

Introduction to Geospatial Data

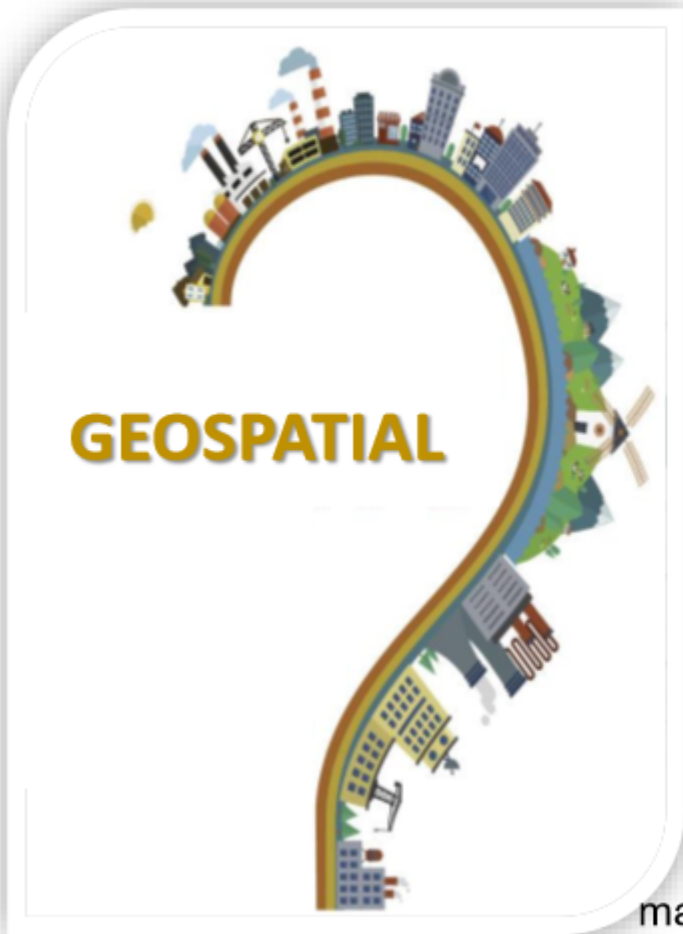
Asmala Ahmad

CACT, UTeM

What is Geospatial Data?

- The word geospatial is used to indicate that data that has a geographic component to it. This means that the records in a dataset have locational information tied to them such as geographic data in the form of coordinates, address, city, or ZIP code. GIS data is a form of geospatial data. Other geospatial data can originate from GPS data, satellite imagery, and geotagging.
- Geospatial data, is information about a physical object that can be represented by numerical values in a geographic [coordinate](#) system.

KENAPA GEOSPATIAL?



Otak manusia tidak berkerja dalam baris dan lajur tetapi selalunya otak proses dan menyusun maklumat berdasarkan masa dan tempa



Peta memudahkan mata m trend yang sebelum ini disi *spreadsheets*

Teknologi sekarang seperti telefon pintar, sensor dan media sosial membolehkan organisasi mengumpul data masa dan tempat berkaitan sesuatu perkara atau peristiwa



Analisis menggunakan data membina peta, graf, statis hubung kait yang rumit mu

Visualisasi data geospasial boleh memaparkan perubahan maklumat daripada data lama sehingga data baharu serta berupaya untuk meramal perkara akan berlaku pada masa hadapan

PERKEMBANGAN MAKLUMAT GEOSPATIAL

Maklumat geospasial telah berkembang daripada peta bercetak kepada peta digital dan kepada 3 dimensi



MAKLUMAT GEOSPATIAL - PEMBANGUNAN LESTARI

ALAM SEKITAR



Pengurusan dan pemantauan sumber asli yang lebih baik

Menangani pencemaran

Menambahbaik pengurusan pesisir pantai, lembangan sungai dan kualiti air

SOSIAL



Meningkatkan tadbir urus negara

Keselamatan negara yang lebih terjamin

Tindak balas kecemasan lebih cekap dan cepat

EKONOMI

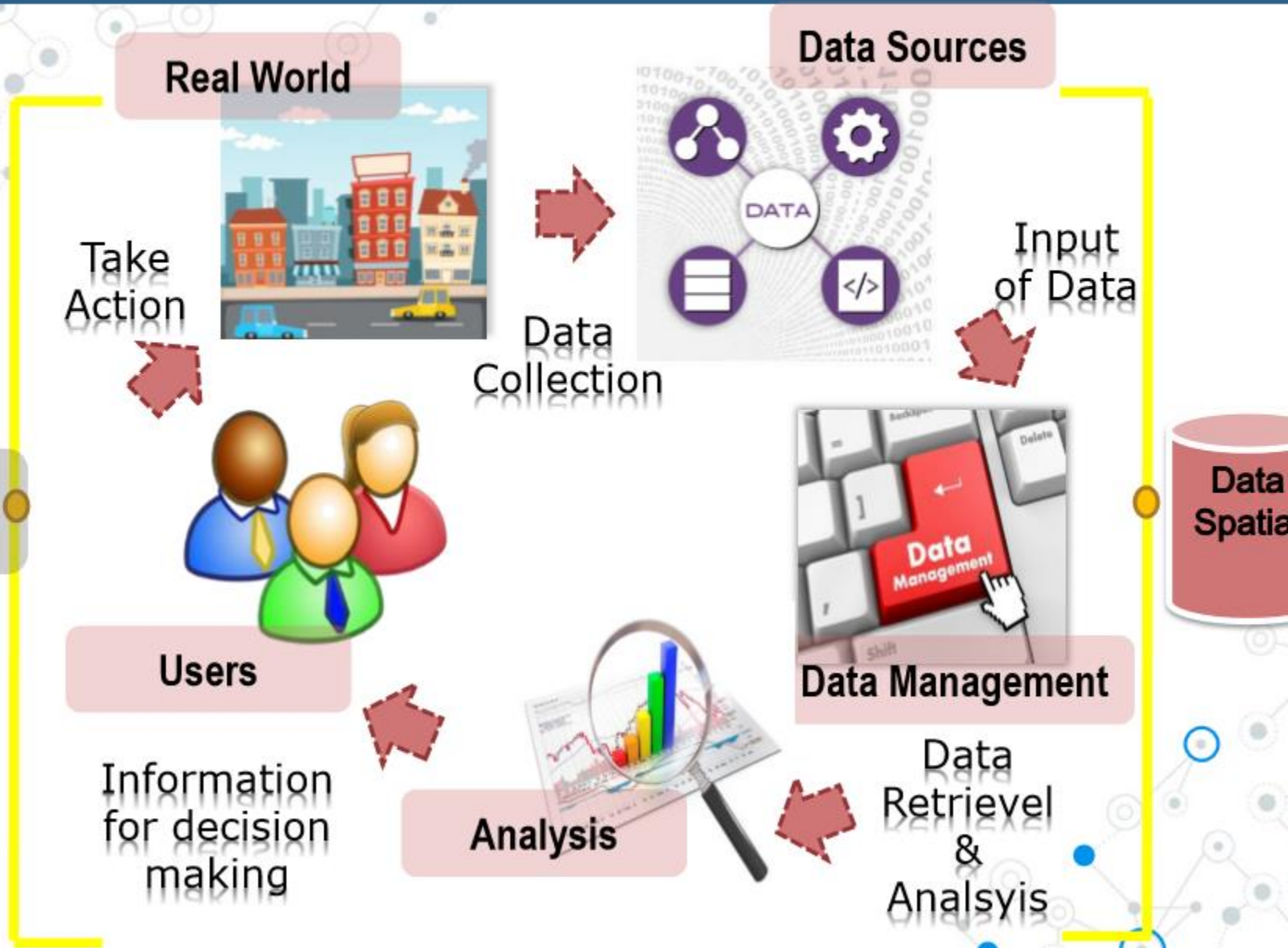


Banyak peluang perniagaan dan perkhidmatan

Menaiktaraf sistem pengurusan infrastruktur

Meningkatkan kecekapan untuk perkhidmatan awam dan swasta

KEBERGANTUNGAN MAKLUMAT GEOSPATIAL



KEGUNAAN MAKLUMAT GEOSPATIAL

Pengurusan Tanah

Pengurusan Bencana

Infrastruktur

Pelancongan

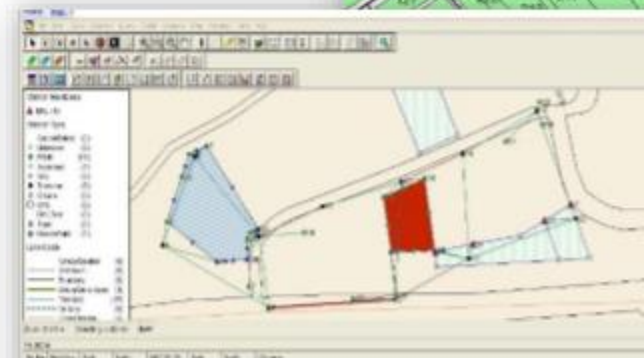
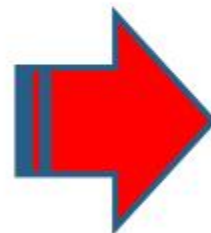
Kesihatan

Keselamatan



PENGURUSAN TANAH

Transformasi maklumat tanah



KEGUNAAN MAKLUMAT GEOSPATIAL

Pengurusan Tanah

Pengurusan Bencana

Infrastruktur

Pelancongan

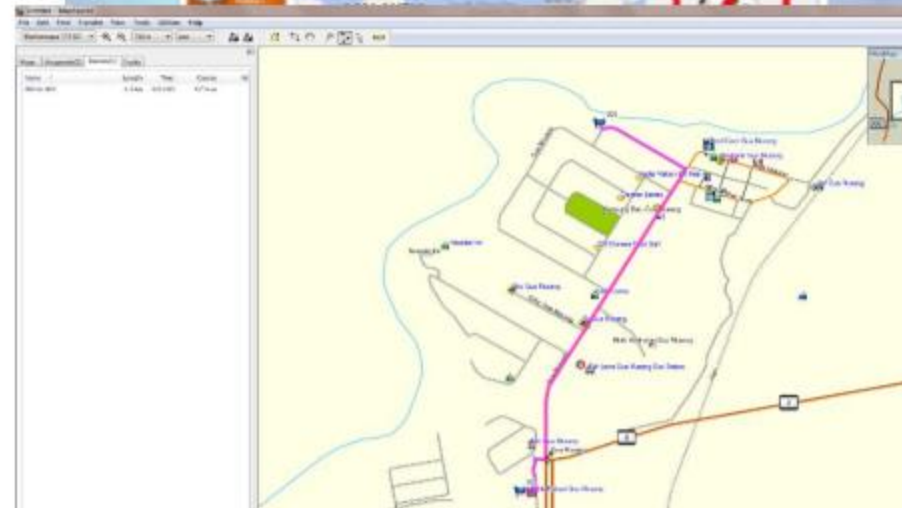
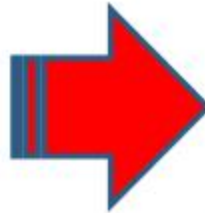
Kesihatan

Keselamatan



PENGURUSAN BENCANA

Transformasi maklumat geospasial dalam pengurusan bencana



KEGUNAAN MAKLUMAT GEOSPATIAL

Pengurusan Tanah

Pengurusan Bencana

Infrastruktur

Pelancongan

Kesihatan

Keselamatan

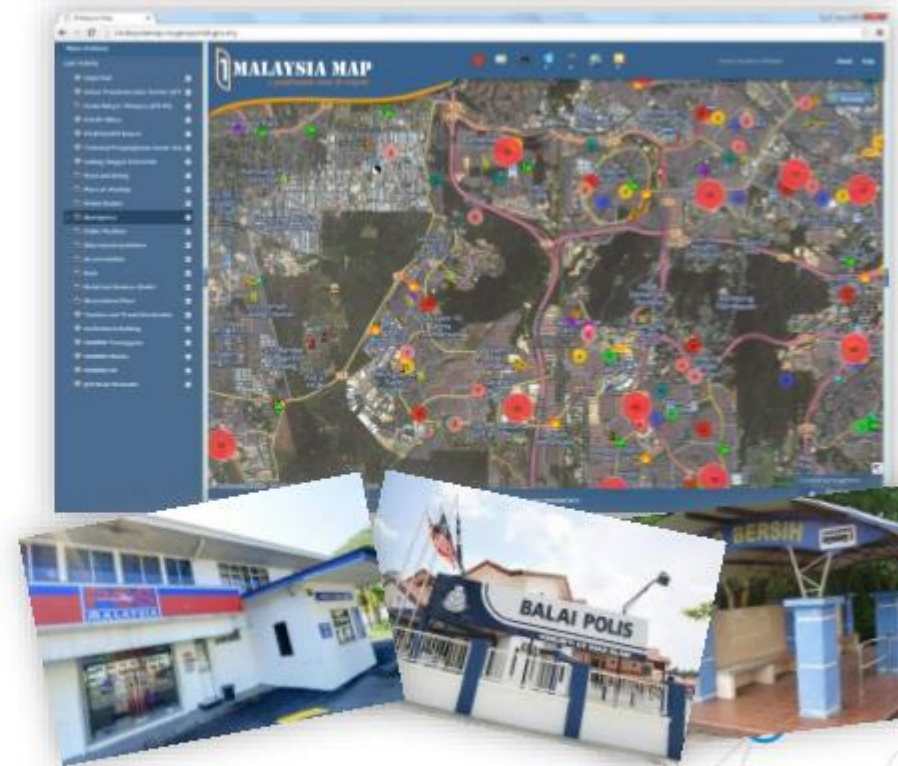


INFRASTRUKTUR

PENGANGKUTAN AWAM



KEMUDAHAN AWAM



Transformasi maklumat geospasial dalam peningkatan pengurusan infrastruktur.

KEGUNAAN MAKLUMAT GEOSPATIAL

Pengurusan Tanah

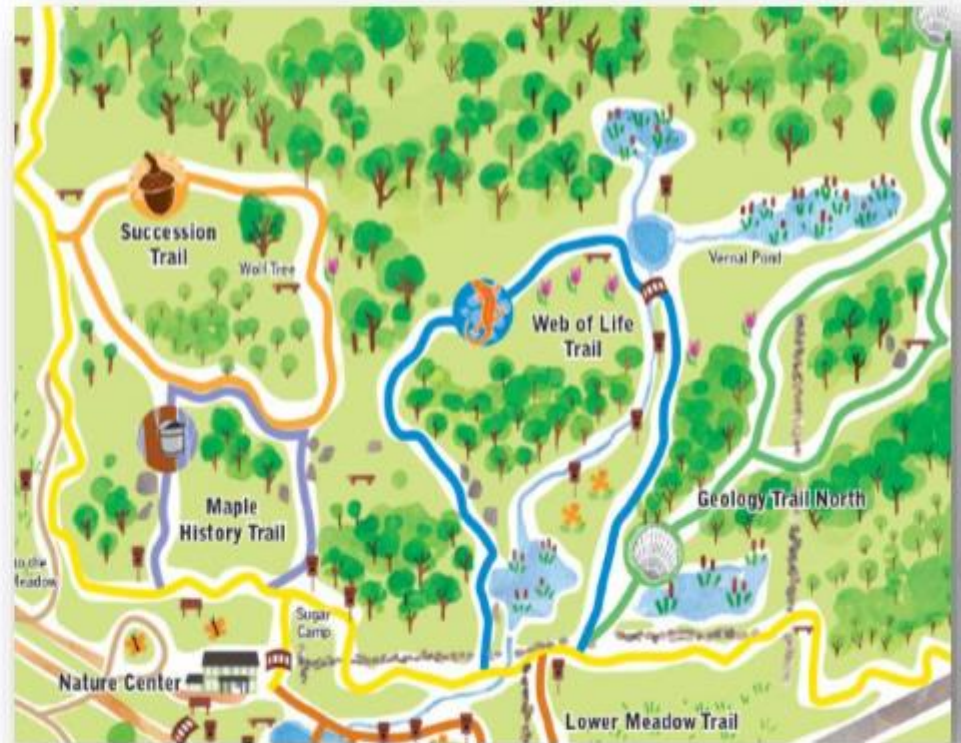
Pengurusan Bencana

Infrastruktur

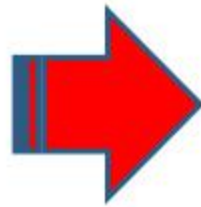
Pelancongan

Kesihatan

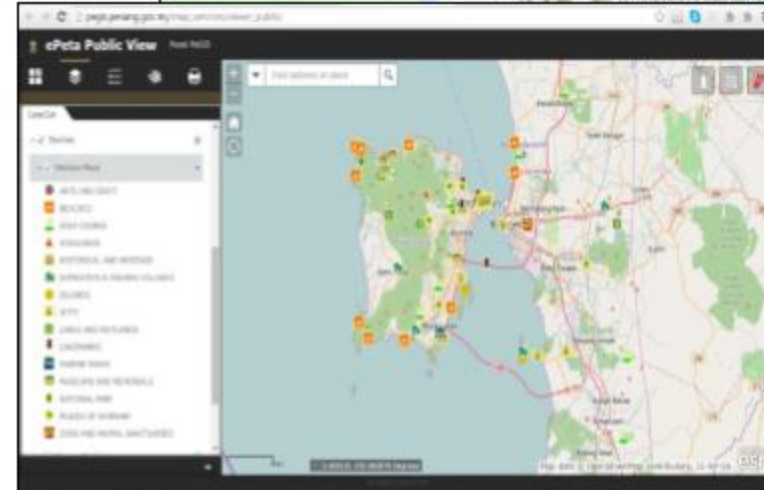
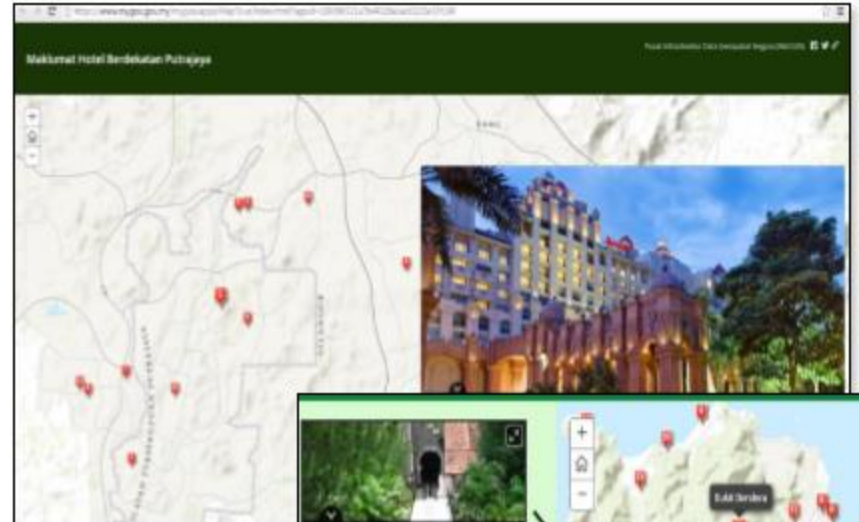
Keselamatan



PELANCONGAN



MyGOS



**Transformasi maklumat
pelancongan manual kepada
web based**

KEGUNAAN MAKLUMAT GEOSPATIAL

Pengurusan Tanah

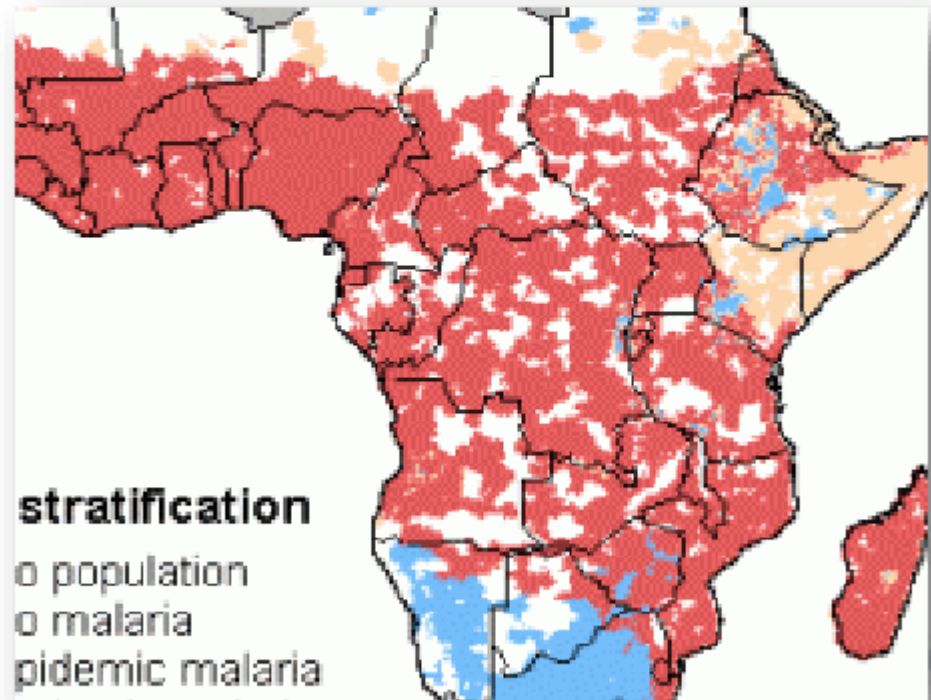
Pengurusan Bencana

Infrastruktur

Pelancongan

Kesihatan

Keselamatan

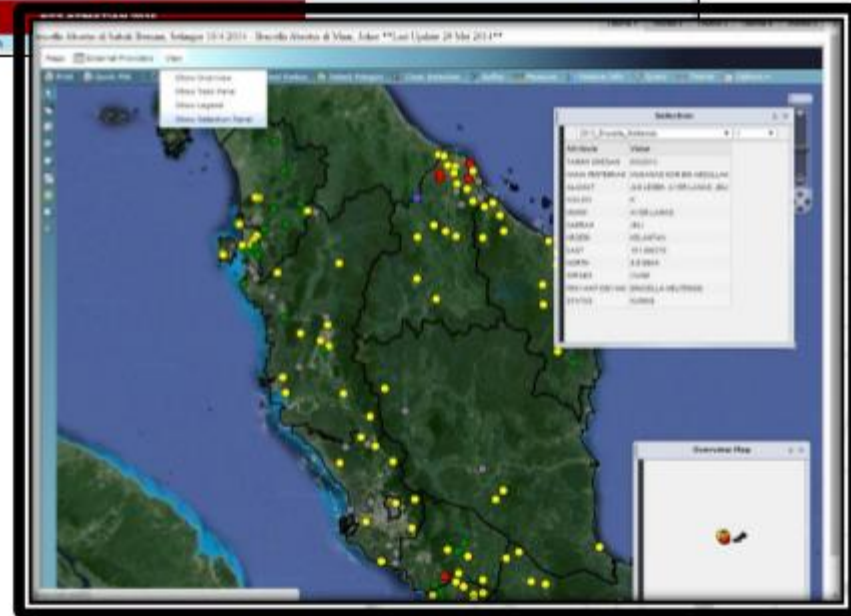
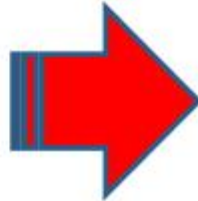


KESIHATAN

Transformasi
penggunaan maklumat
geospasial dalam
pengurusan kesihatan

H

HOSPITAL



KEGUNAAN MAKLUMAT GEOSPATIAL

Pengurusan Tanah

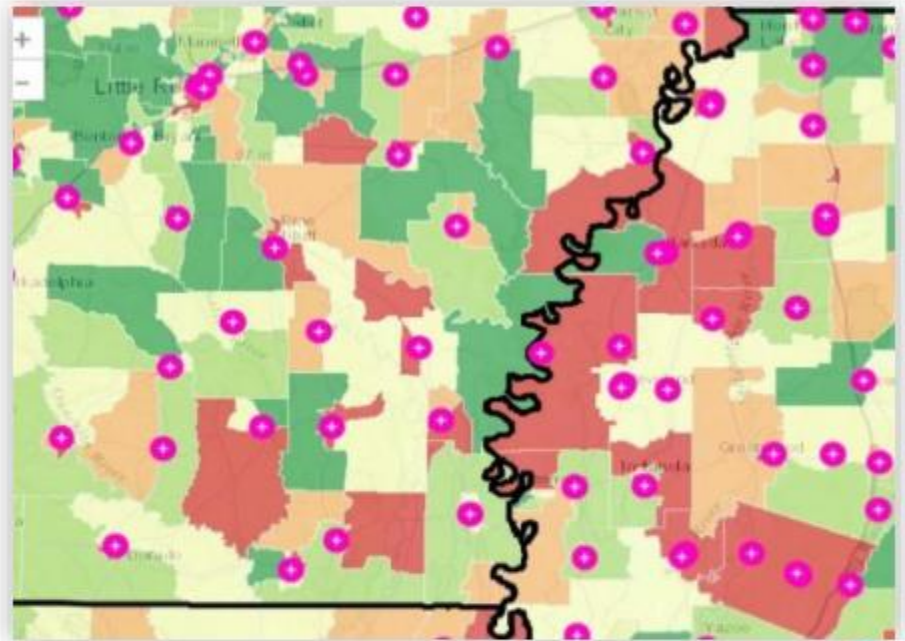
Pengurusan Bencana

Infrastruktur

Pelancongan

Kesihatan

Keselamatan



KESELAMATAN



**Transformasi maklumat
geospasial bagi pengawalan
lokasi jenayah**



**Maklumat
geospasial dapat
digunakan sebagai
perancangan dan
pembangunan
negara**

**Memberi impak
kepada agensi
kerajaan,
swasta dan
juga rakyat**

**Mengoptimumkan
perbelanjaan
negara**

What is Geospatial Technology?

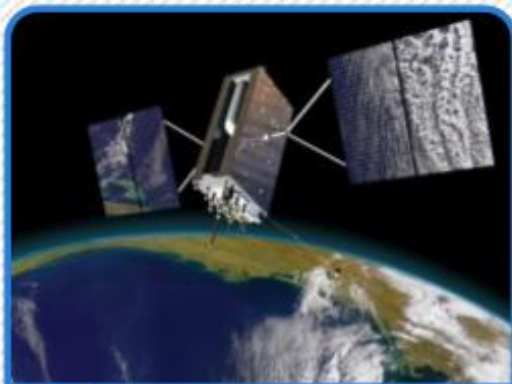
- Geospatial technology refers to all of the technology used to acquire, manipulate, and store geographic information. GIS is one form of geospatial technology. GPS, remote sensing, and [geofencing](#) are other examples of geospatial technology.

<https://www.gislounge.com/difference-gis-geospatial/>

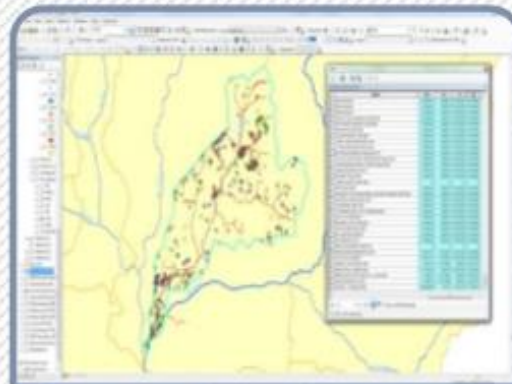
TEKNOLOGI GEOSPATIAL

Teknologi geospasial yang digunakan dalam pengurusan sumber asli dan alam sekitar

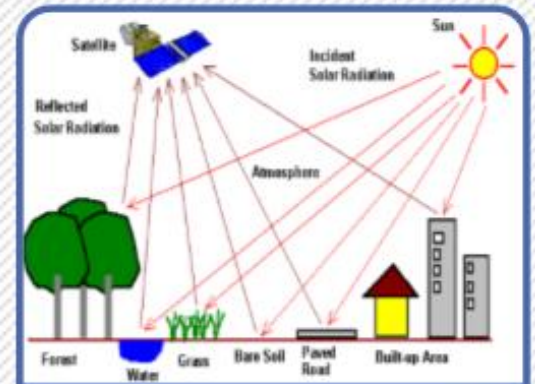
- *Global Positioning Systems (GPS)*
- *Geographical Information Systems (GIS)*
- *Remote Sensing (RS)*



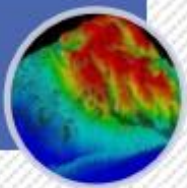
Global Positioning Systems (GPS)



Geographical Information Systems (GIS)



Remote Sensing (RS)



Global Positioning Systems (GPS)

- *a satellite-based system that can be used to locate positions anywhere on the earth*

Geographical Information Systems (GIS)

- *a system designed to capture, store, manipulate, analyze, manage, and present all types of spatial or geographical data.*

Remote Sensing (RS)

- *the science of obtaining information about objects or areas from a distance, typically from aircraft or satellites.*

IMPAK GEOSPATIAL

PENJIMATAN



\$8-\$22 billion dengan meningkatkan pengairan pertanian



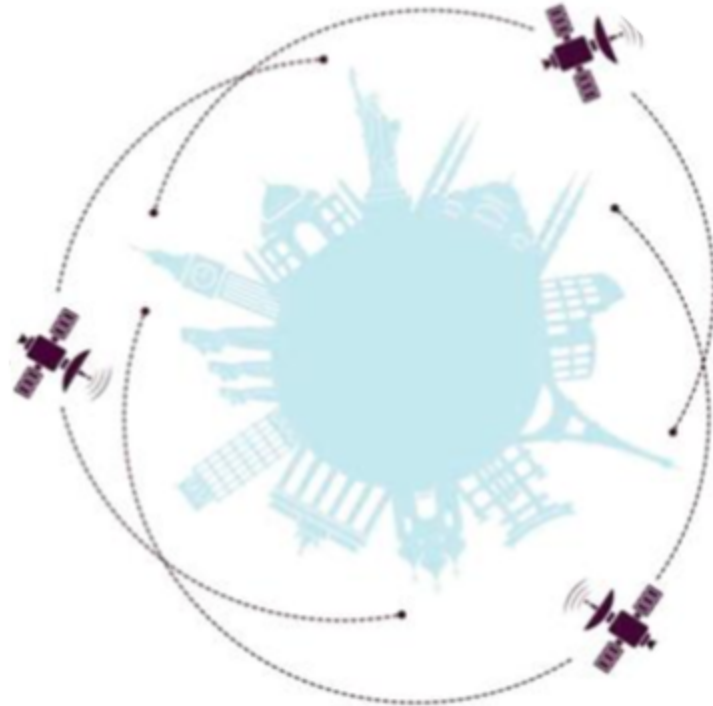
\$3.5 billion liter petrol setahun



Mengurangkan masa perjalanan sebanyak 1.1 billion jam



Perkhidmatan geo mempercepat bantuan kecemasan (menyelamatkan nyawa 152 setahun – England)

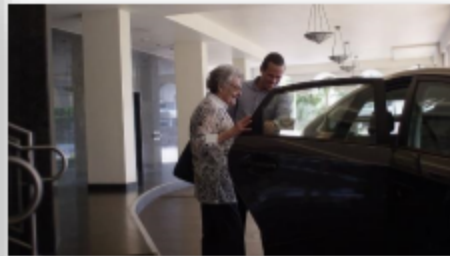


Perkhidmatan
\$150-\$270

Dijana
perkhidmatan
billion

Sumber: Laporan Wh

CONTOH - UBER



Aplikasi Uber menyediakan perkhidmatan tempaan kepada pelanggan dengan menggunakan peta dan fungsi navigasi.

Uber telah berkembang kepada 35 negara dan lebih 100 bandar diseluruh dunia

Nilai Syarikat: Over \$51 Billion.

Bilangan Pengguna: Melebihi 8 juta (sehingga Januari 2015)

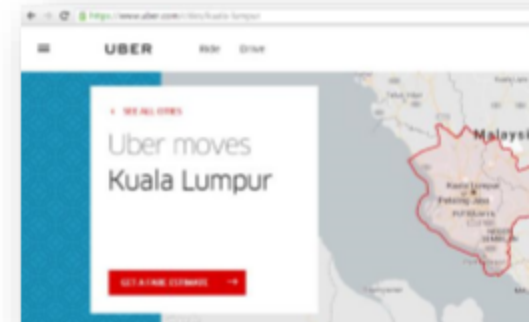
Pemandu Berdaftar: 1,60,000 (sehingga Januari 2015)

Bilangan pemandu Baru: 50,000 setiap bulan

Purata bilangan perjalanan bagi setiap hari: 1.5 juta

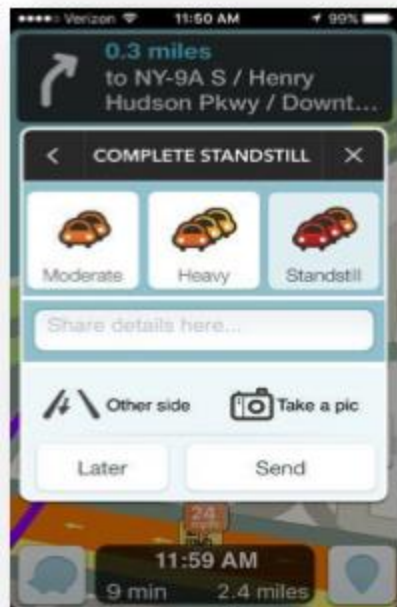
Perkhidmatan Uber di Malaysia 20% lebih murah daripada teksi biasa

Aggaran purata pendapatan pemandu Uber RM3,800 sehingga RM4,000 sebulan berbanding teksi biasa RM1,120 sehingga RM1,200.



CONTOH - WAZE

Waze adalah aplikasi GPS berasaskan navigasi geo untuk telefon pintar dan boleh digunakan secara percuma



Waze member
member
raya sec

Pengguna
makluma
polis, ke
berluban
sebagai
Online M

Terkini W
kemuda

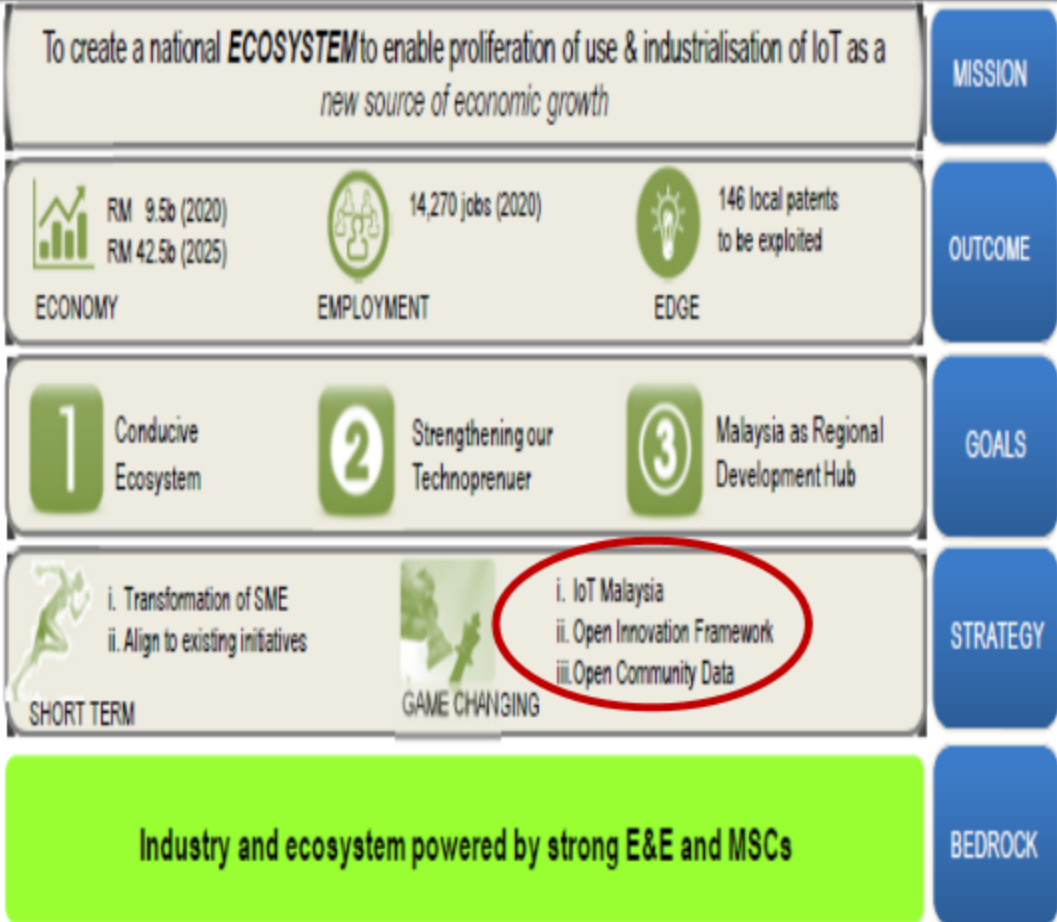
Nilai syarikat: \$1.1 billion (pada 2013)

Bilangan muat turun: 12 juta kali (sehingga Jan 2012)

Bilangan pengguna: 50 juta (sehingga Jun 2012)

INTERNET OF THING (IoT)

Malaysia as the Premier Regional IoT Development Hub

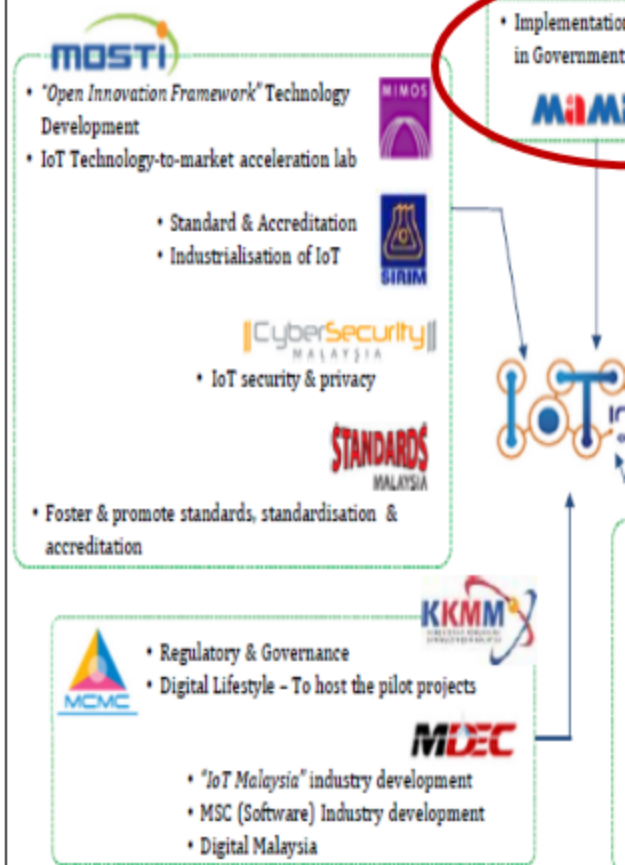


Sumber: National IoT Strategic Roadmap, 2015

MAMPU memudahcara dalam usaha t perkhidmatan kerajaan berasaskan IoT

Collaborative Open Innovation Network:

Alignment of IoT Roadmap and Participating Stakeholders



LANDSKAP ICT MALAYSIA



Sumber: Komunikasi dan Media Buku Maklumat Statistik Q4 2015, Suruhanjaya Komunikasi dan Multimedia Malaysia



MELAYARI I
>6.5 jam



MENONTON T
78 minit



MENDENGA
36 minit



MEM
AKHBAR/
20 minit

AKSES KE INTE



VS



64% : 36%

Rakyat Malaysia kini sangat mudah untuk mengakses maklumat dan maklumat boleh diperolehi di hujung jari.

KERAJAAN DIGITAL DAN GEOSPATIAL - GLOBAL



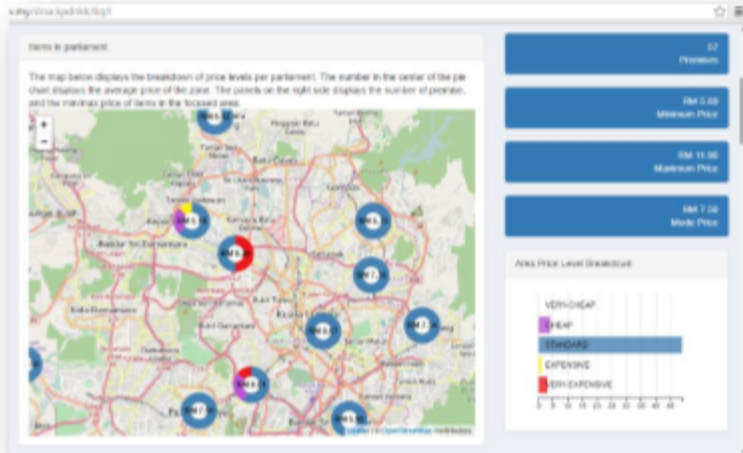
Membina model analisis bagi pembayar cukai pendapatan dengan menggunakan data geospasial untuk mengesan penipuan. Ia berjaya mengurangkan penipuan sebanyak 7% di UK

Data geospasial digunakan bagi memberi amaran kepada orang awam dengan menggunakan aplikasi telefon pintar apabila memasuki lokasi merbahaya. Ini dapat mengelak berlaku jenayah kepada orang ramai



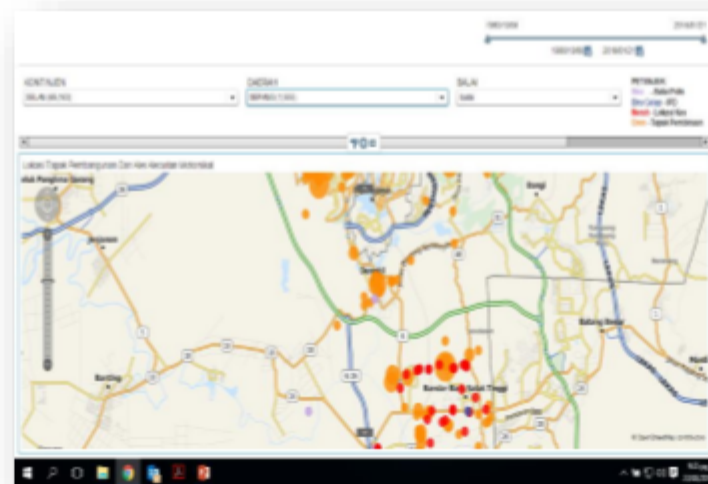
Data geospasial digunakan bagi membina model analisis bagi pembayar cukai pendapatan dengan menggunakan data geospasial untuk mengesan penipuan. Ia berjaya mengurangkan penipuan sebanyak 7% di UK

KERAJAAN DIGITAL DAN GEOSPATIAL - MALAYSIA

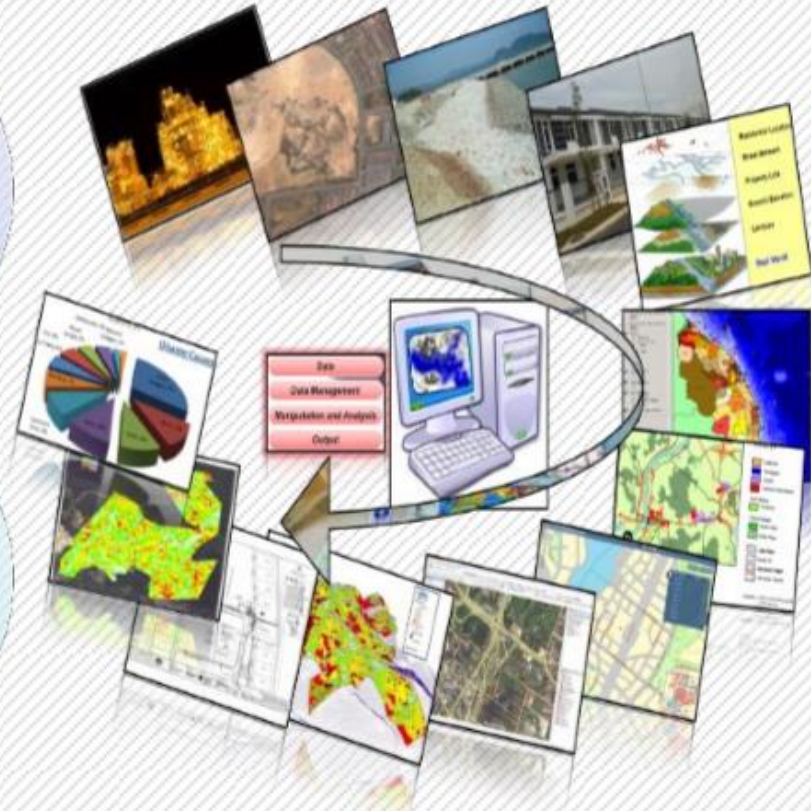
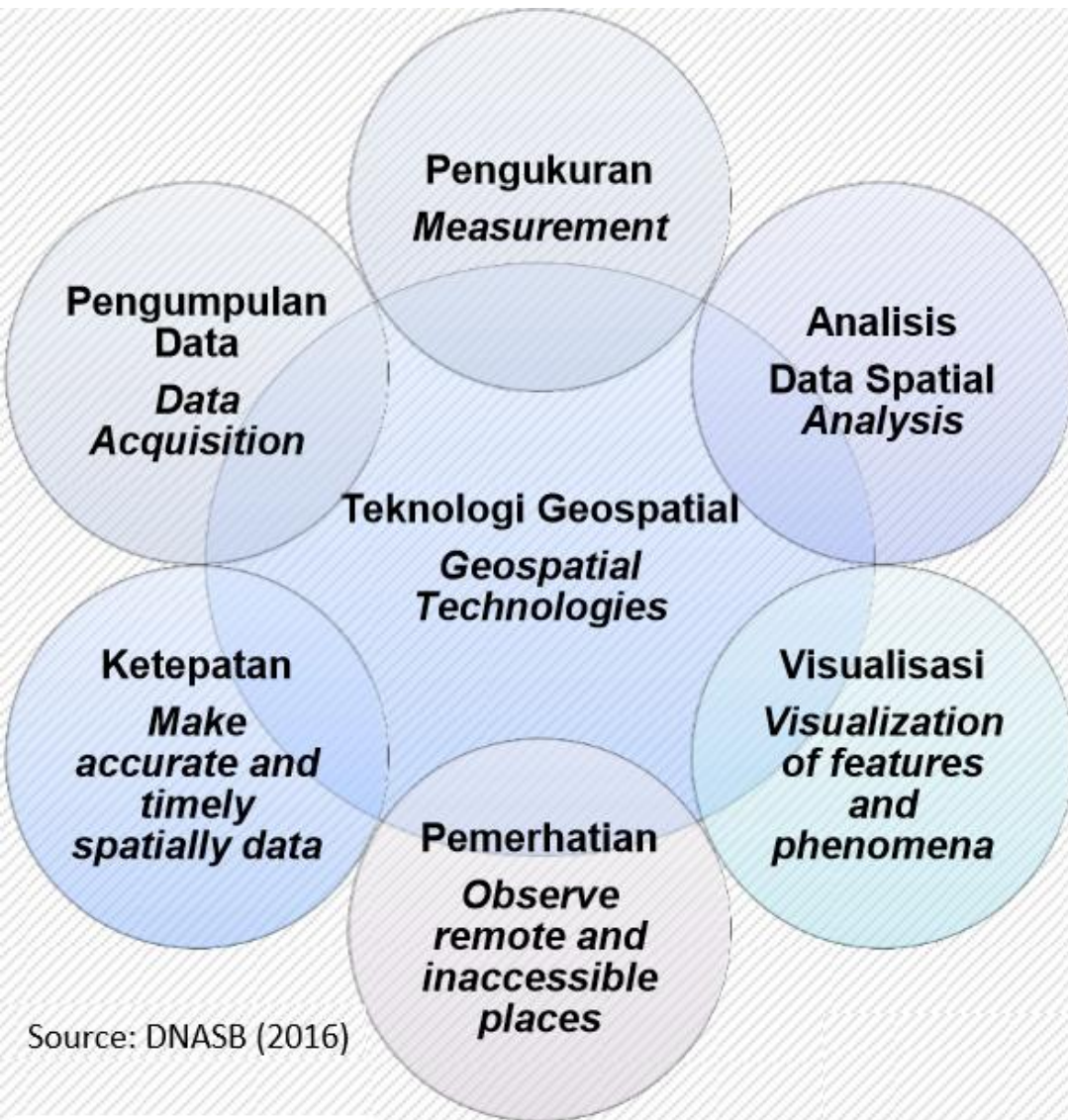


Data geospasial digunakan bagi memaparkan maklumat harga barang mengikut parlimen. Paparan lokasi ini memudahkan penguatkuasa KPDNKK untuk membuat perancangan serbuan jika terdapat premis mengenakan harga barang yang terlalu mahal

Korelasi data kes kecurian motosikal dan data lokasi tapak pembinaan. Taburan lokasi kes kecurian motosikal di tapak pembinaan membantu PDRM memantau lokasi dan masa kejadian. Ini membolehkan PDRM merancang kekerapan masa rondaan di lokasi yang banyak berlaku kes jenayah.

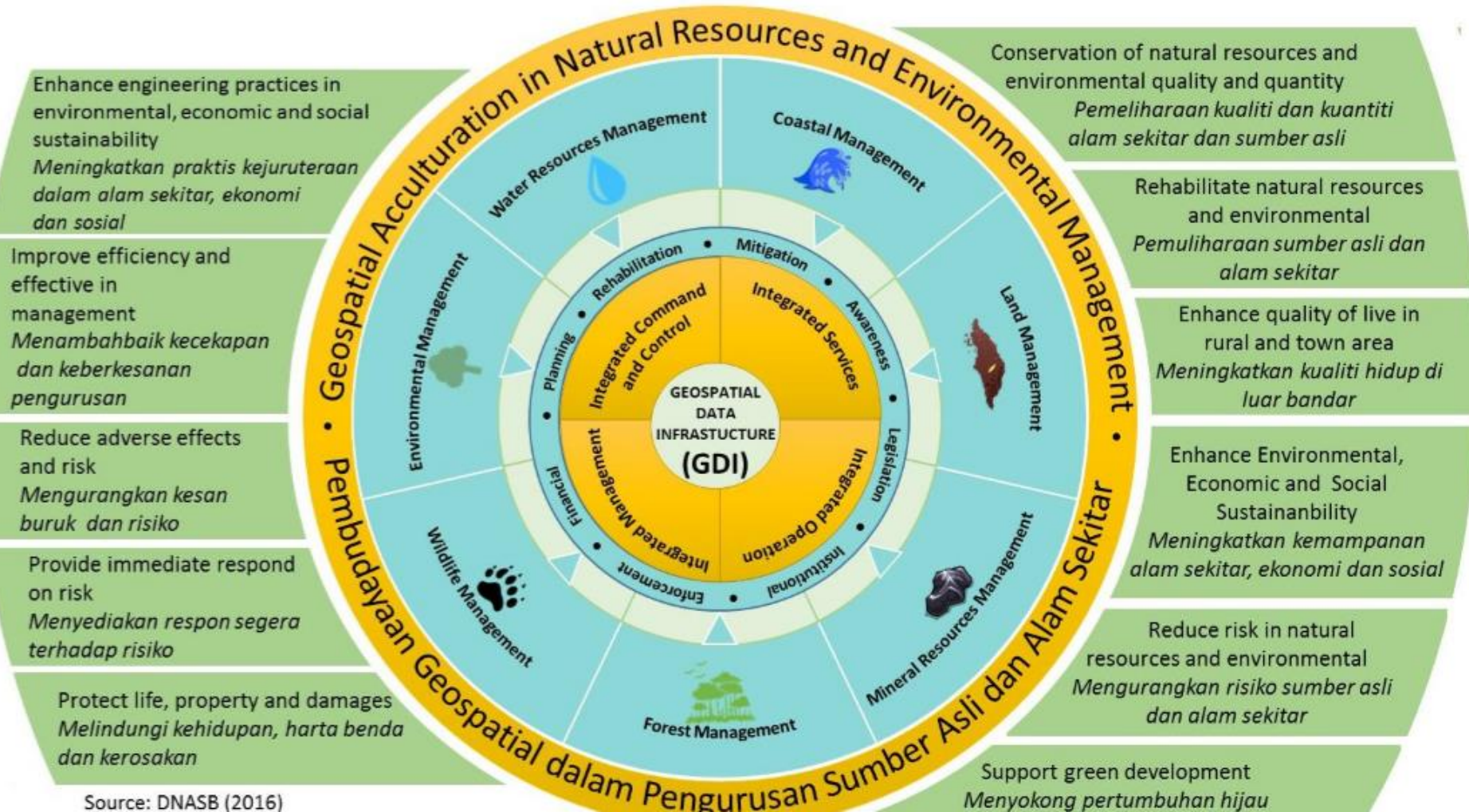


Visualisasi bagi 90 tapak menggunakan data dari agensi NA (rainfall), n (streamflow) boleh digu bertanggung persediaan



Source: DNASB (2016)

PEMBUDAYAAN GEOSPATIAL DALAM PENGURUSAN SUMBER ASLI DAN ALAM SEKITAR



Source: DNASB (2016)

PENGURUSAN YANG LEBIH EFEKTIF DENGAN TEKNOLOGI GEOSPATIAL

Water and Environmental Management

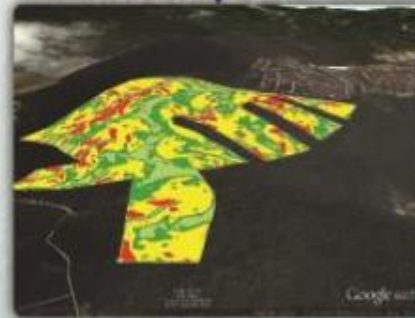
Data Management
Storing, managing and maintaining accurate records

Operational Awareness
Disseminating knowledge where and when it is needed

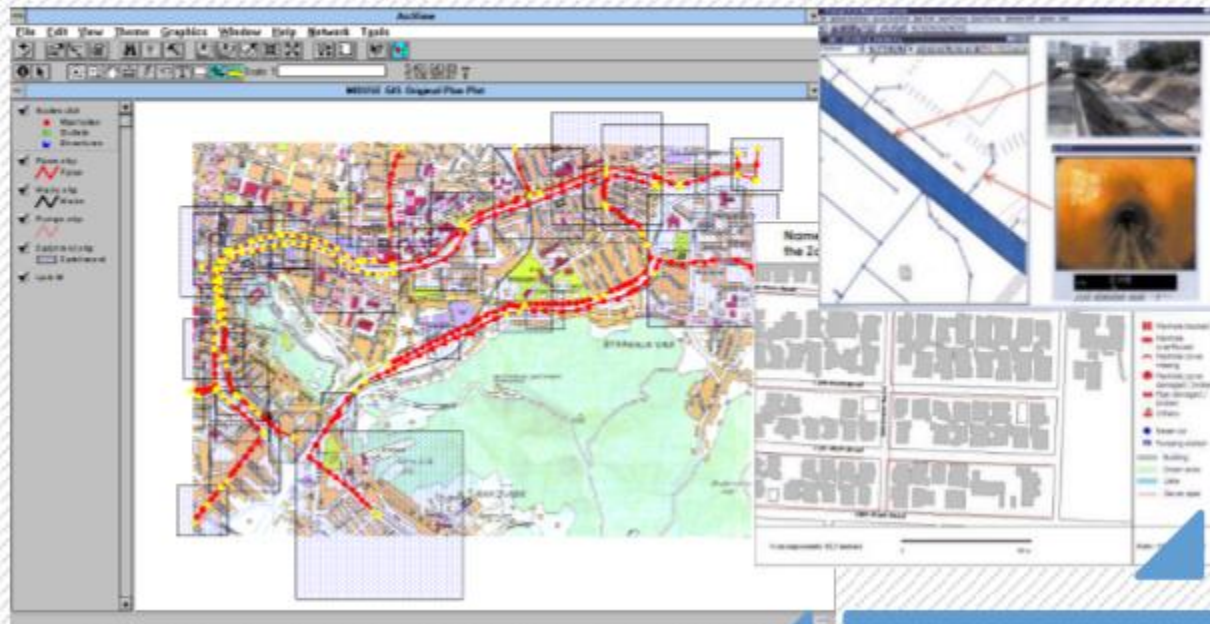
Planning and Analysis
Transforming information into actionable intelligence

Field Mobility
Sharing information with stakeholders

Decision Support System
Assisting in decision making while solving spatial problems.



PENGURUSAN ASSET



Memposisikan semua aset sistem

Mengurus dan menyimpan maklumat mengenai operasi dan penyelenggaraan sistem

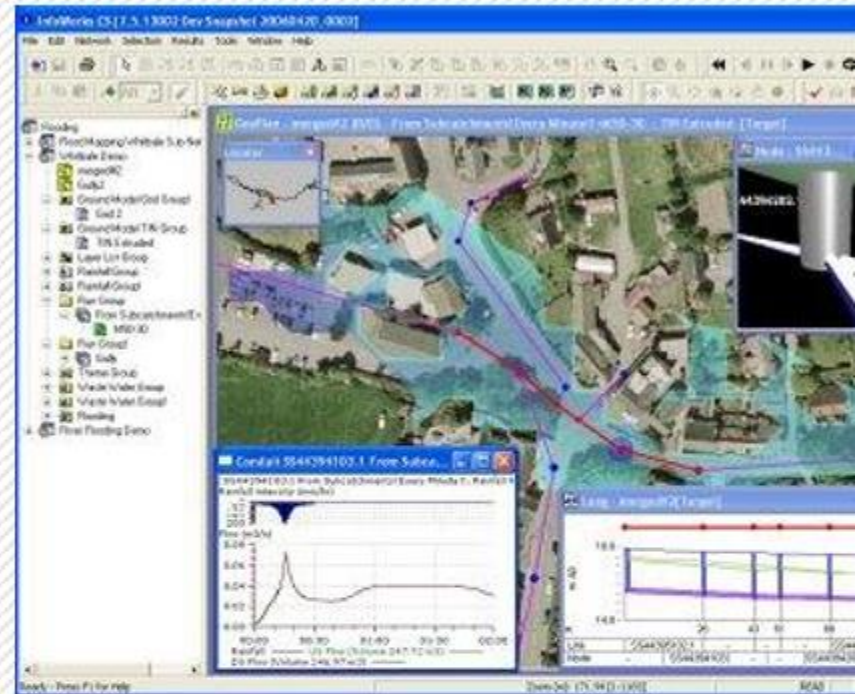
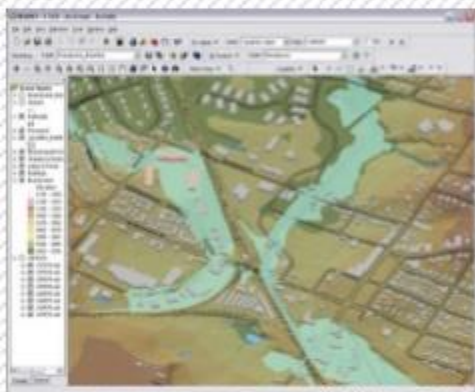
Membantu dalam perancangan sumber manusia, kemudahan dan perbelanjaan

Sokongan dalam lukisan reka bentuk perancangan

Menyediakan perkhidmatan pelanggan yang lebih baik (termasuk pengesanan aduan),

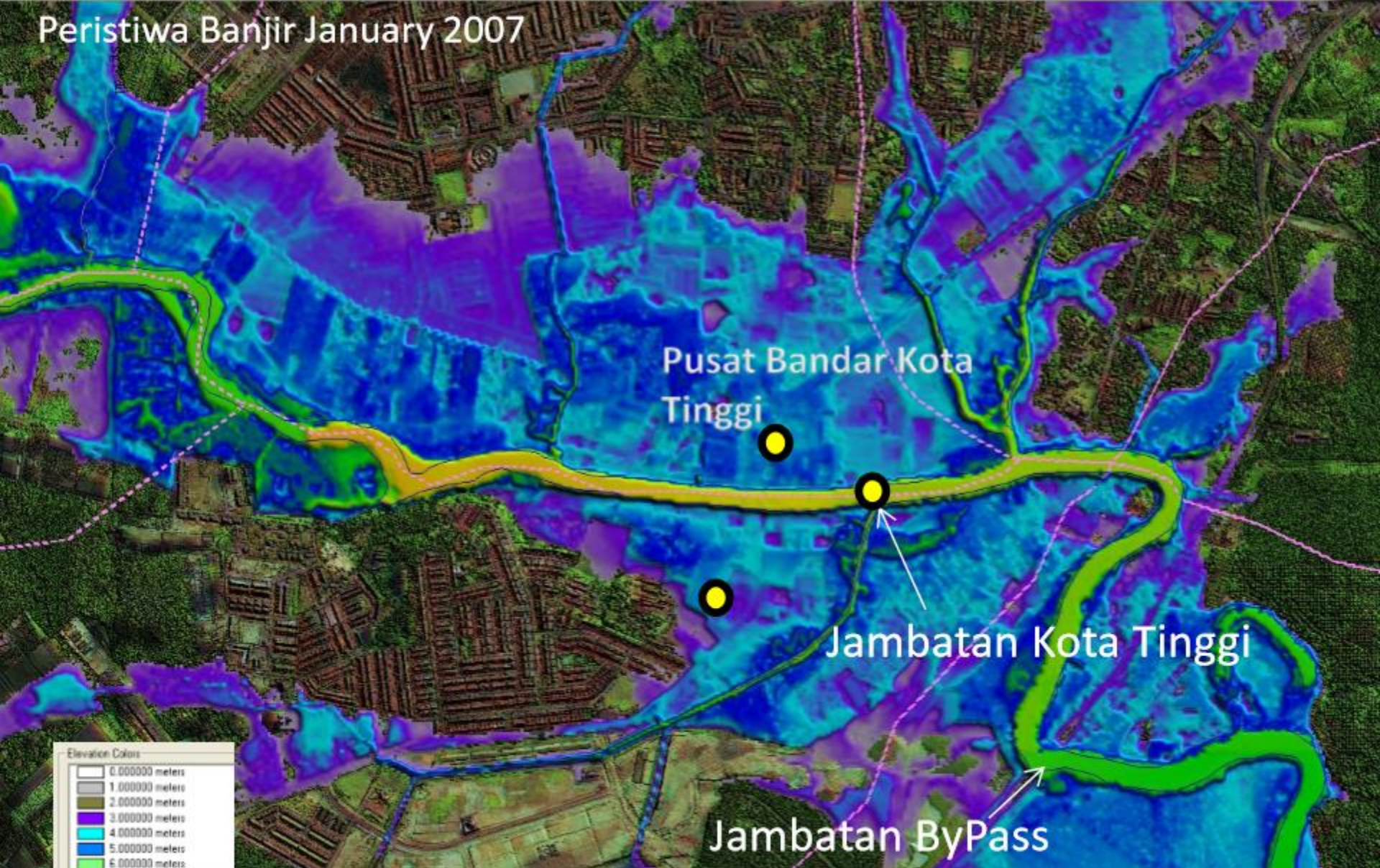
PENGURUSAN RISIKO

- Interaksi dengan Alam Sekitar
- Analisis Sosio-ekonomi
- Pengurusan Guna Tanah
- Pengurusan Banjir
- Pengurusan Bencana



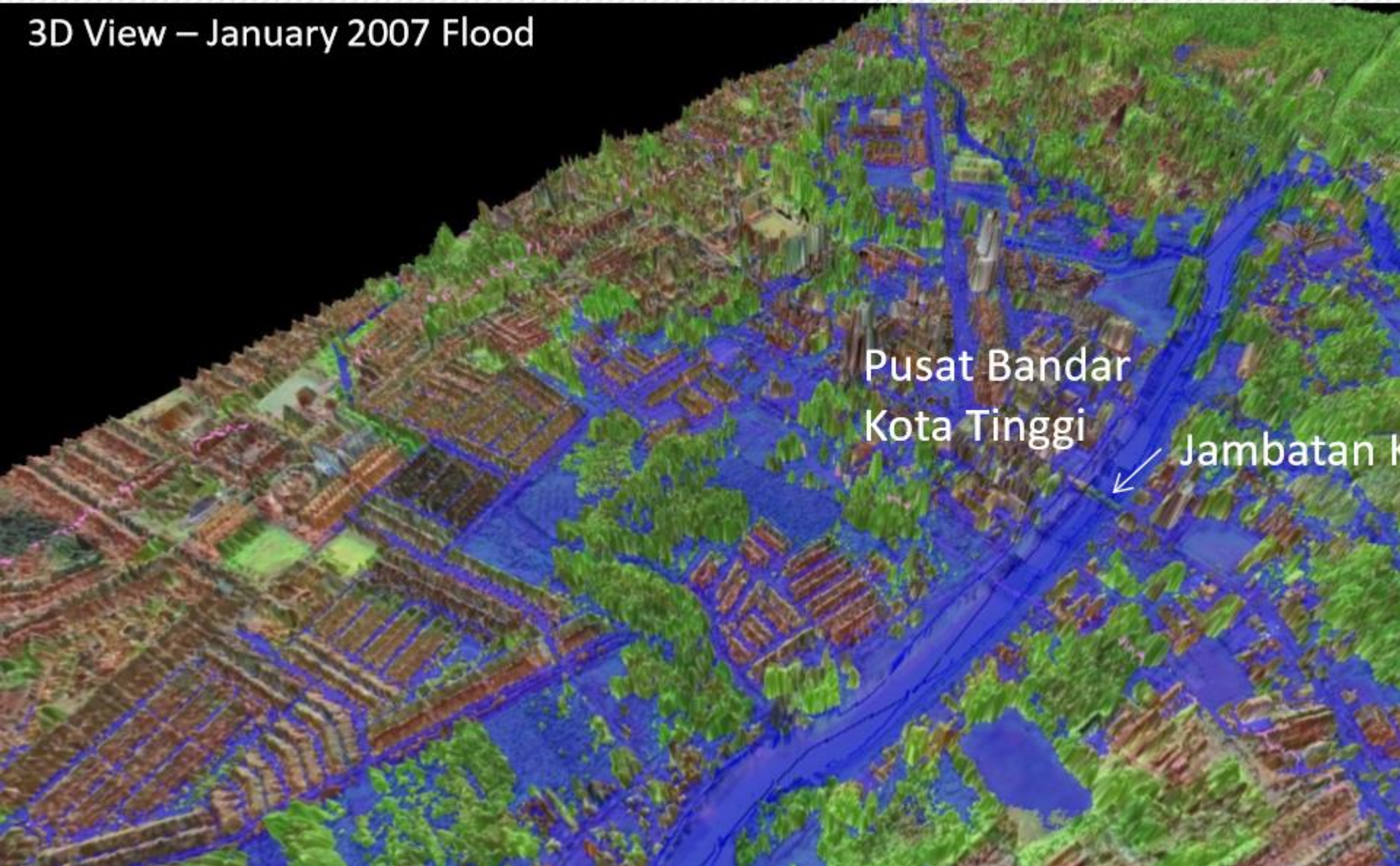
PEMODELAN BANJIR

Peristiwa Banjir January 2007



3D VIEW

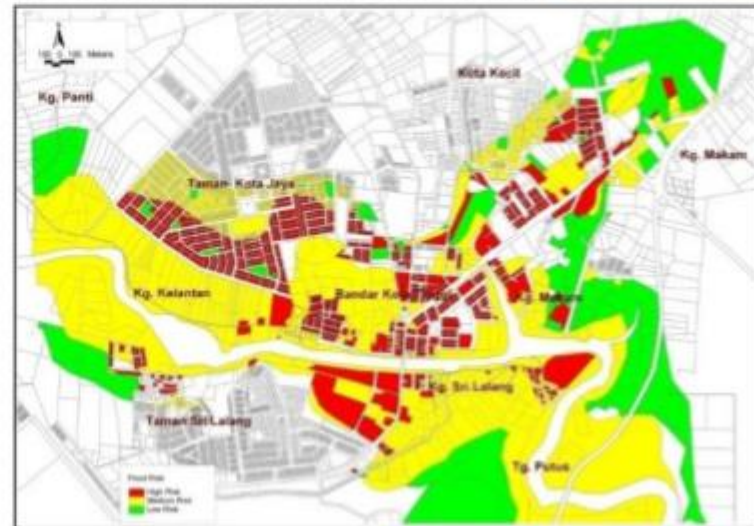
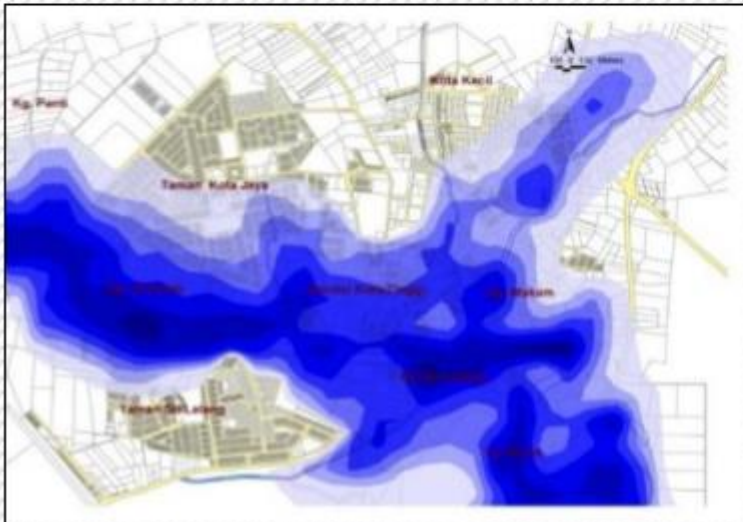
3D View – January 2007 Flood



Pusat Bandar
Kota Tinggi

Jambatan K

PENGURUSAN HAZARD



PETA EVAKUASI BAGI BANDAR KOTA TINGGI



Legend

- Fire Station
- Police Station
- Community Hall
- Hospital
- School
- Mosque
- Agency
- Clinic
- Road
- Railway
- Water body
- River

Elevation Range

- 0.01 - 0.5
- 0.5 - 1.0
- 1 - 1.5
- 1.5 - 2.0
- 2 - 2.5
- 2.5 - 3.0
- More than 3.0m

Ketua Kampung

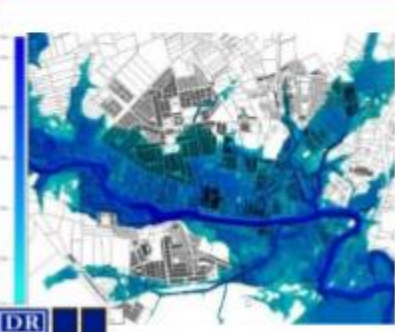
Your Evacuation Centre

Contact In Emergency

Fire Station	07-8831444
Police Station	07-8831222 07-8831223 07-8836733 07-8831221
Hospital	07-8831220
Disaster Operation Centre	
Flood Command Centre	07-8893122 07-8893123 07-8893124 07-8893125
Disaster Coordinating Council	
District Social Welfare Office	07-8835536



In Case of Jan 2007 Flood Event



STAND ALONE

Desktop User Application



ONLINE VIEWER ACCESSIBILITY

Delivery Channel

Terminal Services
Web Services



Web User Application



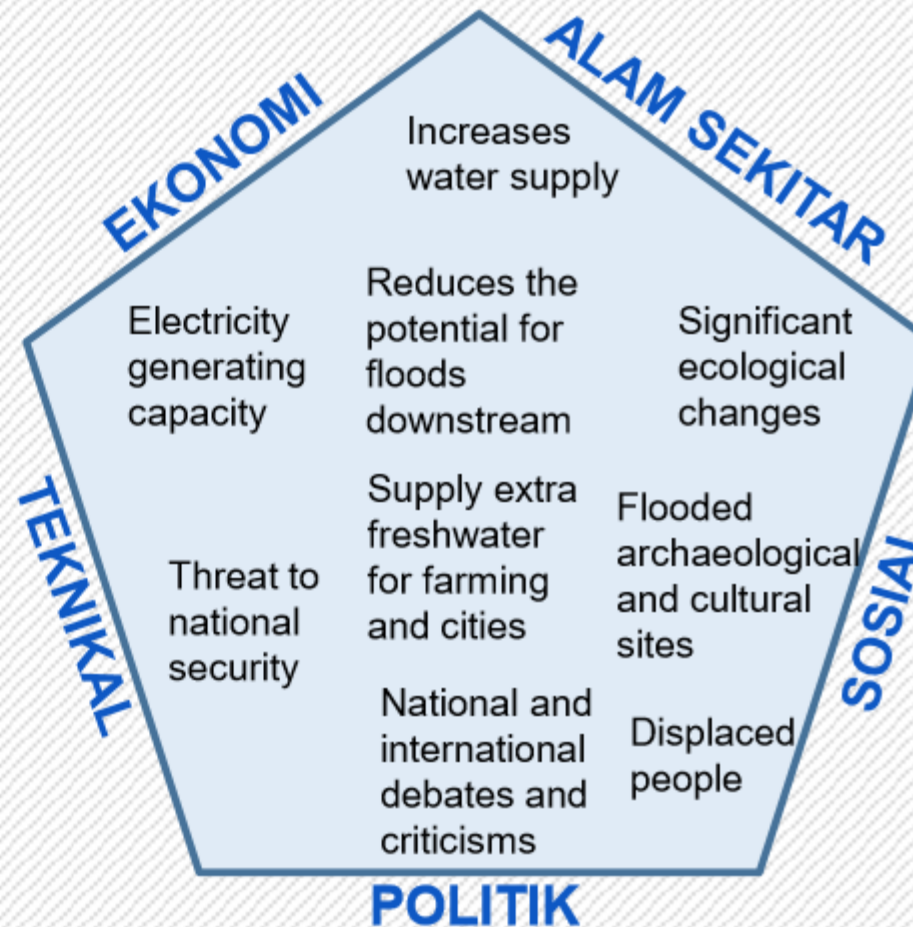
Mobile User Application

DMSS UNTUK KECEKAPAN

MEMBUAT KEPUTUSAN YANG LEBIH TEPAT DENGAN TEKNOLOGI GEOSPATIAL

Bagi menyokong keputusan berkaitan pengaruh dan implikasi berikut

- i. Teknikal
- ii. Ekonomi
- iii. Alam Sekitar
- iv. Sosial
- v. Politik



Characteristics of a smart city

Smart Economy

Smart People

Smart Governance

Smart Mobility

Smart Environment

Smart Living



Characteristics and factors of a smart city

SMART ECONOMY (Competitiveness)

- Innovative spirit
- Entrepreneurship
- Economic image & trademarks
- Productivity
- Flexibility of labour market
- International embeddedness
- *Ability to transform*

SMART PEOPLE (Social and Human Capital)

- Level of qualification
- Affinity to life long learning
- Social and ethnic plurality
- Flexibility
- Creativity
- Cosmopolitanism/Open-mindedness
- Participation in public life

SMART LIVING (Quality of life)

- Cultural fa
- Health con
- Individual s
- Housing qu
- Education
- Touristic a
- Social cohe

SMART GOVERNANCE (Participation)

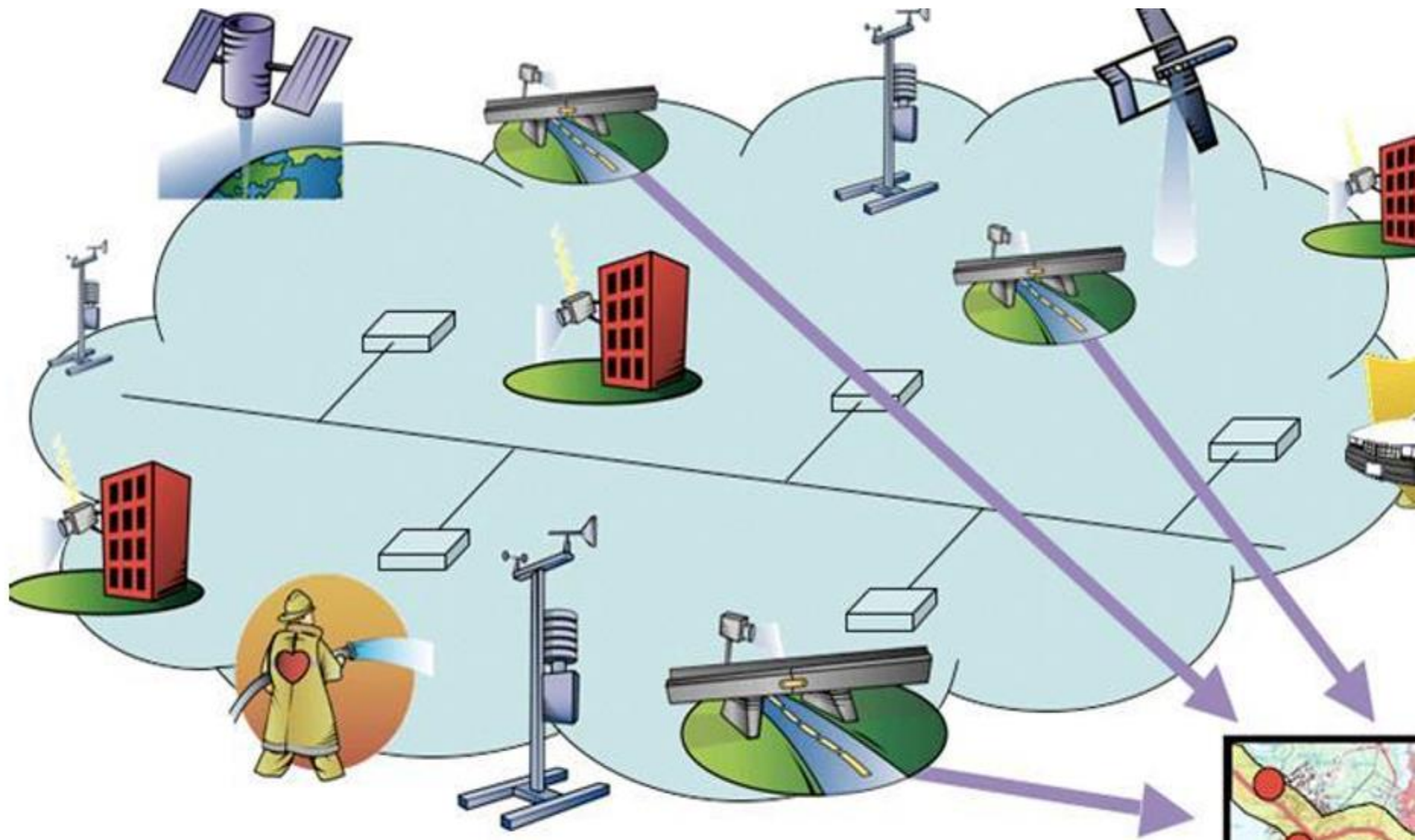
- Participation in decision-making
- Public and social services
- Transparent governance
- *Political strategies & perspectives*

SMART MOBILITY (Transport and ICT)

- Local accessibility
- (Inter-)national accessibility
- Availability of ICT-infrastructure
- Sustainable, innovative and safe transport systems

SMART ENVIRON (Natural resour

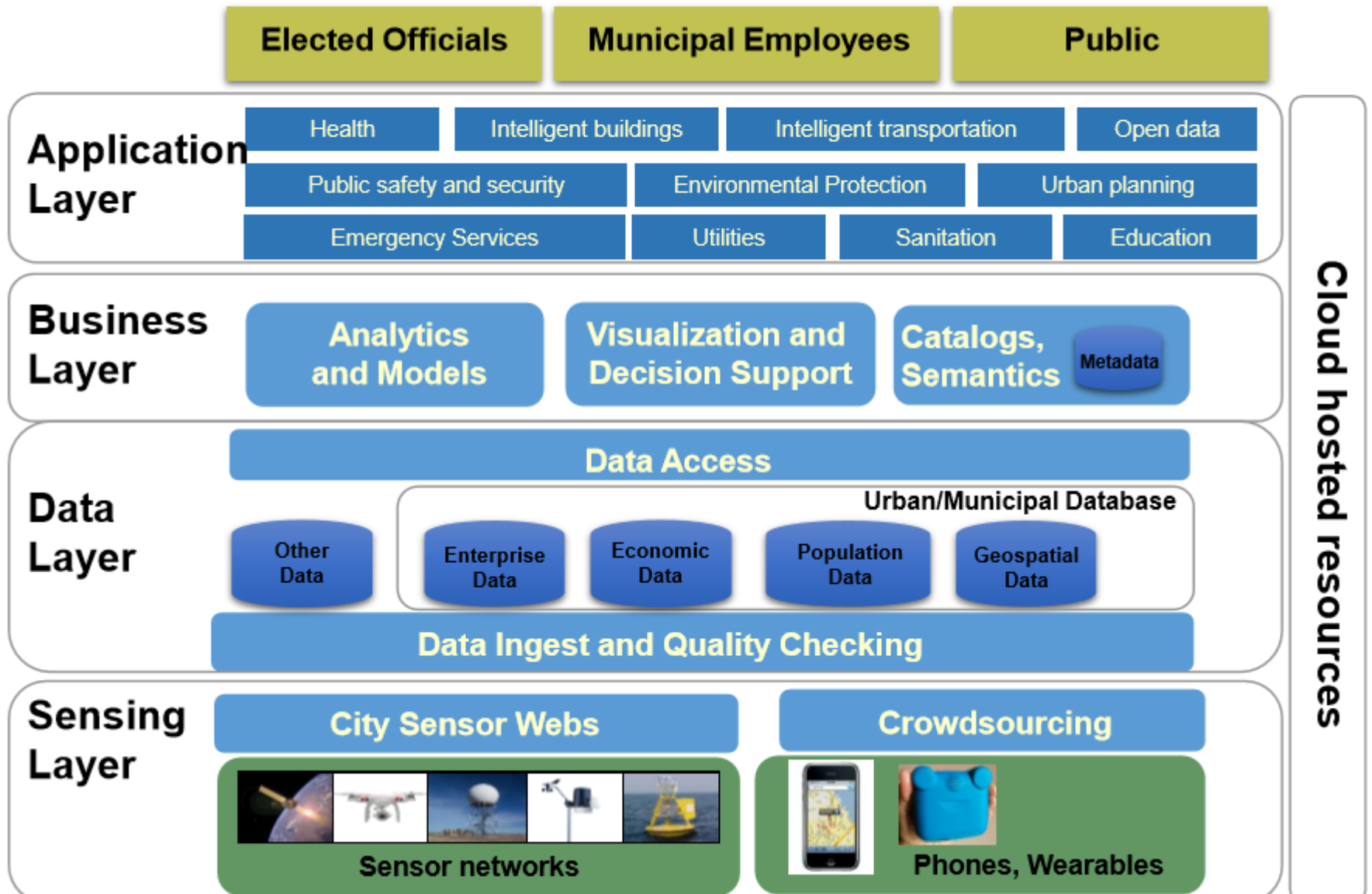
- Attractivity conditions
- Pollution
- Environmen
- Sustainable management



- All sensors reporting position
- All connected to the Web
- All with metadata registered

- All readable remotely
- Some controllable remotely

Smart City Enterprise Components



No.	Services	Components
1.	Waste Monitoring Management	<ul style="list-style-type: none"> • Servers (Database and Application) • Sensors (Waspote, MyRIO, Arduino) • Web Apps Modules (for Control Centre)
2.	Licensing Enforcement Management	<ul style="list-style-type: none"> • Servers (Database and Application) • Sensors (RFID, QR Code) • Web Apps Modules (for Control Centre)
3.	Facility Management	<ul style="list-style-type: none"> • Servers (Database and Application) • Web Apps Modules (for Control Centre)
4.	City Complaint Management	<ul style="list-style-type: none"> • Servers (Database and Application) • Web Apps Modules (for Control Centre)

Smart Waste Management

Objective

1. Value-add existing Solid Waste Management process for waste management under local authorities.
2. To help in decision making for waste management process.
3. To ensure the contractors follow the work procedure.

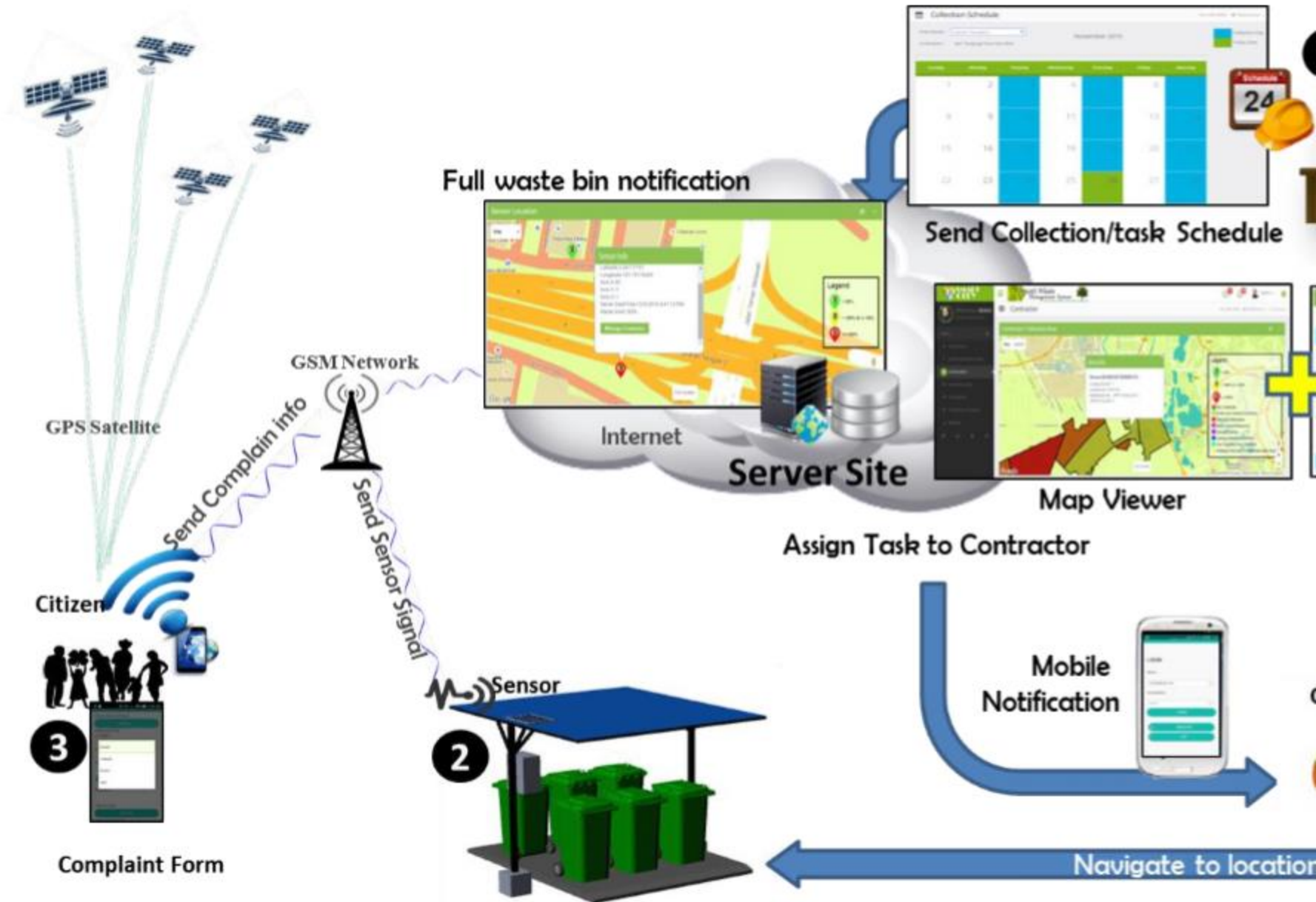


Map Viewer

Modules

- 1 Sensor Management
- 2 Contractor Management
- 3 Waste Collecting Schedule Management
- 4 Complaint Management

Smart Waste Management



DATABASE DEVELOPEMENT

VERTICAL



SEAMLESS LAND USE DATA

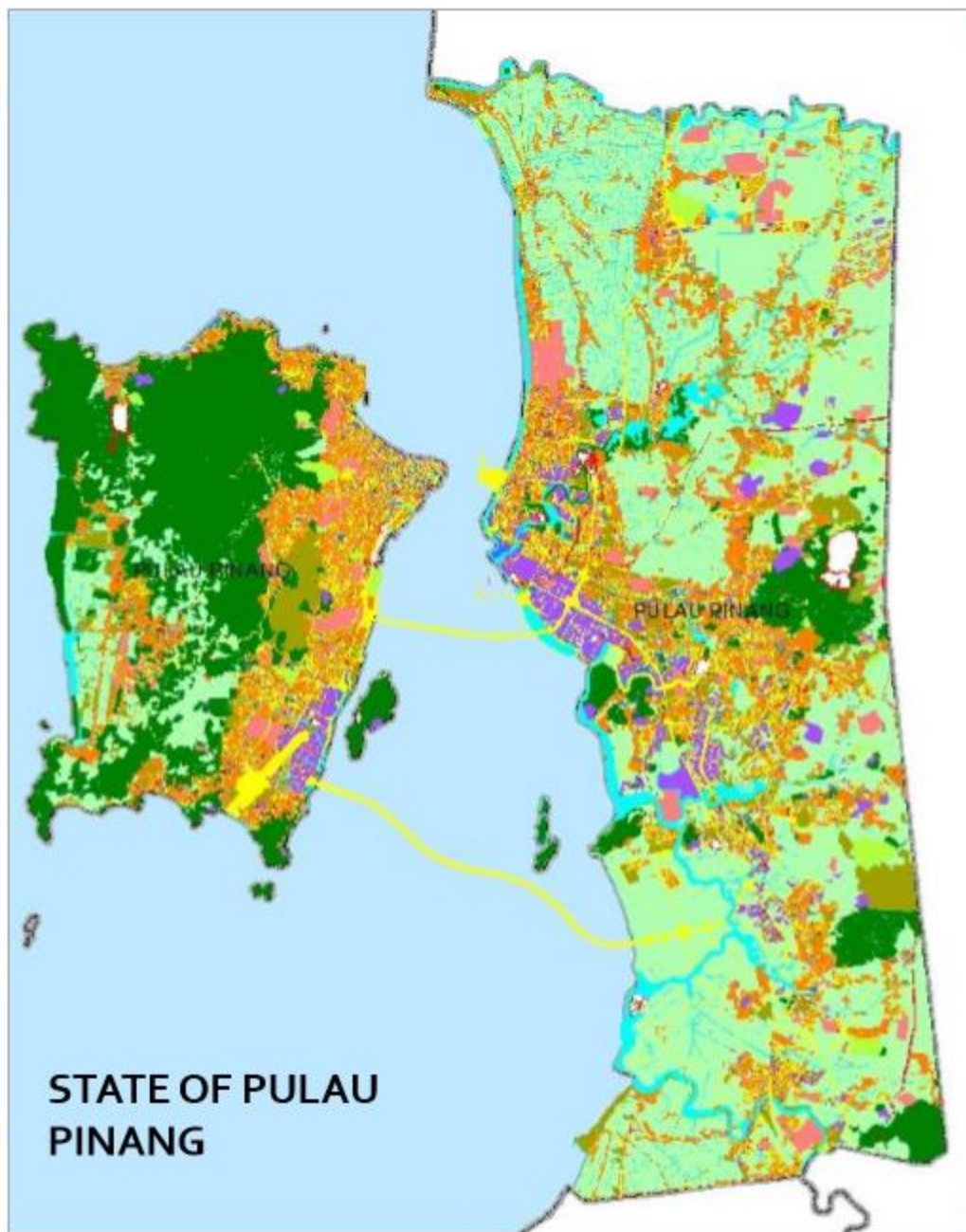




EXISTING LANDUSE



- 11 State
- 101 Local Authorities
- 88 District + 2 Federal Territories



STATE OF PULAU
PINANG



Land

- Resid
- Com
- Indus
- Instit
- Infras
- Vacat
- Oper
- Trans
- Lives
- Agric
- Fores
- Wate

NBOS

STRATEGI LAUTAN BIRU KEBANGSAAN



**IDEA KREATIF
& INOVATIF**



**KOLABORASI
SEMUA AGENSI**



**KOS
RENDAH**



**TINGKATKAN
PENYAMPAIAN**



**SUMBER
SEDIA ADA**



**BERIMPAK
TINGGI**



API (Application Programming Interface)

- API adalah singkatan daripada 'Application Programming Interface' di mana ia adalah satu arahan bahasa pengaturcaraan dalam pembangunan perisian, protocol, struktur data yang standard untuk mengakses aplikasi web dengan menggunakan perisian aplikasi web
- API digunapakai oleh umum agar interaksi perkongsian dapat dijalankan dengan terancang dan mudah.
- Penggunaan API diantara aplikasi dengan aplikasi yang lain dapat dihubungkan supaya maklumat atau data boleh dikongsi antara satu sama lain tanpa perlu melalui proses penterjemahan atau pengubahsuaian kod pengaturcaraan.
- API adalah pintu kepada laluan informasi yang ingin diperolehi dari pelbagai sumber dari luar
- Dapat mempercepatkan proses pembangunan aplikasi dengan mudah melalui proses mengintegrasikan alat kawalan dan system

Infrastruktur Komunikasi



Camouflage



Rooftop



Concrete



Monopole



Steel Tower



Satellite Farm



Cable Landing Station

Lokasi Perkhidmatan / POI



MyComms

Profile Admin Report Home Feedback Logout

Pusat Internet 1M

Enter a location

All State --District-- --Mukim--

Peta Liputan

MyComms

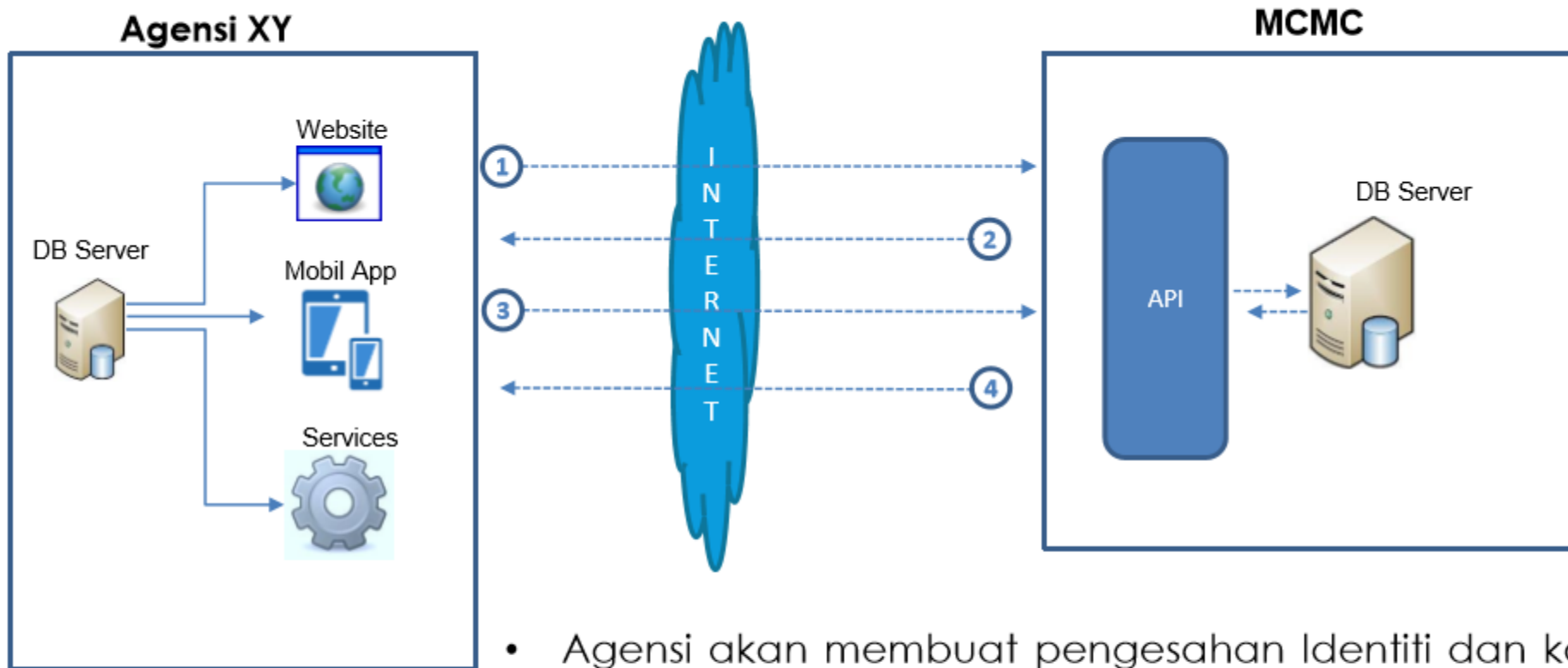
Profile Admin Report Home Feedback Logout

Wireless Service Coverage - 3G

Enter a location

All State --District-- --Mukim--

Konsep API



- Agensi akan membuat pengesahan Identiti dan kata laluan yang diagihkan kepadanya oleh MCMC
- CIMS server akan memulangkan "TOKEN" sekiranya pengesahan betul.
- Agensi akan meminta penyataan (select, update, insert atau delete) dengan token sekuriti
- CIMS server akan memulangkan keputusan kepada agensi

Important Keywords:

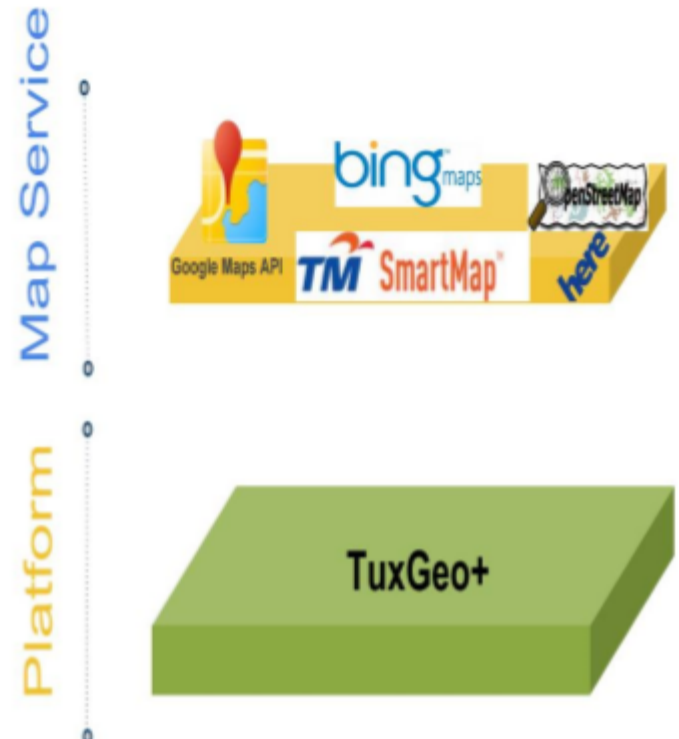
People In Needs : Vulnerable people including the disabled people, elderly, pregnant women, children, people with medical conditions.

Telegram BOT API : free cross, cloud based –platform messaging apps (messages can be sent and accessed from multiple devices).

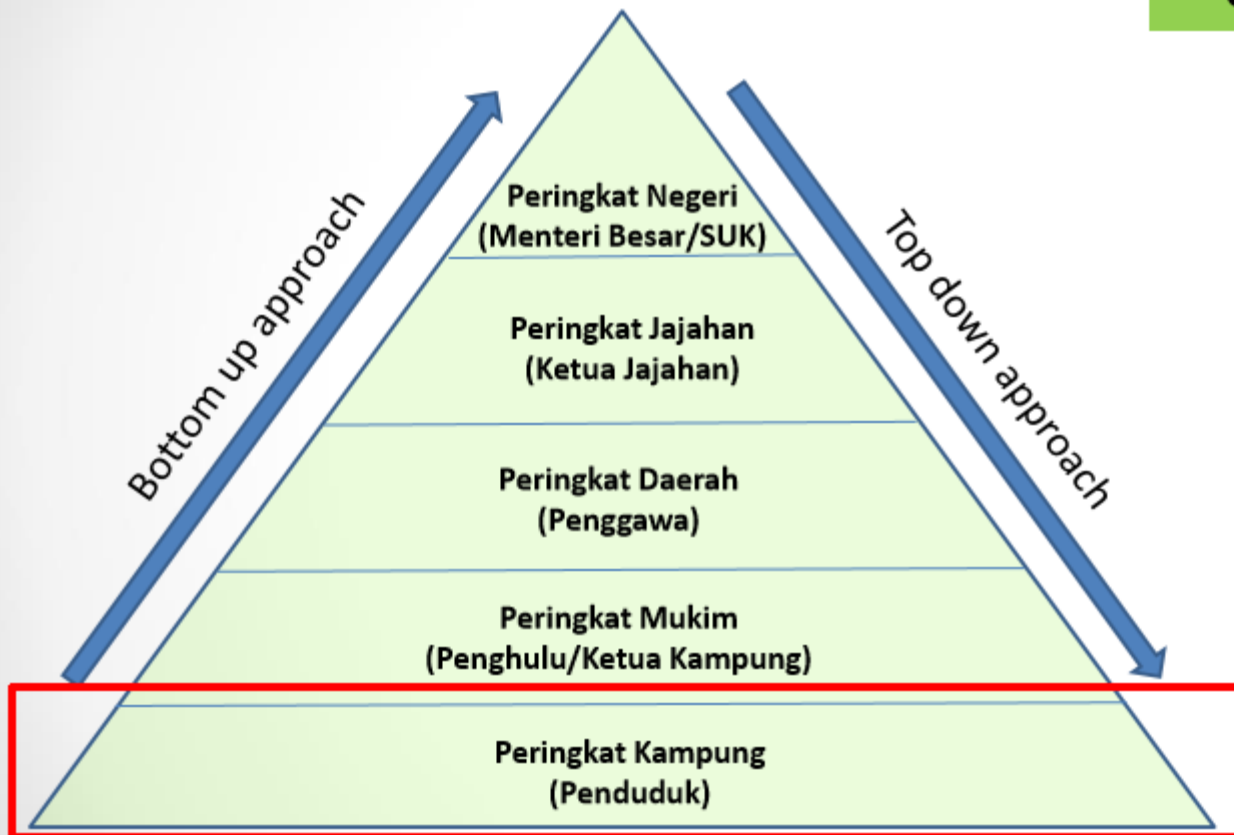
Tuxgeo+ Backend : Cloud based map visualization platform that can be accessed via web and mobile

Geospatial Database: the data or information that identifies the geographic location of features and boundaries.

Non-geospatial Database : the data or information that not consider the geographic location such as socio-demographic data



Disaster Preparedness Level at State Level



Schedule of Coordination Meeting

July every Year
(JPBN)

August every Year
(JBPD)

September every
Year

October every Year

October every Year

Increased the capacity/awareness of the people

Source: *Majlis Keselamatan Negara, Negeri Kelantan*

Information of individual in needs / requiring supports

Personal information of people in needs

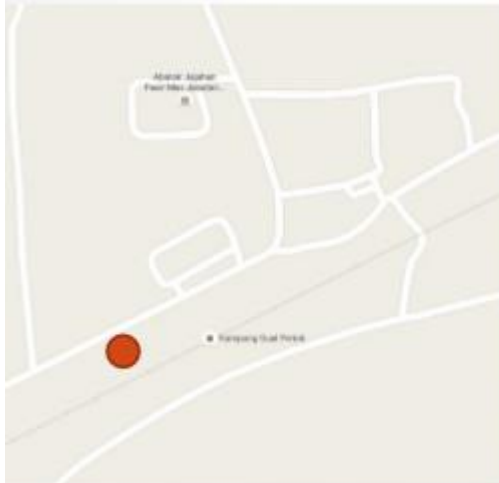
- Name
- IC No.
- Gender
- Contact no.

Send location

Snapshot of the house

Risk level and EC

Health and mobility Conditions



- R1
- R2
- R3
- R4
- R5

- D1
- HD1
- TR3
- ETC

Snapshot of the house



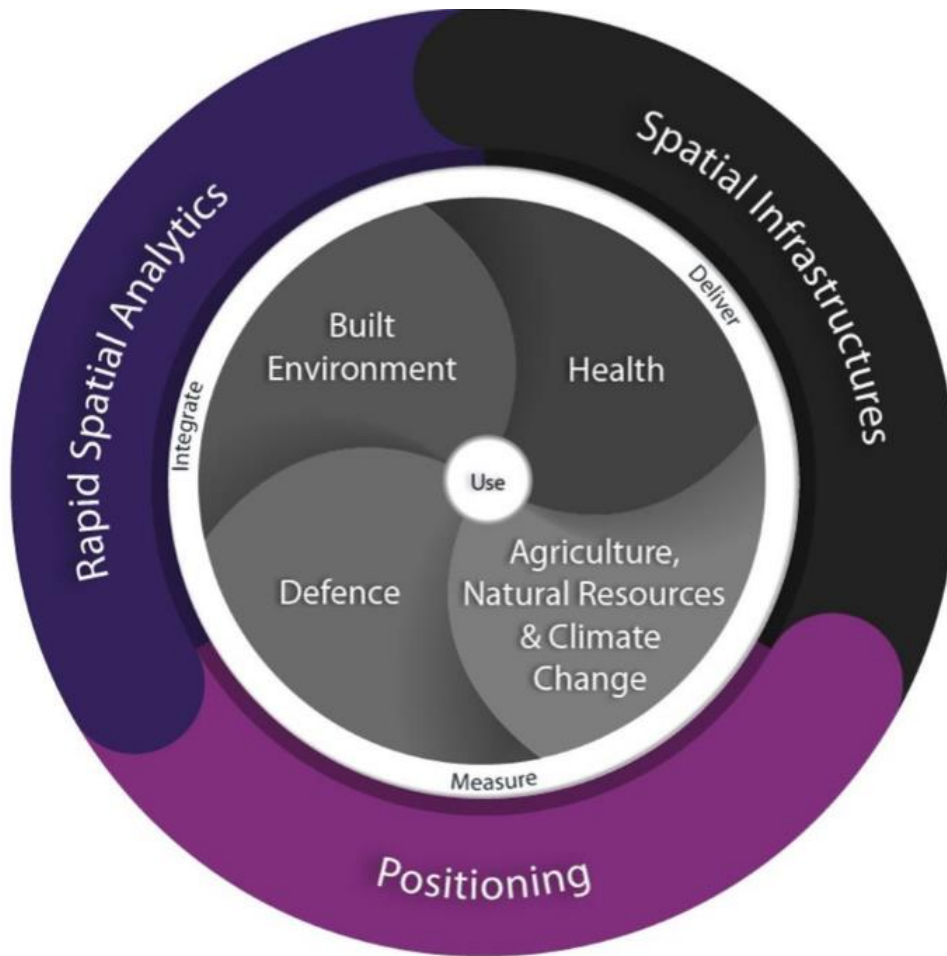
Data

Information

Knowledge

Decision

Action



- Measure
- Integrate
- Deliver
- Use

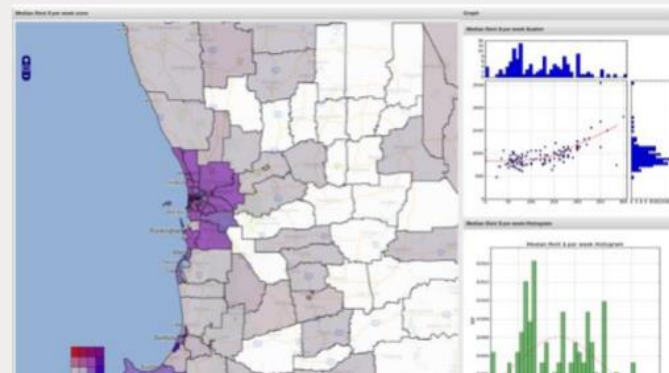
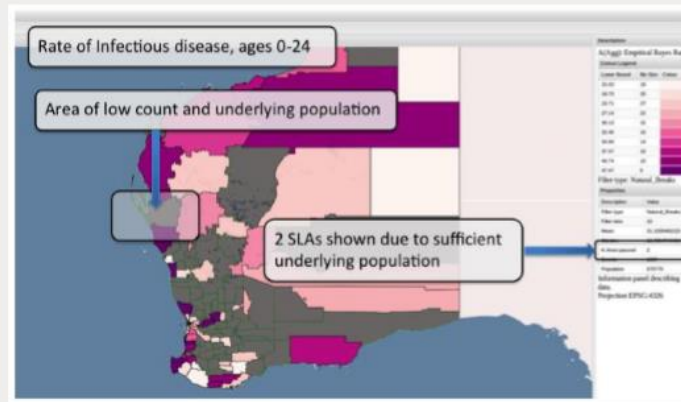
Health: Access to crucial population health data



HealthTracks and Epiphaneee

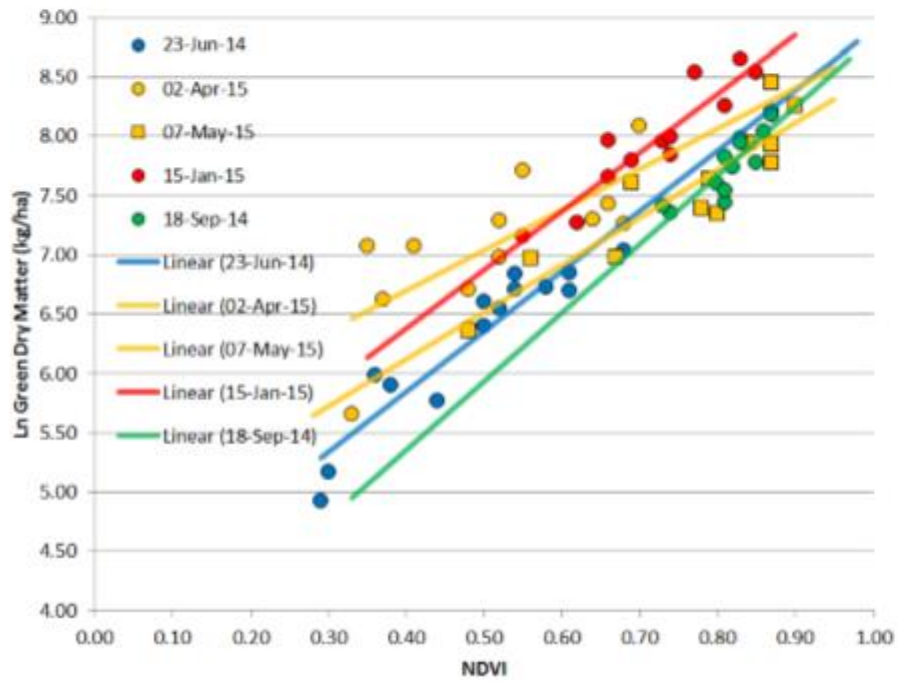
- 150 Users in WA Department of Health
- 10,000 reports so far
- Open up access to millions of patient records
- Highly dynamic
- Processing on the fly
- Visualises complex health data in simple presentations
- Privacy issues addressed
- Being used for mapping obesity, diabetes and many other diseases
- On track for commercialisation through an EOI
- Adapted by Victorian Department of Environment and Planning for Land Capability Mapping

Courtesy: Narelle Mullan

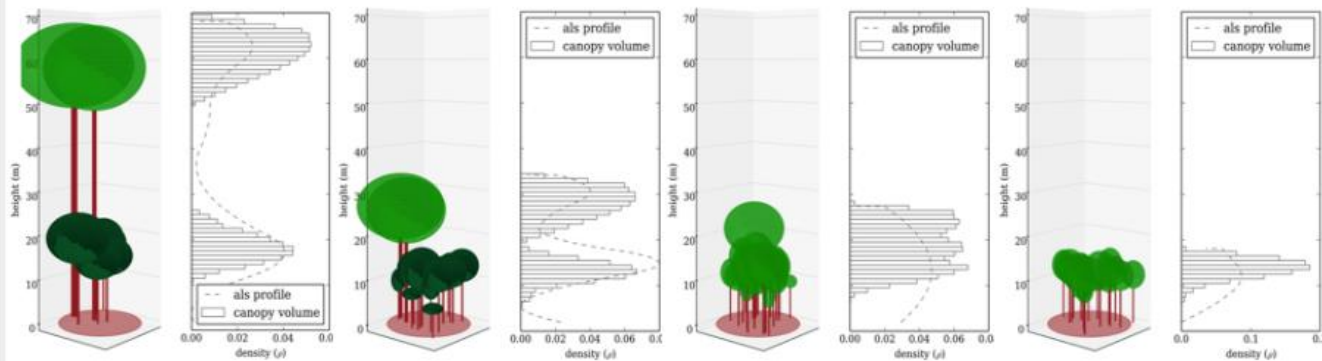




Sundown Lucerne all calibrations



Canopy height profiles



Canopy height profiles from Airborne LiDAR data and forest inventory measurements.

Key result: an automated approach to estimate canopy layers; position and density from airborne LiDAR. Will lead to the creation of a tool kit for widespread operational use.

Future of Sea Level Rise and Coastal Flood Modelling



What is Geospatial Analysis?

- Geospatial analysis is the gathering, display, and manipulation of imagery, GPS, satellite photography and historical data, described explicitly in terms of geographic coordinates or implicitly, in terms of a street address, postal code, or forest stand identifier as they are applied to geographic models.
- The many applications of geospatial analysis include crisis management, climate change modeling, weather monitoring, sales analysis, human population forecasting and animal population management.
- Geospatial analyst filter out relevant from irrelevant data and apply it to conceptualize and visualize the order hidden within the apparent disorder of geographically sorted data. Doing so allows them to provide accurate trend analysis, modeling and predictions. However, analysts must remain vigilant to try to avoid spatial fallacies, biases or misunderstanding effects and causal relationships: Geospatial analysis is sometimes considered to encompass as much intuition as it does science.

What is Geospatial Intelligence?

- Geospatial Intelligence or “GEOINT” is actionable knowledge, a process, and a profession. It is the ability to describe, understand, and interpret so as to anticipate the human impact of an event or action within a spatiotemporal environment.
- It is also the ability to identify, collect, store, and manipulate data to create geospatial knowledge through critical thinking, geospatial reasoning, and analytical techniques.
- Finally, it is the ability to ethically collect, develop, and present knowledge in a way that is appropriate to the decision-making environment. Geospatial Intelligence doesn't just provide the means by which to answer the questions of what?, when?, and where?, but also how?, why?, and what is the significance? Central to this proposed definition is the notion that the best geospatial intelligence resource is an educated analyst and that intelligence is about nothing if not about “out-thinking” your opponent.
- For all the appropriate emphasis on technologies, methodologies, tools, and infrastructure, people still are the most precious resource.

<https://southfront.org/what-is-geospatial-intelligence/>