



Application of Geospatial Technologies for Natural Resources and Environmental Management in Malaysia

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The Needs for Geospatial Information

- **For identifying abundance of natural resources**
- **For sound management and utilization of natural resources**
- **For identifying Impact of extraction/exploitation of natural resources on environmental health**
- **For expedient and quick decisions and actions**
- **For strategic planning and management of natural resources and environment**

Natural Resources



Categories of Natural Resources In Malaysia



Abundance of Forest Resource



- **Peninsular Malaysia: 5.789 mil. ha.**
 - **Sabah: 4.436 mil. ha.**
 - **Sarawak: 10.095 mil. ha.**
 - **Total: 20.312 mil. ha.**
 - **Permanent Forest Reserve: 12.739 mil. ha.**
- Peninsular 4.793 mil. ha.,
Sabah 4.337 mil. ha.,
Sarawak 4.387 mil. ha.**

Ecology of Forest Resource

- ❖ **Mangrove Forest**
- ❖ **Beach/Littoral Forest**
- ❖ **Peat Swamp Forest**
- ❖ **Lowland Mixed Dipterocarp Forest**
- ❖ **Hill Mixed Dipterocarp Forest**
- ❖ **Montane and Sub-Montane Forest**



Forest Industry



Forest Industry contributed RM20.2 bil. to GDP and avail job opportunities to 500,000 Malaysians in 2012

Forest Management Conflicts



**Exploitation in licensed
Concession Areas**



**Illegal Forest
Harvesting:
647 ha. (2006 –
2011)**

Abundance of Mineral Resource



Metals:

- ✓ Bauxite
- ✓ Gold
- ✓ Ilmenite
- ✓ Iron Ore
- ✓ Manganese
- ✓ Rare Earth
- ✓ Rutile
- ✓ Tin
- ✓ Silver
- ✓ Struverite
- ✓ Zirkon

Non-Metals:

- ❖ Rock
Aggregates
- ❖ Clay
- ❖ Coal
- ❖ Feldspar
- ❖ Kaolinite
- ❖ Limestone
- ❖ Mica
- ❖ Sand and
Gravels
- ❖ Silica Sand

Mining Industry



Industry Performance:

- Mining and Quarrying Sector contributed RM6.26 bil. or 1.06% to GDP in 2011
- 289 mines in 2011
- 7,053 workers

Mineral Reserves:

- Silica Sand 155,800,000 m/tons
- Kaolinite 117,180,000 m/tons
- Coal 970,570,000 m/tons
- Iron Ores 50,000,00 m/tons

Threats to Mineral Resource



Exploitation in licenced mining areas
Illegal mining
Unwarranted discard of wastes
Discharge of slurries

Water Resource



**Most valuable
natural
asset to humans**



Threats to Water Resource



- ✓ Climate Change
- ✓ Unplanned developments
- ✓ Uncontrolled physical activities by individuals and groups
- ✓ Unethical actions



Polluted and Degraded Quality

Monitoring Destruction of Natural Resources and Environmental Health



**Remoteness and Inaccessibility:
How and what to do???**

Thus.... The Use of Geospatial Technologies



Geospatial technology is an essential component of **Natural Resources Management Tools**, as natural resources are directly affected by changes in the shape and extent of the proposed disturbance.

Geospatial Technologies

- **Refer to all the means used for the measurement, analysis and visualization of features and phenomena that occur on Earth.**
- **Three commonly used technologies:**
 - ✓ **Global Positioning Systems (GPS)**
 - ✓ **Geographical Information Systems (GIS)**
 - ✓ **Remote Sensing (RS)**

Functions:

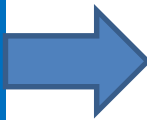
- **Geospatial technologies provide the means to integrate diverse datasets based on their geospatial attributes, thus allowing for holistic analysis.**
- **Geospatial technologies make it possible to observe remote and inaccessible places, thus making accurate and timely spatially distributed datasets readily available (eg., open burning).**

Application: GPS



GPS is a network of 2 dozens satellites, transmitting signals to GPS receivers, allowing them to determine location, direction and speed.

USES



- ✓ Geodetic control for surveying, engineering, mapping...
- ✓ Cadastr survey

Application: GIS

Forest Resource and Environment:

- ✓ Land area and coverage, soil types, species composition, topography, hydrography, infrastructure, rainfall.....

Mineral Resource:

- ✓ Land area, soil chemistry, topography, rock formations and physical properties.....

Water Resource:

- ✓ Hydrography, Aquifers and Ground Water, Topography.

Application: RS

Science and Techniques of obtaining geospatial information about a phenomenon without in contact with it (e.g., flood)



RS Applications for Natural Resources Management

FORESTRY:

- ✓ Identifying forest types and Species
- ✓ Estimating timber volume and yield

MINING:

- ✓ Identifying rock formations and minerals
- ✓ Estimating mineral reserves

WATER

RESOURCE:

- ✓ Determination of water boundaries and surface areas
- ✓ Mapping of floods and flood plains

ENVIRONMENT: Monitoring land degradation and pollution, water pollution, air pollution, open burning, impact of natural disasters...

Spatially-Enabled Information

Human decisions, about 80%, always involve a WHERE (locations) question:

- ❖ **Locations.... Where to park my car.....**
- ❖ **The need to visualize complex social, economic and environmental indicators in a form of map.**
- ❖ **The need to provide various options for planning scenarios resulting in quantitative measures that allow developers, planners and project proponents to feel confident with the ultimate design decisions.**

Natural Resources Geospatial Information imply.....

- Knowledge, represented by using and analysing a series of geospatial information datasets.
- Geospatial information that are the sum of our interpretation and synthesis of datasets.
- **We cannot provide relevant geospatial information** without fundamental datasets, including interrelationship between these datasets, the management of datasets, and the means of accessing and distributing those datasets.

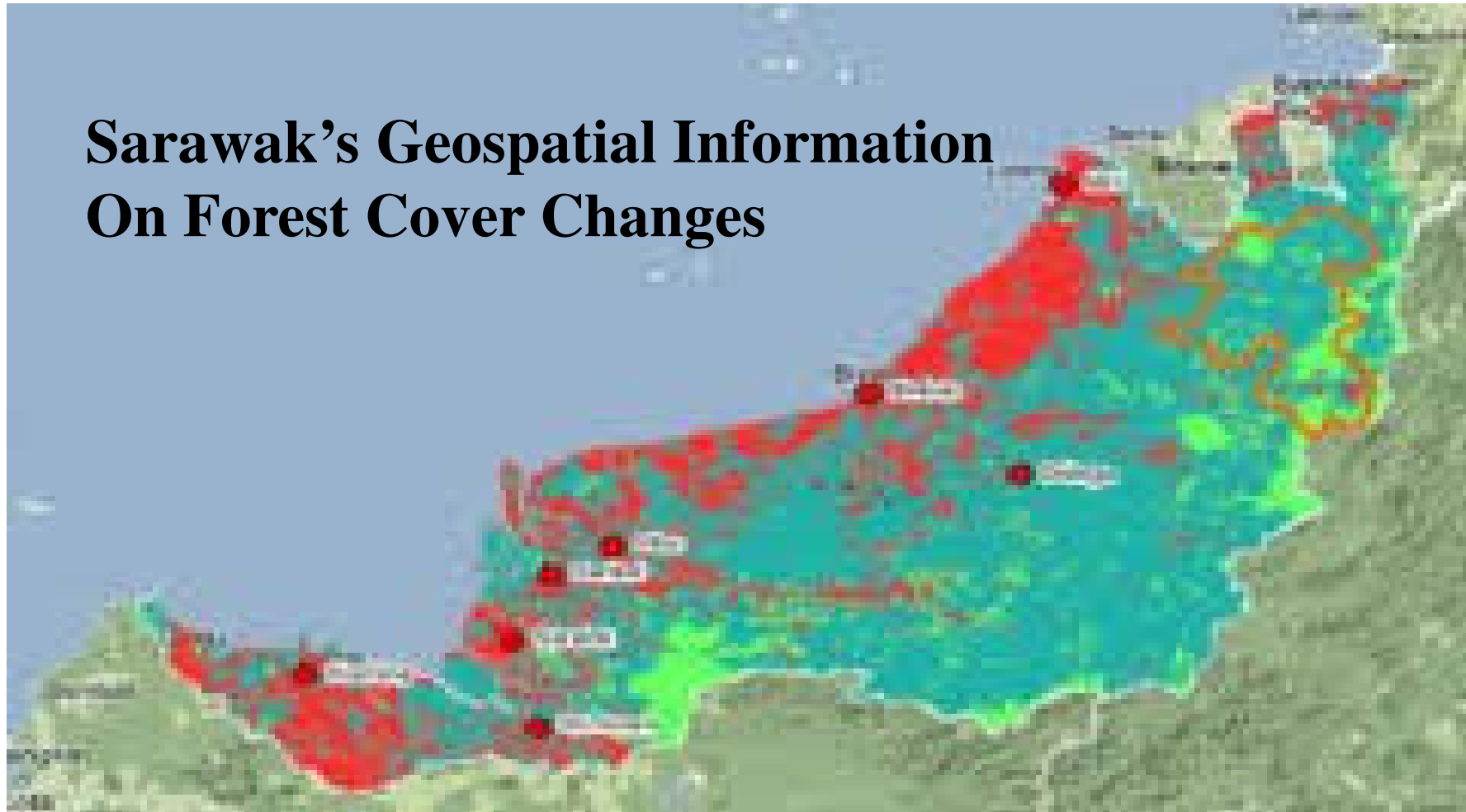
Assessment of Forest Destruction Using Geospatial Information



- ✓ **Extensive logging – Exploitation.**
- ✓ **Non-compliance to Forest Management Plan and logging prescriptions, such as size and duration of logging, cutting cycle, diameter limit.**

Assessment of Forest Cover Changes Using Geospatial Information

**Sarawak's Geospatial Information
On Forest Cover Changes**



Assessment of Mining Sites Using Geospatial Information



**Determining
productivity,
safety hazard issues,
compliance to laws
and regulations,
adherence to work
plans....**

Assessment of Water Resource Using Geospatial Information



Determining quantity and quality

Environmental Impacts of Natural Resources Extraction, Exploitation and Utilization

- ✓ Land degradation
- ✓ Natural disasters
- ✓ Biodiversity loss

**Terrestrial
Ecosystem**

- Quality of river
water:**
- ✓ 59.3% clean
 - ✓ 32.3% slightly polluted
 - ✓ 8.4% polluted

**Inland Water
Aquatic
Ecosystem**

Land Degradation, Natural Disasters, and Biodiversity Loss





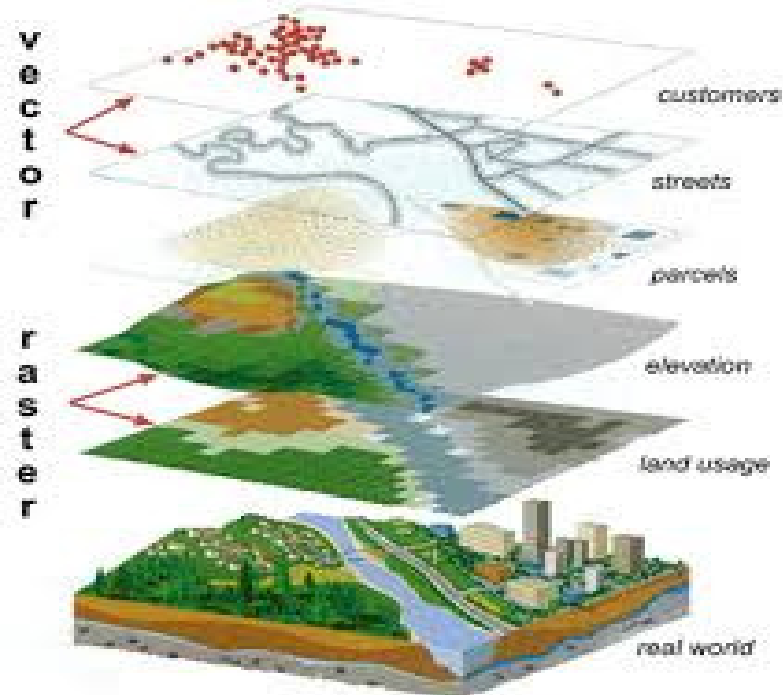


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Kelang 317
Banting 232
Petaling Jaya 173
Shah Alam 161





Geospatial Indicators Portfolio for Sound Management of Natural Resources and The Environment



Thematic

Lead Indicators

Land

**Agriculture Land/Plantation.
Forest Area.
Urban Area.
Land Degradation.**

Forests

**Area of overage.
Natural/Planted Forests.
Forest Types and Species
Composition.
Licenced Harvesting Area.
Forest Degradation.**

Minerals

**Locations and Reserves.
Abundance and Types.
Licenced Mining Sites.**

Thematic

Lead Indicators

**Inland Water
Resource**

**Rivers and Lakes.
Locations and Surface Area.
Saline or Fresh, identifiable
by stretches.
Polluted or Clean, classified
under National Water Quality
Standards (NWQS).**

Coastal Marine

**Water Quality.
Coastal Pollution.
Littoral Degradation.
Mangrove Ecosystem
Degradation.**

Thematic

Lead Indicators

**Biodiversity
Conservation**

Natural Disasters

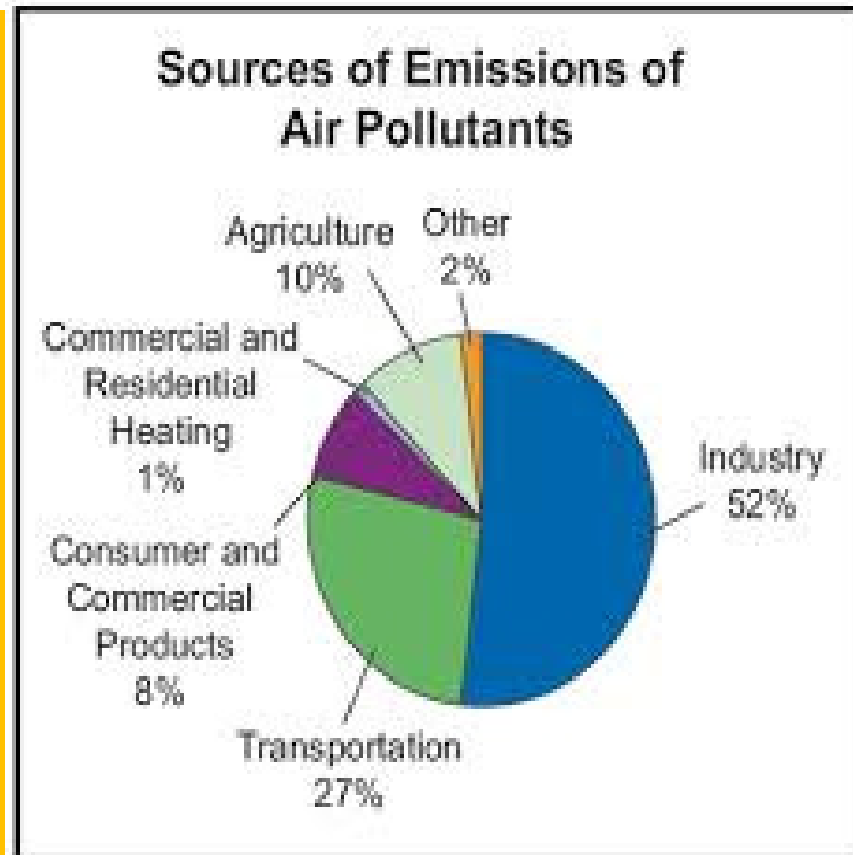
**Protected Areas.
Wetland Areas.
Invasive Species.
Flooding.
Bush Fires.
Soil Erosion and
Landslide.**



Defining the Use of Geospatial Technologies

**Utilization
of Geospatial
Technologies
are based on:**

- **Types of information to be delivered**
- **Users needs**



Integrated Management Plan For Natural Resources and Environment

**Geospatial information required for
Inventory, delineation and mapping of
natural resources:**

- ❖ Production Forests**
- ❖ Protected Areas and Wetlands**
- ❖ Wildlife Reserves**
- ❖ Mining Sites and Mineral Reserves**
- ❖ Water Resource and Pollution**

Role of the Ministry of Natural Resources and Environment

- **Secretariat formed for National Infrastructure for Land Information System (NaLIS)**
- **Malaysian Centre for Geospatial Data Infrastructure (MyCGDI)**

- ❑ **Creation of Platform for Users Needs**
 - ❑ **Supply and Equitable Sharing of Geospatial Data**



Role of NRE

- **Determining price and distribution of Geospatial Data**
- **Developing and implementing MyGDI**
- **Custodian of Geospatial Data**
- **Sharing and distribution of Geospatial Data**

**Terima
Kasih**



Thank You