# An introduction to DOPA Explorer 3.1

**Introduction**

The DOPA (Digital Observatory for Protected Areas) Explorer 3.0 is a web based tool developed by the [Joint Research Centre of the European Commission](#) (EC JRC) to support the European Union's efforts "*to substantially strengthen the effectiveness of international governance for biodiversity and ecosystem services[1]*" and more generally for "*strengthening the capacity to mobilize and use biodiversity data, information and forecasts so that they are readily accessible to policymakers, managers, experts and other users[2]*".

In particular, DOPA aims to provide the best available material (data, indicators and models) made available by a few institutions (*i.e.* the EC-JRC, the UN Environment - World Conservation Monitoring Centre, the International Union for the Conservation of Nature, BirdLife International, GBIF and others) which can serve for establishing baselines for research and reporting.

DOPA Explorer provides a simple means to explore terrestrial, marine and mixed protected areas, identify those with the most unique ecosystems and species, and assess the pressures they are exposed to because of human development.

The latest version DOPA Explorer 3.1 is available at [http://dopa.jrc.ec.europa.eu/explorer/](http://dopa.jrc.ec.europa.eu/explorer/)

**Area of interest**

Using the July 2018 version of the World Database on Protected Areas (WDPA) (UNEP-WCMC & IUCN, 2018), DOPA Explorer 3.1 provides summary indicators and statistics at the country and ecoregion levels.

The indicator can be used to assess how far countries or ecoregions are from the Aichi Target 11 of having 17% of the land and 10% of coastal and marine areas covered by well-connected systems of protected areas. Inversely, the information highlights where on the globe additional efforts are most needed in expanding or reinforcing the coverage by protected areas.

More detailed assessments regarding species, climate, land cover change and pressures have been computed for all protected areas ≥ 25 km$^2$ (nearly 30,000 protected areas covering more than 95% of the global protected surface). Table 1 provides a summary of the core indicators and statistics proposed in DOPA Explorer. Note that information on EU funding for biodiversity conservation, currently available in a specific tool, eConservation (see [http://econservation.jrc.ec.europa.eu/](http://econservation.jrc.ec.europa.eu/)), will be added to DOPA Explorer at a later stage.

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[1] EC/COM/2006/0216 final
[2] UNEP/CBD/COP/10/27

| Key Indicators | Country | Ecoregions | Site level (25 km²) |
|---|---|---|---|
| Coverage by protected areas | √ | √ | NA |
| Connectivity of protected areas | √ | √ | NA |
| Land cover & changes | √ | √ | √ |
| Forest cover & changes | √ | √ | √ |
| Surface water & changes | √ | √ | √ |
| Terrestrial Habitat Diversity | - | - | √ |
| Marine Habitat Diversity | - | - | √ |
| Threatened species counts | √ | √ | √ |
| Threatened species lists | - | - | √ |
| Agricultural pressure | √ | - | √ |
| Population pressure | √ | - | √ |
| Built-up areas pressure | - | - | √ |
| Road pressure | - | - | √ |
| Monthly climate | NA | NA | √ |
| Soil organic C | √ | √ | √ |
| Above ground C | √ | √ | √ |
| Land degradation | √ | √ | √ |
| Land fragmentation | √ | √ | √ |
| Funding | √ | - | √ |

**Table 1.** Summary table of the core indicators and statistics proposed in DOPA Explorer 3.1. (NA = Not Applicable)

**Policy targets**

Biodiversity loss has continued largely unabated despite increased efforts by the international community and several conservation successes (Butchart *et al.*, 2010; Hoffmann *et al.*, 2010). The 10th meeting of the UN Convention on Biological Diversity (CBD) thus adopted in 2010 an ambitious Strategic Plan for Biodiversity, including the 20 Aichi Biodiversity Targets, for the 2011 - 2020 period. Among the targets, Target 11 states"*By 2020, at least 17 per cent of terrestrial and inland water areas and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.*" The EU has pledged to meet the international biodiversity targets agreed under the CBD by 2020.

Because PAs play a key role in biodiversity conservation and the sustainable use of natural resources (Watson *et al.,* 2014; UNEP-WCMC & IUCN, 2016), these are at the heart of many conservation initiatives such as Natura 2000. This network of PAs is designed to ensure the long-term survival of Europe's most valuable and threatened species and habitats, listed under the Birds Directive and the Habitats Directive (Beresford *et al.*, 2016). Target 6 of the EU Biodiversity Strategy addresses the EU contribution to global conservation and requires that, by 2020, the EU steps up its contribution to avert global biodiversity loss by greening its economy and endeavoring to reduce its pressure on global biodiversity. The 11th meeting of the CBD in Hyderabad, India (2012) further saw The Parties of the CBD agreeing on an overall substantial

increase of total biodiversity-related funding for the implementation of the Strategic Plan. The objectives of the Hyderabad commitment included the setting of a preliminary target of doubling total biodiversity-related international financial resource flows to developing countries by 2015 and at least maintaining this level by 2020. This is a substantial effort for the EU considering that EuropeAid, the European Commission's Directorate for International Cooperation and Development, invested alone already around 1.3 billion in biodiversity-related projects between 2007 and 2013 to support developing countries to meet their targets (EuropeAid, 2016).

Approaching fast 2020, a new global strategy has already been put in place by the United Nations. In January 2016, a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030 was adopted and is articulated around 17 SDGs (Sustainable Development Golas) and 169 associated targets.

We hope the DOPA will contribute to the SDGs 15, 16 and 17 and we will futher focus on Aichi Targets 5, 11, 12 and 20 until 2020.

Sustainable Development Goal 15 on life below water

Sustainable Development Goal 15 on life on land

Sustainable Development Goal 17 on partnerships for the goals

Aichi Biodiversity Target 5 on natural habitats

Aichi Biodiversity Target 11 on protected areas

Aichi Biodiversity Target 12 on species

Aichi Biodiversity Target 12 on financial resources

**Key caveats**      Although global datasets allow for the development of comparable indicators across countries and regions, these also often suffer from higher local uncertainties when compared to national or regional datasets. The current information presented in the various applications of the DOPA need therefore to be used with care when it comes to site-level assessments. In other words, applications such as the DOPA Explorer should be seen as a compass rather than a GPS to help decision makers navigate large amounts of biodiversity information that is otherwise difficult to access and manage. Earth observations, on the other hand, become increasingly freely available and portray the world every day with an increasing resolution and frequency. This

wealth of additional information that is essential to biodiversity conservation also stresses the need to capture information about PAs directly on the ground, if only to validate the global products. Information that cannot be captured through remote-sensing techniques such as the presence of key species, threats, conservation projects, infrastructure, many land cover types, etc. are critical to assess protected areas and their effectiveness and need to be captured regularly as well.

Country boundaries include disputed territories which may contain protected areas. In such cases, protected areas are assigned to all the countries claiming this territory. Note that the designations employed and the materials and maps produced in DOPA do not imply the expression of any opinion whatsoever on the part of the European Commission concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Protected areas with a reported area and a point but no boundaries are artificially generated using buffers. This approach can underestimate or overestimate the level of protection of an ecoregion as well inaccurate estimates of the elements that are marine or terrestrial when buffered points cover coastal areas. See Visconti *et al.* (2013) for further discussions.

**System status**  DOPA Explorer 3.1 has been released in April 2019. Its underlying infrastructure has been documented in Dubois *et al.* (2016). For further technical details regarding the data processing we refer to Bastin *et al.* (2017).


## Available data and resources

**Data available**  The data proposed in DOPA are made available in the DOPA Explorer 3.1 which is available at http://dopa-explorer.jrc.ec.europa.eu/ but also directly via our web services. See http://dopa-services.jrc.ec.europa.eu/services/ (registration is required, data distribution depending on the license agreements of the data providers). We also provide in a downloadable file, in a tabular format, most of the quantitative results proposed.

**Data updates**  We expect the core indicators of the DOPA to be updated regularly (2 times / year), targeting more frequent updates to align with the monthly releases of the World Database on Protected Areas by UN the Environment-WCMC & IUCN. However, a number of indicators require extensive computational efforts and these will be updated only once a year for the time being. This is the case for the connectivity indicators.

**Codes**  We started sharing and documenting our codes in the documentation section of the DOPA website at http://dopa.jrc.ec.europa.eu/. This effort is still in progress.

## **Methodology**

**Methodology**    Assessing protected areas for biodiversity conservation at national, regional and international scales implies that methods and tools are in place to evaluate characteristics such as the protected areas' connectivity, their species assemblages (including the presence of threatened species), the uniqueness of their ecosystems, and the threats these areas are exposed to. Typical requirements for such analyses are data on protected areas, information on species distributions and threat status, and information on ecosystem distributions. By integrating all these global data consistently in metrics and indicators, the DOPA provides the means to allow end-users to evaluate protected areas individually but also to compare protected areas at the country and ecoregion level to, for example, identify potential priorities for further conservation research, action and funding.

We refer to Dubois *et al.*, 2016 and Bastin *et al.*, 2017 for detailed discussions on the methods used. Note that our key indicators are further documented in specific factsheets which can be downloaded in the Documentation section of our homepage, at http://dopa.jrc.ec.europa.eu/en/documentation

**Input datasets**    The core indicators and metrics proposed by the DOPA are derived from the following input datasets:

Country boundaries
Country boundaries are built from a combination of GAUL country boundaries and EEZ exclusive economic zones (see Bastin *et al.*, 2017) for more details.

- Global Administrative Unit Layers (GAUL), revision 2015 (2017-02-02).

  o Latest version available online:
    http://www.fao.org/geonetwork/srv/en/metadata.show?id=12691

- Exclusive Economic Zones (EEZ), World EEZ v9 (2016-10-21)

  o Latest version available online
    http://www.marineregions.org/downloads.php

Terrestrial Ecoregions of the World
The Terrestrial Ecoregions Of the World (TEOW) are a biogeographic regionalization of the Earth's terrestrial biodiversity.

- TEOW (Olson *et al.*, 2001)

  o Latest version available from:
    https://www.worldwildlife.org/publications/terrestrial-ecoregions-of-the-world

Marine Ecoregions of the World
The marine ecoregions are the Marine Ecoregions Of the World (MEOW) and the Pelagic provinces of the world (PPOW)

- MEOW (Spalding *et al.*, 2007)
    - o Latest version available from: https://www.worldwildlife.org/publications/marine-ecoregions-of-the-world-a-bioregionalization-of-coastal-and-shelf-areas

- PPOW (Spalding *et al.*, 2012)
    - o Latest version available from: http://data.unep-wcmc.org/datasets/38


Protected Areas
- World Database on Protected Areas (WDPA) of July 2018 (UNEP-WCMC & IUCN, 2018).
    - o Latest version available from: http://www.protectedplanet.net


Key Biodiversity Areas
- World Database of Key Biodiversity Areas (2018 version), managed by BirdLife International on behalf of the KBA Partnership
    - o Latest version available from: http://www.keybiodiversityareas.org


Species Ranges
- IUCN Red List of Threatened Species TM 2017 version 2 (IUCN, 2017a)
    - o Latest version available from: http://www.iucnredlist.org


Threatened species statistics by country
- IUCN Red List of Threatened Species TM country summaries 2018 version 2 (IUCN, 2018b)
    - o Latest version available from: http://www.iucnredlist.org/about/summary-statistics


Species Occurrences
- The Global Biodiversity Information Facility (November 2018)
    - o Latest version available from: https://www.gbif.org/developer/summary


Temperature and precipitations
- WorldClim 2, Release 1, June 2016 (Fick & Hijmans, 2017)
    - o Latest version available from: www.worldclim.org/version2

### Sea Surface Temperature

- Global monthly data distributed by the Copernicus Marine Environment Monitoring Service (Product identifier: SST_GLO_SST_L4_NRT_OBSERVATIONS_010_001) were extracted for the period January 2007- December 2016 (Donlon *et al.*, 2012).

  o Latest version available from: http://marine.copernicus.eu


### Elevation (bathymetry and topography)

- GEBCO 2014 Grid (Weatherall *et al.*, 2014)

  o Latest version available from: http://www.gebco.net/data_and_products/gridded_bathymetry_data/


### Land Cover

- Annual global land cover maps for the years 1995, 2000, 2005, 2010, 2015. (Land Cover CCI, 2017).

  o Latest version available from: http://maps.elie.ucl.ac.be/CCI/viewer/index.html


### Land Productivity Dynamics

- 15 years trends (1999-2013) in Land Productivity Dynamics (LPD) are available from the World Atlas of Desertification.

  o Latest version available from: https://wad.jrc.ec.europa.eu/landproductivity

### Global Human Settlements (built-up areas and population densities)

- GHS population grid for the years 1975, 1990, 2000, 2015 (Pesaresi et *al.*, 2015; EC-JRC & CIESIN, 2015, )

  o Latest version available from : http://ghsl.jrc.ec.europa.eu/datasets.php


### Soil Organic Carbon

- Global Soil Organic Carbon (GSOC) map (FAO and ITPS, 2018a, 2018b)

  o Latest version available from: http://www.fao.org/global-soil-partnership/pillars-action/4-information-and-data-new/global-soil-organic-carbon-gsoc-map


### Above-Ground Biomass

- GlobBiomass global map of forest above-ground biomass (Santoro, 2018).

  - The global above-ground biomass map is available for download, in the form of 40° x 40° tiles, at: http://globbiomass.org/products/global-mapping/

Road maps
- Global Roads (gROADS) version 1. 1980-2010. (CIESIN-ITOS, 2013)

  o Latest version available from:
    http://sedac.ciesin.columbia.edu/data/set/groads-global-roads-open-access-v1

Agricultural Areas
- IIASA-IFPRI cropland map for the year 2005 (Fritz *et al.*, 2015)

  o Latest version available from:
    https://www.geo-wiki.org/downloads/

Inland Surface Water
- Global Surface Water and long-term change maps accessed directly from the Global Surface Water Explorer (Pekel, J.F. *et al.*, 2016). Quantitative assessments of changes in protected areas done in Google Earth Engine with support from J.-F Pekel & N. Gorelick.

  o Latest version available from: https://global-surface-water.appspot.com/

Forest cover 2000 and change for the period 2001–2016
- Global Forest Change (Hansen *et al.*, 2013)

  o Available from: http://earthenginepartners.appspot.com/science-2013-global-forest

  o Further details on the version of this dataset used in DOPA Explorer are available from: http://earthenginepartners.appspot.com/science-2013-global-forest/download_v1.4.html

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