EO Services (Thematic)

This page shows the taxonomy structure of the EO services organised thematically. There are 6 classes of service as shown on the tabs. Each class contains a number of thematic sectors into which the EO services are grouped.

- Thematic Sector: this is the classification of the grouped EO services.
- Client view: These are each EO service described as a client may wish.
- Key-words: these define the products which can make up an EO service.

Land

Thematic Area	EO Services	Description
Monitor agriculture	Assess environmental impact of farming	Assess how yields and production are evolv
	Assess crop damage due to storms	Protect crops from extreme weather events food-security, impact.
	Assess and monitor crop disease and stress	crop health (disease and stress), crop acrea
	Monitor and forecast crop yields	Monitor and forecast specific crop types i.e. affect crop acreage and yield harvest (inver emergency preparedness, return on investn
	Detect illegal or undesired crops	Crop planting area monitoring, crop area inf
	Monitor water use on crops and horticulture	Monitoring of run-off, improved agricultural v
Monitor forests	Assess deforestation / forest degradation	Assessment and monitoring of forest bioma verification (MRV), Reducing Emissions fror
	Assess forest damage due to storms or insects	Assessing and managing damaged timber c
	Assess, monitor & manage onitor forest resources	Mapping forest and classifying forest type/c analysis (timber volume, inventory, clear cu
	Detect illegal forest activities	Detect and identify illicit logging, change-de
	Assess environmental impact of forestry	Assess changes in the forestry and tree line
	Monitor forest carbon content	Monitor carbon balance, carbon tracking, gl
Monitor bodies of inland water	Assess and monitor water bodies	Provides qualitative and quantitative informa water quality, pollution, temperature, volume
	Assess & monitor wetlands	Water bodies monitoring and assessment, s
	Assess ground water and run-off	Assess water run-off (water quantity), hydro catchment.
Monitor snow & ice	Monitor ice on rivers and lakes	Monitor grounded and floating ice covers or
	Detect changes in glaciers	Long term monitoring of glacial variations es
	Monitor & assess snow cover	Monitoring snow cover area extent (depth, t
Assess land ecosystems	Assess land ecosystems and biodiversity	Assessment of the ecosystem condition and and biomass, leaf area index (LAI), estimati
	Assess environmental impact of human activities	Monitoring anthropogenic impact on land re term cultivated; improved pasture, unimprov
Monitor land use	Monitor land use and land use change	Monitoring Land Use (LU) and Land Cover (assessment procedures), Land Use, Land U
	Detect illegal mining activities	Monitor and address various impacts of min illegal mining. These activities monitor the p
	Assess land accounting (value, ownership, type, use)	Measure land use statistics and land accou use of fertilizers/ pesticides, threats to wildli landscape changes e.g. land use land cove accounting and land administration, land us
	Monitor vegetation encroachment	Monitoring terrain surrounding infrastructure

	Monitor land cover and detect change assessment	A range of direct and indirect measurement (characterization & classification), soil sealir
Monitor topography & motion	Baseline mapping	Surface deformation maps and profiles elev
	Measure and detect land surface change	Measure ground and infrastructure displace
	Monitor coastal land cover	Monitor coastal land cover, coastline, shore
	Detect and monitor ground movement	Detect reservoir compartmentalization & op
Extract information about subsurface geology	Map geological features	Detect and map features extraction, near su
	Map seismic survey operations	Map seismic (survey, coupling, logistics), gr
	Monitor mineral extraction	Monitoring the environmental impacts of mi
	Identify hydrocarbon seeps in soil	Identification of hydrocarbon seepage (oil s

Built Environment

Thematic Area	EO Service	Description
Monitor built environment	Monitor urban areas	Observation, identification, mapping, assessment and monitoring of urban areas and their dynamics at a range of spatial and temporal resolutions. Digital imaging processing methods such basic thresholding, unsupervised classification or products such urban heat island, impervious surfaces, land use change (residential, commercial, other), building density (3D city modelling), high photovoltaic penetration at the urban scale..
	Monitor urban surroundings	Understanding human settlements on the outskirts and near rural areas. Mapping and evolution characterization of human interactions (environmental, population and habitat fragmentation, soil sealing and socio-economic) of rural areas and surroundings, urban sprawl, green urban areas.
	Monitor urban green & blue areas	Monitor green and blue urban areas (in relation to urban form, energy use and carbon emissions). It is about the estimation of urban energy fluxes at a neighbourhood scale (urban energy balance) using land cover, Digital Surface Models (DSM), surface roughness parameters (such as plan area index, frontal area index, roughness length and zero-displacement height), urban ecosystem restoration, urban heat island effect, green corridors, garden monitors.
	Monitor construction & buildings	Construction site surveying and progress mapping, comprising surrounding ground as well as displacements of key components of such structures. There is a need for Near Real Time (NRT) data delivery and measuring stress.
Monitor infrastructure & installations	Assess damage from industrial accidents	Assess structural integrity of the infrastructure, site suitability and vulnerability. Connection with disaster risk reduction (emergency response, recovery, rehabilitation and reconstruction).
	Asset infrastructure monitoring	Industrial activity assessment, monitoring of functional planning zones, exploit correlation with industrial activity to improve the model of subsurface, site suitability and vulnerability, land cover, infrastructure, dyke monitoring, emergency airport planning, etc.
	Map & monitor solar energy (solar farms)	Urban solar mapping and understanding the basic characteristics of solar radiation over specific monitoring locations including estimating the variability of solar radiation for site selection and grid data/operators. Solar monitoring services use time series, Direct Normal Irradiance (DNI), Diffuse Horizontal Irradiance (DHI) and Global Horizontal Irradiance (GHI), shadow mask.
	Map & monitor wind energy (wind farms)	Understand where wind farms can be sited most cost-effectively and monitor and map wind energy fields (design and operation), wind roses, wind speed & direction.
	Map & monitor hydroelectric energy	Hydrological network mapping (drainage navigation erosion) including hydropower grid monitoring and resource assessment. Water resource (reservoirs) monitoring, hydrological modelling and flood forecasting and mapping (dams).

Monitor transport networks	Map line of sight visibility (land surface)	Landscape visibility mapping and analysis, including spatial planning, terrain mapping (DTMs), land surface, map transmission and land routes.
	Map & monitor transport networks	Transportation systems, interdependencies and industrial progress planning including site, soft ground and network mapping, highway environmental monitoring and assessment, identification of road or track for logistics planning.
Monitor waste	Monitor land pollution & waste management	Identifying illegal dumping and waste management and disposal for law enforcement. Landfills and dump sites emit large quantities of methane, quantify the emissions from these large sites in a single snapshot (maps) and do it frequently, surface and subsurface soil contamination monitoring, Land use/Land cover (LU/LC) maps which depict the physical characteristics of the surface, dry matter productivity, migration of pollutants and imperviousness land surface are parameters needed for this service.

Maritime & Marine

Thematic Area	EO Service	Description
Metocean	Forecast & monitor ocean currents and drift	Ocean water forecasting including ocean dynamics and circulation: tides and ocean currents (surface current models for tides), sea level, sea surface salinity (internal waves, eddies and frontal areas), upwelling, sea state, etc.
	Forecast & monitor ocean winds and waves	Wind resource mapping, derived winds (speed, direction, stress) and waves (current veins, swell-maps, sea surface height), wave exposure (fetch, averaged directional wind speed and bathymetry). The sea surface roughness is impacted by wind (waves) and rain cells.
	Forecast & map large waves	Forecasting extreme waves / tsunami, inundation forecasting (flow depth distribution), vulnerability maps, bathymetry, current velocity.
	Detect & monitor hurricanes and typhoons	Monitoring atmospheric front, local weather phenomena, cloud structure, winds and waves, sea-surface temperature and sea-surface height.
	Monitor ocean level & surface	Monitor (changes in) sea level, physical characteristics such as gravity, currents, temperature and salinity, ocean circulation (currents and eddies at the edges of holes and bumps), seasonal or inter-annual variations, or even longer periods (long-term rise in sea level), hindcasting.
Monitor coastal areas	Monitor water depth or charting	Satellite derived bathymetry mapping and charting. Surveying shallow waters.
	Monitor transitional water bodies	Essential environmental monitoring and management in aquatic ecosystems focus on rivers (inland waters, watershed) and lagoon/estuary-coastal region-ocean/Sea. Research projects now aiming to harmonise monitoring approaches across different water bodies.
	Assess & monitor coastal water quality	Detecting and mapping suspended sediment concentrations sediment (qualitative, quantitative), turbidity (quality, quantitative), visibility, chlorophyll-a concentration, suspended sediment may be indicative of estuarine processes, re-suspension or pollution.
	Predict jellyfish	Assess the impact of jellyfish in human activities through ocean physics analysis maps (salinity, currents, sea level (SS hight), temperature (SST), ocean colour), ocean biogeochemistry analysis maps (ocean chlorophyll), policy objectives (marine policy, coastal management, common fisheries policy, marine strategy framework).
Monitor marine ecosystem	Monitor ocean quality & productivity	Assessing water-related ecosystems. Water quality status (sea surface temperature (SST), transparency or turbidity, and ocean colour ocean colour composite (chl-a, transparency, swath, qualitative, quantitative), which enable eutrophication assessments and the detection of algal bloom (phytoplankton, harmful blooms - HABs), ocean productivity (carbon content, primary production).

	Monitor marine habitats	Monitoring generic life marine ecosystem (algal blooms, marine mammals...), sea surface temperature, sediments, plumes, nutrients, dredging operation, coral reef health assessment (bleaching), marine non-indigenous species (NIS), etc.
	Monitor ocean acidification	Monitoring the ocean carbonate chemistry, bio-geo-chemical cycles, ocean salinity, insitu (partial pressure of carbon dioxide in the water, dissolved inorganic carbon, alkalinity and pH).
	Monitor invasive species	Sargassum detection for seasonal planning (estimate drift and eventual landings on the coasts), Products such as drifting simulation modelling, together with weather and surface currents.
Monitor fisheries	Map fish shoals	Fish-shoal location, fish population dynamics fed by-catch reports (ERS-Electronic recording and reporting system) and catch efforts estimated from VMS (Vessel Monitoring System), collection of catch reports. Other products in consideration such bathymetry, waves, current movement and drift, pollution, ocean colour, surface temperatures (SSTs), sea surface height anomalies and sea surface colour revealing the abundance of chlorophyll a).
	Detect & monitor illegal fishing	Track and localization of licensed fishing vessels movements and detect suspicious activity, fleet management services (ocean colour, PP, SST, etc).
Monitor sea-ice & icebergs	Detect & monitor ice-risk at sea	Detect sea-ice and icebergs (ice cover, sea ice thickness, height of the ice surface, water body extent) during ship routing.
Ships monitoring, detection & tracking	Detect ships in critical areas	Detect and monitor the movement of ships and activity at associated ports and infrastructures (baseline activity), shipping and navigation.
	Monitor ship movements	Monitor sea-traffic, shipping lanes, ship-source pollution, discharges, sea surface temperature (SST).
Monitor marine pollution	Monitor pollution at sea	Monitoring turbidity & pollutants at sea such marine litter, marine plastics, hazardous and noxious substances (HNS) with relevant parameters (altimetry, sea-surface salinity, sea-surface temperature, ocean colour and sea-ice data) and policy objectives (integrated maritime policy, environmental action programme, etc).
	Detect & monitor oil slicks	Detect and monitor size, extent and location of oil spills, as well as providing information on wind, current and waves to predict oil movement. The oil spill threats are on early warning stages of natural oil seepage and during the disaster monitoring and characterization).
	Monitor oil rigs & flares	Monitoring of methane and other gases flared from gas flares and oil rigs, oil wells due to possible malfunctioning. Typically service accompanying forecast weather conditions.

Atmosphere & Climate

Thematic Areas	EO Service	Description
Monitor the atmosphere	Monitor and forecast air quality & emissions (fluxes)	Pollution and greenhouse gas emission monitoring. Measuring atmospheric concentrations and characterizing the micrometeorology or using atmospheric dispersion models to back-calculate the emission rates that gave the concentrations observed. Air quality/pollution source maps (CH4, CO2, NO2 & SO2, Particulate Matter, maps of average pollutant flux PM2.5, PM10).
	Monitor atmosphere composition	Monitoring present conditions and forecasting the distribution (transportation), for a few days ahead, of both anthropogenic and naturally occurring key greenhouse gases (GHG) like carbon dioxide (CO2), methane (CH4), or reactive gases such as nitrogen dioxide (NO2), sulphur dioxide (SO2), ozone (O3), etc.
	Forecasting sunlight exposure	While the solar radiation impacting the top of the atmosphere can be well modelled, the solar radiation arriving at the surface is dependent on the atmospheric transmission and turbidity and aerosol optical depth. Forecasting and risk assessment amount of solar (sunlight) radiation which reaches the surface of the planet (UV, radiation measures, models).
Monitor climate change	Assess changes in the carbon balance	Measuring carbon stocks, especially aboveground biomass and providing an overview of a range of approaches that have been developed and used to map biomass across a diverse set of conditions and geographic areas (quantifying stem volume and carbon stock changes). It also includes historical climate data.

	Assess climate change risk & climate forcing	Assess current and future vulnerability to climate change including variability caused by a perturbation of the climate system and associated atmospheric composition (aerosol, ozone and greenhouse gases) driven by human activities). The radiative forcing measures the imbalance in the surface solar irradiance and is a useful predictor of globally averaged temperature change.
Forecast the weather (meteo)	Forecast weather	Monitor and forecast weather conditions such as temperature, storms, precipitation, heat waves and tropical cyclones – as well as other hazards influenced by weather, like floods or dispersion of atmospheric or marine pollution.

Disasters & Geohazards

Thematic Area	EO Services	Description
Assess disasters & geohazards (emergency)	Map and assess flooding	Map and assess the extent of the flooding event (floods map, exposure), floodplain mapping, flood risk dynamic assessment and management of water buffer areas (overflow). Measure a variety of physical and biological parameters (incl. turbidity levels) in aquatic ecosystems over small and large areas. Products look into the flood impact and extent in phases such as early warning (early/quick/rapid detection), response and recovery monitoring.
	Forecast and assess landslides	Mapping, monitoring, early warning (quick/rapid detection) and assessment of trigger events, unstable areas (rainfall influence) such as landslides (dynamic risk damage, slope instability, subsidence detection, fault and discontinuity maps (vector or raster), ground deformation and motion). Associated services include support for the evacuation of areas prone to collapse or the identification of suitable areas for urban replacement.
	Assess and monitor volcanic activity	Assess ground deformation associated with volcanoes, seismic activity, volcanic eruptions (pre-eruptive, sin-eruptive, gas emissions, atmospheric ash, dispersion, heat flux). Rapid damage estimation (prevention), earthquake damage extent (loss adjuster dispatch). Impact on land cover and landscape (changes). Early warning (quick/rapid detection) and tracking of unrest / eruptive activity using satellite data in support of hazards mitigation activities. Map of the recent lava flows.
	Detect and monitor wildfires	Use optical data to detect and monitor the heat emitted by the fires [forest fire risk (extent, burnt scars) under rapid damage estimation, fire weather index[1] damage, fire protection, rapid damage estimation (prevention, insurance)]. Impact on global atmospheric emissions, with biomass burning to contribute to the risk on human health (besides direct effects, PM2.5, PM10 health impacts) and also to global budgets of greenhouse gases (GHG) like carbon dioxide etc. Monitoring of risk prevention factors [early warning (early/quick/rapid detection)] and issuing alerts for high risk locations.
	Assess damage from earthquakes	Mapping and monitoring of seismic exposure (e.g. population distribution and density in high-seismic-hazard areas). Earthquake disaster prevention, early warning (early/quick/rapid detection), recovery (reconstruction monitoring, residual risk assessment, dynamic risk assessment, information, damage). Extracting background information on seismic, inter-seismic deformations, slip rates & active faults, stress transfer on faults, rapid damage estimation (prevention), change detection and preliminary damage map earthquake damage extent (loss adjuster dispatch).
	Map disaster areas and multi hazard assessment	Assess overall disaster risk maps in an appropriate format by using space, in-situ and location-based disaster risk information, vulnerability, capacity, exposure, hazard characteristics and their possible sequential effects at the relevant social and spatial scale on ecosystems, in line with national circumstances. Products will include disaster recovery maps and rapid mapping for crises, humanitarian aid maps (population density, infrastructure, logistical information), vulnerability assessment, damage assessment. Important to note the Sendai Framework for Disaster Risk Reduction 2015-2030.

Security & Safety

Thematic Areas	EO Service	Description
Monitor critical assets	Monitor sensitive risk areas	Geospatial intelligence analysis, sensitive risk areas (mines, unexploded objects (UXO), de-mining) mapping, high risk areas mapping, precision mapping, activity detection, auxiliary research and judgment on anti-terrorism in important areas of public security.
	Monitor critical infrastructure	Risk evaluation, threat analysis, vulnerability assessment, dams monitoring, water treatment monitoring facilities monitoring, oil fields monitoring, pipelines monitoring, pumping stations monitoring, airports monitoring, governmental buildings monitoring, transport networks monitoring.
	Cultural heritage assessment	Mapping heritage sites and in supporting the archaeological investigation, understand the scale, impact, opportunities, responses and tools for conserving world heritage and mitigating threats, vulnerability assessment, damage assessment, risk evaluation, looting tracking. Detect ground deformation and monitor subsidence at archaeological sites, monuments and historic urban centres to detect different types of surface changes caused by erosion, floods, vegetation or human actions.
	General crime & security surveillance assessment	Border control monitoring, terrorism threat risk assessment, piracy, illegal cropping analysis, cross-border state disputes analysis.

Monitor borders	Monitor land & marine border incursions	Border area monitoring, coastal area monitoring, migration monitoring.
	Assess pressures on populations and monitor humanitarian movement	Monitor movement of people, population pressures, monitoring of settlements, evolution, characterization, situation maps, migration and cleansing monitoring, population pressures, displacement of population assessment, planning of contingency operations and operations security & coordination maps (moving objects such vehicles), impact on the surrounding environment, humanitarian camps.
	Monitor transport routes	Monitor economic activity, transportation of legal and illegal goods monitoring, tracking and identification (drug trafficking monitoring), smuggling location, maritime traffic assessment.
Monitor health	Forecasting epidemics and diseases	Health maps and epidemic vector control mapping (daily disease risk maps, NDVI, land cover, soil type), environmental monitoring of endemic diseases and chronic diseases, public health emergencies disaster/danger, pollution-health risks profiling in the urban environment.
Food security & production	Food security monitoring	Map and assess the extent and intensity of the drought. support food security throughout the cycle, from design to implementation, monitoring, evaluation, and adaptive decision making. Assess a variety of physical and biological parameters in ecosystems and economy; maximize sustainable yield and productivity by providing timely and accurate information (early warning system) like; drought, insect plagues, pest and diseases, infection risks, storm damage. Monitor crop's growth, monitor groundwater and water levels in rivers, radiation and soil, etc.