OBJEK STUDI SIG

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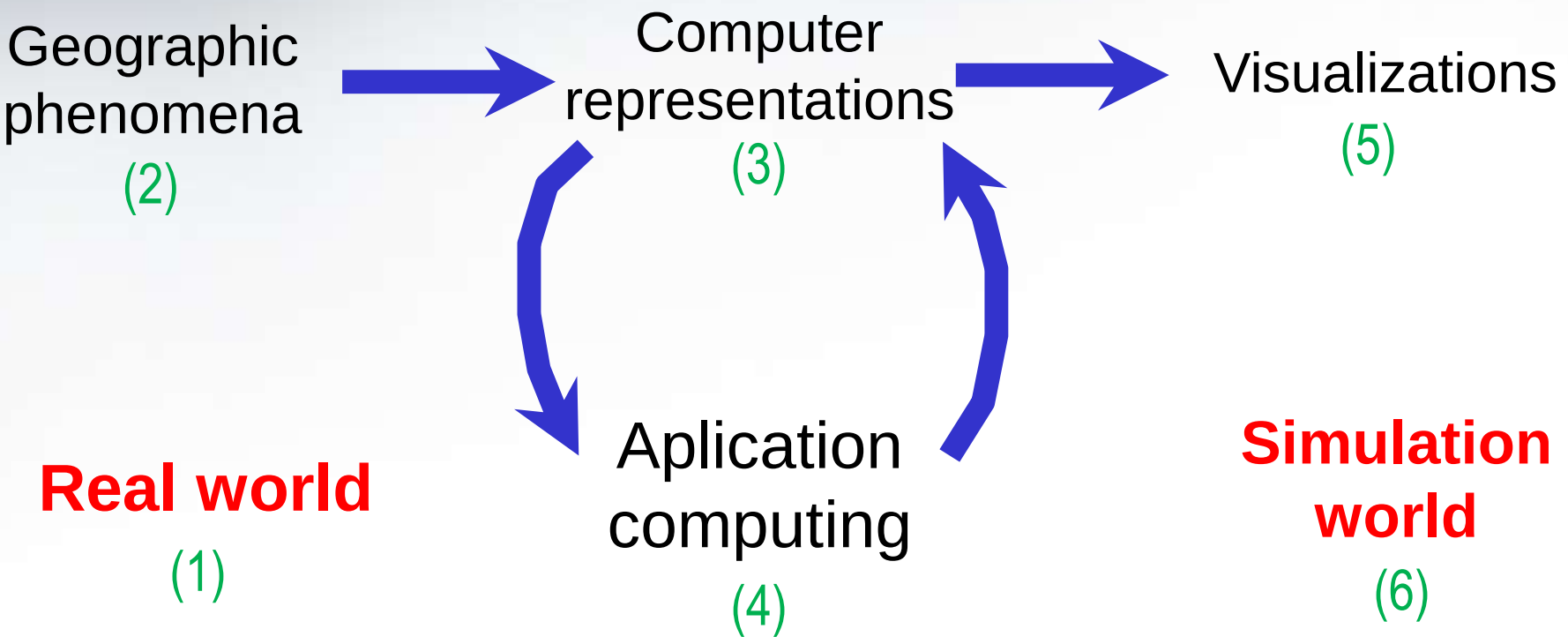
the objects of study in a GIS application

The three ways in which we can look at the objects of study in a GIS application



Rolf A. de By (ed.), 2004

Real world

(1)

Real world

Geospasial atau ruang kebumian adalah aspek keruangan yang menunjukkan lokasi, letak, dan posisi suatu objek atau kejadian yang berada **di bawah**, **pada**, atau **di atas** permukaan bumi yang dinyatakan dalam sistem koordinat tertentu.
(UU No 4 ttg. IG 2011)

Geographic phenomena

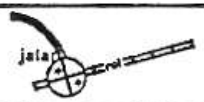
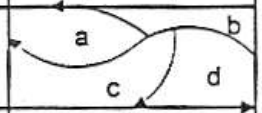
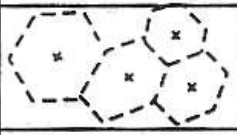
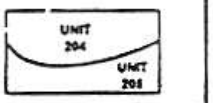
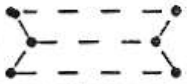
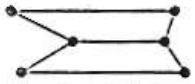
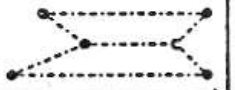
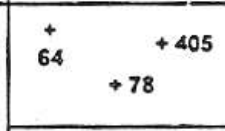
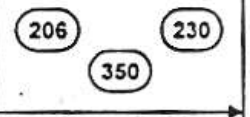
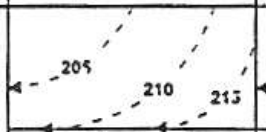
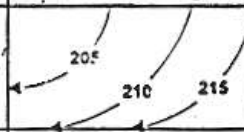
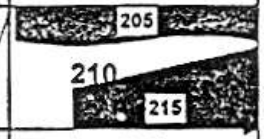
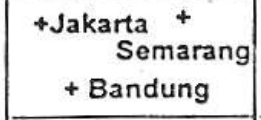
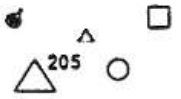
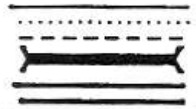
(2)

FENOMENA GEOGRAFIS

We might define a geographic phenomenon as a manifestation of an entity or process of interest that

1. **can be named or described,**
2. **can be georeferenced, and**
3. **can be assigned a time (interval) at which it is/was present.**

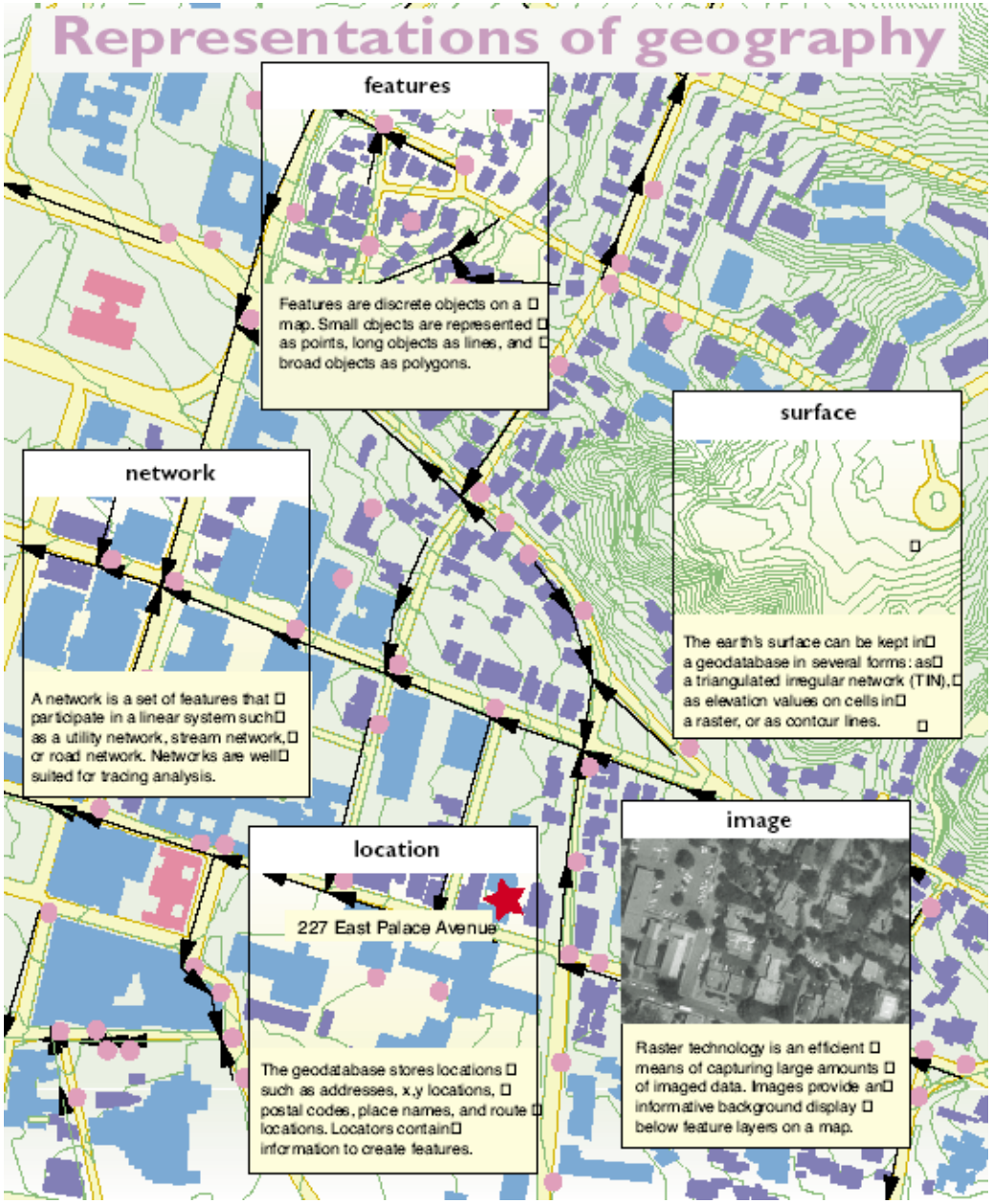
What the relevant phenomena are for one's current use of GIS depends entirely on the objectives that one has.

SIMBOL	TITIK	GARIS	POLIGON (AREA)
KENAMPAKAN (*FEATURE DATA*)			
	Kenampakan titik Situs Arkeologi	Kenampakan garis (jalur jalan)	Poligon Batas lahan
UNIT AREA (*AERIAL UNIT*)			
	Poligon Centroid	Batas Administratif	Unit Area
JARINGAN TOPOLOGI (*NETWORK TOPOLOGi*)			
	Hubungan Titik	Jaringan (Jalan)	Poligon (Blok)
SAMPEL (*SAMPLING*)			
	Stasion Cuaca	Jalur terbang	Test Plot Area
DATA PERMUKAAN BUMI (*SURFACE DATA*)			
	Titik elevasi	Garis kontur	Area Poligon
LABEL/ TEKS DATA (*LABLE / TEXT DATA*)			
	Nama titik/ tempat	Nama garis	Nama poligon
SIMBOL DATA			
	Simbol titik	Simbol garis	Simbol poligon

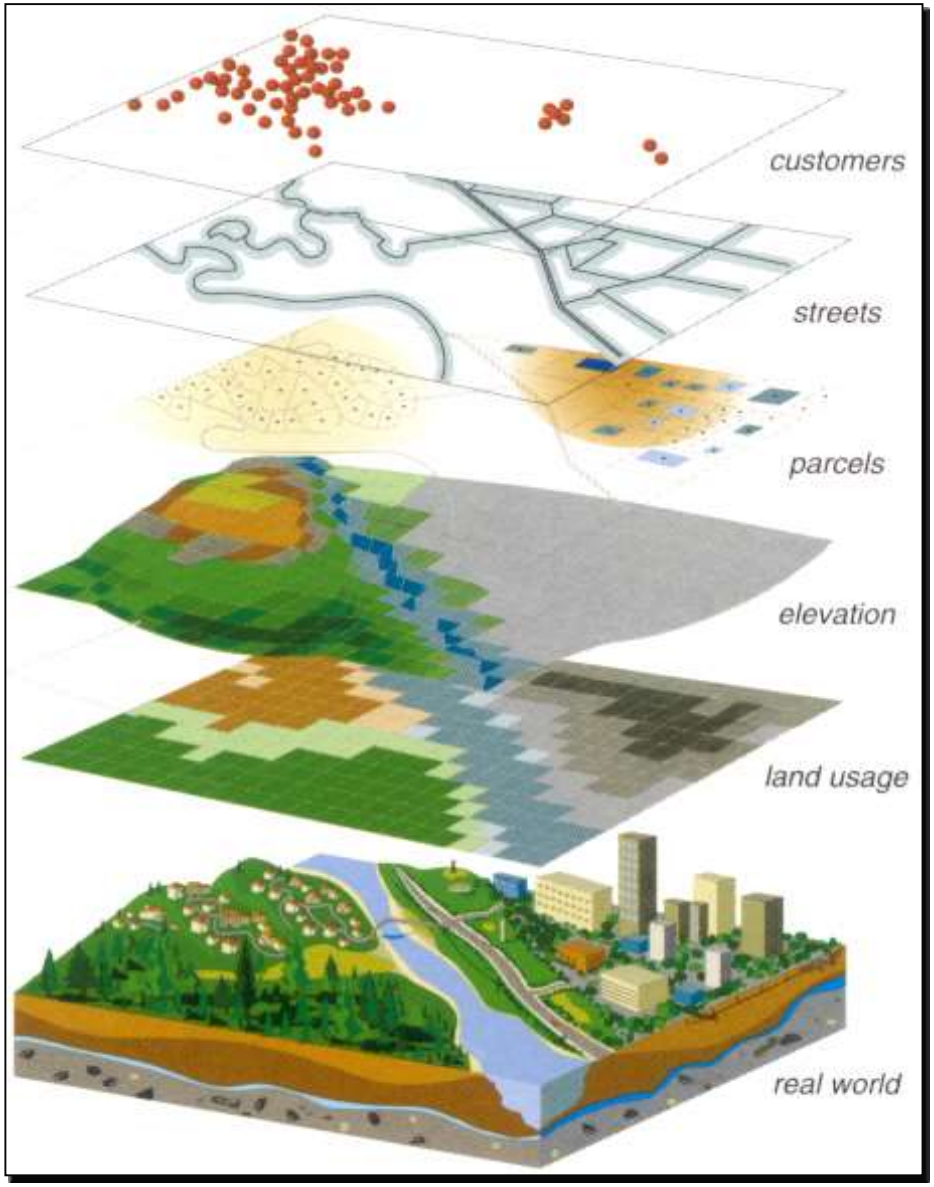
7 (*tujuh*) fenomena geografis

Computer representations (3)

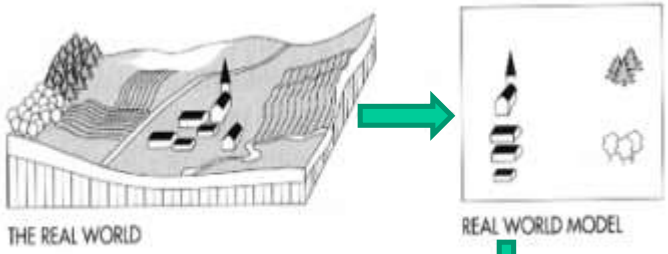
Representations of Geography



KONSEP LAYER PADA DATA SIG



A GIS map consists of one or more data **layer** s. Each layers contains a collection of features that represent real-world objects.



Buildings	
• Probable categories:	Houses, industrial buildings
• Location:	Property no.
• Representation:	Area (polygon)
• Geometric accuracy:	± 10 meters

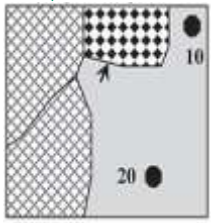
Vegetation	
• Probable categories:	Mango, Neem
• Coverage:	Hectares
• Representation:	Point
• Geometric accuracy:	± 2 meters

DATA MODEL

ID	Type	Location	X	Y	Accuracy
10	Mango	North Avenue	325	654	± 10 meters
20	Neem	South Avenue	455	725	± 10 meters

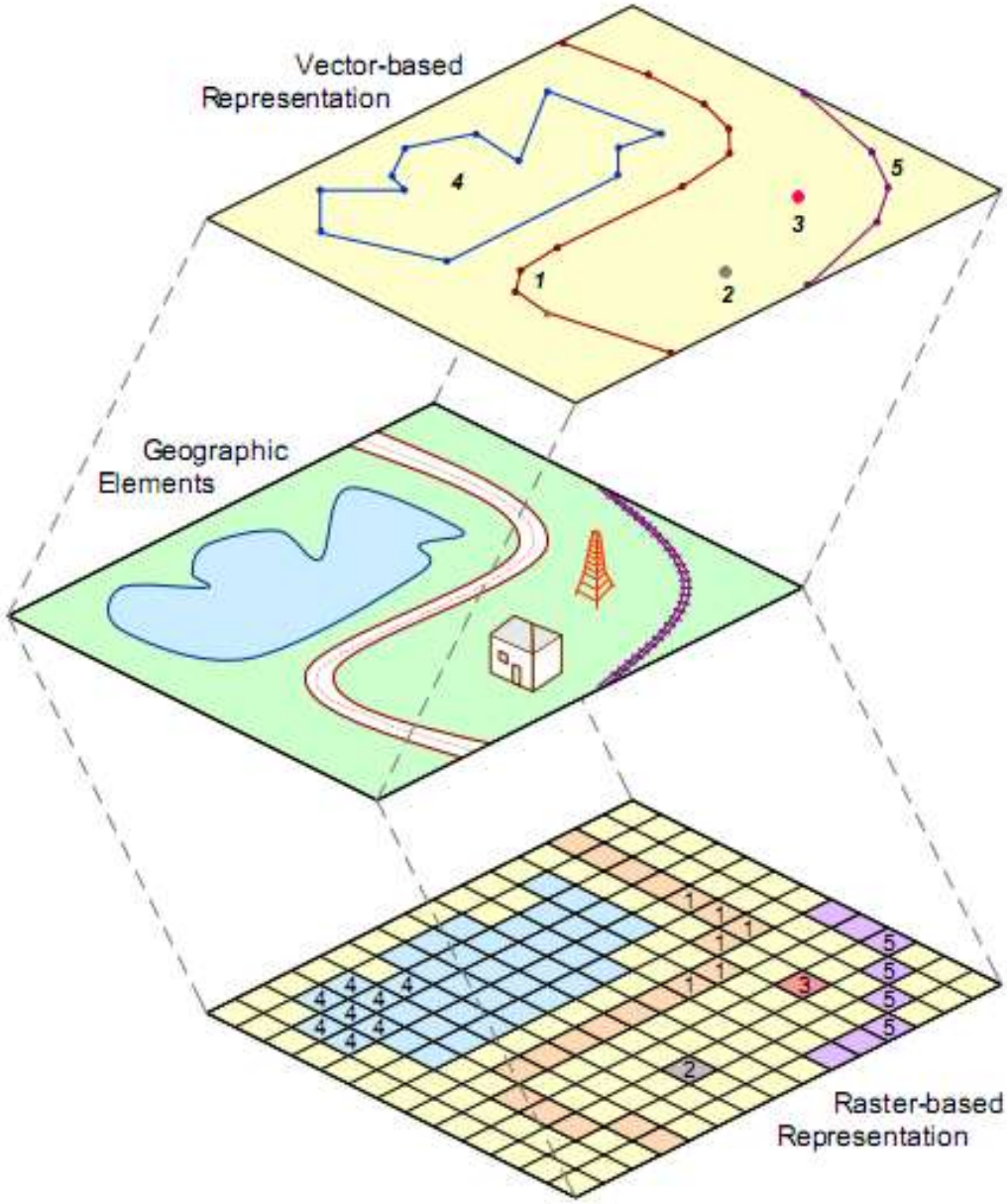
ID	Type	Area	Coordinates	Accuracy
1	House	75	350, 540. 350, 400. 250, 540. 175, 400	± 2 meters
2	Industrial	50	750, 820. 750, 650. 250, 820. 175, 650	± 2 meters

DATA BASE



MAP WITH SYMBOLS

Modelling process. The transformation of the real world into GIS products is achieved by means of simplification and models (Bernhardsen)



Representations of Geographic Data

Aplication computing

(4)

GIS or Spatial analysis

- Spatial analysis **the crux of GIS** because it includes all of the transformations, manipulations, and methods that can be applied to geographic data **to add value** to them, to support decisions, and to reveal patterns and anomalies that are not immediately obvious.
  - **Spatial analysis is the process by which we turn raw data into useful information,**

Examples:

John Snow map of cholera

GIS or Spatial analysis: application of operations or functions to spatial data **to add value**, support decisions, and reveal patterns.

Geoprocessing (according to ESRI): GIS operation in which new data is derived from existing data.

http://news.uk.msn.com/monks-protest-in-burma.aspx

Spatial analysts

manipulate, extract, locate and analyze geographic data.

https://gisgeography.com/what-gis-geographic-information-systems/

Spatial analysis: Way in which we turn raw data into useful information

- A set of techniques whose results are dependent on the locations of the objects being analyzed
- Variety of methods
- Powerful computers
- Intelligent users

Christine Erlien

More about spatial analysis…

- Some methods are highly mathematical.
- All effective spatial analysis requires an intelligent user, not just a powerful computer.
- "Spatial analysis is best seen as a collaboration between the computer and the human, in which both play vital roles." *(Geographic Information Systems and Science, Wiley, 2001)*

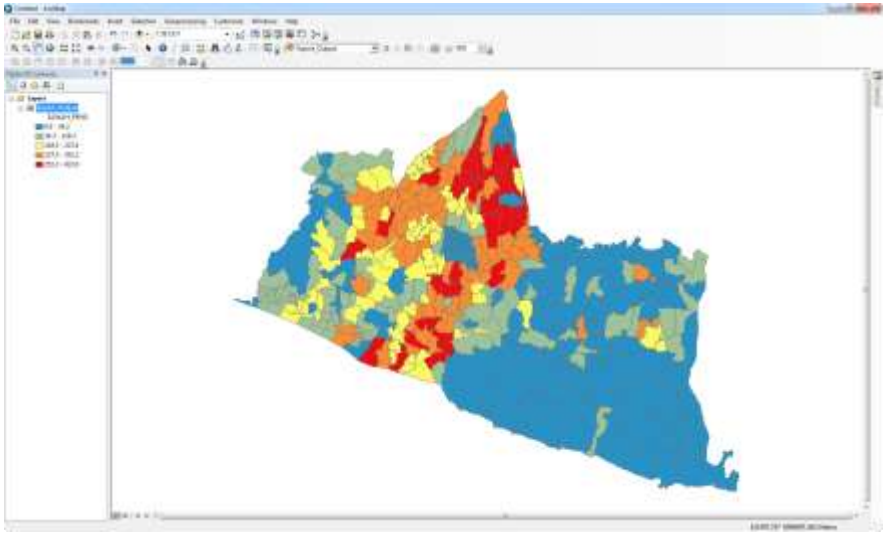
Spatial Analysis is considered the crux of GIS. Why?

- Spatial analysis is the means of adding value to geographic data.
- It turns data into information
- Spatial analysis can reveal things that might otherwise be invisible. It can make what is implicit explicit.

Spatial analysis can reveal things that might otherwise be invisible. It can make what is implicit explicit.

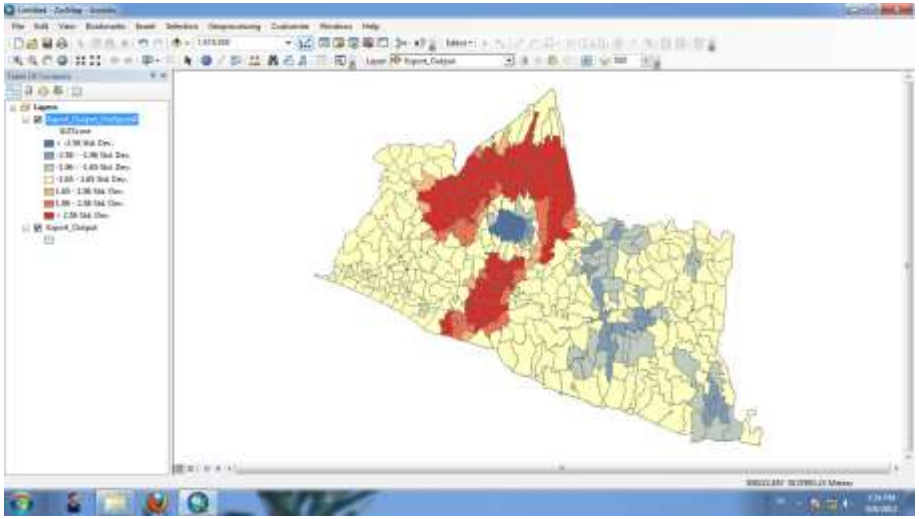
Manipulation of data to reveal what would otherwise be invisible invisible

Klasifikasi 5 kelas dg Natural of Breaks (jenks)



Peta choropleth Sawah Irigasi di DIY

Hot Spot Analysis (Getis-Ord Gi*)

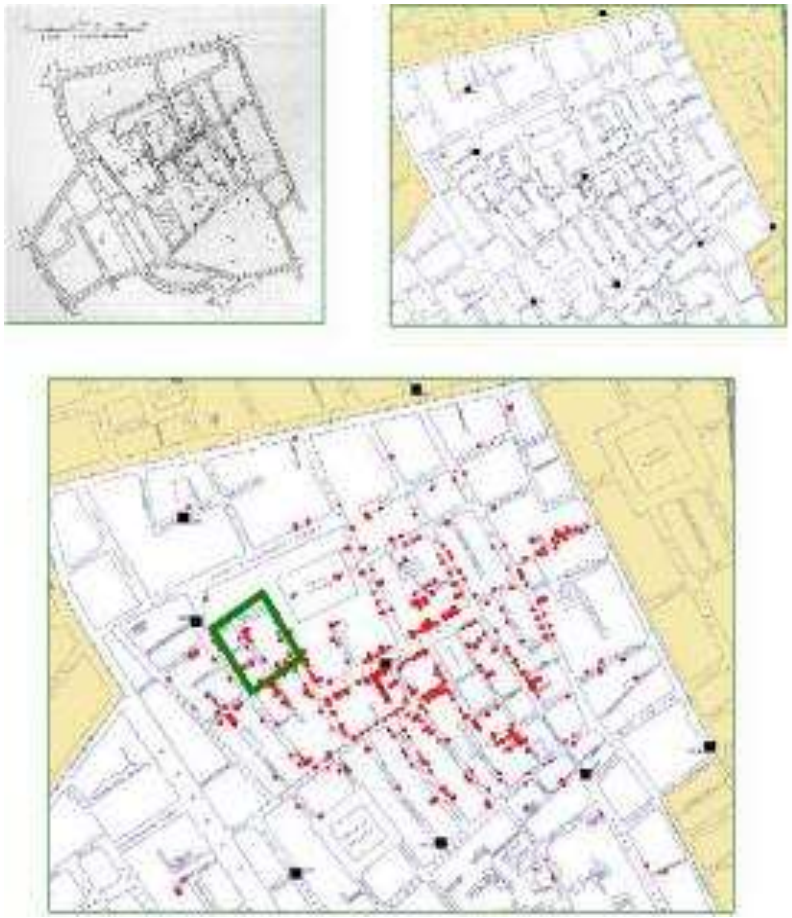


Potensi Pengembangan Sawah Irigasi di DIY

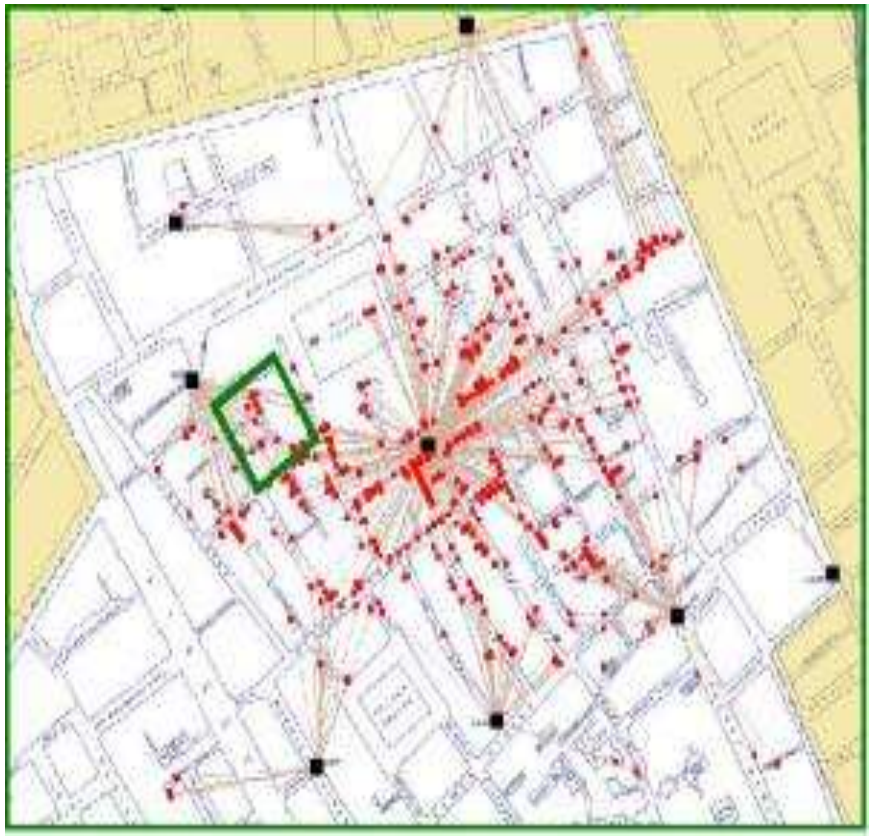
Pada tahun 1854, Dr. John Snow menghadapi permasalahan bencana kolera yang terjadi di distrik Soho, London.

Secara teori ada 2 kemungkinan penyebab penularan penyakit kolera disana, yaitu:

1. **yang paling populer masyarakat disana percaya bahwa kolera disebabkan kontaminasi udara kotor dari areal bekas pekuburan kuno di pusat kota.**
2. **pendapat Dr. John Snow yang memperhatikan kemungkinan pemakaian air dari sumur-sumur yang ada di kota tersebut.**

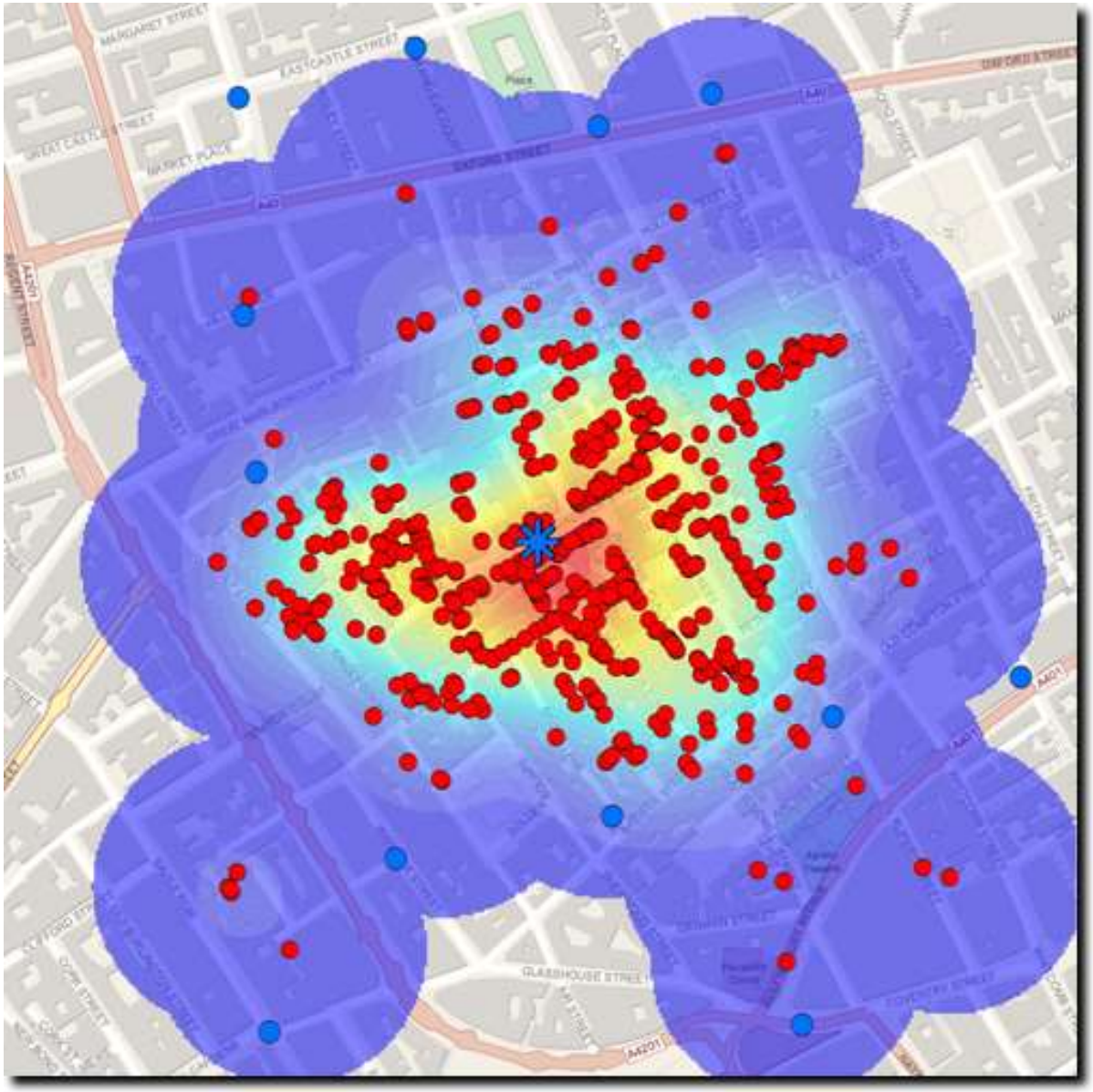


Kemudian Dr. John Snow menarik garis-garis hubungan antara korban dengan kedekatan ke lokasi pekuburan dan sumur.



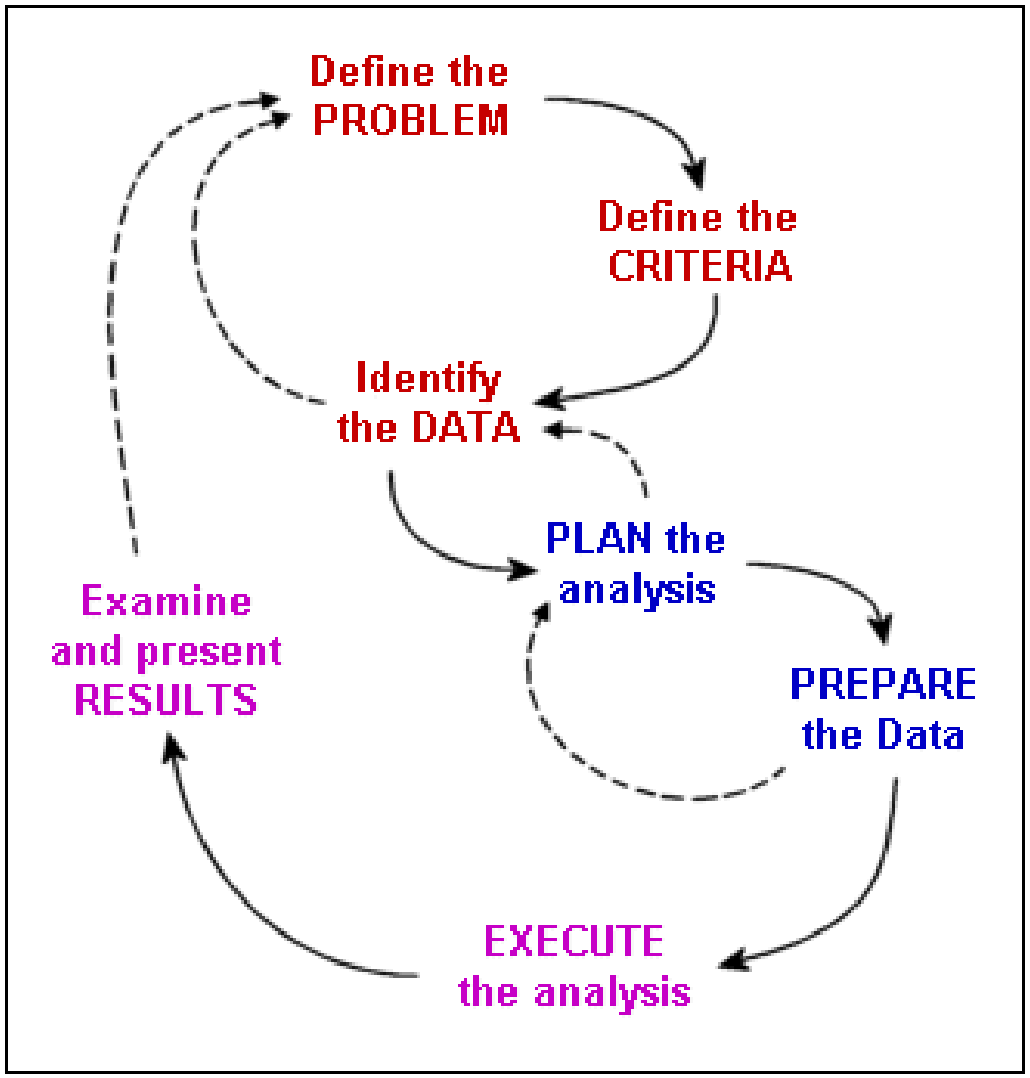
Akhirnya, terungkap di atas peta sebuah pola yang sangat kuat menggambarkan hubungan antara korban dengan sumber air sumur yang diduga terkontaminasi.

Setelah menutup sumur tersebut pasien berkurang drastis, setelah diteliti, ternyata saluran kotoran rumah yang ditanam 22 kaki telah bocor memasuki sumber air permukaan sedangkan sumur digali hanya selisih 6 kaki saja (28 kaki) menyebabkan air yang terambil adalah bagian yang terkontaminasi.



Density of cholera deaths using a 100 m kernel density function

The GIS analytical process



1. Define the problem
2. Define the criteria
3. Identify the data you need
4. Plan the analysis
5. Prepare the data for analysis
6. Execute the analysis
7. Examine and present the results

Common analysis functions of GIS

1. Search (thematic search, search by region) ☑
2. Location analysis (buffer, corridor, overlay) ☑
3. Terrain analysis (slope/aspect, drainage network) ☑
4. Flow analysis (connectivity, shortest path) ☑
5. Distribution (nearest neighbor, proximity, change detection) ☑
6. Spatial analysis/statistics (pattern, centrality, similarity, topology) ☑
7. Measurements (distance, perimeter, shape, adjacency, direction) ☑

Types of spatial analysis*

- **Query and reasoning**

  Where is? How much is this here? How to get from A to B?

- **Measurement**

  Area, Distance, Length, Slope

- **Transformation**

  Buffering, overlay, interpolation

- **Exploration and description**

  clusters, trends, spatial dependence, fragmentation

- **Optimization**

  Site selection, re-districting, traveling salesman

- **Inference**

  Samples from a population, problem of spatial autocorrelation

- **Modeling**

  Climate change effects, impact of nuclear accident, dispersal

* After Michael Goodchild: http://www.csiss.org/aboutus/presentations/files/goodchild_qmss_oct02.pdf

What kinds of analysis can we do with GIS?

1. Measurements ☑
2. Layer statistics ☑
3. Queries ☑
4. Buffering (vector); Proximity (raster) ☑
5. Filtering (raster) ☑
6. Map overlay (layer on layer selections) ☑
7. Transformations ☑
8. Reclassification ☑
9. Network analysis ☑
10. Spatial interpolation ☑
11. Grid (raster) analysis ☑
12. Surface analysis ☑
13. Analytic modeling ☑

(Some material adapted from Heywood et al 1998; Theobald, 1999)

GIS Analysis

A classification of software components commonly used in geographic information systems

Jack Dangermond

Environmental Systems Research Institute, 380 New York Street, Redlands, California 92373

1. Data Retrieval ☑
2. Map Generalization ☑
3. Map Abstractions ☑
4. Map Sheet Manipulation ☑
5. Buffer Generation ☑
6. Polgygon Overlay And Dissolve ☑
7. Grid Cell Analysis ☑
8. Measurement ☑
9. Digital Terrain Analysis ☑
10. Output Techniques ☑

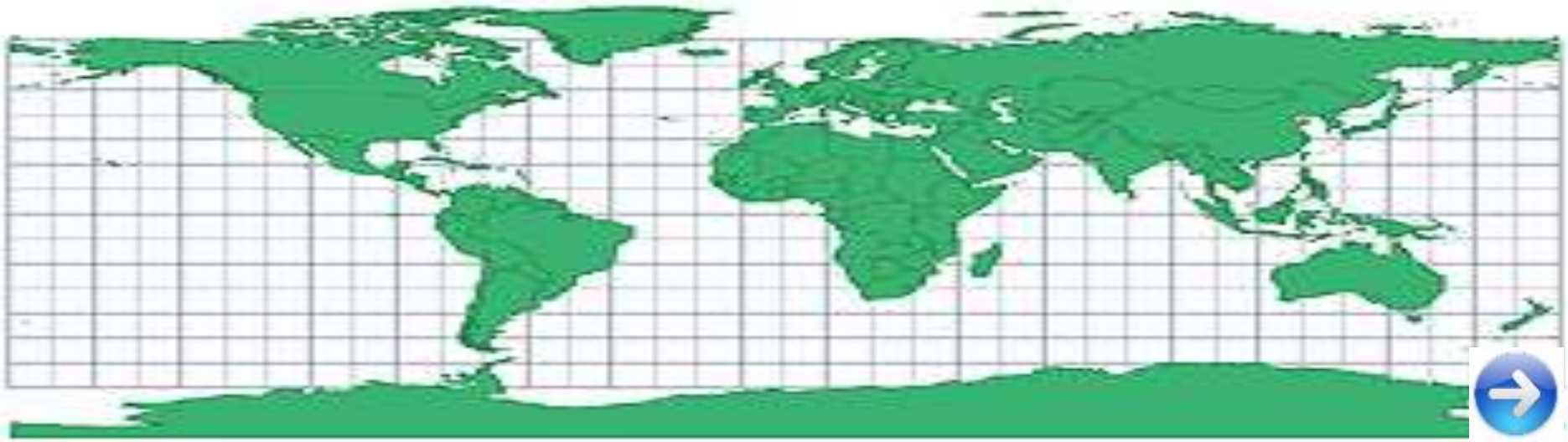
Visualizations

(5)

OUTPUT SIG

- Peta (*Map Layout*)
- Tabel (*Tables*)
- Grafik (*Chart*)
- Laporan (*Report*)
- Kombinasinya

Hardcopy/Softcopy



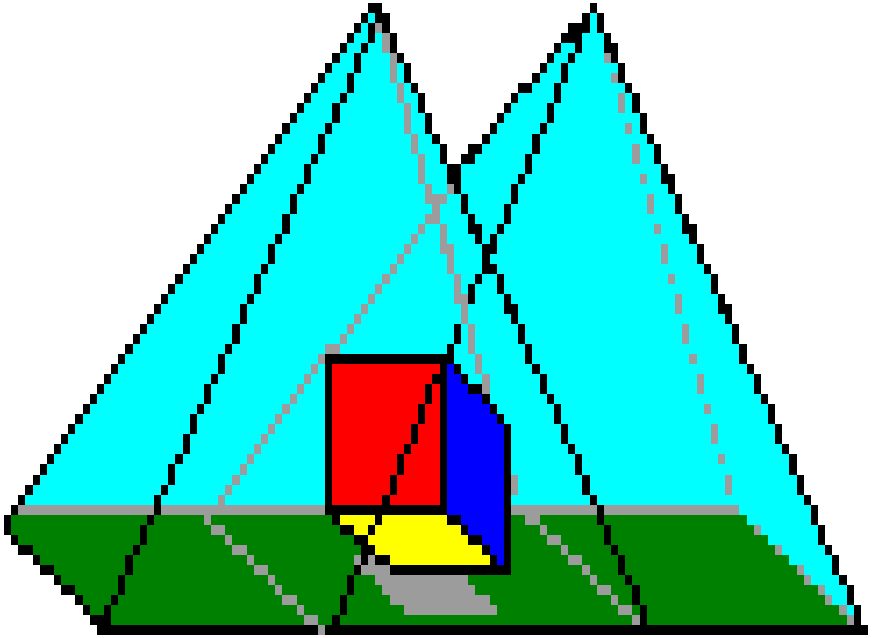
Simulation world

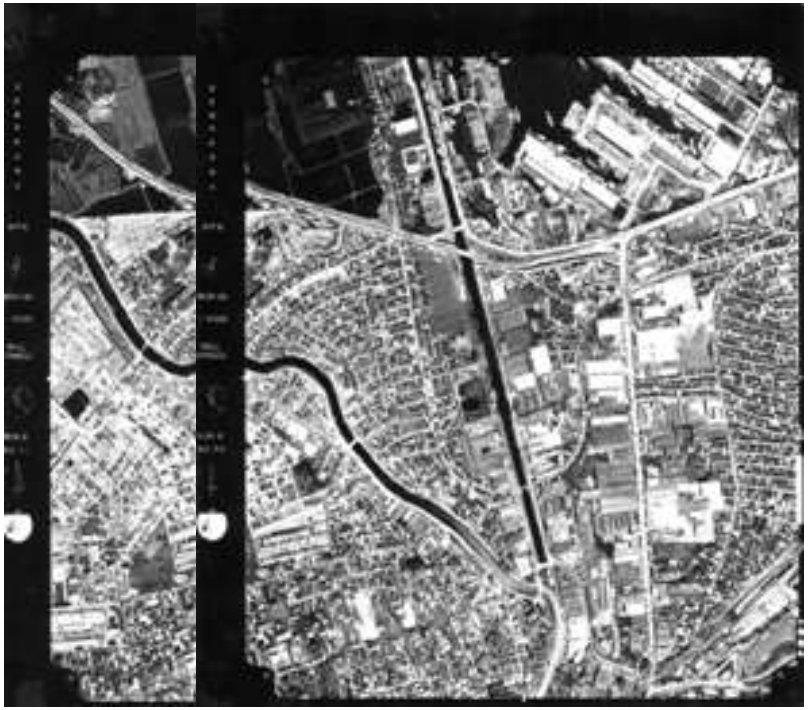
(6)

CONTOH SIMULASI

MEMBANGUN BASISDATA SPASIAL 3-DIMENSI UNTUK REKONSTRUKSI WILAYAH

(*Aplikasi : Daerah Genangan Karena Banjir Rob*)





KERANGKA KERJA PERANCANGAN DTM

Collecting :
- fidusial marks
- GCPs
- Tie points

Setting up photo pair
- scaling
- rotating
- moving

Building DEM

DEM

converting to grid

height points

building TIN

land surface model

Orthorectifying

Orthophotos

Objects digitizing :
- building area
- roof construction
- others (rivers,roads, shore lines,etc)

construction lines

modelling

landcover models

Exporting external

External Orientation

photos set-up

Height differences caculating according to parallax differences

Height data

input

sea level variation

modelling

sea level model

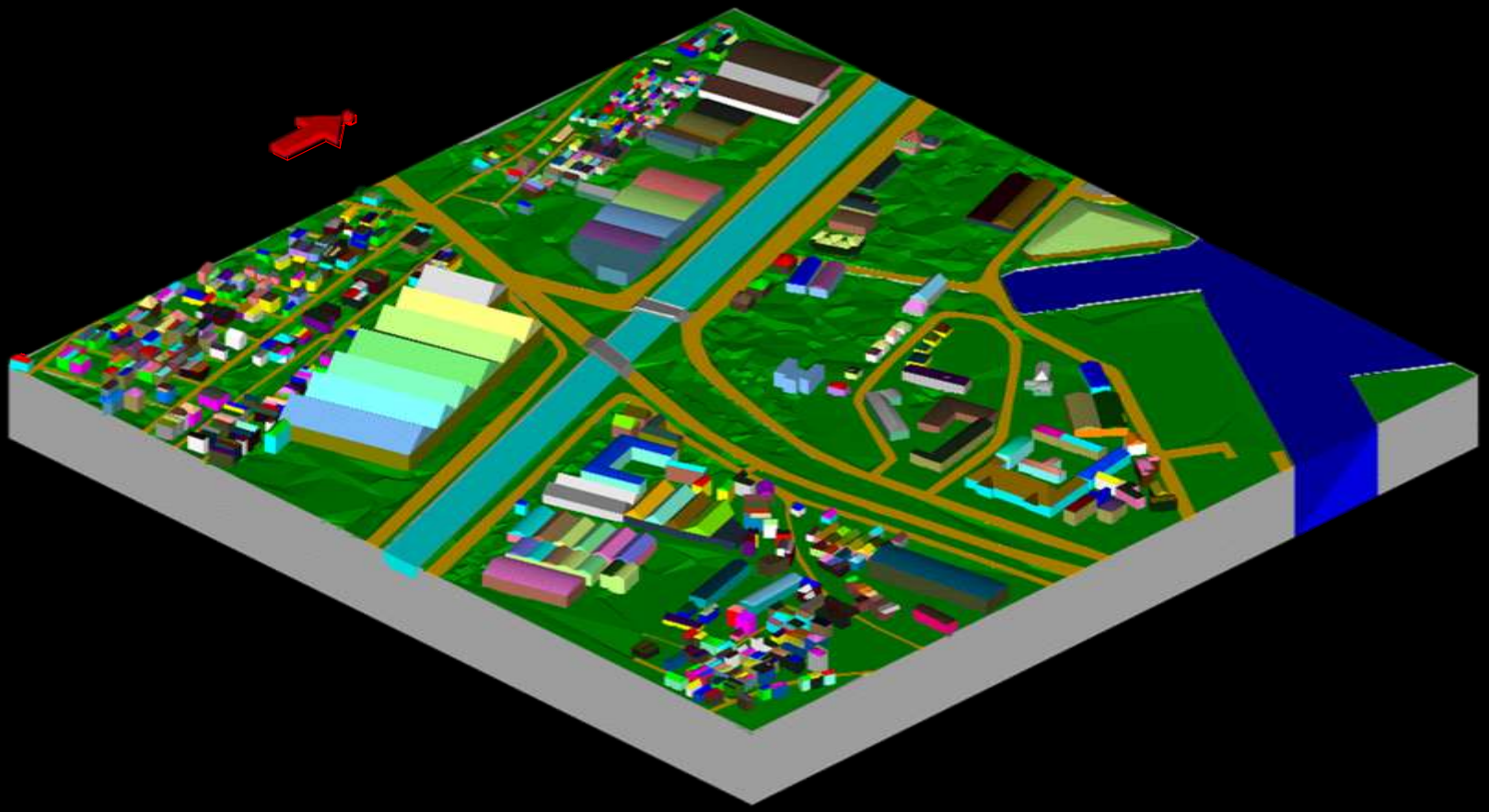
overlay

overlay

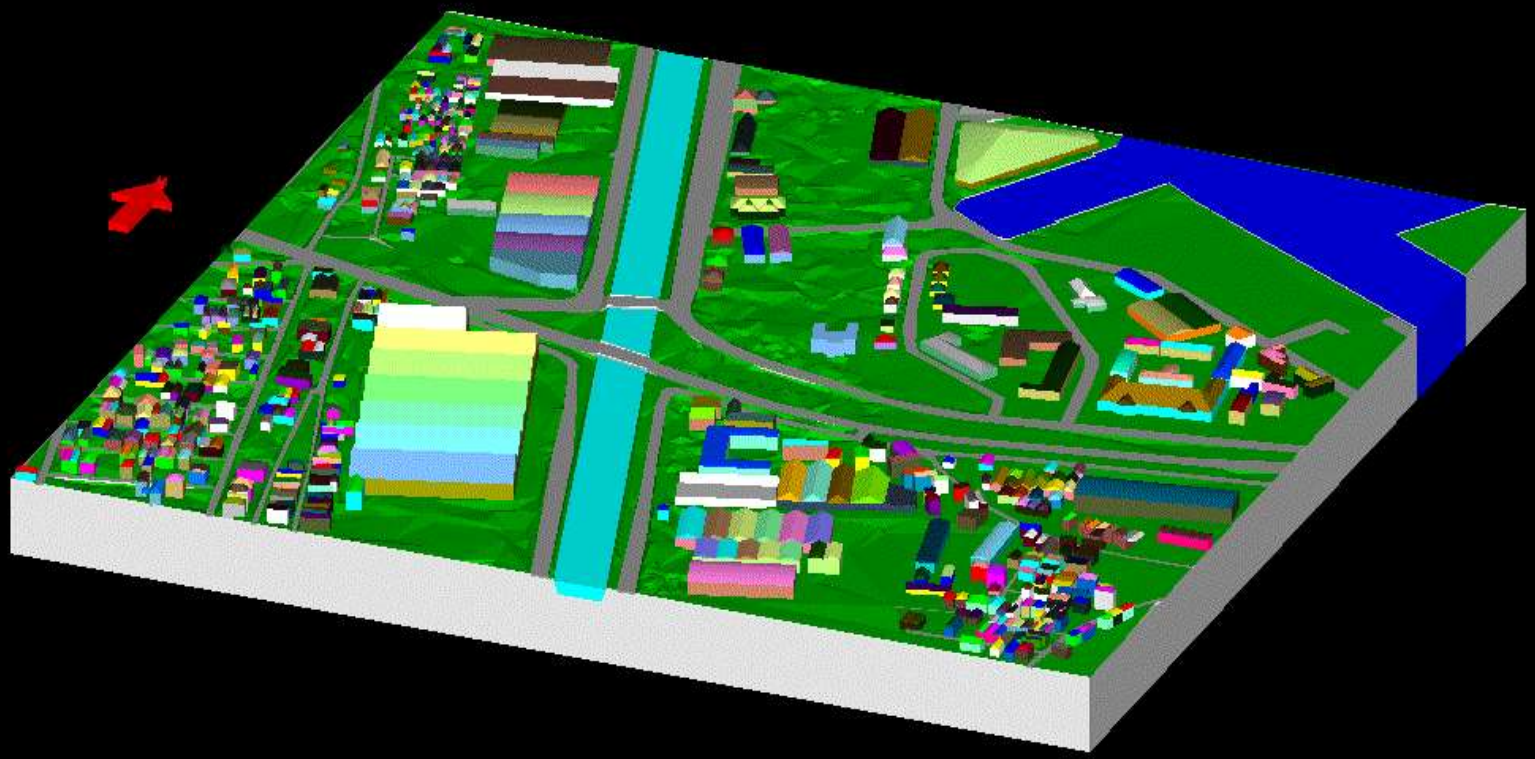
DIGITAL TERRAIN MODEL

ROB FLOOD SIMULATION

MODEL MEDAN DIGITAL



MODEL MEDAN DIGITAL



AERIAL PHOTOGRAPHS

ORTHOPHOTOS

PHOTO SET-UP

SEA LEVEL VARIATION

OBJECT DIGITIZING

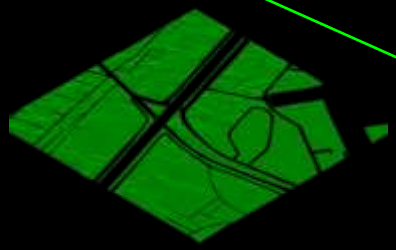
PARALLAX DIFFERENCE MEASURING

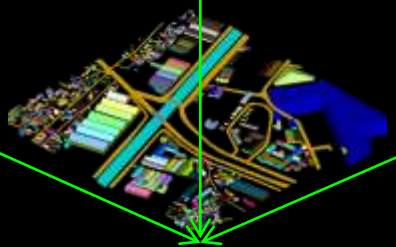
MODELLING

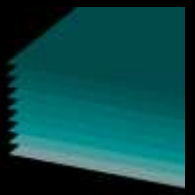
SURFACE MODEL

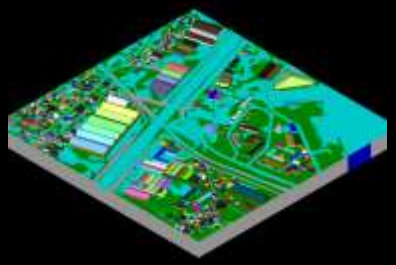
LANDCOVER MODEL

SEA LEVEL MODEL



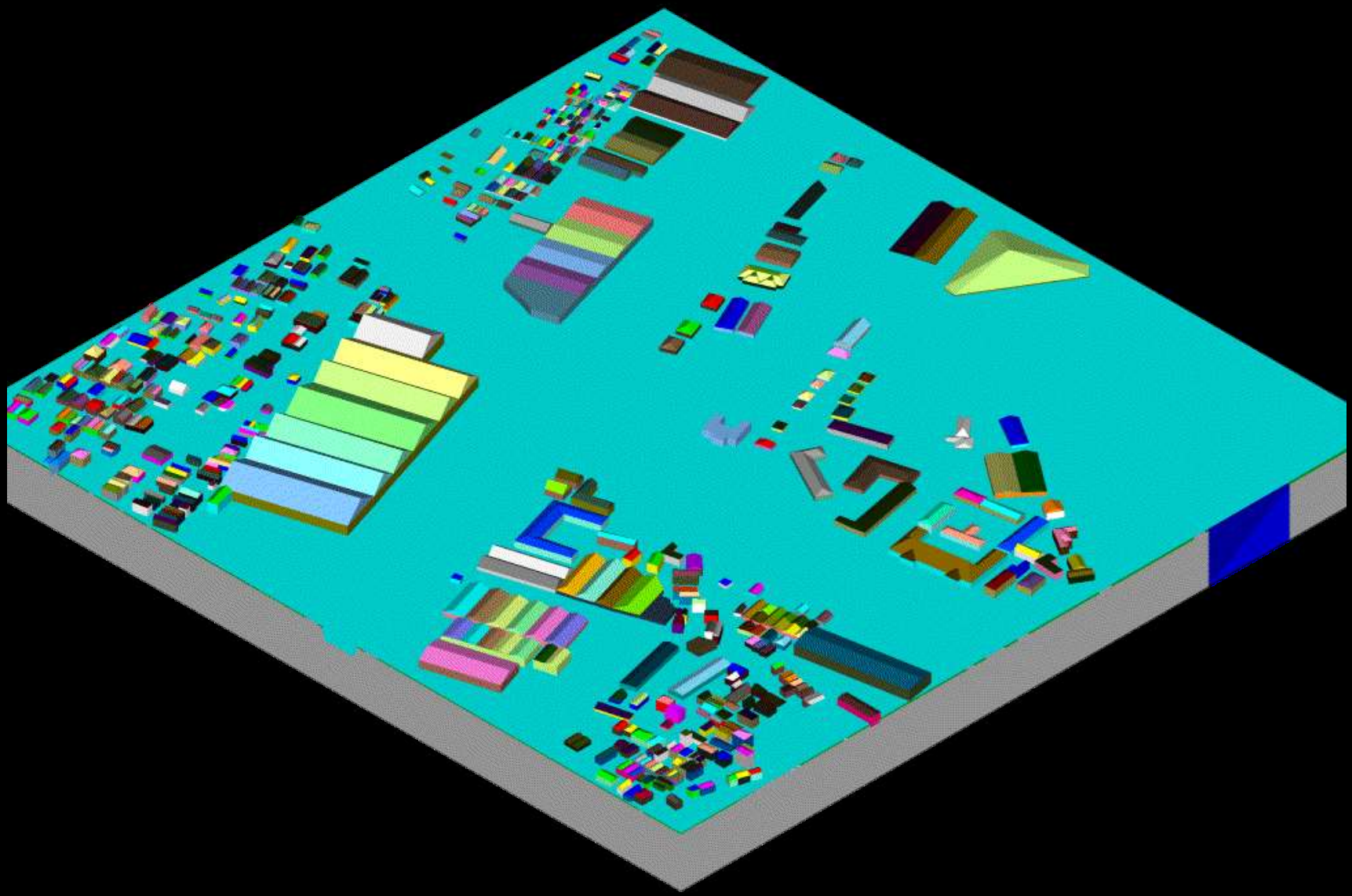






DIGITAL TERRAIN MODEL

SIMULASI GENANGAN ROB



KETINGGIAN MUKA LAUT 2.55 METER


SEKIAN