

TECHNICAL WHITE PAPER

Satellite Remote Sensing Methods

A practical overview of multispectral monitoring with Sentinel-2,
Landsat 8/9, and MODIS

What this resource provides

A decision-oriented reference for selecting imagery, preparing observations, interpreting indices, and communicating limitations.

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1. The monitoring question comes first

Remote sensing is a measurement workflow, not simply an imagery feed. Start by stating the decision, the area of interest, the reporting interval, and what evidence would change an action. Then choose the sensor and indicator that can answer that question at an appropriate spatial and temporal scale.

Sentinel-2 is often useful where field-level spatial detail is important; Landsat 8/9 provides a long, consistent record at moderate resolution; MODIS supports frequent regional signals but at coarser spatial detail. Availability, cloud cover, revisit, and archive limits should be part of the design.

- Agriculture: vegetation condition, crop-stage comparisons, and field-level change.
- Land: built-up or canopy-change screening with spatial context.
- Water: surface-water extent and water-related spectral indicators with field validation.

2. A defensible processing chain

A repeatable chain makes each result explainable: acquire imagery, apply quality masks, harmonize the area and period, calculate the indicator, summarize spatially, and retain provenance. Processing choices should be recorded with the output rather than left implicit in a dashboard.

Common sources of error include clouds and shadows, haze, mixed pixels, seasonal phenology, changing observation geometry, boundary changes, and missing scenes. A “no reliable observation” status is better than silently carrying forward an old value.

- Keep source, acquisition date, processing date, resolution, and mask information.
- Use comparable composites or dates when comparing periods.
- Review edge pixels and small polygons where mixed land cover can dominate.
- Show data-quality status alongside maps, charts, and narrative summaries.

3. Interpreting common indices

NDVI is a relative vegetation signal derived from red and near-infrared reflectance; NDWI has several definitions and is commonly used as a water-related screening signal; NDBI is a built-up-related indicator. The same label can hide different band choices and processing rules, so name the formula and interpretation in the methodology.

Indices are not universal physical measurements. Thresholds should be treated as context-specific screening rules and calibrated against field data, local conditions, or authoritative reference layers.

- Compare distributions and trends, not just a single pixel value.

- Use a baseline and document the period used to define “unusual.”
- Avoid causal language unless additional evidence supports it.
- Validate important decisions with field, administrative, or sensor data.

4. Reporting and reproducibility

A decision-ready report should allow a reviewer to answer: what was observed, where and when, using which data, with what limitations, and what action is recommended? Include a concise method note, source dates, the area analyzed, and any validation evidence.

A mature monitoring program also tracks failed or missing observations. That record helps teams distinguish environmental change from data availability and improves trust when a result is challenged.

- Use stable project and zone identifiers across reporting periods.
- Keep map legends, units, dates, and scale visible in exported outputs.
- Version thresholds and model or processing changes.
- Invite domain experts to review interpretation before high-stakes publication.

Minimum metadata for a decision-facing result

Sensor and product, acquisition window, cloud/data-quality treatment, index formula, spatial unit, baseline or comparison period, validation source, and known limitations.

Important note

This paper is a practical overview, not a substitute for sensor documentation, local calibration, or scientific review of a specific monitoring program.