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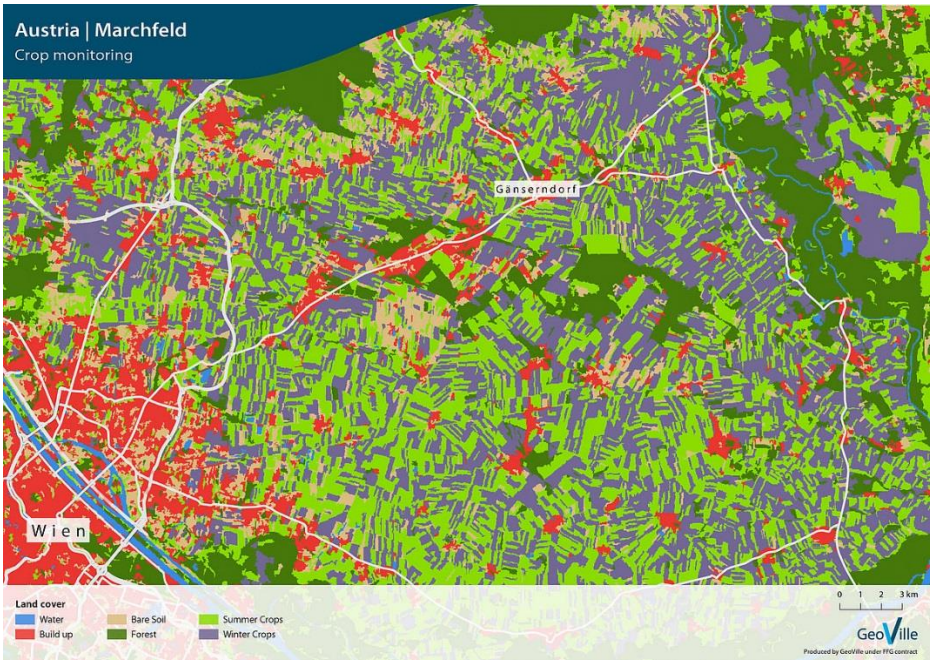
CROP HEALTH MONITORING



Crop monitoring (Source: GeoVille)

PRODUCT DESCRIPTION

Category

☐ Topographic information	☐ Surface deformation
☒ Impact assessment	☐ Precision ortho-images
☒ Change detection / continuous monitoring	☐ Terrain information
☐ Land cover / use	☐ Water quantity & quality
☐ Near surface geology	

Uses

Crop health monitoring

Environmental monitoring – Baseline historic mapping of environment and ecosystems

Environmental monitoring – Continuous monitoring of changes throughout the lifecycle

Challenges addressed

Permitting Process – Land Usage

Development and Operations – Affected Stakeholders

Closure and Aftercare – Affected Stakeholders

Geo-information needs

P-12: Farming activities – Baseline crop health / animal health

DO-30: Impact on nearby industries (in particular agriculture)

CA-8: Farming activities – confirm return to baseline conditions for crops / animals

Description

To analyse the impacts of raw mining activities and in case of negative effects to react properly, it is important to get information on crop health of surrounding farming activities that might be affected. EO can support this activity with crop health monitoring methods that are used to classify crops as well as monitor health.

The assessment builds upon various parameters, so-called Vegetation Indices (VI) that are derived from different band combinations satellite imagery. These are e.g. the Normalized Vegetation Difference Index (NDVI), the Leaf Area Index (LAI), and the Fraction of Absorbed Photosynthetically Active Radiation (FAPAR). Based on unique spectral characteristics the calculated parameters indicate different crop types and further information on the identification, detection, quantification and mapping of crop diseases.

Various attributes of plants, such as changes in leaf colour, transpiration rate or morphology, florescence, changes in leaf chlorophyll, pigment, chemical concentrations, cell structure, water uptake and nutrient affect the spectral reflectance properties of plants which can then be calculated with the above mentioned different band combinations of imagery. Finally, the derived values indicate different crop types, different stages of growing season, fertility, crop health.

Known restrictions / limitations

The mentioned methods are restricted by the resolution of the accessibly data as well as spatial coverage of the imagery. Using open data sources Concerning change products consistent data from the same sources and the same period for the entire region is needed.

Lifecycle stage and demand

Exploration	Environmental Assessment & Permitting	Design, Construction & Operations	Mine Closure & Aftercare
		■■■■	■■■■

Design, Construction & Operations:

- Assessing crop productivity and crop health to demonstrate whether there are impacts once mining commences

Mine Closure & Aftercare:

- Assessing farming activities after mine closure to assure that there is no impact on farming activities

Geographic coverage

Globally available.

EARSC Thematic Domain

DOMAIN	LAND
Sub-domain	Agriculture
Product description	Monitor crops

PRODUCT SPECIFICATIONS

Input data sources

Sampling of available products:

Satellite	***Sentinel 1***	***Sentinel 2***	***Landsat 8***	***SPOT 6, 7***	***MODIS***	***Landsat 9***
Status	In operation	In operation	In operation	In operation	Archive	Planned
Operator	ESA	ESA	NASA	Airbus Defence and Space	Digital Globe	NASA
Data availability	Public	Public	Public	Commer-cial, on demand	Public	Public
Resolution (m)	5 – 100	10 – 60	15 – 100	1.5	1 – 4	15 – 100
Coverage	Global	Global	Global	Global	Global	Global
Frequency (days)	< 3	5	16	< 1	< 3	
Launch year	2014	2015	2013	2012 / 2014	1999 – 2015	2020
Website	link	link	link	link	link	link

Minimum Mapping Unit (MMU)

Field Parcel.

Accuracy / constraints

Thematic accuracy:

Crop type, >85% accuracy for major classes; growth peak of crop types; crop health.

Spatial accuracy:

Dependent on input-pixel resolution. Using open data a resolution of 10 m is possible.

Accuracy assessment approach & quality control measures

Usually, an accuracy of 80–90 % is reached.

Frequency / timeliness

Observation frequency:

Every 1 or more days, depending on satellite.

Timeliness of delivery:

Within 5 (working) days of sensing.

Availability

Data from all Sentinel satellites are freely available through the open data policy of the operator ESA (Sentinel-1A since 2014, Sentinel-2A since 2015, Sentinel-1B since 2016, Sentinel-2B since 2017).

Data from Landsat 8 (since 2013) are freely available through the open data policy of the operator USGS.

IKONOS (1999–2015) and SPOT data (SPOT 6: since 2012; SPOT 7 since 2014) are freely available through the portal of ESA.

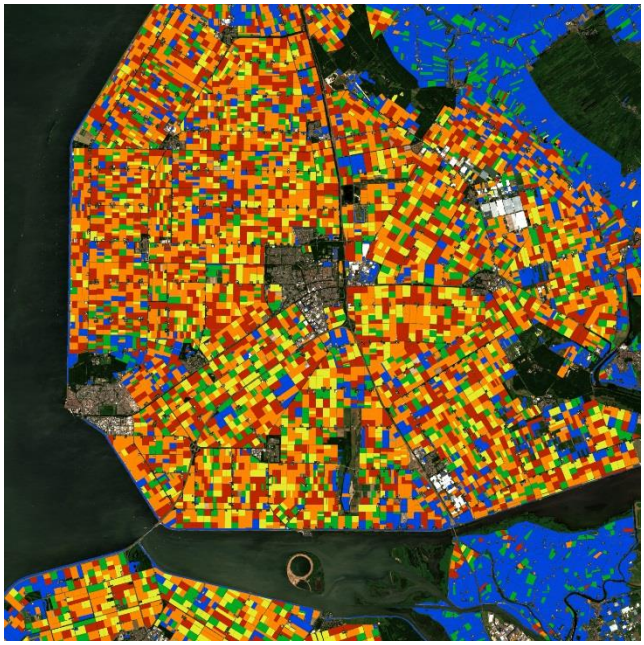
Delivery / output format

Data type: Vector formats, Raster formats

File format: Geotiff, Shapefile

Further delivery formats: Indicators, Reports

USE CASE



Source: GeoVille

Crops in the Netherlands

This image shows different crop types around Emmeloord in the Netherlands. Sentinel-2 imagery was used for processing. The green colour indicates summer crops, red shows potatoes, orange is market crops, yellow is cereals and blue indicates grassland. The image reveals in what detail the outcome of crop monitoring products may be. Although its focus in the example lies on potatoes, it may be expanded to other crop types.