

Lesson 1 Introduction to Geographic Information Systems for Urban Planning

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What will you learn from this lesson?

- Introducing Urban Planning
 - Motivation of urban planning
 - Urban planning practice
 - Urban planning in Singapore
- Geographic Information Systems (GIS) Fundamentals
 - Basic concepts of GIS
 - Major components of a GIS
 - GIS toolkits

What is Urban Planning?

- A **technical** and **political process** concerned with the development and design of land use and the environment and the infrastructure passing into and out of urban areas.
- The primary concern is the **public welfare**, which includes considerations of efficiency, sanitation, protection and use of the environment, as well as effects on social and economic activities.
- Urban planning is considered an **interdisciplinary** field that includes social engineering and design sciences.

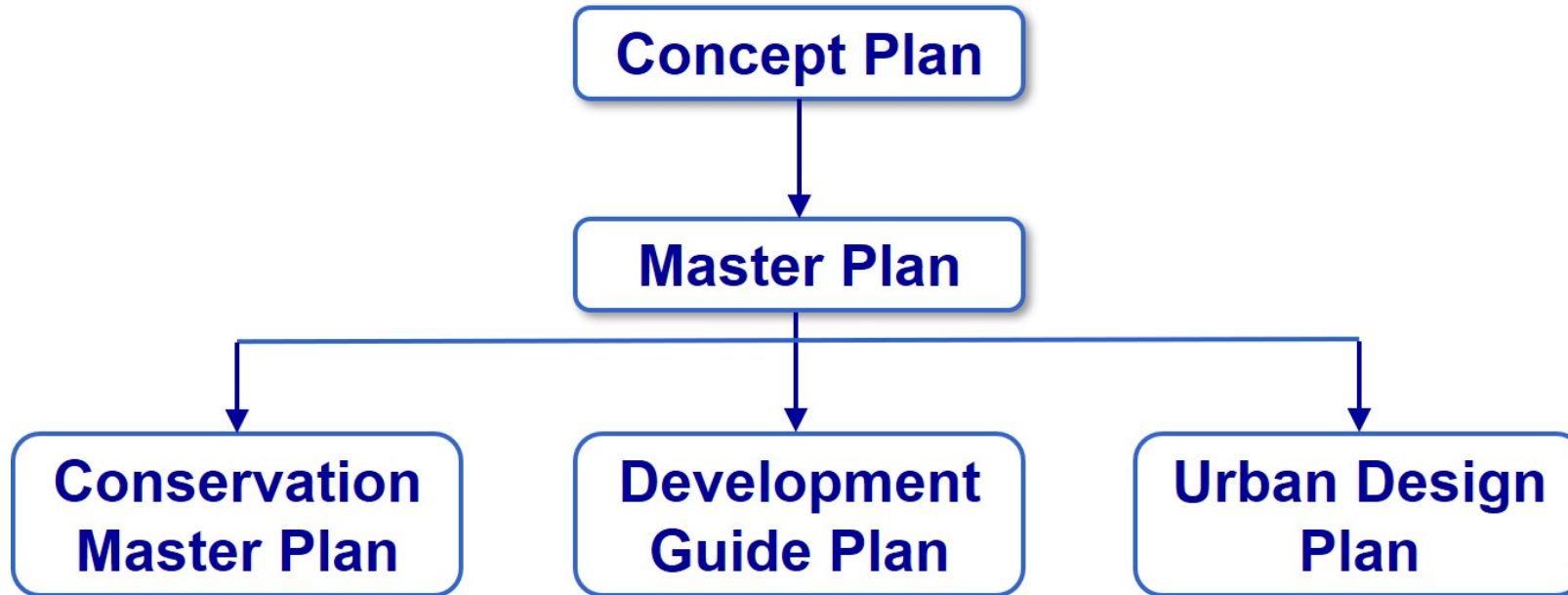
Urban Planning in Practice

Practitioners of urban planning are concerned with research and analysis, strategic thinking, architecture, urban design, public consultation, policy recommendations, implementation and management.

Enforcement methodologies include governmental zoning, planning permissions, and building codes, as well as private easements and restrictive covenants.

Urban Planning in Singapore

Functions of Singapore's national planning authority



Source: Singapore, [Urban Redevelopment Authority](#)

Why Geographic Information Matters?

About 80% of all data maintained by organizations around the world has a location component.

(Source: BusinessWeek Research Services, 2006)

GI in Smart Nation

Thursday, Jan 8, 2015

THE STRAITS TIMES / Singapore

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Singapore needs to be 'smart city' to stay ahead: PM

PUBLISHED ON NOV 24, 2014 11:13 AM

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The need for Singapore to be a "smart nation", using the latest technology to benefit the country, goes beyond just making life better for the people, said Prime Minister Lee Hsien Loong at the launch of the Smart Nation initiative on Monday. -- PHOTO: ST FILE

One major initiative will be to let people access maps and build up geospatial databases by contributing information such as animal sightings, traffic incidents or the best mee pok eateries.

Source: [Singapore needs to be 'smart city' to stay ahead: PM](#)

The explosion in the availability of Government GI

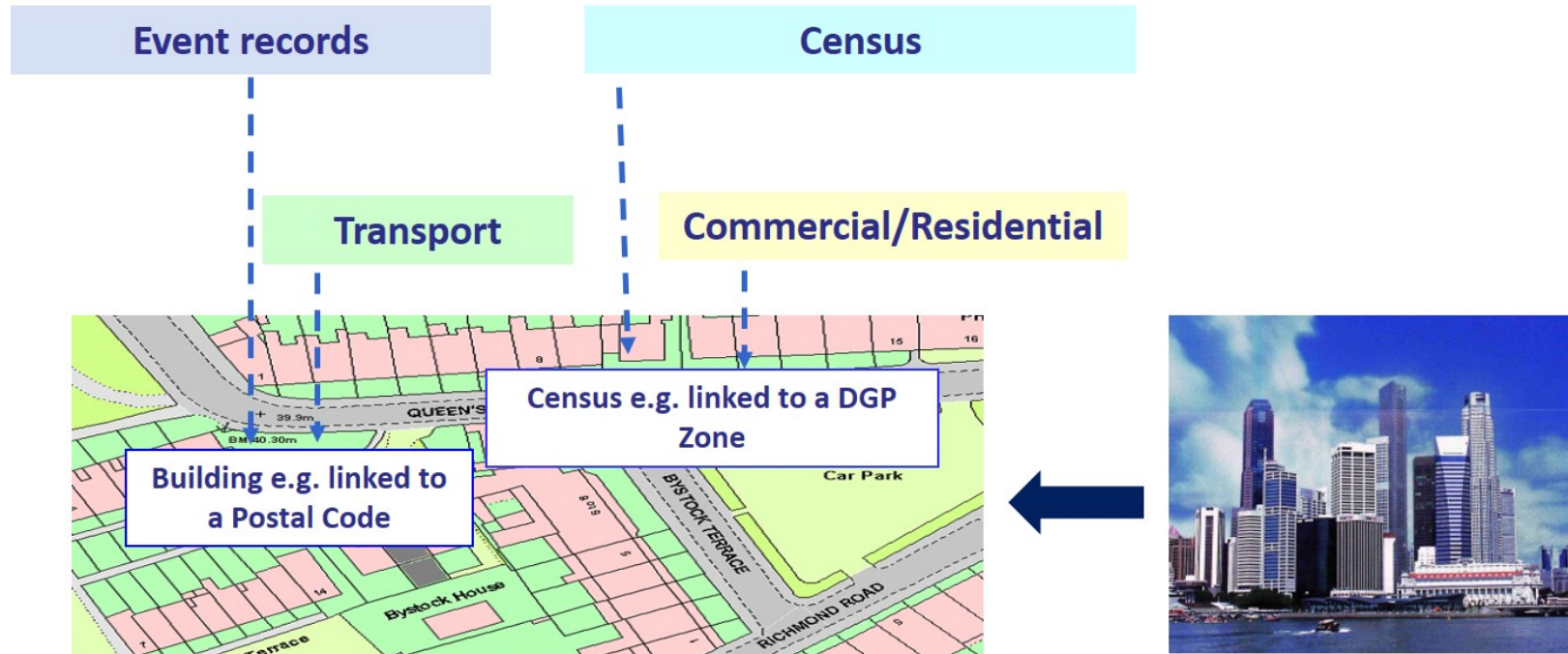


GIS Fundamentals

- Introduction to GIS
- Major component of a GIS
- GIS functions
- GIS toolkits

GIS as a toolkit

A Geographic Information System (GIS) is a toolkit for creating, managing, analyzing, visualising, and sharing data of any kind according to where it's located.



Components of a GIS

GIS extends the study of information systems by including geospatial data management, geoprocessing and geographically mediated knowledge.



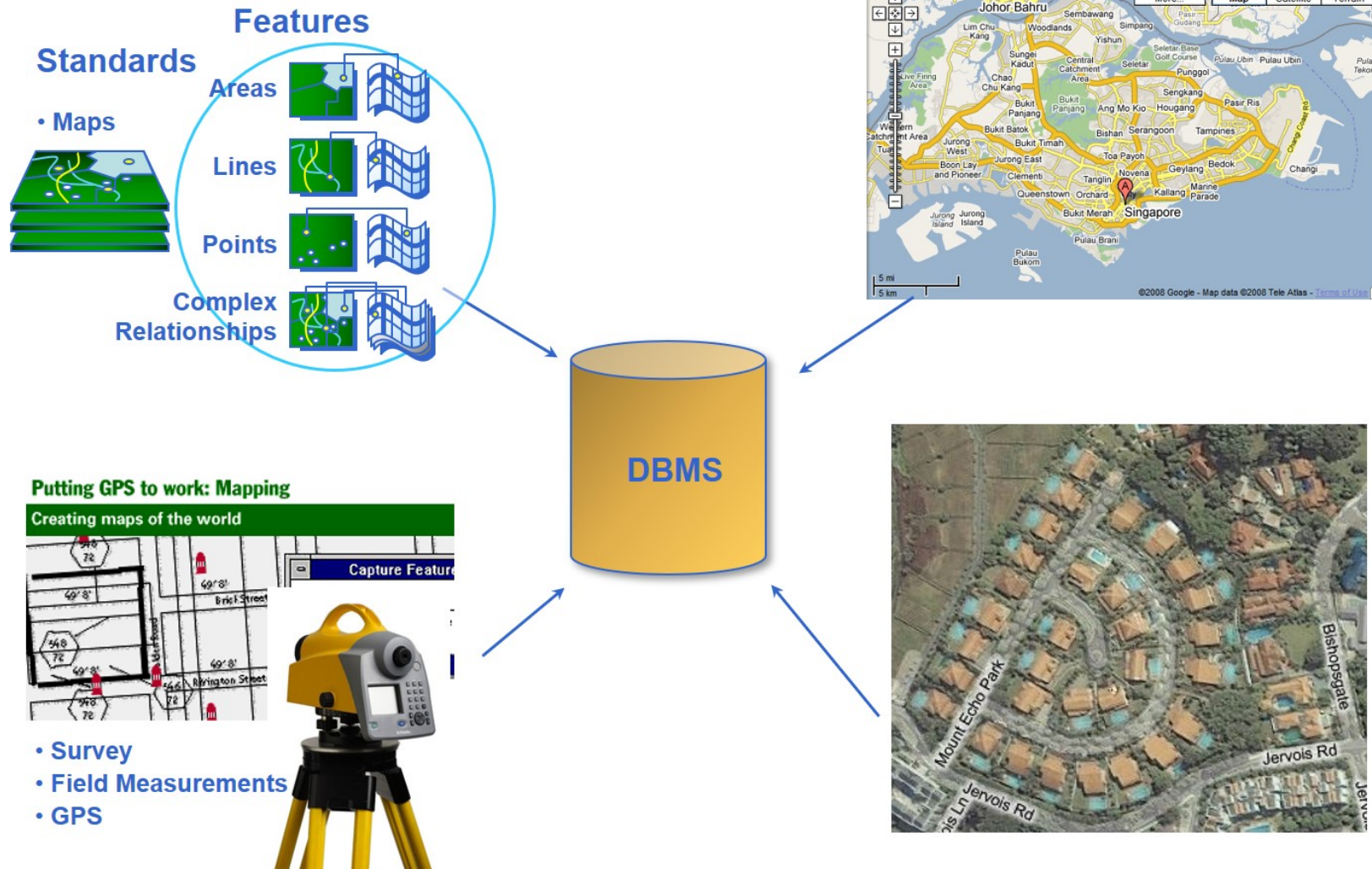
Getting to Know GIS Functions

Geospatial Data Management

GIS Mapping and Geovisualisation

GIS Analysis

Geospatial Data Management: Data Capture



Geospatial Data Management: Data Integration

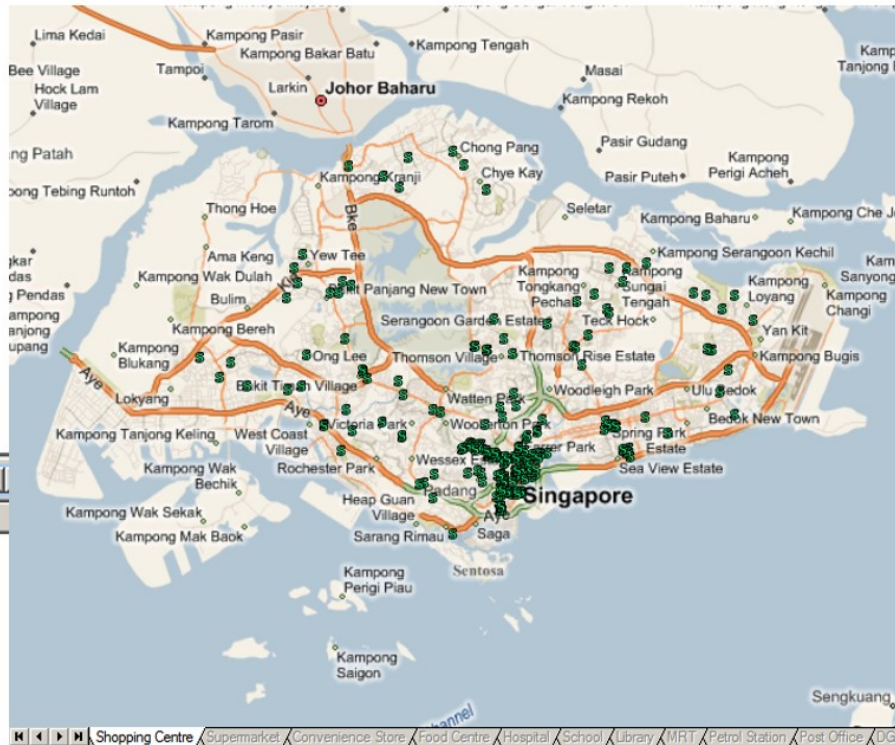
- Spatial Information + Attribute Information
- Spatial data model: vector vs raster

Spatial Information

HDB Transaction Table *				
ID	X (I)	Y (I)	Longitu...	Latitud...
1274081	31498.3...	31758.1...	103.8665	1.3035
1274082	22454.2...	31650.8...	103.7852	1.3026
1274083	22454.2...	31650.8...	103.7852	1.3026
1274084	22454.2...	31650.8...	103.7852	1.3026
1274085	22831.5...	32793.2...	103.7886	1.3129
1274086	34658.4...	38466.7...	103.8949	1.3642
1274087	34658.4...	38466.7...	103.8949	1.3642

Attribute Information

HDB Transaction Table *				
ID	ADDRESS	POSTAL...	CATEGORY	PRICE
1274081	1 Beach Rd	190001	HDB3RM	250000
1274082	1 Dover Road	130001	HDB3RM	236000
1274083	1 Dover Road	130001	HDB3RM	215000
1274084	1 Dover Road	130001	HDB3RM	220000
1274085	1 Ghim Moh Road	270001	HDB3RM	275000
1274086	1 Hougang Ave 3	530001	HDB3RM	141000
1274087	1 Hougang Ave 3	530001	HDB3RM	155000
1274088	1 Kg Kayu Rd	432001	HDB3RM	180000

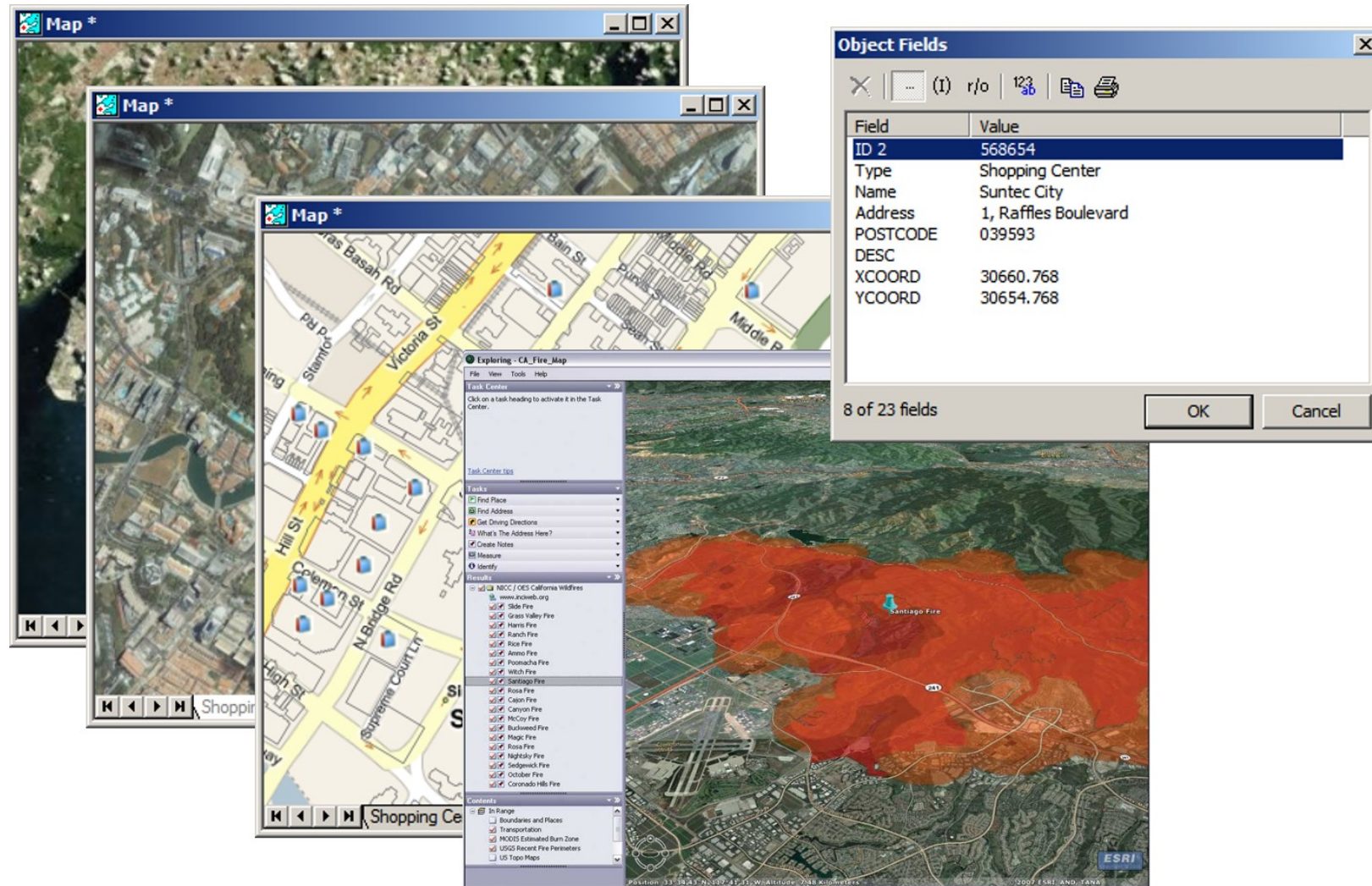


Geospatial Data Management: Georeferencing

Integrating layers of GIS data into an unified view



Geovisualisation: interactive maps

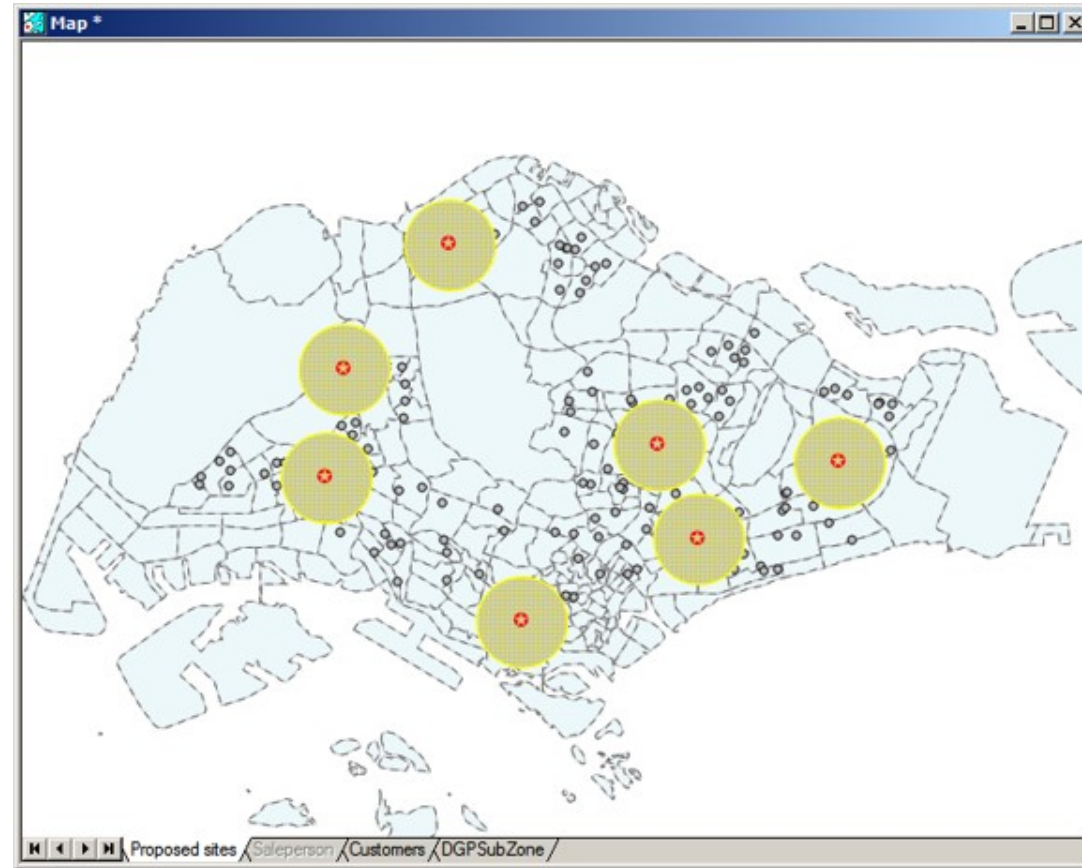


GISs generates information

- Locations What is at.....?
- Conditions Which environment.....?
- Trends What has changed....?
- Patterns What data are related.....?
- Models What if?

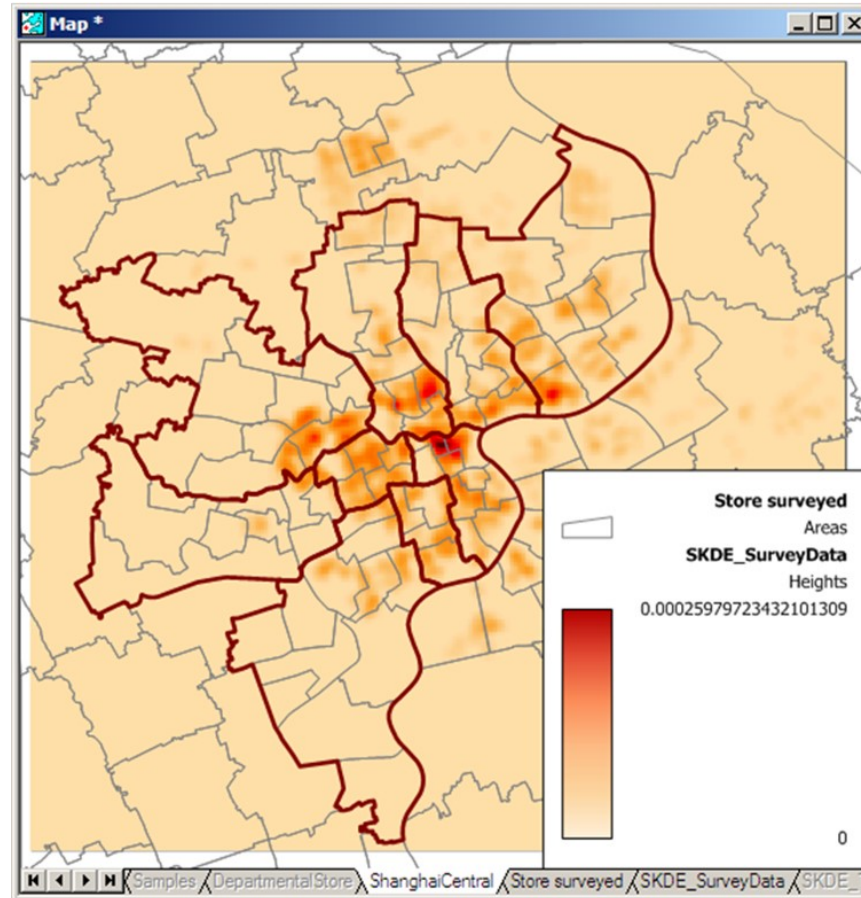
GIS analysis – vector-based

- Geoprocessing techniques: buffering, overlaying etc



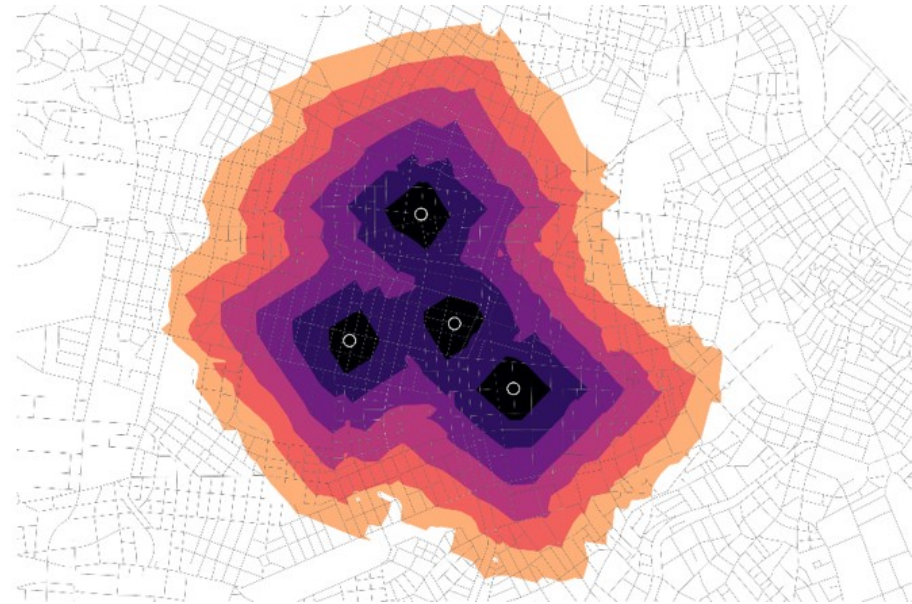
GIS analysis – raster-based

Map algebra, surface analysis, cartographic modelling.

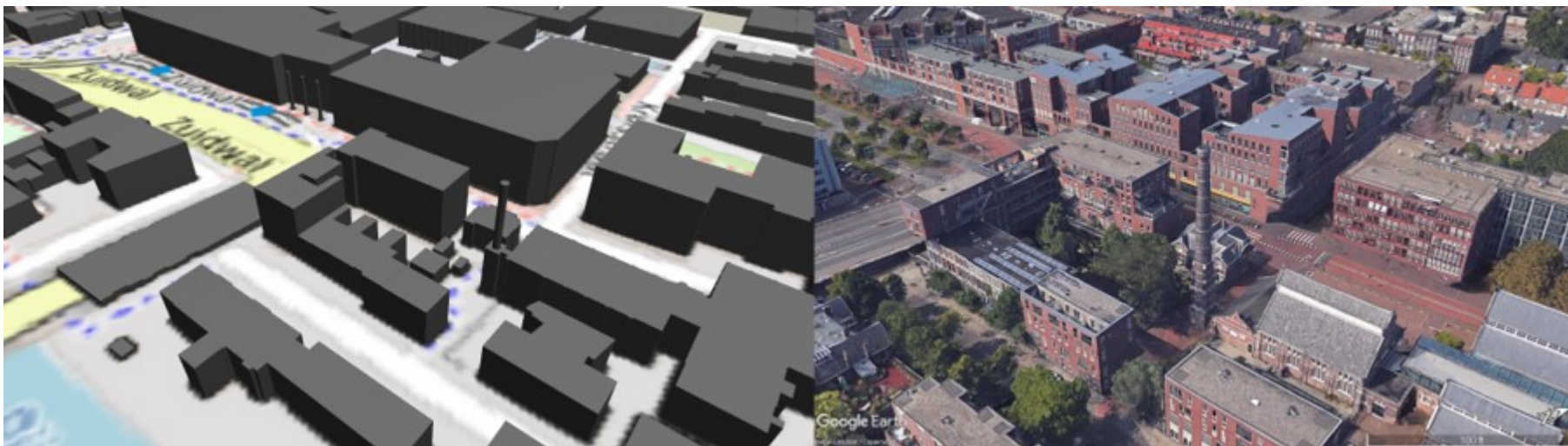


GIS Analysis – network-based

Shortest path analysis, travelling salesman modelling, network service area



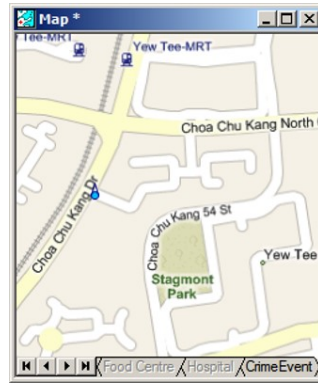
GIS Analysis: 3d Urban Models



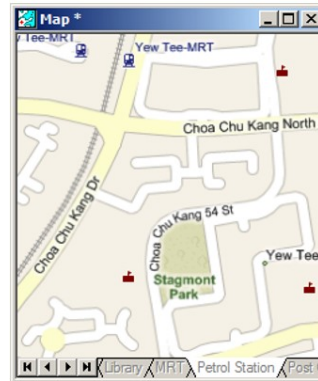
[Link](#) to an 3d Urban Model

GIS as a Melting-Pot

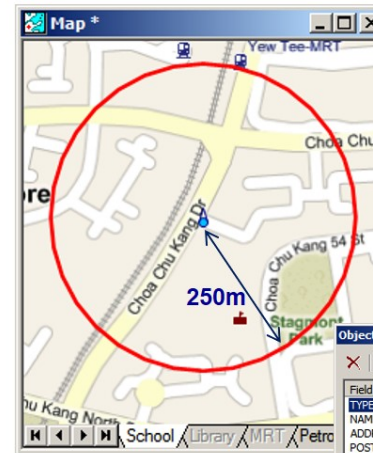
Planning Support Systems for city



Petrol station



School



Emergency Risk

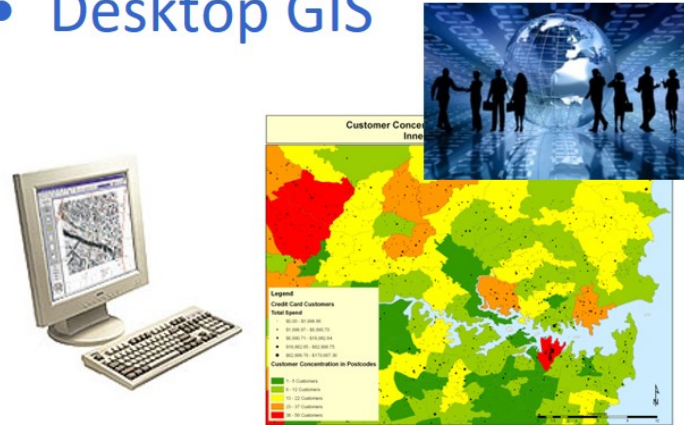
Field	Value
TYPE	Primary
NAME	Krang Primary
ADDRESS	11 Choa Chu Kang Street 54 S689189
POSTALCODE	689189
WEBSITE	
XCOORD	18494.074
YCOORD	41799.577

7 of 22 fields

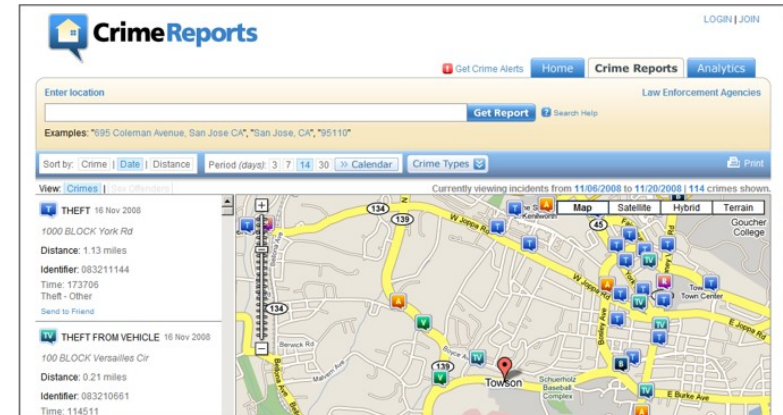
OK Cancel

GIS platforms

- Desktop GIS



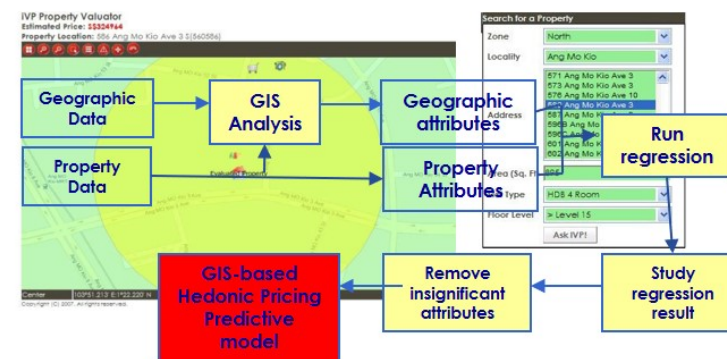
- Internet Map Service



- Mobile GIS



- Server GIS



GIS Desktop Software

Proprietary vs Open Source



GRASS



UDIG



JUMP



QGIS



gvSIG

QGIS: An Open Source Desktop GIS

Visit this [link](#) to learn more about QGIS.



The screenshot shows the QGIS website homepage. At the top, there is a dark navigation bar with the QGIS logo on the left, which includes the version number '3.20.1' and '3.16.9 LTR'. To the right of the logo are links: 'DISCOVER QGIS', 'FOR USERS', 'GET INVOLVED', and 'DOCUMENTATION'. Further right is a search bar and a language dropdown menu set to 'English'. Below the navigation bar, the word 'QGIS' is prominently displayed in a large, bold, white font. Underneath it, the tagline 'A Free and Open Source Geographic Information System' is written in a smaller white font. The main visual element is a large banner with a historical map background. Overlaid on the map is the text 'QGIS 3.20 Odense has been released!' in a large, white, sans-serif font. Below this text, there is a smaller line of text: 'New release: 3.20!' followed by 'Get the [installer](#) or [packages](#) for your Operating System and read the [changelog](#).' At the bottom of the page, there are two lines of text: 'Create, edit, visualise, analyse and publish geospatial information on Windows, Mac, Linux, BSD and mobile devices' and 'For your desktop, server, in your web browser and as developer libraries'. On the right side of the banner, there are three lines of small text indicating release schedules: 'Time until freeze 2021-09-10 12:00:00 UTC 31d 20h 11m', 'Time until packaging 2021-10-22 12:00:00 UTC 73d 20h 11m', and 'Time until next pointrelease 2021-08-13 12:00:00 UTC 3d 20h 11m'.

3.20.1
3.16.9 LTR

DISCOVER QGIS FOR USERS GET INVOLVED DOCUMENTATION

English ▼

Time until freeze 2021-09-10 12:00:00 UTC 31d 20h 11m
Time until packaging 2021-10-22 12:00:00 UTC 73d 20h 11m
Time until next pointrelease 2021-08-13 12:00:00 UTC 3d 20h 11m

QGIS

A Free and Open Source Geographic Information System

QGIS 3.20 Odense has been released!

New release: 3.20!
Get the [installer](#) or [packages](#) for your Operating System and read the [changelog](#).

Create, edit, visualise, analyse and publish geospatial information on Windows, Mac, Linux, BSD and mobile devices

For your desktop, server, in your web browser and as developer libraries

ArcGIS vs QGIS

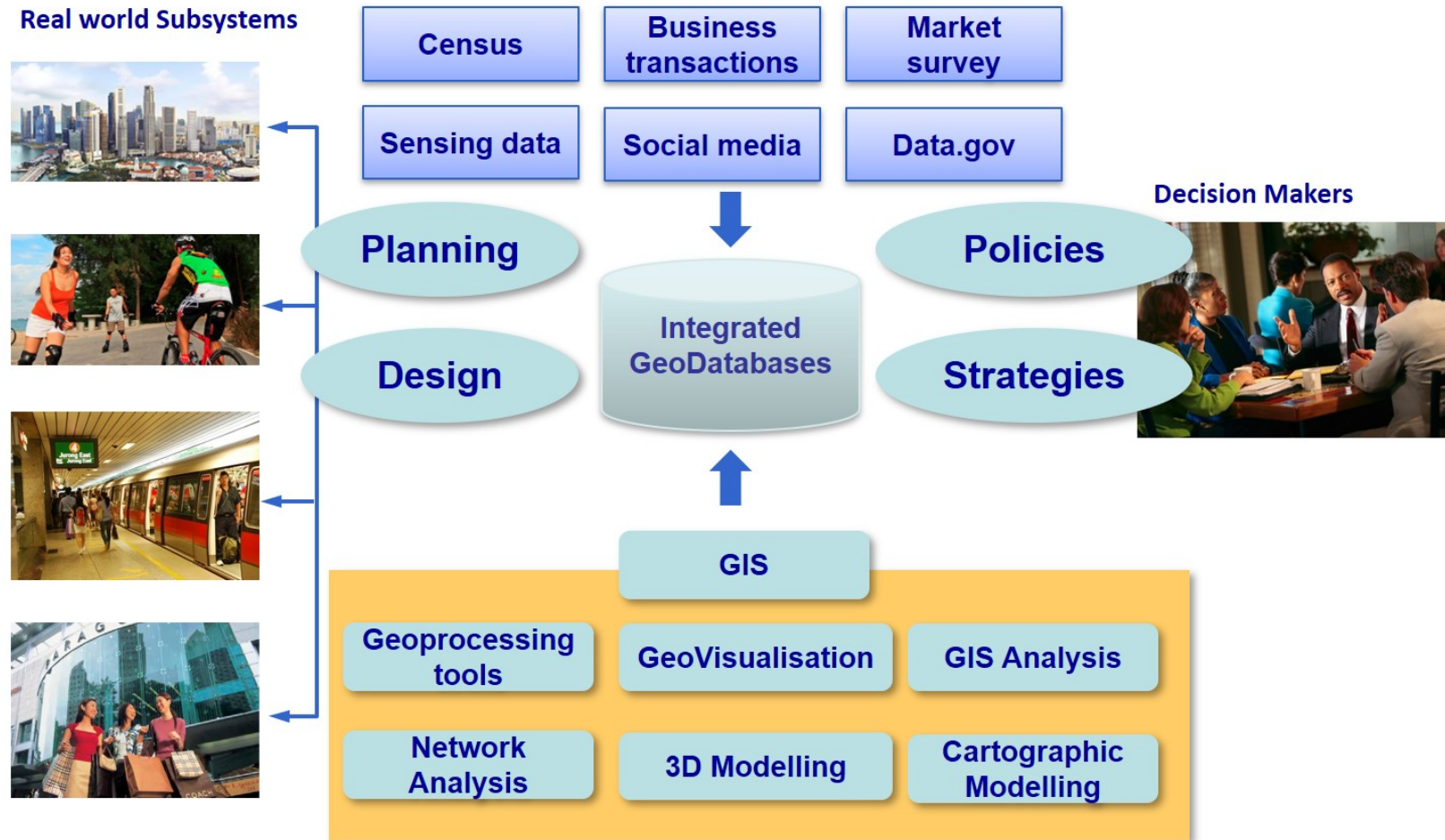


Reference: [27 Differences Between ArcGIS and QGIS – The Most Epic GIS Software Battle in GIS History](#)

GIS Users in Singapore

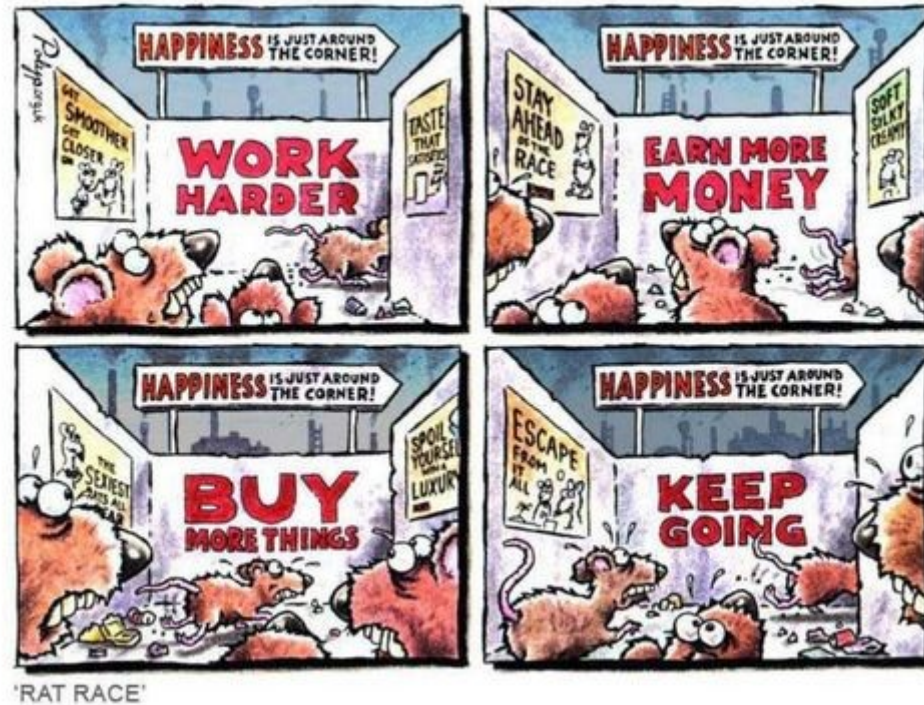


GIS Supported Urban Planning Framework



Social Consciousness

Using GIS to create a better world



In conclusion, GIS support

Better informed decision making

Better communication with management

Better communication between departments

Better problem solving

More efficient use of resources

GIS = Get Intelligent Solutions

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