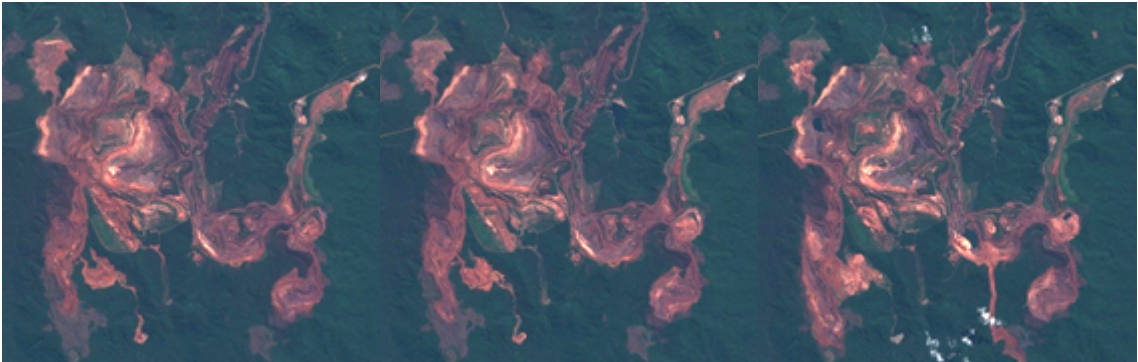


Product Sheet: Land disturbed by mining activities

Land disturbed by mining activities		Download Product Sheet
		
Observations (July 2016, 2017 and 2019) of mining activities at the Carajas mine, Brazil (source: Sentinel-2).		
PRODUCT DESCRIPTION		
Category		
<div><div><input type="checkbox"/> Topographic information</div><div><input checked="" type="checkbox"/> Impact assessment</div><div><input checked="" type="checkbox"/> Change detection / continuous monitoring</div><div><input checked="" type="checkbox"/> Land cover / use</div><div><input type="checkbox"/> Near surface geology</div></div> <div><div><input type="checkbox"/> Surface deformation</div><div><input type="checkbox"/> Precision ortho-images</div><div><input type="checkbox"/> Terrain information</div><div><input type="checkbox"/> Water quantity & quality</div></div>		
Uses		
Environmental Assessment & Permitting: <ul style="list-style-type: none">Baseline information to monitor land disturbed by mining activities Design, Construction & Operations: <ul style="list-style-type: none">Continuous monitoring of mining activities, infrastructures and land cover changesContinuous monitoring of the vegetation close to the mining siteCan support in detecting illegal mining Mine Closure & Aftercare <p>Continuous monitoring of the rehabilitation of land disturbed by mining activities</p>		
Challenges addressed		
<ul style="list-style-type: none">Development and Operations – Affected Land StatusDevelopment and Operations – Illegal MiningClosure and Aftercare – Environmental MonitoringClosure and Aftercare – Mapping of InfrastructureClosure and Aftercare – Affected Stakeholders		
Geo-information needs		
<ul style="list-style-type: none">DO-4: Land disturbed by mining activitiesDO-5: Land progressively rehabilitated;DO-27 Mapping of illegal mining operationsCA-1: Demonstration of rehabilitation/revegetation;CA-2: Characterisation of flora and fauna;CA-4: Demonstration of infrastructure removal;CA-6: Demonstrate no impact on a special area of conservation;CA-8: Farming activities - confirm the return to baseline conditions for crops/animals		
Description		
<p>The product reports (for a given area) the land disturbed by the mining operators during the construction and operational phases. By comparing two or multiple satellite images (optical imagery products) acquired at different times, both the mapping and mining authorities can control whether the conducted mining activities are nominal. By combining manual or automatic inspection of those images and the use of a Geographical Information System (GIS) program, vector layers can be generated to delimit the land disturbed by mining activities and investigate the evolution of the land cover throughout the construction and operation phases.</p> <p>Moreover, infrared and optical imagery products can also be coupled (i.e., by making ratios of images taken at different wavelengths) to quantify how the vegetation within and around the mining site have been disturbed (via for example the generation of vegetation index map products).</p>		

Known restrictions / limitations

Cloud coverage might be an issue if a high-resolution land use/cover evolution (in time) is needed. The magnitude of such limitation is dependent on the geography and climate of the mining site as well as the season.

Lifecycle stage and demand

Exploration	Environmental Assessment and Permitting	Design, Construction and Operations	Mine Closure and Aftercare

Geographic coverage

Demand and coverage are global.

EARSC Thematic Domain

Domain	Land
Sub-domain	Land use
Product description	Monitor land cover and detection change

PRODUCT SPECIFICATIONS

Input data sources

Satellite	<i>Sentinel-2</i>	<i>Landsat-8</i>	<i>GeoEye-1</i>	<i>Worldview-1, 2 and 3</i>	<i>SPOT 6, 7</i>	<i>Pleiades</i>
Status	In operation	In operation	In operation	In operation	In operation	In operation
Operator	ESA	NASA	Digital Globe	Digital Globe	Airbus	
Data availability	Public	Public	Commercial	Commercial	Commercial	Commercial
Resolution (m)	10 - 60	15 - 100	0.46	0.31-0.46	1.5	0.5
Coverage	Global	Global	Global	Global	Global	Global
Frequency (days)	5	16	< 3	< 2	< 1	< 1
Launch year	2015	2013	2008	2007/2009/2014	2012/2014	2011
Website	link	link	link	link	link	link

NOTE: Airborne and drone imagery products (optical and infrared) for local and regional analysis might also be used in order to obtain higher image resolution.

NOTE 2: Most of the satellite operator provide images under raster type of formats such as ".tif" files. Satellite products are often gathered into a single product containing several bands (i.e., images obtained at different wavelengths).

Minimum Mapping Unit (MMU)

Minimum detectable feature size (*dependent on the input pixel resolution, ~1 - 3 px*)

Accuracy / constraints

Thematic accuracy:

>85% threshold for overall accuracy / class accuracy.

Spatial accuracy:

Dependent on the input pixel resolution; typically, ~0.5 - 1 pixel.

Accuracy assessment approach & quality control measures

Dependent on the input pixel resolution; typically, ~0.5 - 1 pixel.

Frequency / timeliness

Digitization of land disturbed by mining activities from imagery products can be completed within a few hours/days of work, dependent on how large the area disturbed by mining activities is.

To tie in with corporate reporting, monthly assessment and reporting would be required.

Availability

Data from Sentinel satellites are freely available through the open data policy of the European Space Agency. Data is made available typically within 6-12 hours of satellite fly-over (similar for Landsat through NASA open data policy).

GeoEye-1, Worldview, SPOT and Pleiades data are commercially licensed and must be purchased through operator/vendor. Usually available within hour(s) of satellite fly-over.

Airborne and drone imagery products can be purchased through operator/vendor. Usually available within hours or days after acquisition.

Delivery / output format

Overview map of mining activities (and evolution in time)

Land cover (land disturbed)

Overview map of land disturbed by mining activities

Output: raster formats - GeoTiff, report on key indicators, client-specified spatial formats

Shetland Islands | Sullom Vær
Environmental impact assessment

2003

2013

Land cover

- Water
- Roads
- Bare areas
- Agriculture
- Grassland
- Peat bog
- Peat bog - dry
- Peat bog - wet
- Peat bog - degraded
- Young peat bog
- Sealed and bare areas
- Built up
- Oil and gas tanks
- Production facilities
- Harbour - built up
- Harbour - pipelines

Construction

Scale: 0 750 1500 m

GeoVile
Produced by GeoVile for British Petroleum (BP) as part of the BP Sullom Vær Environmental Impact Assessment

Source: GeoVille

Shetland Islands – Environmental impact assessment

The aim of this project was to support environmental impact assessment and to provide guidance to minimize ecological impacts and to value ecosystem services in the region. A detailed very high-resolution land cover and land use classification was provided. The examples were used to identify valuable ecosystem services, to recognize ecosystem services dependencies and the impact caused by the operations. This method may also be applied to monitor mining activities and the land disturbed by them.