

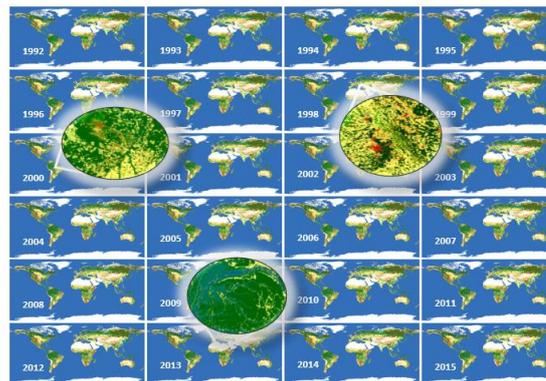
# climate change initiative

## → LAND COVER NEWSLETTER

Issue n. 8 August 2019

### In this issue:

- LC maps 2016, 2017 and 2018 have been generated
- Your voice matters! Take an on-line survey
- Get to know our land cover user community
- What are the achievements of the ESA CCI LC team?
- Future R&D within CCI+ LC



## Extending the CCI LC map series to 2016-2019 in an operational manner within the Copernicus Climate Change Service

**The Copernicus Climate Change Service (C3S) provides global annual LC maps from 2016 to 2019. The CCI LC team is pleased to announce that the 2016, 2017 and 2018 LC maps have already been generated, and the 2016 and 2017 LC maps will be released very soon (fall 2019).**

In 2017, the CCI LC team officially released the first time series of annual global Land Cover maps at 300m, spanning a 24-year period, from 1992 to 2015; thus contributing to the objective of providing the longest possible, consistent and mature climate data records at the global scale. This unique dataset has been endorsed by Copernicus as a part of Copernicus Climate Data Records.

Exploiting the expertise gained during the CCI LC project and the recognized maturity of the CCI LC products, the R&D carried out by the CCI LC team is now operationally and routinely

applied within the Copernicus Climate Change Service (C3S) to deliver the LC maps series extension from 2016 to 2019 in a fully consistent manner.

The LC maps 2016 and 2017 have already been produced using Proba-V imagery, and their quality assessed. Their overall accuracies are of 71.1% (n=1350).

The validation procedure used an independent reference database, inherited from the CCI LC project. This validation database was built, independently, by interpretation of very high resolution (VHR) imagery

thanks to an international network of LC experts and was continuously updated within C3S to reflect current years.

C3S is implemented by the European Centre for Medium-Range Weather Forecasts (ECMWF) on behalf of the European Commission. For more information about the C3S, visit the C3S website at:

<https://www.copernicus.eu/en>

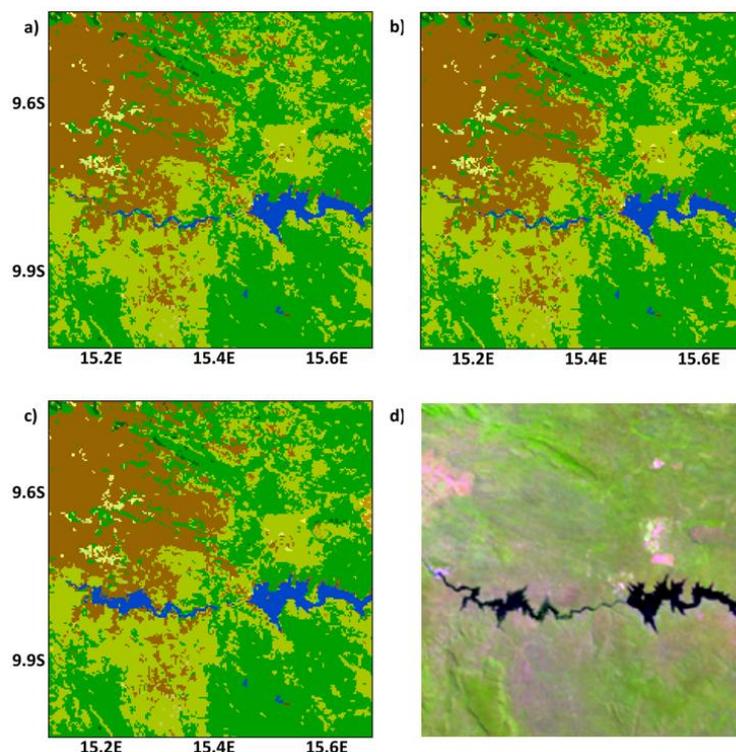


The official release of the C3S LC maps 2016 and 2017 is foreseen in fall 2019 following the strict Copernicus release procedure. LC maps and relevant documentation will be accessible and downloadable through the Climate Data Store (CDS). The current CCI LC viewer will also be linked to the CDS.

A visual quality assessment of the 2016 and 2017 products has shown the good consistency that exists between these products and the existing LC map series, and also with high-resolution imagery. The 2017 LC map, for example, clearly captures the construction of new dams, as seen in the figure to the right.

**Example of changing water levels due to a dam in Angola:**

a) 2015 LC map; b) 2016 LC map; c) 2017 LC map; d) 2017 PROBA-V imagery



## Achievements of the CCI Medium Resolution Land Cover (LC) project

**The ESA CCI LC team successfully developed an end-to-end processing chain for the generation of the most consistent, global, annual LC maps from 1992 – 2019 at 300m spatial resolution.**

In 2010, the Climate Change Initiative (CCI) Land Cover (LC) project started with a user survey aiming at defining the LC requirements of key climate and LC users communities. Seven years of R&D later, the outcomes of the project have gone far beyond the expected requirements.

Within the European Space Agency (ESA) CCI, the LC team aimed to revisit all algorithms required for the generation of global LC products that are stable and consistent over time. To this end, the LC concept was first revisited and in 2014, a set of three consistent global LC products at 300 m and 22 LC classes built on the UN Land Cover Classification System (LCCS),

allowing for consistency and interoperability with other LC products, was released for three 5-year epochs centered on the years 2010, 2005 and 2000.

In 2017, an updated dataset, made of 300m global annual land cover maps from the 1990s to 2015 were produced. In addition, the change detection was improved, detecting up to 13 different types of change. These datasets were built using a multi-sensor archive made of MERIS FR and RR, AVHRR, SPOT-VGT, PROBA-V 1 km and 300 m.

A visual quality assessment showed the achievements between the 5-year epoch maps and the updated dataset,

including improvements in mapping the cropland, forest and urban LC classes. Using an independent validation database developed within GlobCover 2009, a precursor to CCI LC, an overall accuracy value of 71.5% (n = 2329) was estimated for the 2015 LC map.

A key strength of the CCI LC consortium was the significant and coordinated involvement of three major climate modelling groups from the early days of the research. This inter-disciplinary cooperation, together with the high flexibility of each of the EO teams to take into account user feedback, made this project a success.

**Visualize and download the CCI Land Cover Climate Research Data online**

<http://maps.elie.ucl.ac.be/CCI/viewer>



## Users of the ESA CCI Land Cover maps 1992 – 2015 and Users Workshops

Initially targeted to key climate modelling communities the CCI LC maps series has been widely used among a far more diverse community in a variety of applications less directly related to the climate.

There have been 30796 downloads of the CCI LC products from 9903 IP addresses, corresponding to a volume of 39.02TB. This is an impressive 92% increase since September 2018 (20.37 TB).

Since the release of the CCI LC Climate Data Record (CDR), this unique long-term LC time series has met many unexpected needs: LC and land cover change (LCC) maps can be useful in many domains, with varied applications such as climate change,

land accounting, forest monitoring, desertification and agriculture. As such, several significant collaborations have taken place with various projects, programs, national agencies and international bodies.

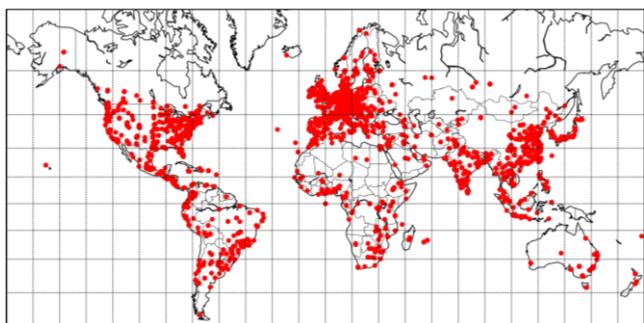
The climate modelling community remains the major user of the CCI LC product. Beyond research communities, the political arena is also eager to monitor the land cover in various contexts such as deriving

statistics and indicators related to land accounting.

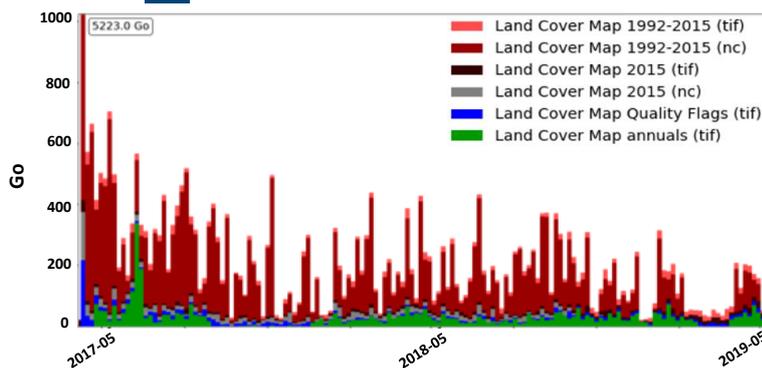
The dataset is equally used in scientific research. View a list of publications on the ESA CCI LC website: <https://www.esa-landcover-cci.org/?q=node/184>

The two annual CCI LC user workshops successfully gathered a diversity of users to exchange about the exploitation of the CCI LC time series.

### Worldwide IP user distribution for the CCI LC products



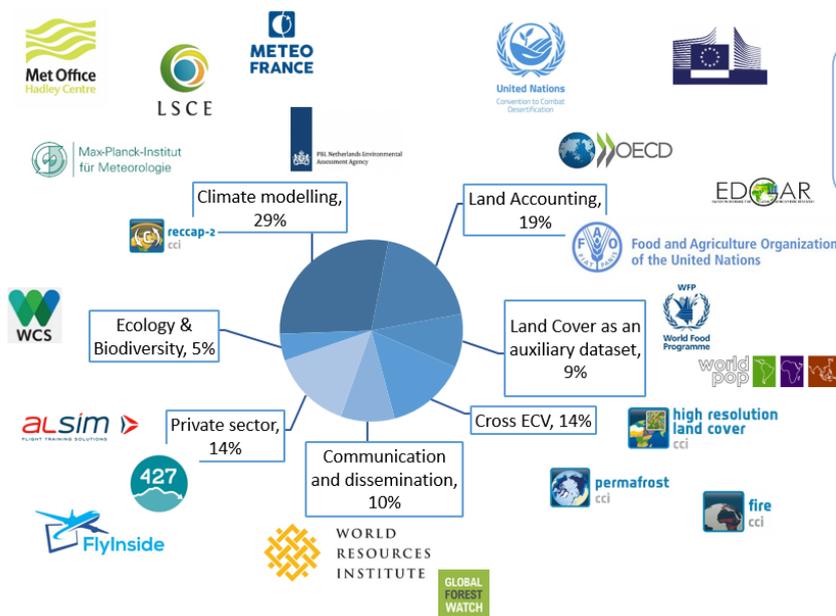
### Download volumes for the CCI LC products



### Existing users and applications of the CCI LC Climate Data Record

Implementation in the HYDE database and IMAGE integrated assessment modelling of the PBL Netherlands Environmental Assessment Agency.

In the context of the CMIP6 experiment, LSCE has combined CCI LC maps with the land use harmonization (LUHV2) database to generate a time series of global ORCHIDEE PFT maps from 1850 to 2015.



OECD develops new headline green growth indicators that facilitate the monitoring of global natural assets.

FAOSTAT uses CCI LC to develop an agri-environmental indicator of LC.

CCI LC is used for reporting on the Sustainable Development Goal 15.3 on land degradation neutrality (UNCCD).



## Continuing the CCI global annual LC time series through CCI +

As an extension to the CCI, the Climate Change Initiative Extension (CCI+) continues to support our team for R&D activities, focusing on maintaining, improving and ensuring the evolution of the LC CDR.

The CCI+ LC project, gathers an international consortium, led by UCLouvain and composed of Brockmann Consult, the Laboratoire des Sciences du Climat de l'Environnement, the Met Office Hadley Centre, was officially kicked-off in March 2019.

The CCI LC team aims to demonstrate the value of the CCI LC products by:

- Reinforcing our users' engagement, including an update of the high-level GCOS requirements and the organization

of the annual CCI LC User Workshops, and a survey of a wide range of users and services, identifying both the minimum requirement to be met to ensure that data are relevant and the ideal requirement driving further improvements.

- Continuing the R&D by developing innovative methods and algorithms to address priority areas already identified on uncertainty characterization and propagation, the Quantitative Plant Functional Types (PFT)

characterization (necessary for climate modelling) and aggregation and the validation of LC change. Implementing these methods at full scale at a later stage.

- Improving the flexibility of the LC User Tool and the CCI toolbox to support LC users needs.
- Assessing the impact of this new R&D on climate modelling.



**Your voice matters!**

## CCI+ User Requirement Survey

The CCI LC team is launching an extensive user requirement survey. The survey aims to identify current assets and shortcomings of the CCI LC CDR products (1992 – 2015), to define priority areas for potential improvements.

While the GCOS implementation plan provides high-level requirements for the CCI LC products, there are a broad range of user requirements, not only among climate science communities, but also other scientific communities, less related to climate, that also use intensively the CCI LC CDR.

Targeting the existing CCI LC users, which include the broader climate community and national and international bodies and agencies, the survey will take place to define a precise update of our users'

requirements and the requirements of the service.

In addition to the customary characteristics (spatial detail, temporal resolution, LC categorization), the survey will particularly address the requirements for ECV product uncertainties and how they should be expressed, including those that are difficult or impossible to quantify.

This assessment of our users' requirements ensures that the full

range of needs is considered and understood for deriving detailed product specifications.

Have you used any of the CCI LC products? Then your feedback is very important to us! Please take a short time to complete our User Requirements Survey online at the following link:

<https://forms.gle/sBhZau4XG5iwmXcp8>

The survey will be accessible until the 4<sup>th</sup> of September 2019.

For more information on the project, please visit [www.esa-landcover-cci.org](http://www.esa-landcover-cci.org)