ERASMUS-EDU-2023-CBHE
Project number: 101129032

Duration: 36 months
(01/01/2024 – 31/12/2026)

LESLIE
LAND MANAGEMENT
ENVIRONMENT &
SOLID-WASTE

Co-funded by
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MICRO-CREDENTIAL

LAND MANAGEMENT IN CENTRAL ASIA

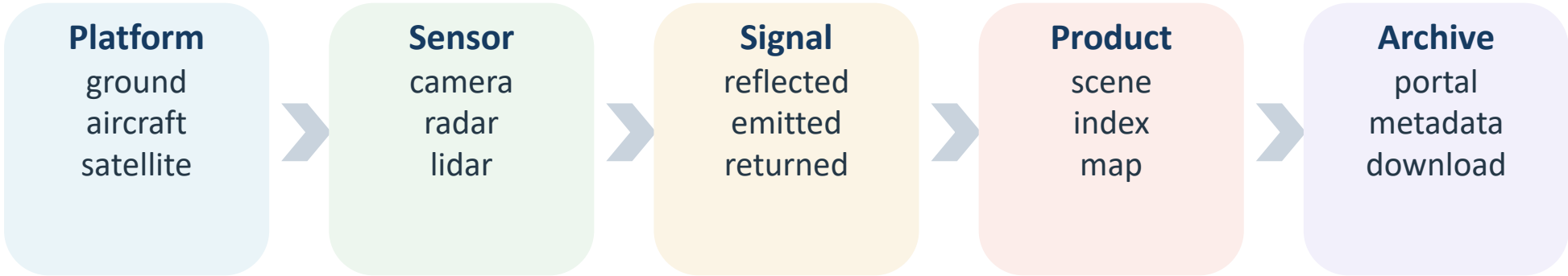
10.- Introduction to Remote Sensing

Remote Sensing Data Sources

LM-W10-V67

A data source is a chain

Think from observation to usable information.



Students should ask four questions: where was it measured, what was measured, in what form is it delivered, and how is it accessed?

Ground sources anchor interpretation

Field measurements and local observations explain what the image really means.

Why use them?

best local truth

strong for calibration and validation

Examples

GPS

field spectrometer

soil probe

Examples

photos

water gauge

weather station

Main lesson

Field data are small in area, but large in value.

Airborne sources fill the middle scale

They connect field detail and satellite coverage.

Aircraft
larger local coverage
planned missions

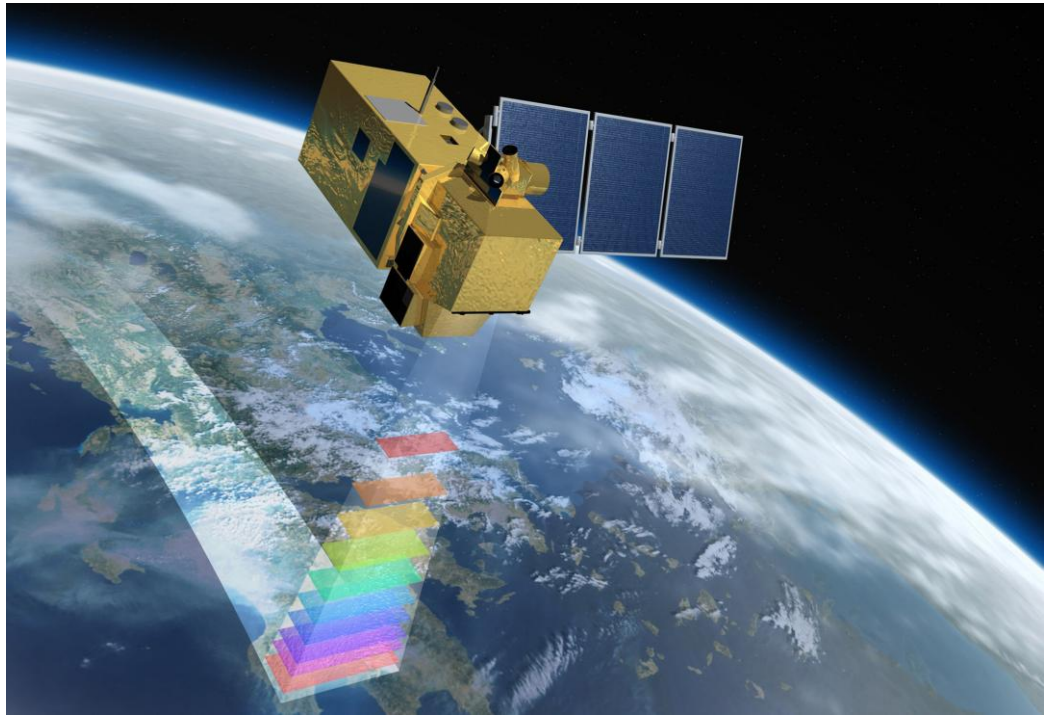
Best use cases

corridors
field studies
small projects
custom timing

UAV / drone
very high detail
fast local repeat

Satellite sources support broad and repeated observation

They are the backbone of long-term Earth observation.



Core strengths
wide coverage
repeat observation
consistent archive

Polar orbit
strong for land and regional monitoring

Geostationary
strong for weather and very frequent views

The biggest advantage is not one image. It is the time series.

Optical sources are the most familiar

They work best when clear sky and daylight conditions are available.

Visible	Near IR	SWIR	Multispectral	Limit
good for direct visual reading	very useful for vegetation	helps with moisture and material differences	many bands improve land analysis	clouds haze shadows

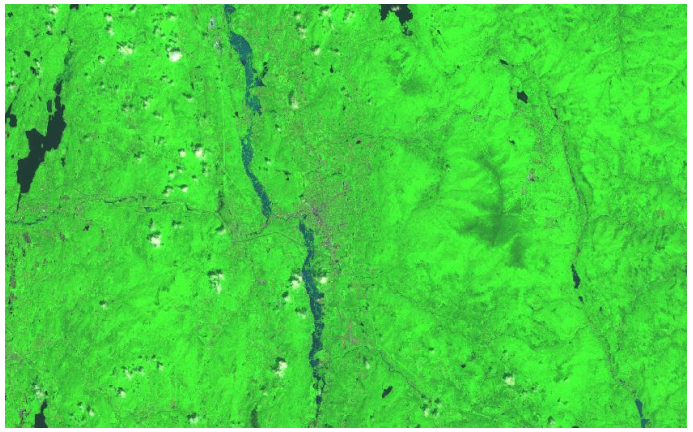
simple visual spectrum cue

Three important non-visual sources

These sources expand remote sensing beyond ordinary photography.

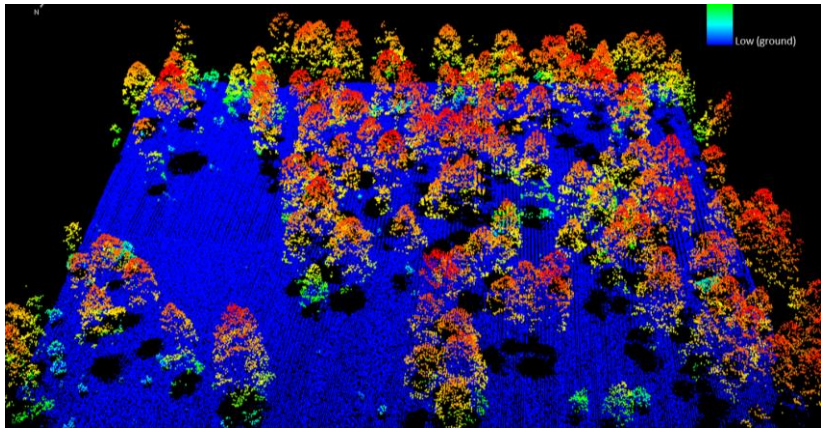
Thermal

surface temperature
heat patterns
water stress



Radar / SAR

day-or-night observation and strong value under cloud cover



Lidar

precise elevation, canopy height, and 3D surface structure

Access pathways also matter

A source is only useful when it can be found, understood, and used.

Open public archives

good for teaching
and long time series

Agency portals

catalogues
metadata
download tools

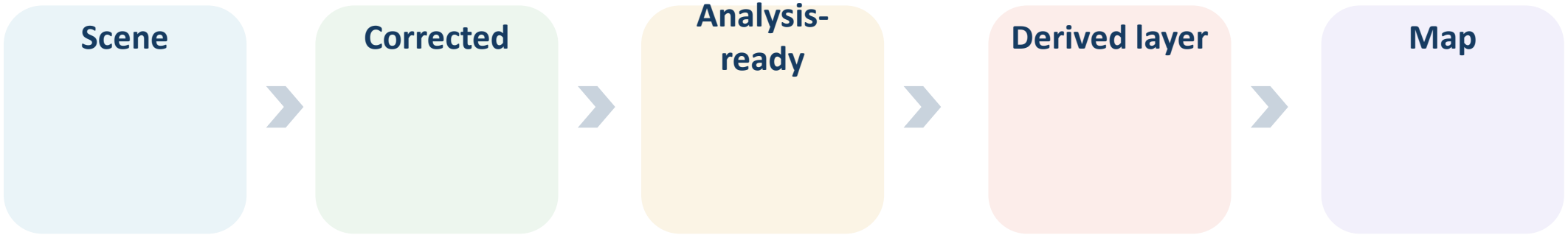
Commercial access

very high detail
licensed products

Best practice: choose by problem first, then by availability.

One source can produce many product levels

Users may work with the original scene or with a derived information layer.



Interpretation shortcut

Scene = measurement. Derived layer = processed information. Both can be valid sources, but they answer different needs.

Choose the source by four filters

This simple framework keeps the analysis focused.

1. Spatial fit
Is the target large enough to be seen clearly?

2. Time fit
How often does the area need to be observed?

3. Signal fit
Does the source measure the right property: colour, heat, moisture, or height?

4. Access fit
Can the source be obtained and processed reasonably?

Start with the question, not with the dataset name.

Different applications prefer different source mixes

There is no single best source for every land study problem.

Land studies	Agriculture	Water	Environment	Planning
optical lidar time series	optical drone ground truth	optical thermal radar	time series optical radar	mixed sources

Most real projects improve when two or more complementary sources are combined.

Regional relevance for Central Asia

Source choice should reflect irrigation, arid land surfaces, mountains, and seasonal water change.

Irrigation	Salinity / degradation	Reservoirs / rivers	Snow / glacier
satellite repeat + drone detail	optical time series + field checks	optical + radar for seasonal change	time-series satellite observation

Regional lesson: one source is rarely enough. Mixed-source workflows are usually strongest.

Worked example: irrigation monitoring

A simple source mix can be designed from the question.

Question
Which fields are stressed?

Need
repeated view through time

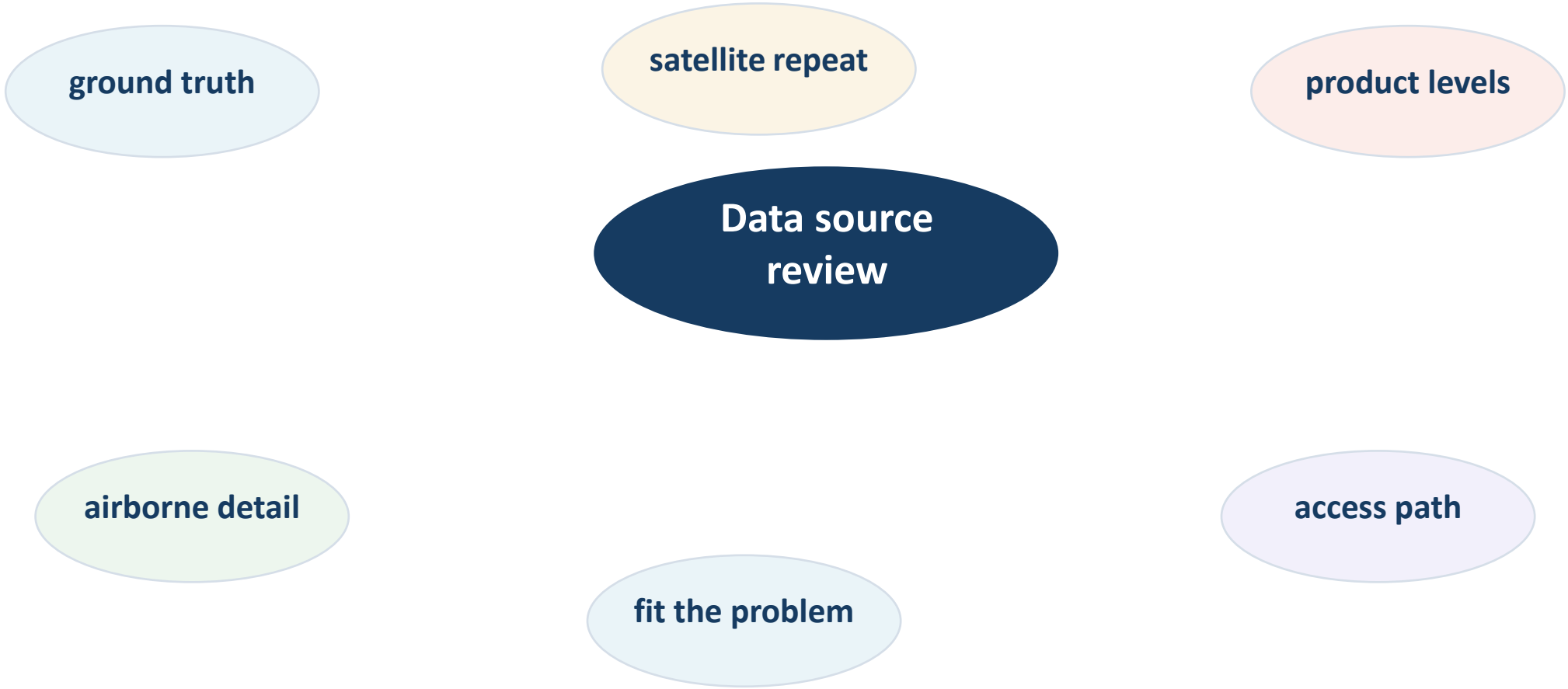
Best mix
satellite
+ drone
+ field

Why this mix works

satellite for seasonal pattern
drone for local detail
field data for confirmation

Visual review

Six ideas to remember about remote sensing data sources.



Conclusion and references

The goal is not to memorise every source, but to choose wisely.

Key conclusion

Remote sensing data sources differ by platform, sensor, signal, product level, and access route. The best choice is the one that matches the problem and the scale.

Selected references

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- NASA Earthdata. Earth Observation Data Basics; Fundamentals of Remote Sensing.
- U.S. Geological Survey. Landsat Missions; Landsat Data Access.
- European Space Agency. The Sentinel missions; Sentinel-1 and Sentinel-2.
- Copernicus Programme. Access to data; Copernicus Data Space Ecosystem.
- USDA ARS, NOAA, NASA, and USGS image resources used for slide visuals.

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