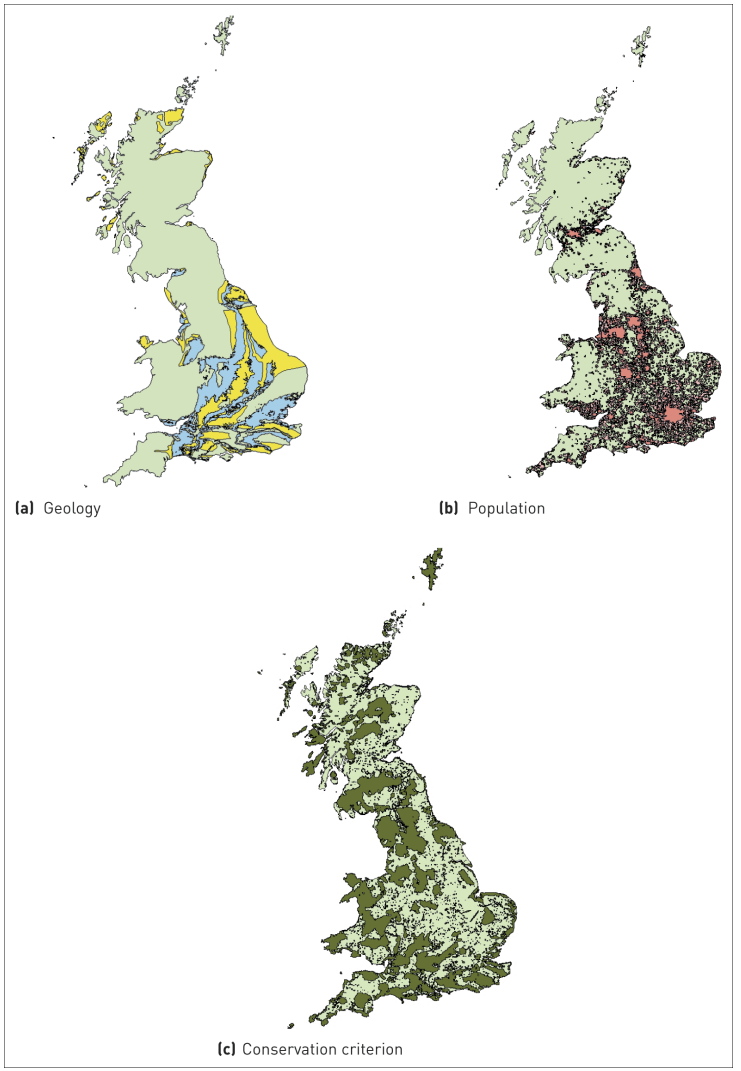
Used as theme through the course

- Happy Valley Ski Resort
- Nuclear waste disposal site search and selection
- Land use planning (Zdarske Vrchy)
- Search for a new home

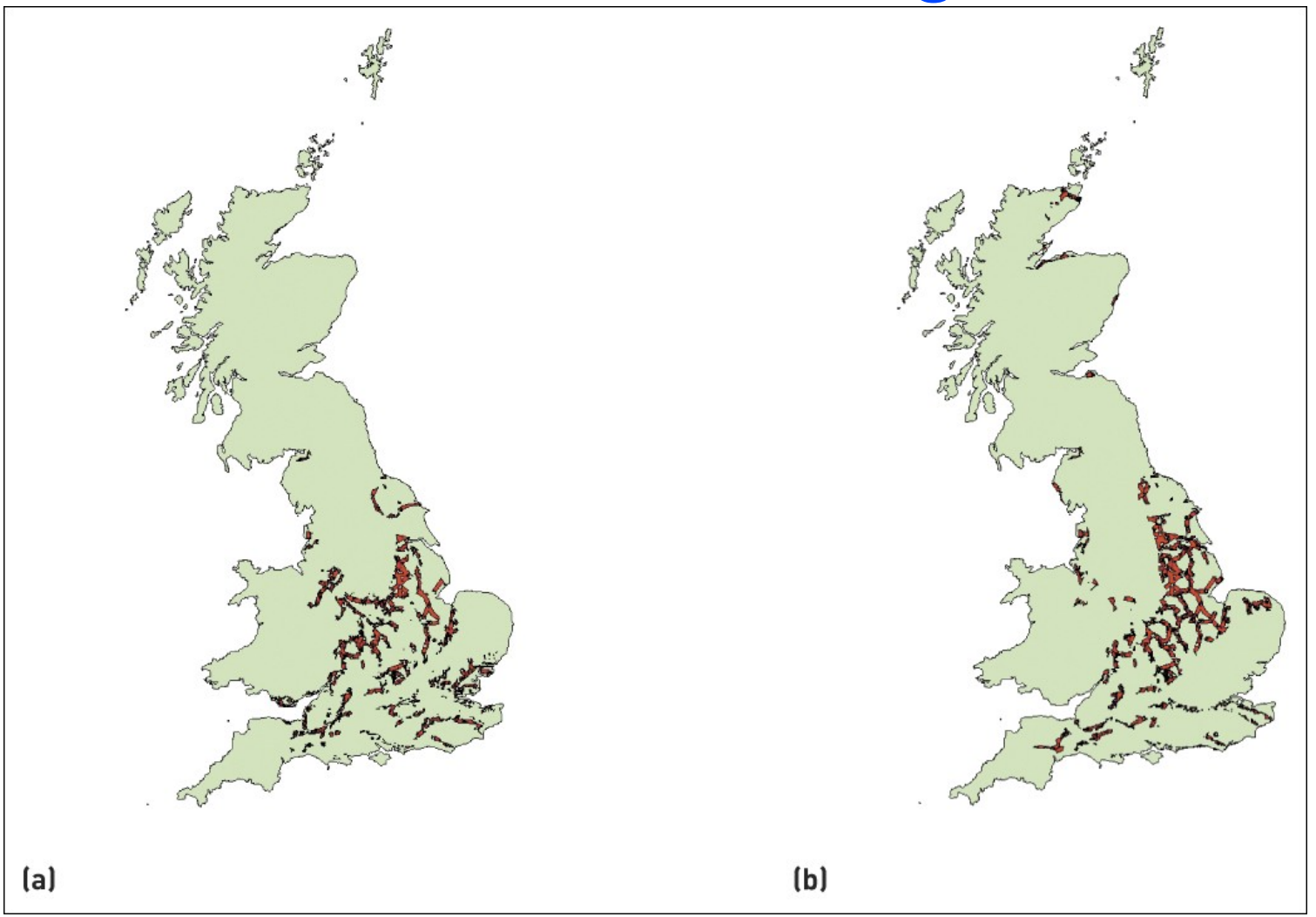
Using GIS for siting a NIREX waste site



Radioactive waste case study: geology, population and conservation criteria maps



Radioactive waste case study (a and b) results from different siting scenarios



Siting Problems

Old way – tracing paper overlay

Issues raised in this example

- Errors in source data
- How to make abstract concepts (near to, far from ...) precise enough for a computer to deal with
- GIS output must be viewed with caution (see above)

GIS definition

A geographic information system is a system designed to capture, store, manipulate, analyze, manage, and present all types of geographically referenced data. In the simplest terms, GIS is the merging of cartography, statistical analysis, and database technology.

A GIS can be thought of as a system—it digitally creates and "manipulates" spatial areas that may be jurisdictional, purpose or application-oriented for which a specific GIS is developed. Hence, a GIS developed for an application, jurisdiction, enterprise or purpose may not be necessarily interoperable or compatible with a GIS that has been developed for some other application, jurisdiction, enterprise, or purpose. What goes beyond a GIS is a spatial data infrastructure (SDI), a concept that has no such restrictive boundaries.

GIS components

Hardware

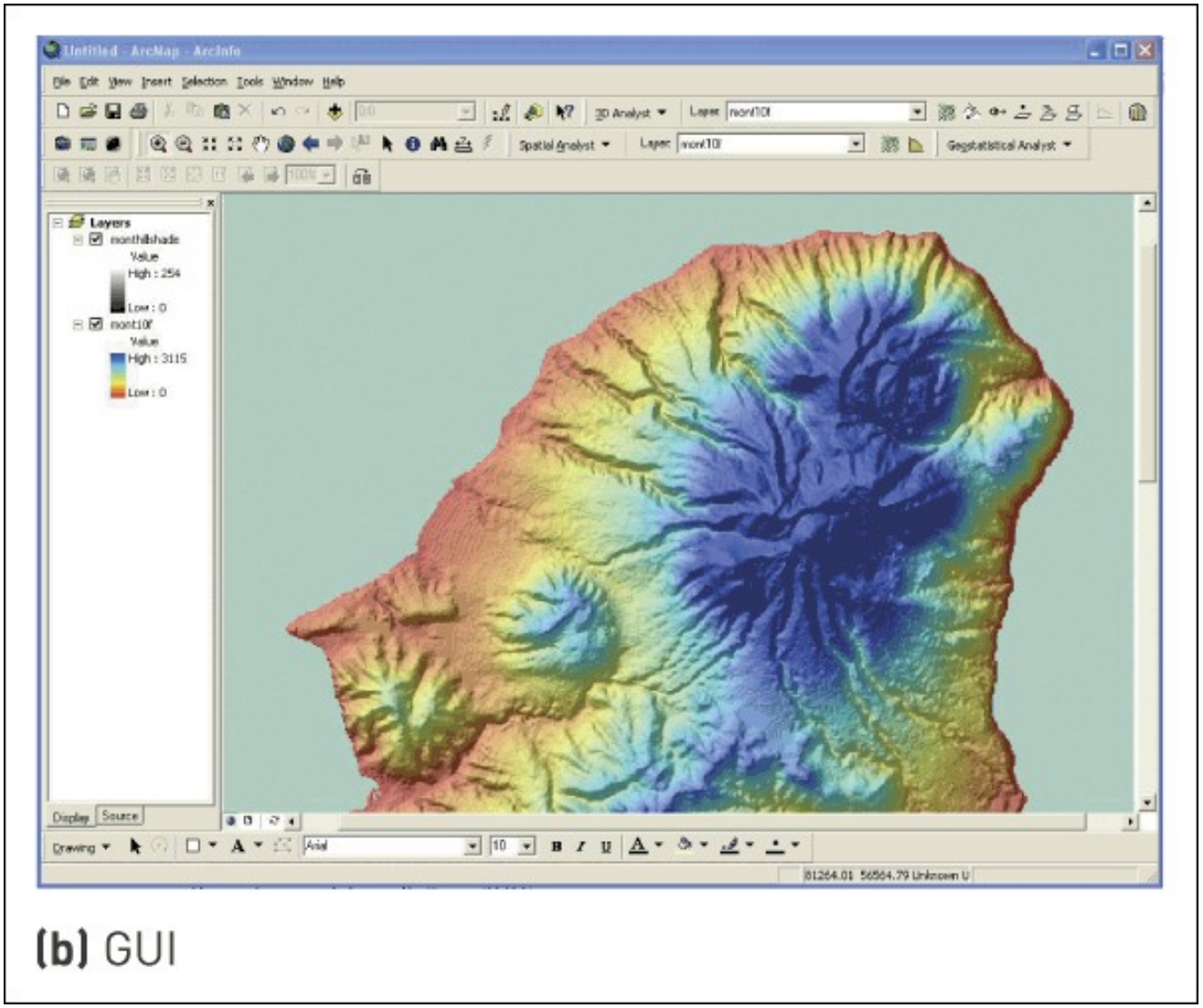
Software

Data

Procedures (‘orgware’)

People

Typical GIS interface



(b) GUI

Spatial Data

The layered approach

Discrete objects and continuous fields

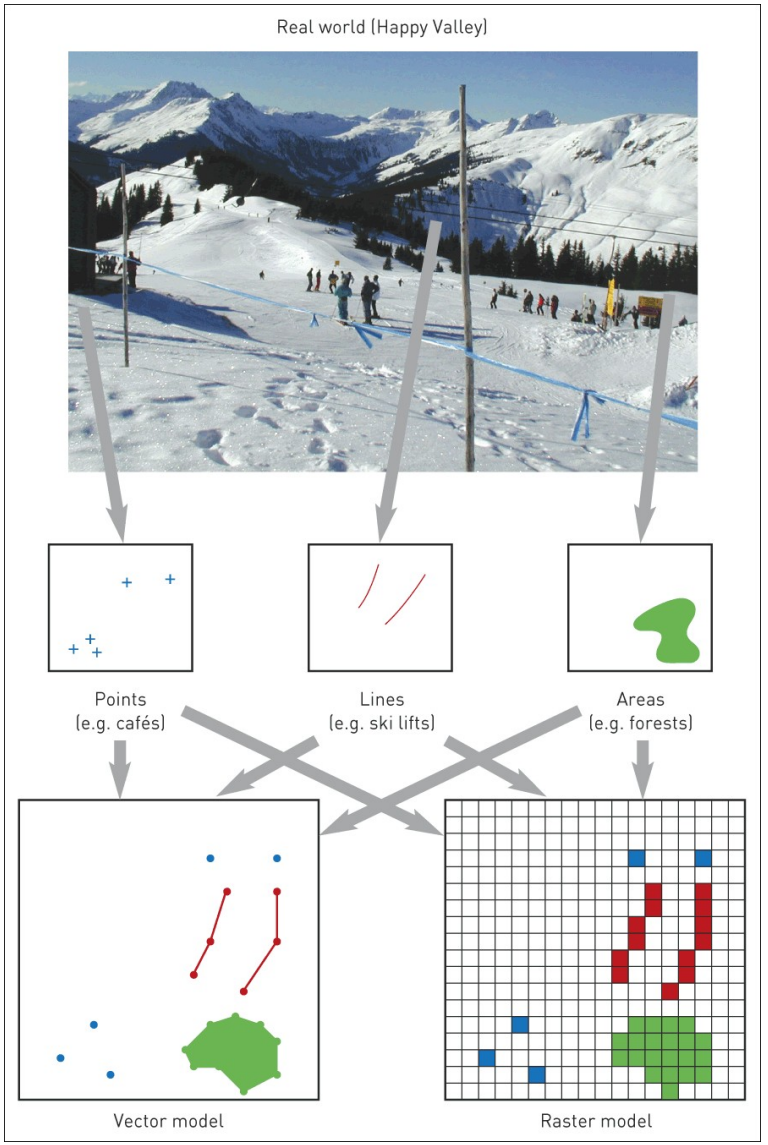
Vectors and Rasters

Points, Lines and Polygons

Attributes

Data input, management, analysis and transformation

Output – maps but also much more


Real world (Happy Valley)
Points
(e.g. cafés)
Lines
(e.g. ski lifts)
Areas
(e.g. forests)
Vector model
Raster model

Application areas of GIS

earth surface-based scientific investigations;

resource management

asset management and location planning

archaeology;

environmental impact-assessment;

infrastructure assessment and development;

urban planning;

cartography, for a thematic and/or time-based purpose;

criminology;

geospatial intelligence;

logistics;

population and demographic studies;

prospectivity mapping;

statistical analysis;

disease surveillance;

military planning.

Examples of use are:

GIS may allow emergency planners to easily calculate emergency response times and the movement of response resources (for logistics) in the case of a natural disaster;

GIS might be used to find wetlands that need protection strategies regarding pollution;

GIS can be used by a company to site a new business location to take advantage of GIS data identified trends to respond to a previously under-served market. Most city and transportation systems planning offices have GIS sections; and

GIS can be used to track the spread of emerging infectious disease threats. This allows for informed pandemic planning and enhanced preparedness.