



# A platform for biodiversity-related portfolio risk assessment based on Earth Observation and open geodata

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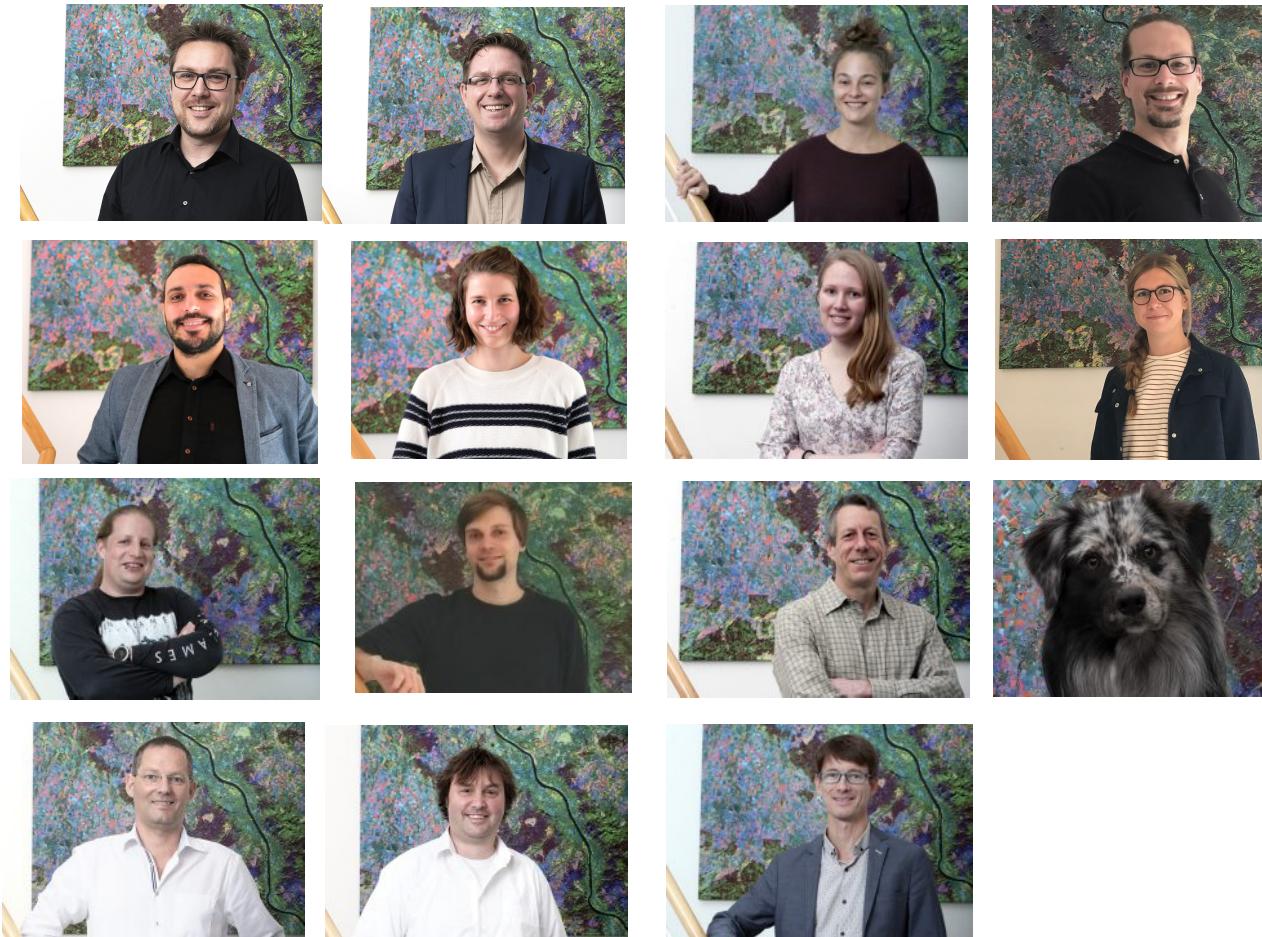
<sup>2</sup> Climate & Company

<sup>3</sup> Earthmind



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# About mundialis



- Founded in 2015, located in Bonn, Germany
- 14 experts + 1 specialised in sleeping
  - Focus on Earth Observation and geospatial data analytics
  - Open Source and cloud development
- Customers (excerpt): *ESA, DLR, WHO, Deutsche Telekom, GIZ, Norwegian Env. Agency, Deutsche Bahn, German Archeological Institute*
- Research projects: numerous European (H2020, CEF) and nationally funded projects  
<https://www.mundialis.de>



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# Consortium



- Sustainable finance think tank, project lead
- Analysis of disaggregated firm-level data: supply chain, corporate structure, revenue distribution



- Biodiversity in finance expertise
- Design and methodology consolidation

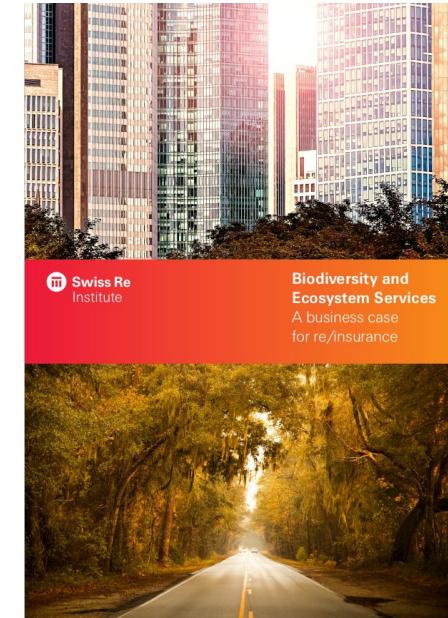
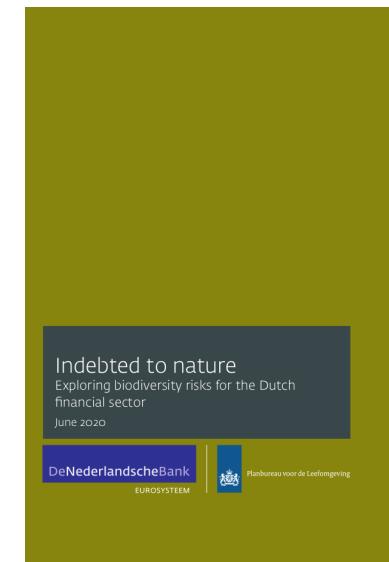
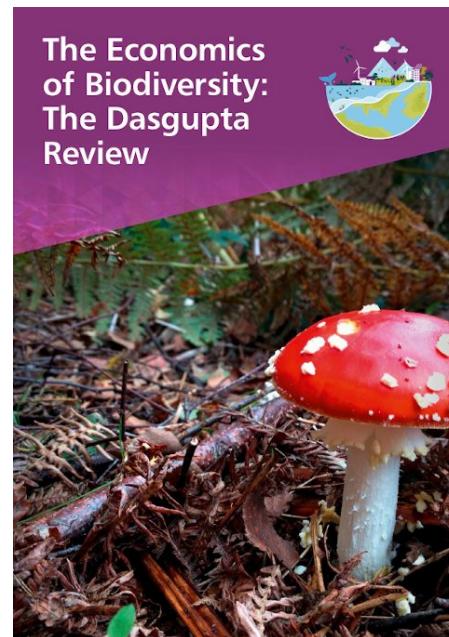
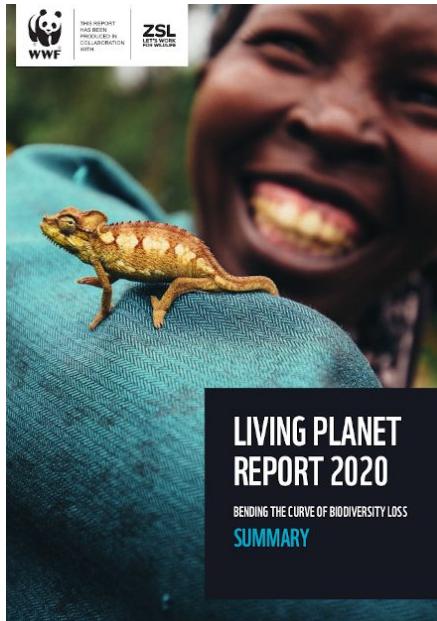


- EO and geospatial data analysis
- Development of the prototype tool



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# Background





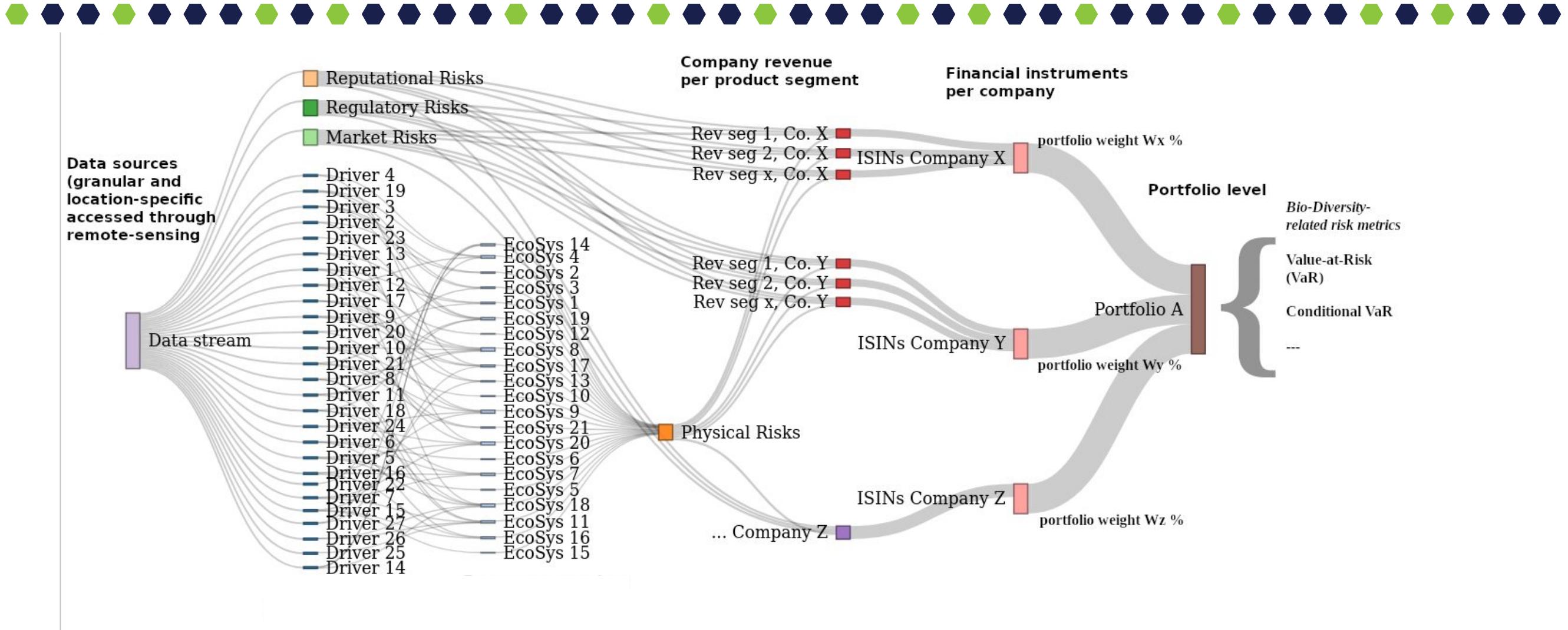
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# Project Goals



- Development of a spatially explicit (nature-related) risk assessment framework
  - Combine local company asset level information with geospatial and EO datasets
- Different risk categories: ***physical*** (*first order, supply chain*), ***regulatory, reputational (transitional)*** and ***market*** risks. Focus on physical risks.
- Develop a prototype tool to assess (financial) risks based on a portfolio
- Identify limitations and data gaps on the way

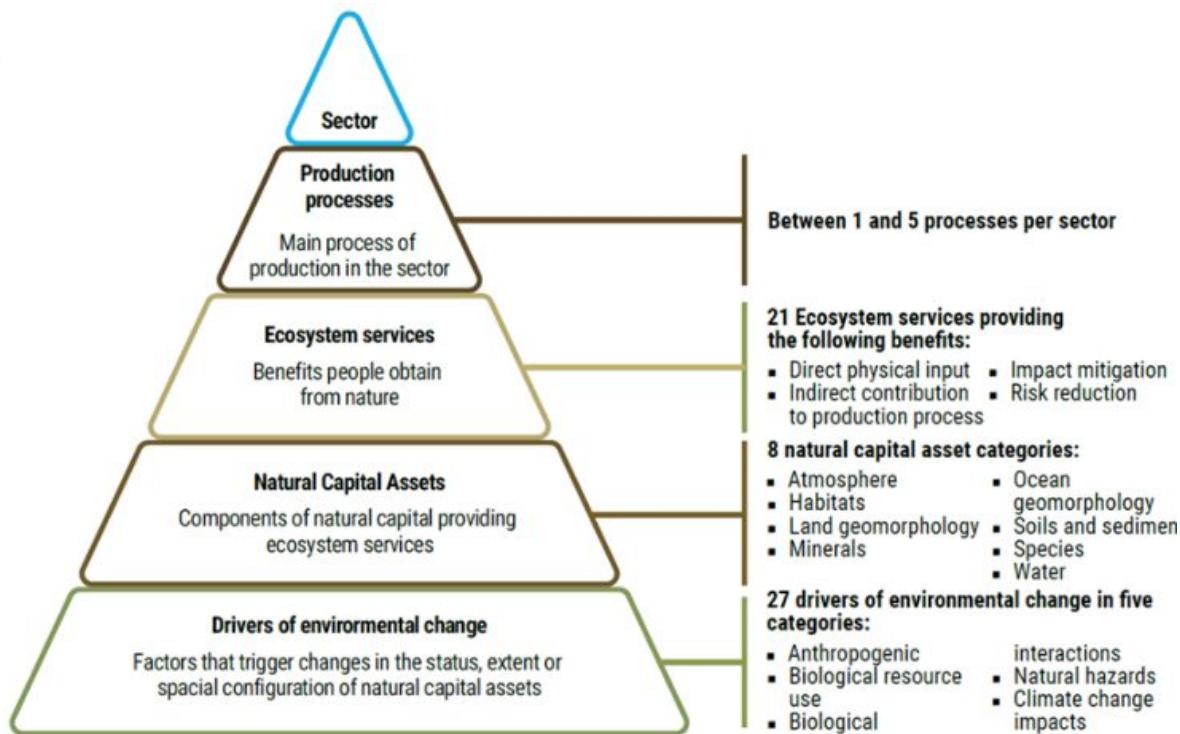
# Methodology - Overview





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# Methodology – ENCORE terminology



Ecosystem service	Category	Market cap	Total assets	Revenue
<i>X% of the global share of mcap/assets/revenue depends on...</i>				
Surface water	Direct Physical Input	17.43%	6.97%	13.04%
Ground water	Direct Physical Input	7.41%	2.40%	7.54%
Flood and storm protection	Protection from Disruptions	7.19%	3.60%	9.43%
Climate regulation	Protection from Disruptions	4.03%	1.67%	6.81%
Mass stabilisation and erosion control	Protection from Disruptions	2.02%	0.84%	1.53%
Water flow maintenance	Enabling	0.99%	0.39%	0.91%
Water quality	Enabling	0.58%	0.55%	2.00%
Fibres and other materials	Direct Physical Input	0.32%	0.10%	0.14%
Buffering and attenuation of mass flows	Protection from Disruptions	0.09%	0.04%	0.07%
Soil quality	Enabling	0.04%	0.01%	0.04%
Disease control	Protection from Disruptions	0.03%	0.01%	0.03%
Maintain nursery habitats	Enabling	0.03%	0.01%	0.02%
Pollination	Enabling	0.03%	0.01%	0.02%
Pest control	Protection from Disruptions	0.03%	0.01%	0.02%
Animal-based energy	Direct Physical Input	0.01%	0.00%	0.01%



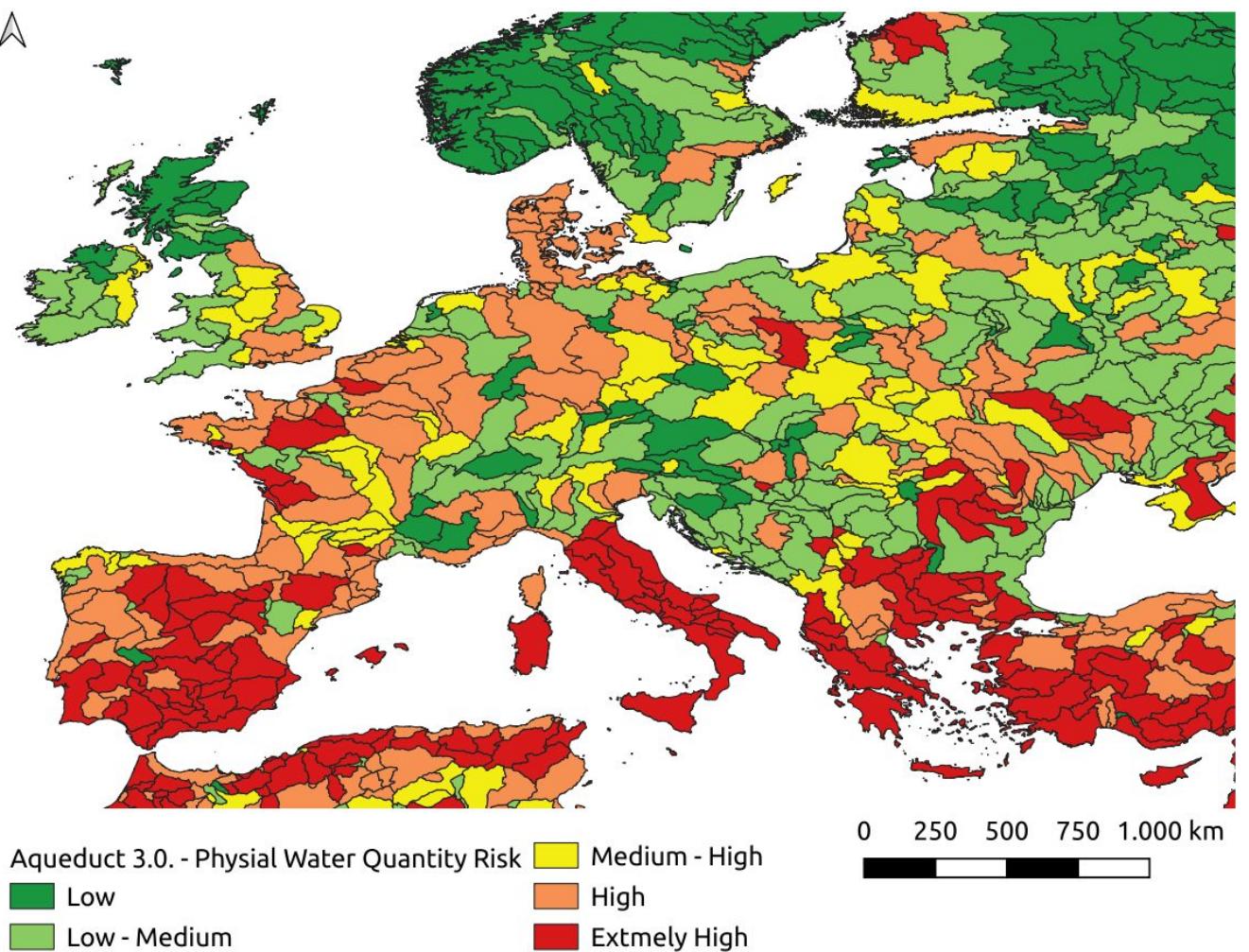
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# Methodology – Data Sources



## Provision of Surface Water

- AQUASTAT (FAO)
- HydroAtlas (WWF)
- WaterRiskFilter (WWF)
- Aqueduct 3.0 (WRI)
- ...





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# Methodology – Data Sources



## Driver: Habitat Modification

- Land Cover Change
  - Copernicus Global Land Cover
  - ESA CCI Land Cover
  - ESA WORLDCOVER
  - Sentinel-2 time-series
  - Semantics?





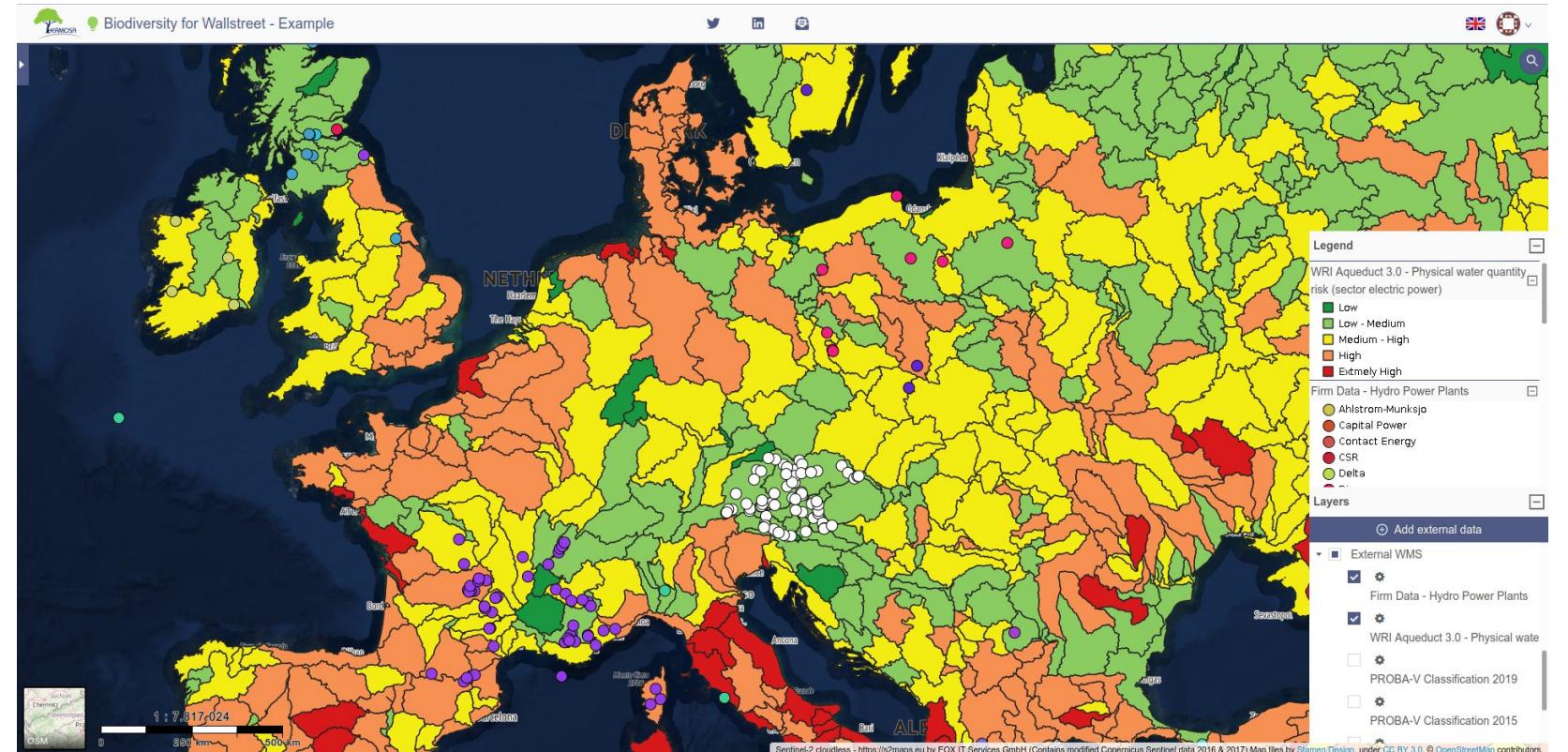
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# Methodology – Spatial Scale



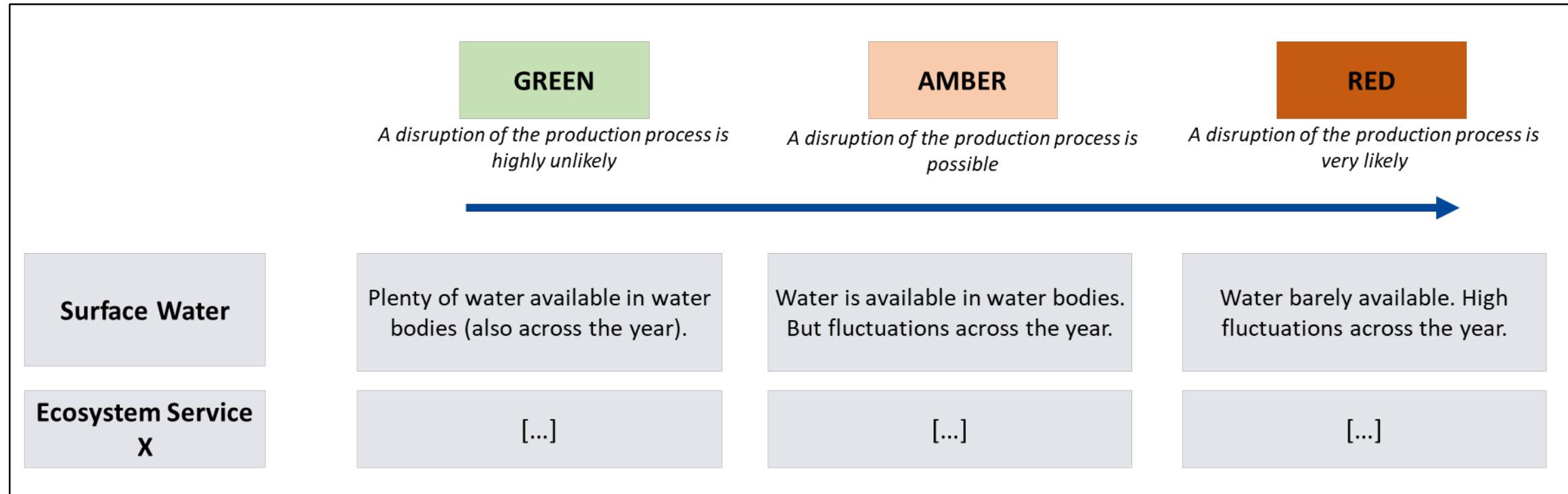
## Defining a suitable scale for ecosystem service assessment at asset level

- (buffered) exact location
- natural boundaries
  - (sub-)basins
  - landscapes
- administrative boundaries





# Grading





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# Platform Prototype



Biodiversity for Wallstreet



EARTH MIND

Capital Power x CSR x

Name Sektor Symbol Gewichtung (Summe = 100%)

Capital Power	50%
CSR	50%

Absenden

Value-at-Risk (gesamt)

Der bedingte Value-at-Risk (auf 99%-Niveau) Ihres Portfolios beträgt: 2

Nach Firmenname

Name	Physisches Risiko	Oberflächengewässer	Hochwasser- und Sturmschutz	Bestäubung	Fasern und andere Materialien	Klima-Regulierung
CSR	3	2	1	1.67	3	2.67
Capital Power	1	2.33	2.33	1.83	2	2.17

Nach detailliertem Standort

Name	Sektor	Oberflächengewässer	Hochwasser- und Sturmschutz	Bestäubung	Fasern und andere Materialien	Klima-Regulierung
CSR	Australia	2	1	3	3	3
CSR	Australia	2	1	1	3	2
CSR	Australia	2	1	1	3	3

Informationen zu Ökosystemleistungen

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# actinia - geoprocessing engine



- **cloud based geoprocessing API & engine**
- based on **GRASS GIS**
- easy **automatisation** in processing chains
- **scalable** (docker, Openstack, Openshift, ...)
- **user-owned data + EO archives**  
(e.g. Sentinel, Landsat, ...)
- **OSGeo Community Project since 2019**

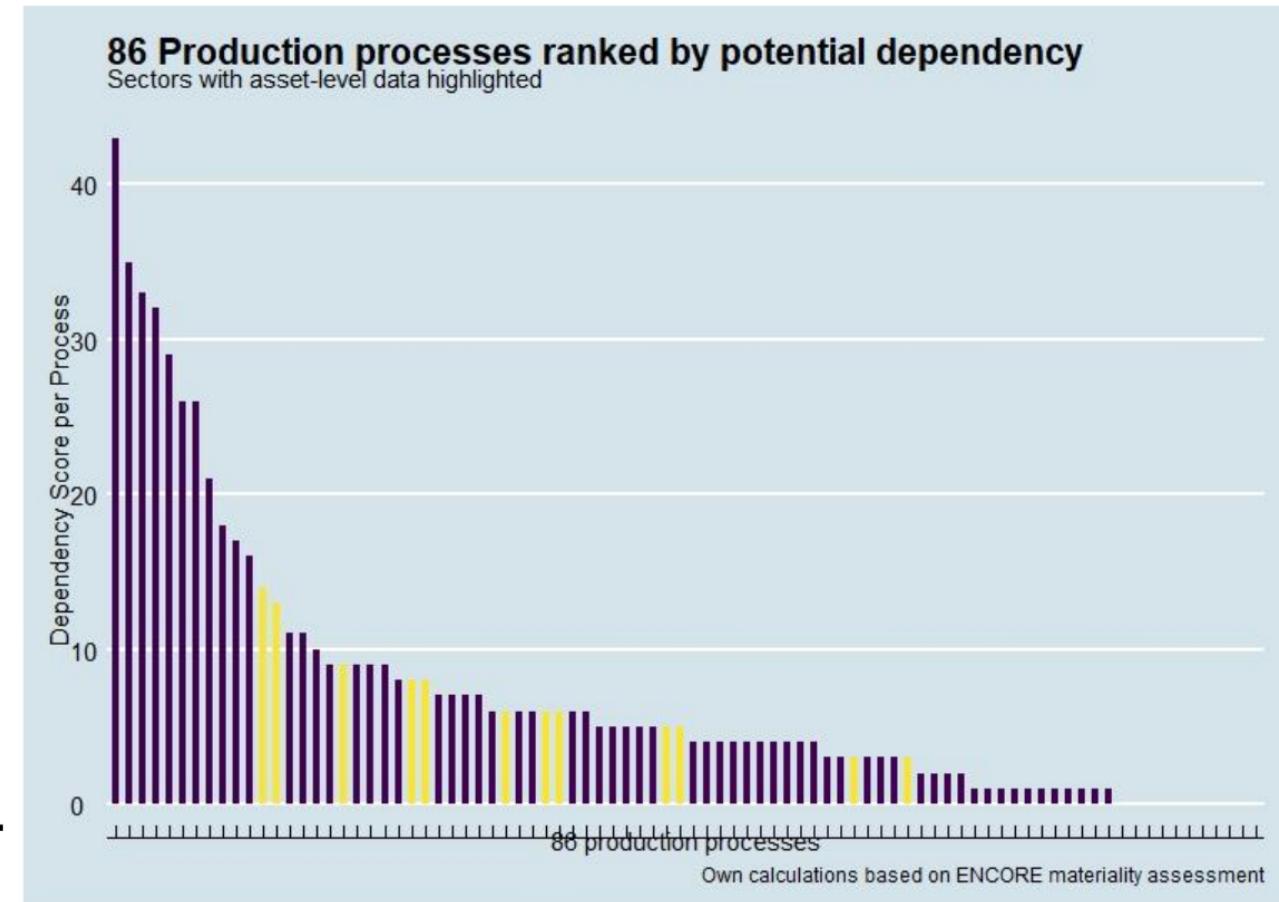




# Limitations

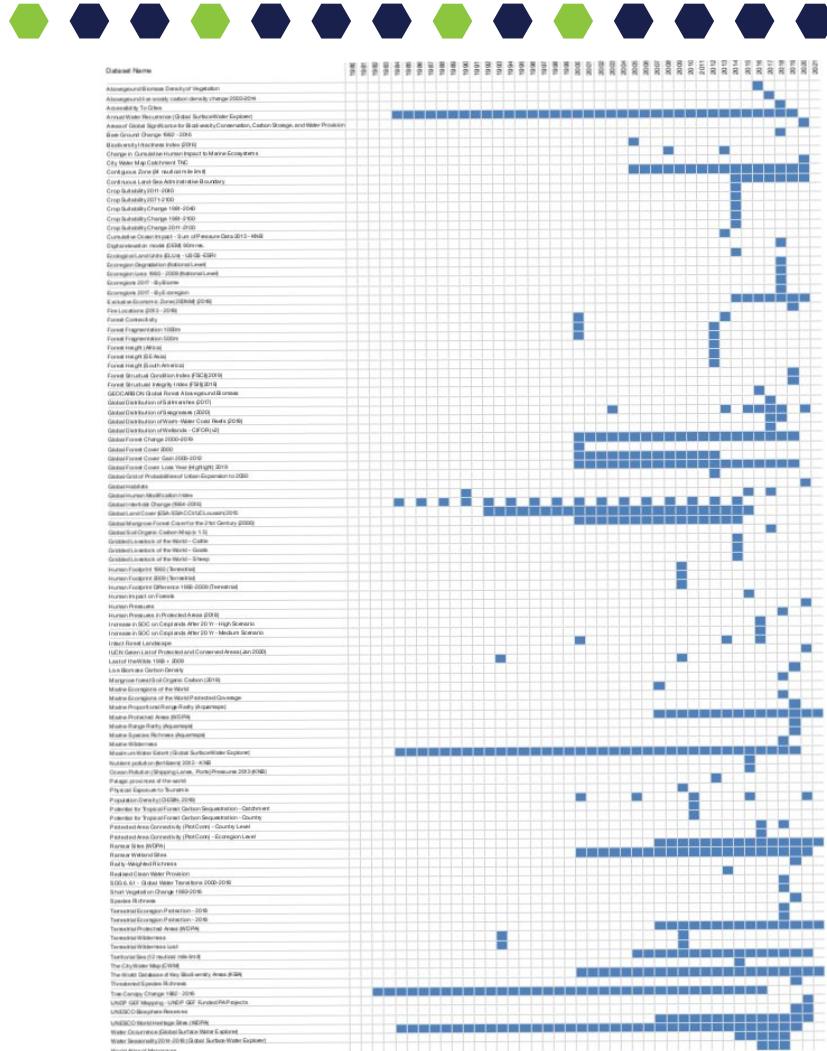


Sector	ENCORE: production processes (with high or very high dependency on Ecosystem Service...)	Open Source Data Availability
Oil	<b>Integrated Oil and Gas</b> ( <i>Surface water, Flood and storm protection, Water quality, Ground water</i> )	WRI
Gas	<b>O &amp; G transportation</b> ( <i>Mass stabilisation and erosion control</i> )	WRI
Coal	<b>Mining</b> ( <i>Surface water, Water flow maintenance, Ground water, Climate regulation</i> )	WRI or Global Tailings Portal
Power ( <i>Thermal Oil/Gas/Coal; Nuclear; Hydro; Renewables</i> )	<b>Biomass energy production</b> ( <i>Fibres and other materials</i> ) <b>Geothermal energy production</b> ( <i>Ground water</i> ) <b>Hydropower production</b> ( <i>Mass stabilisation and erosion control, Flood and storm protection, Surface water, Water flow maintenance, Climate regulation</i> ) <b>Nuclear and thermal power stations</b> ( <i>Surface Water</i> ) <b>Solar</b> ( <i>Climate Regulation</i> ) <b>Wind energy provision</b> ( <i>Climate Regulation</i> )	WRI
Automotive	<b>Manufacturing of machinery, parts and equipment</b> ( <i>no high dependency</i> )	Not available
Aviation <sup>1</sup>	<b>Airport Services</b> ( <i>Flood and storm protection</i> )	Not available
Shipping <sup>1</sup>	<b>Marine ports and services</b> ( <i>Surface water, Ground water</i> ) <b>Marine transportation</b> ( <i>Flood and storm protection, Climate regulation</i> )	Not available
Cement	<b>Construction materials production</b> ( <i>Ground Water, Surface Water</i> )	Spatial Finance Initiative
Steel	<b>Steel production</b> ( <i>no high dependency</i> )	Spatial Finance Initiative
Iron	<b>Iron production</b> ( <i>no high dependency</i> )	Spatial Finance Initiative

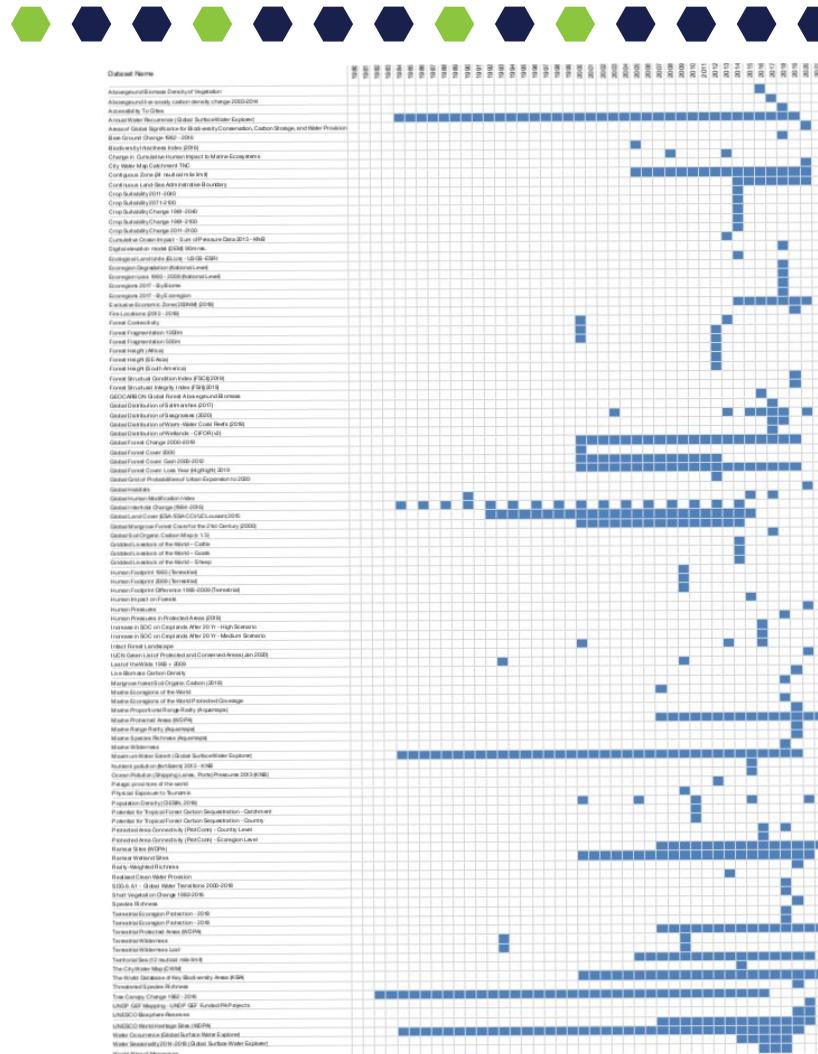




# Limitations & Outlook



# Limitations & Outlook



Copernicus Global Land Service		Copernicus Europe's eyes on Earth	
Providing bio-geophysical products of global land surface			
Home	Products	News	Product Access
<b>Overview of the product portfolio</b>			
From medium to high resolution			
Theme	Variable	Spatial Resolution	
		Moderate 100m	
Vegetation	Land Cover	In development	
From coarse to medium resolution			
Theme	Variable	Spatial Resolution	
		Coarse ≥ 1km	Medium 300m
Vegetation	Fraction of photosynthetically active radiation absorbed by the vegetation	In production	In production
	Fraction of green vegetation cover	In production	In production
	Leaf Area Index	In production	In production
	Normalized Difference Vegetation Index	In production	In production
	Vegetation Condition Index	In production	
	Vegetation Productivity Index	In production	
	Dry Matter Productivity	In production	In development
	Burnt Area	In production	In production
	Land Surface Temperature	In production	
	Top Of Canopy Reflectance	In development	In development
Energy	Surface Albedo	In development	In development
	Soil Water Index	In production	
	Surface Soil Moisture	In development	
	Downward Short- and Longwave Fluxes at the surface	In development	
	Water Bodies	In production	In development
Water	Lake Surface Water Temperature	In development	
	Lake Water Quality (reflectance, turbidity, trophic state)	In development	
	Lake Ice Extent	In development	
Cryosphere	Snow Cover Extent	In development	
	Snow Water Equivalent	In development	
Non-gridded products			
Theme	Variable	Rivers and Lakes	
Water	Water Level	In development	

Copernicus Global Land Service		Copernicus Europe's eyes on Earth			
Providing bio-geophysical products of global land surface					
Home		Products			
Use cases		Product Access			
Viewing		Library			
Get Support					
<b>Overview of the product portfolio</b>					
The Copernicus Global Land Service reliably provides a set of biophysical variables which describe the state and the evolution of the vegetation, the energy budget, the water cycle and the cryosphere over the land surface at global scale.					
The below tables show the availability of the latest major version, <b>In near-real time</b> . For more details on the definition, quality, development or version history of the products, as well as the available archive (time series), please visit the individual product pages.					
<b>From medium to high resolution</b>					
Theme	Variable	Spatial Resolution			
		Moderate 50-100m			
Vegetation	Land Cover	In production			
Water	Lake Water Quality	Archive only			
	Water Bodies	In production			
<b>From coarse to medium resolution</b>					
Theme	Variable	Spatial Resolution			
		Coarse ≥1km	Medium 250m-500m		
Vegetation	Fraction of photosynthetically active radiation absorbed by the vegetation	Archive only; Near-Real Time (NRT) to be resampled from 300m			
	Fraction of green vegetation cover	Archive only; NRT to be resampled from 300m			
	Leaf Area Index	Archive only; NRT to be resampled from 300m			
	Normalized Difference Vegetation Index	Archive only; NRT to be resampled from 300m			
	Vegetation Condition Index	Archive only			
	Vegetation Productivity Index	Archive only			
	Dry Matter Productivity	Archive only; NRT to be resampled from 300m			
	Burnt Area	Archive only; NRT to be resampled from 300m			
	Soil Water Index	In production			
	Surface Soil Moisture	In production			
Energy	Land Surface Temperature	In production			
	Top Of Canopy Reflectance	In production			
	Surface Albedo	Archive only			
Water	Water Bodies	Archive only			
	Lake Surface Water Temperature	In production			



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# Thank you very much for your attention!



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