Enhanced Water Security Through IWRM
Mahaweli Experience

27th November – 4th December 2013 Sri Lanka

Value of Data in River Basin Management Practices

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Asian Development Bank
Sri Lanka Residence Mission

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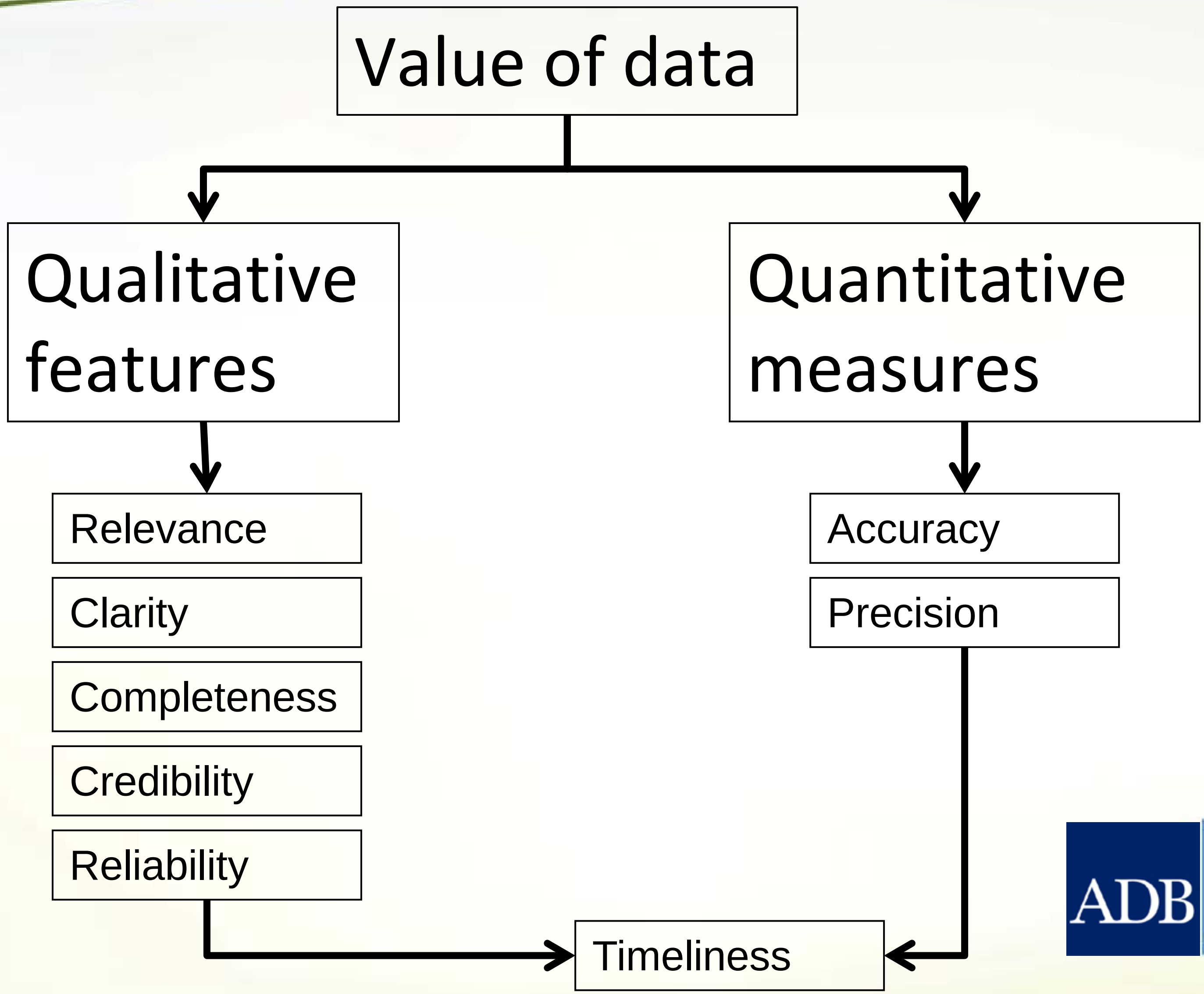
Why value of data is so important



Why value of data is so important in river basin management (RBM) practices

Water - scarce resource (irrespective from the purpose of its use)

e.g. Diverted, pumped, or delivered river water:

- change quality, state or spatial location;
- may be an irreversible process;

Change data characteristics timely as well as location to location

Why value of data is so important in RBM practices

Human activities change Land cover (e.g. upper catchment), land use pattern (e.g. downstream)

Change data characteristics timely as well as location to location

Characteristics of data → change RBM decisions:

Quantitative data → e.g. rainfall, river flow, canal flow, drainage flow, command area, catchment area

- Where, the decision is concern? → Location
- When, the decision to be made? → Time

River basin management decision process is data driven

Quantitative data = *f* (Time, Location)

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Data classification in RBM practeristics

Primary Data –
Collected from the field/ System
e.g. River gauge reading, Weather records, Field measurements

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Secondary Data –

Received from other stake holder groups

e.g. Catchment area, rainfall intensity

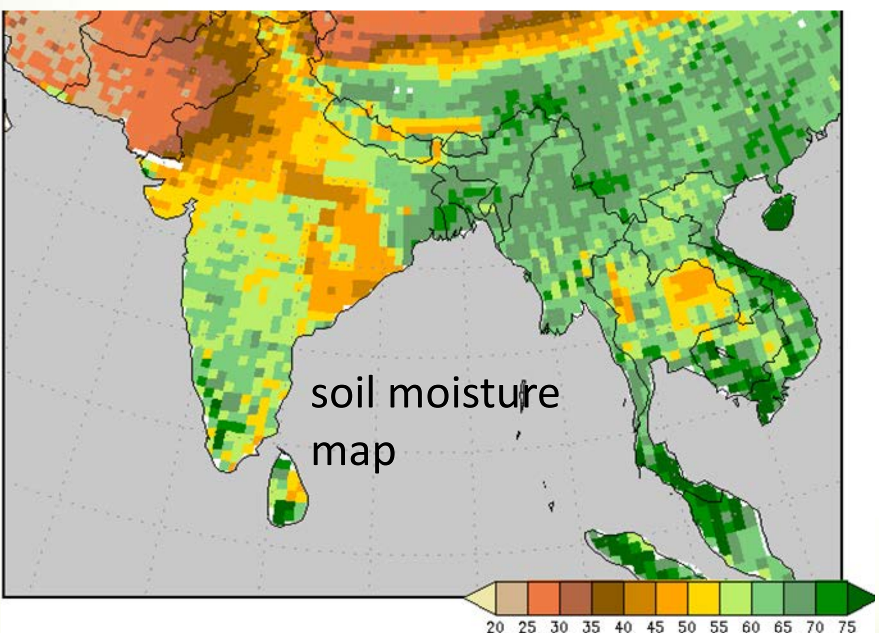
Or derived using coefficients, accounting methods, models, algorithms

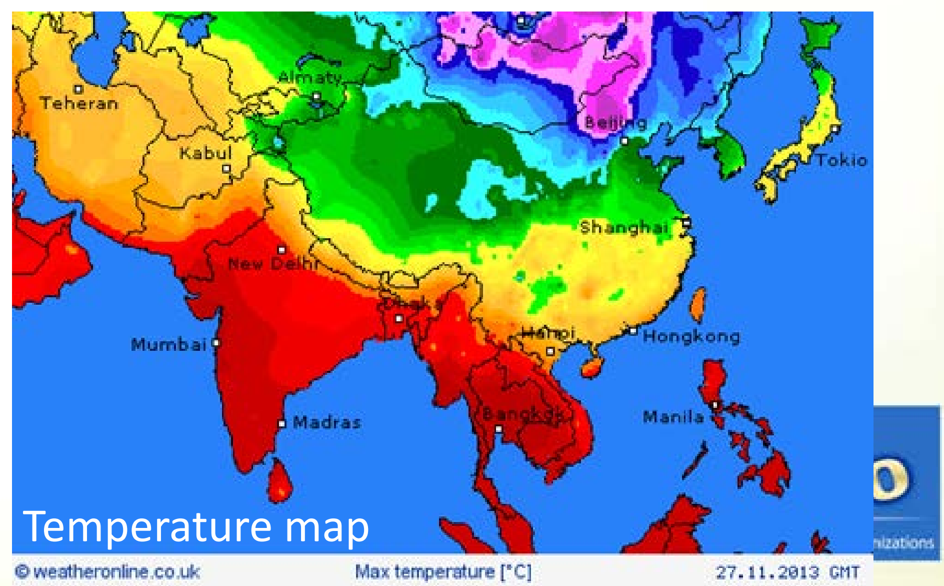
e.g. River discharges, soil moisture, Evapo-transpiration (ET)

Spatial Data – Acquired from a certain location

i.e. Data characteristics will vary from location to location

e.g. Rainfall, soil moisture, ET, Temperature





Temporal Data

Acquired from a particular time

i.e. Data characteristics will vary subject to time

e.g. rainfall, ET, Soil moisture, Temperature

River basin management decisions

Data driven process

Data characteristics subject to spatio-temporal changes

Value of data in RBM process= *f* (Spatial location, Time)

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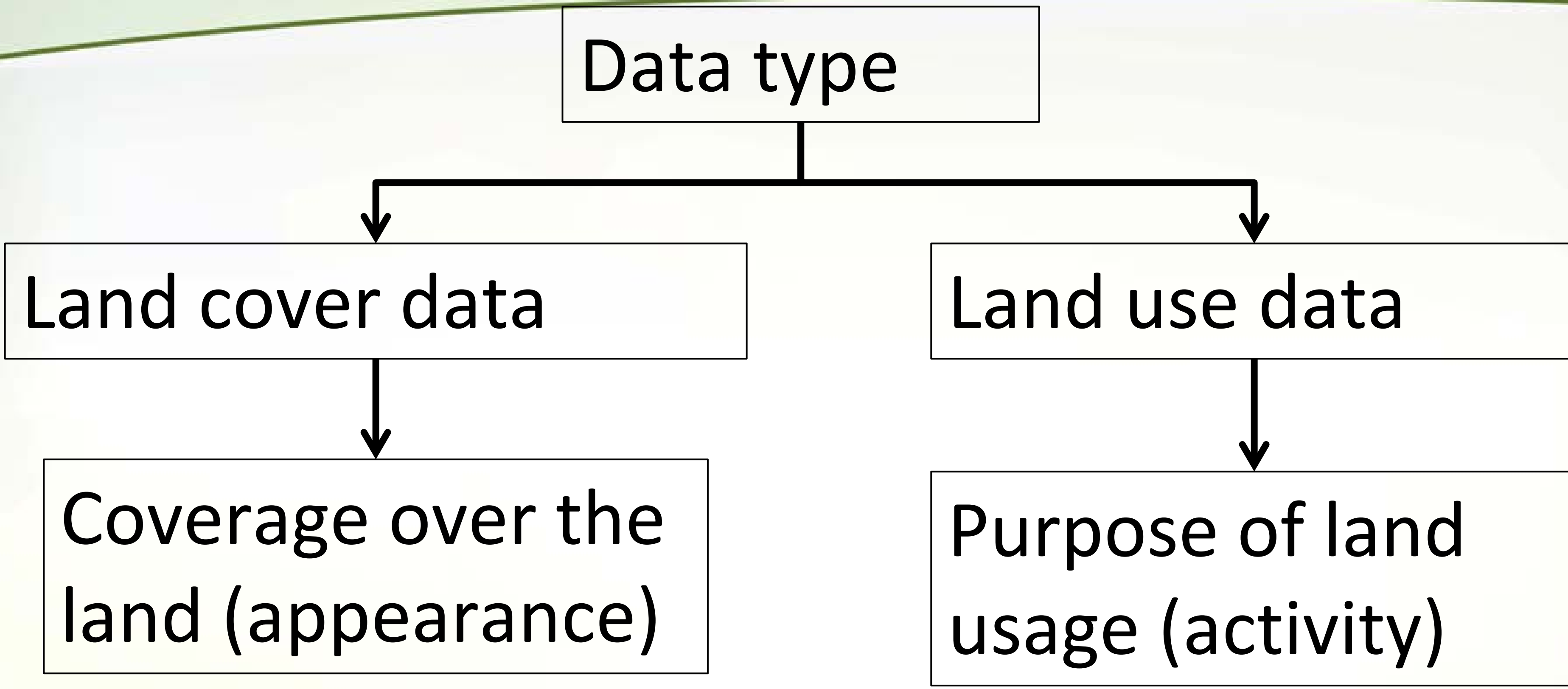
Examples of spatio – temporal changes



Examples of spatio – temporal changes

Data location	Land cover		Land use	
	Qualitative	Quantitative	Qualitative	Quantitative
Catchment area	Forest, green canopy	100 ha	Catchment management	100 ha
River section	Water, sand	2 sq. km spread area	Flow measurement	50 cu.m/sec
Irrigation reservoir	Water, earth	30 sq. km spread area	Water storage	100 MCM
Irrigated agri. land	Crops, earth	100 ha	Food production	500 ton

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Spatio – temporal features of land cover and land use data

e.g. Life cycle of an irrigated agricultural land (Paddy cultivation)

Temporal stages	Land cover (appearance)	Land use (activity)
Land preparation	Muddy water	Food production
Initial stage	Plant, water	Food production
Development stage	Plant	Food production
Mid stage	Green canopy	Food production
Late stage	Brown canopy	Food production

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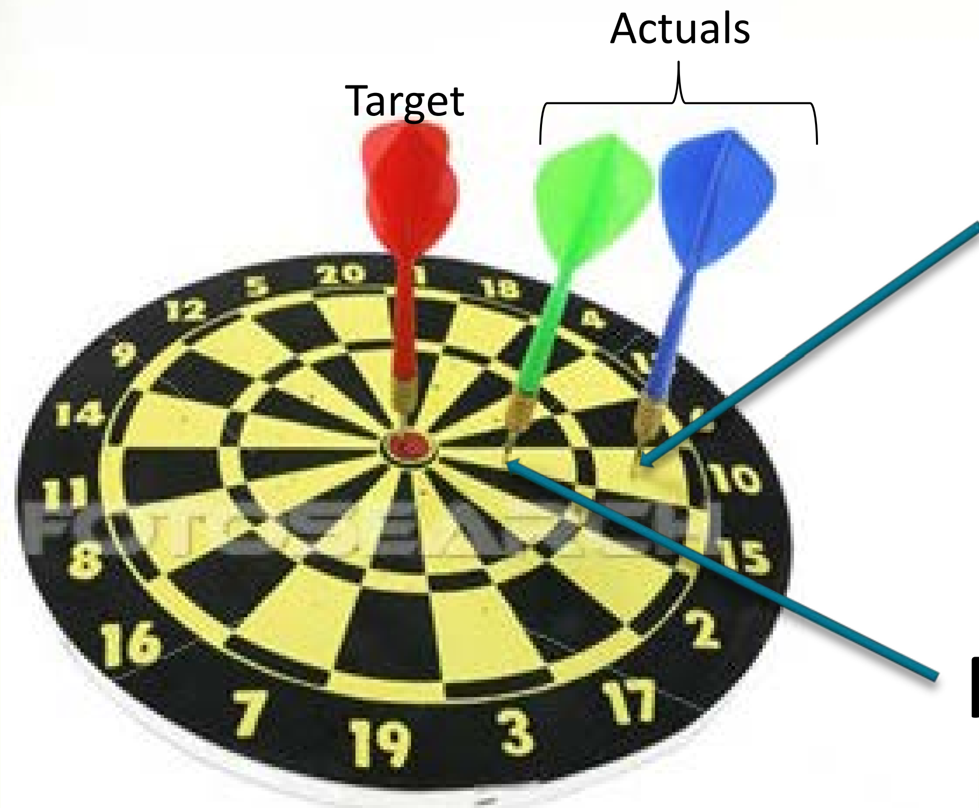
Accuracy of data –

Quantitative data

Accuracy - How closer the actual to the target



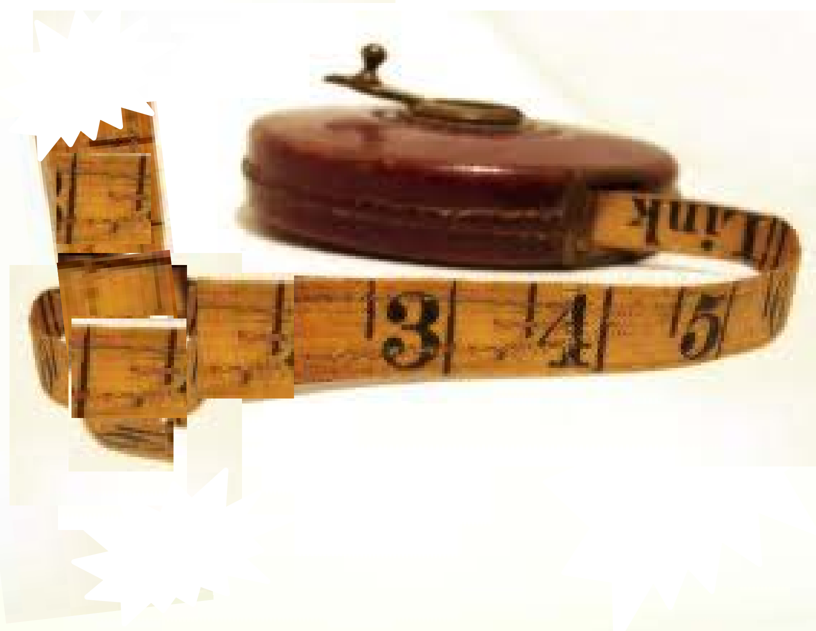
Precision of data –

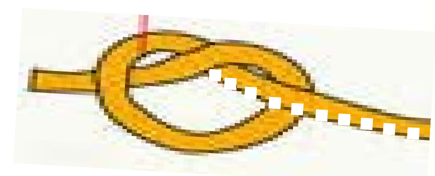
Quantitative data

Smallest calibrated unit - can be measured using a particular measuring device

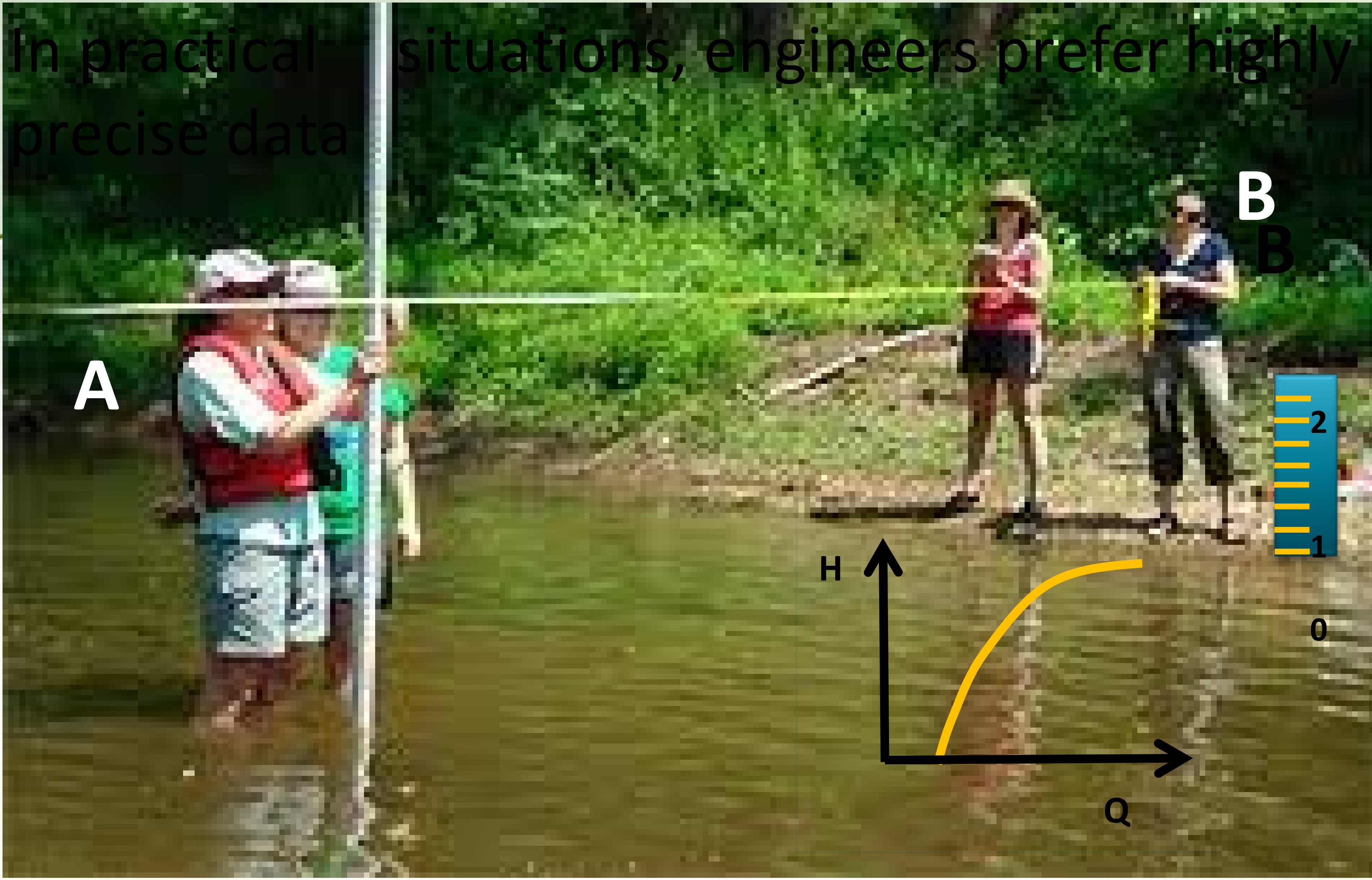
Precision = 1/16 of an inch

River Basin Managers (engineers) are much concern about the precision and the accuracy of data





In practical situations, engineers prefer highly precise data



Measurement is highly precise, but not accurate?

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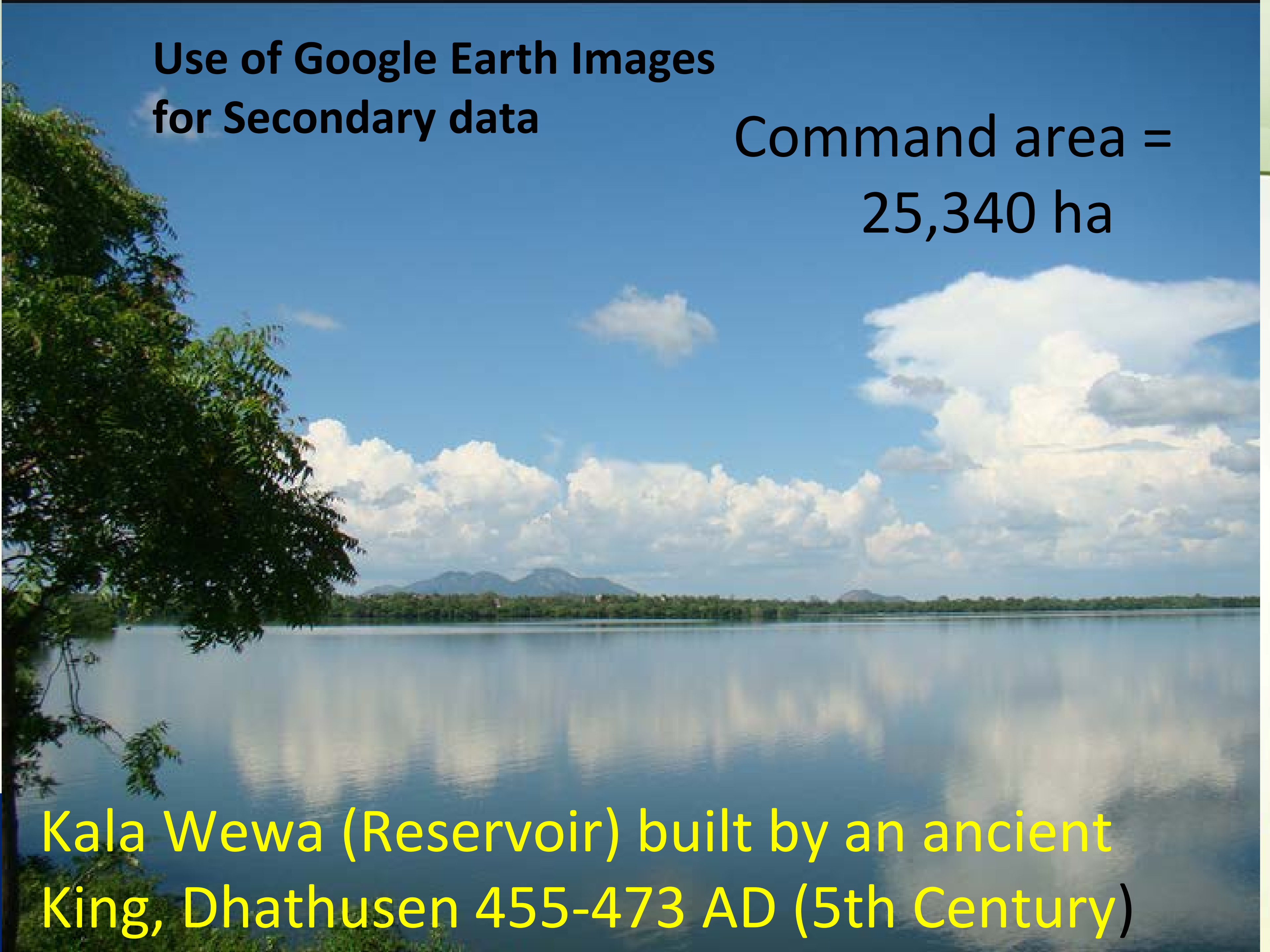
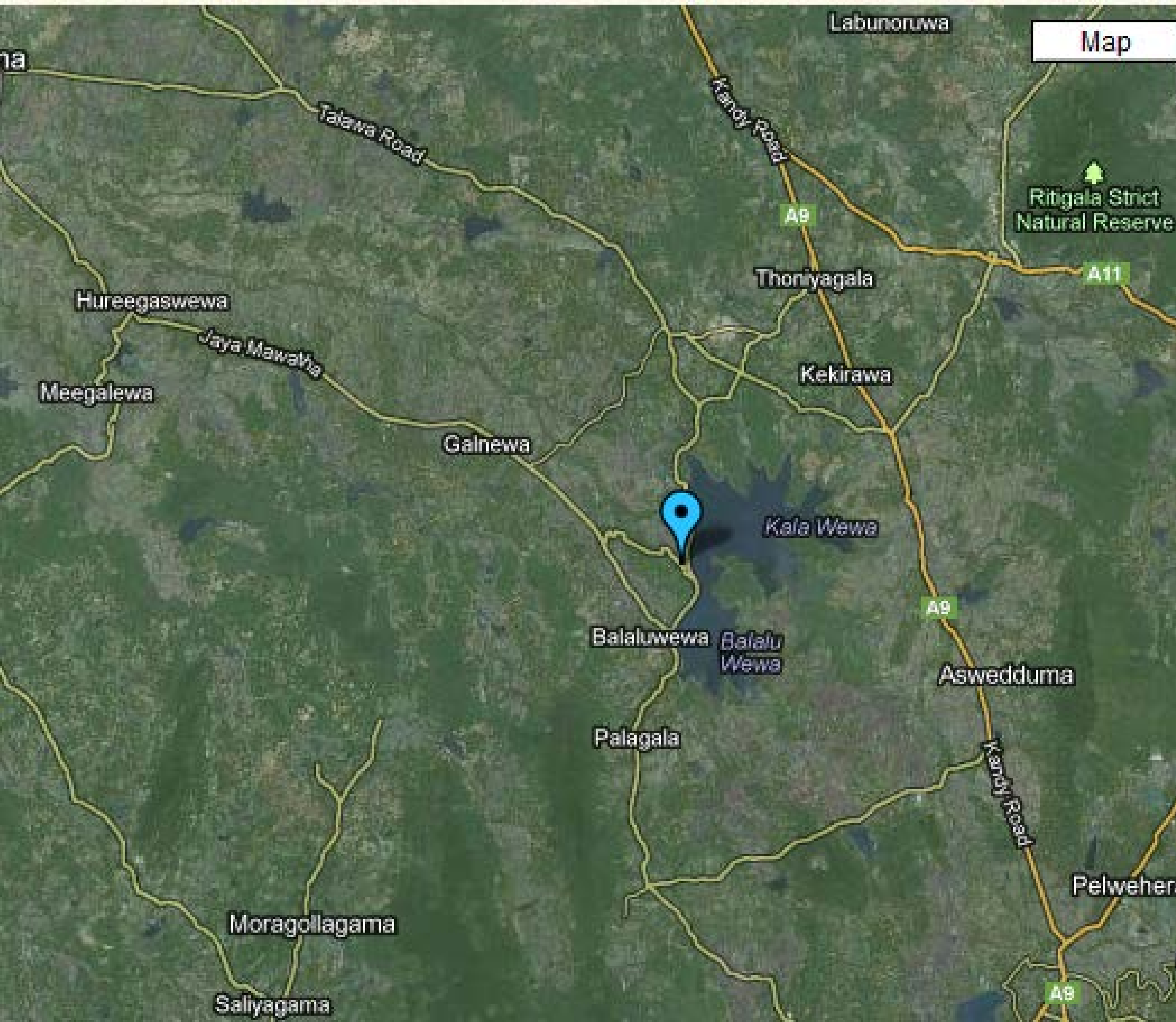
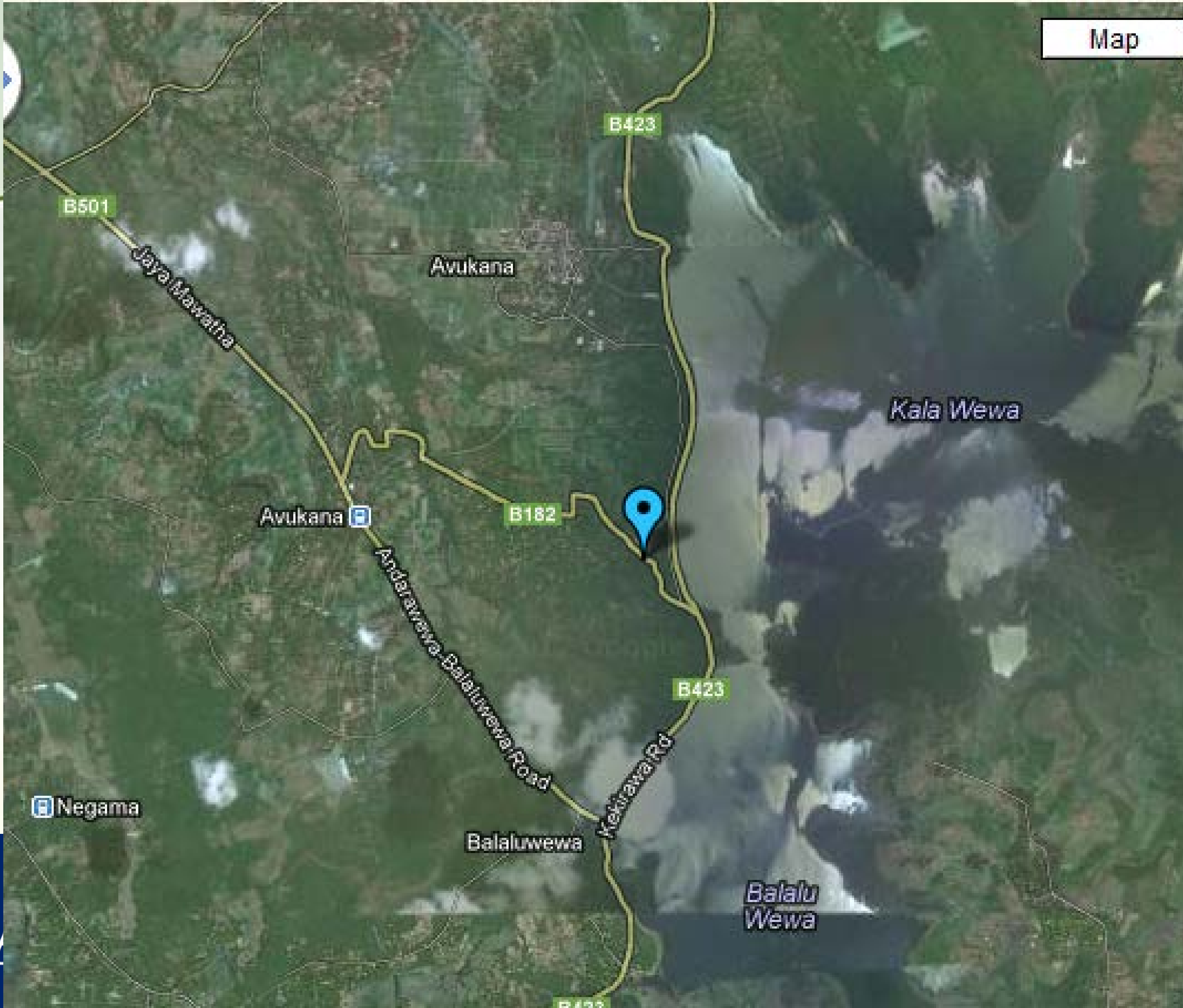
Use of Google Earth Images for Secondary data

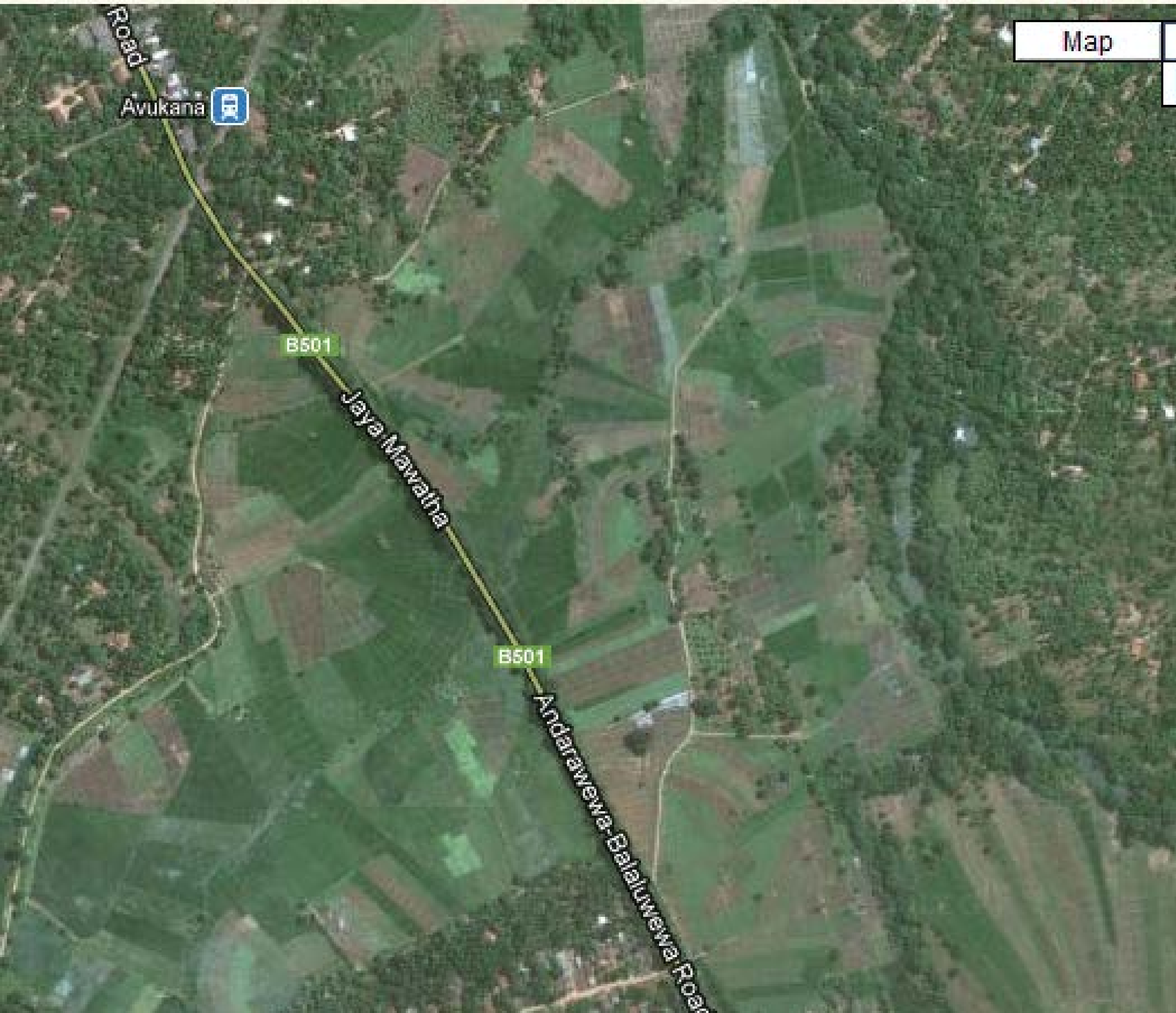
Command area = 25,340 ha



Kala Wewa (Reservoir) built by an ancient King, Dhathusen 455-473 AD (5th Century)


Map
Labunoruwa
Talawa Road
Kandy Road
A9
Ritigala Strict Natural Reserve
A11
Thoniyagala
Hureegaswewa
Jaya Mawatha
Kekirawa
Meegalewa
Galnewa
Kala Wewa
A9
Balaluwewa
Balalu Wewa
Aswedduma
Palagala
Kandy Road
Pelwehera
Moragollagama
Saliyagama
A9


Map
B423
B501
Avukana
Jaya Mawatha
Kala Wewa
B182
Avukana
Andarawewa-Balaluwewa Road
B423
Kekirawa Rd
Negama
Balaluwewa
Balalu
Wewa


Map
Road
Avukana
B501
Jaya Mawatha
B501
Andarawewa-Balaluwewa Road

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In case of a crop failure, Google maps cannot be used

Out dated information
Coarse resolution

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Usage of Raw Satellite Images

Temporal Resolution

Re-visit time

Spatial Resolution

Smallest Homogenous area that could be measured/observed – i.e. Precision

Higher the temporal resolution, lower the spatial resolution

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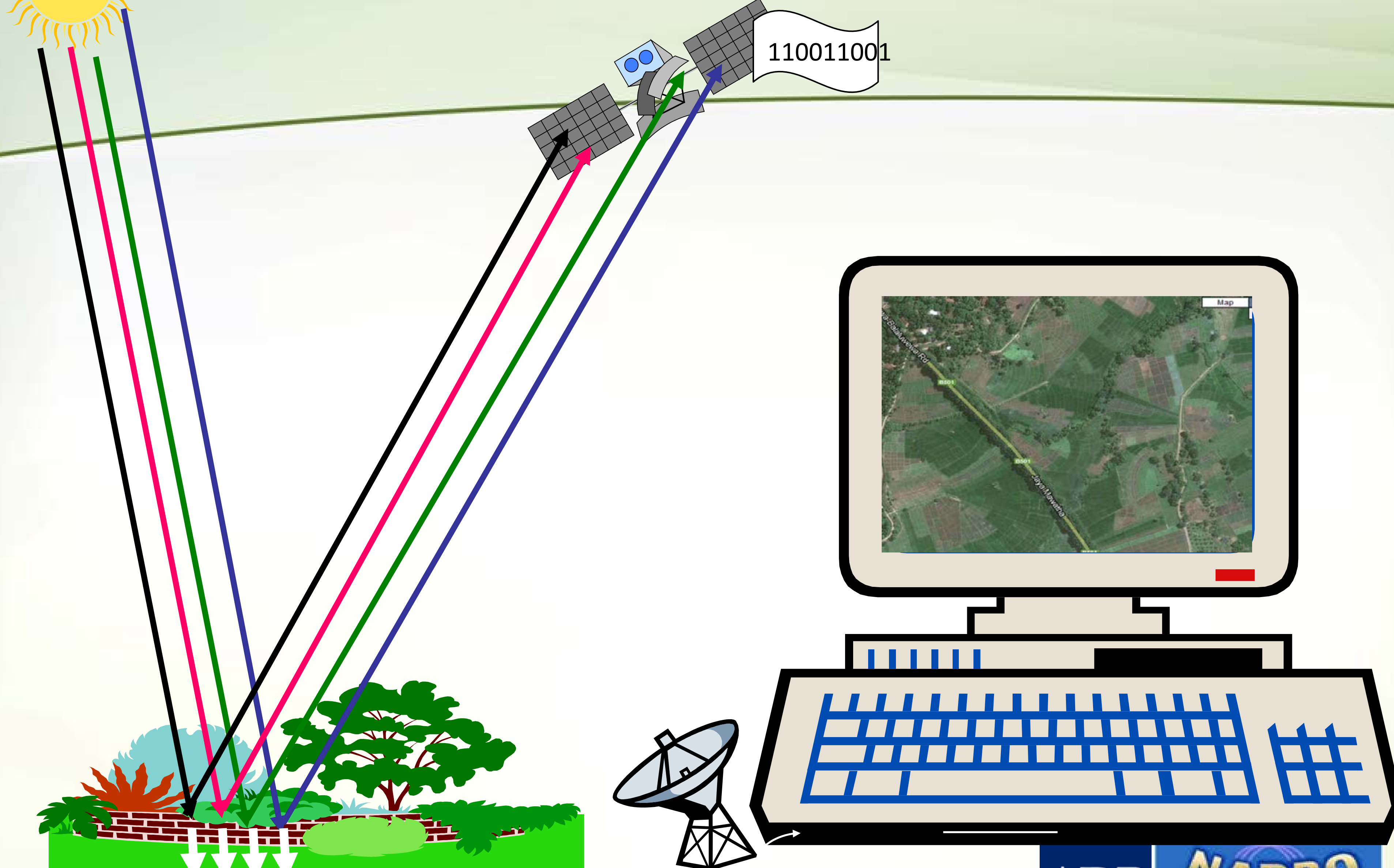
Quick Bird –
Spatial Resolution 63 cm (panchromatic),
1m color composite
Temporal Resolution 16 days

MODIS–
Spatial Resolution 1 km color composite
Temporal Resolution 24 hrs

Basic process of Satellite Remote Sensing



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Use of GPS for River basin management activities

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Use of a handheld GPS

Maximum Possible Allowable error = 15 m
Minimum Possible error = 3 m

Manageable error (in clear sky, without cloud cover & other disturbances) = 5 m

1. measurement can be 15 m away from the target – i.e. Accuracy

2. Smallest measurement 1 cm (1/100 of a meter) - i.e. precision

Is this acceptable?

Use of a handheld GPS

Engineering surveying is always not possible /necessary– because of Cost, Time, Accuracy

1: 10,000 metric topographical sheets are used

Inherited human error 0.5 mm
In 1: 10,000 metric sheet 0.5 mm represents 5 meters

Use of a handheld GPS

1: 10,000Metric Topographical Map

For 0.5 mm precision, possible error (inaccuracy) is 5 meters

Hand held GPS

For 1 cm precision, possible error (inaccuracy) is 5 meters

Use of Digital Equipment

Purpose – Rainfall, Temperature, Humidity, Wind Speed

Cost – Rs. 1 m

Maintenance – Solar Powered, less maintenance

Data logging - Digital

Data processing & sharing – Software : ARCGIS, Open Source

Decision Making – Timely decision

Implementation – Communication through Mobile phones

Monitoring

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Thank You….

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