

CLC V20 Lineage, reduced version

Abstract

CORINE Land Cover (CLC) was specified to standardize data collection on land in Europe to support environmental policy development. The reference year of first CLC inventory was 1990 (CLC1990), and the first update created in 2000. Later the update cycle has become 6 years. The number of participating countries has increased over time – currently includes 33 European Environment Agency (EEA) member countries and six cooperating countries (EEA39) with a total area of over 5.8 Mkm². Ortho-corrected high spatial resolution satellite images provide the geometrical and thematic basis for mapping. In-situ data (topographic maps, ortho-photos and ground survey data) are essential ancillary information. The project is implemented by national teams under the management and quality control (QC) of EEA. The basic technical parameters of CLC (i.e. 44 classes in nomenclature, 25 hectares minimum mapping unit (MMU) and 100 meters minimum mapping width) have not changed since the beginning, therefore the results of the different inventories are comparable.

The layer of CORINE Land Cover Changes (CLCC) is produced since the second CLC inventory (CLC2000). CLCC is derived from satellite imagery by direct mapping of changes taken place between two consecutive inventories, based on image-to-image comparison. Change mapping applies a 5 ha MMU to pick up more details in CLCC layer than in CLC status layer. Integration of national CLC and CLCC data includes some harmonization along national borders. Two European validation studies have shown that the achieved thematic accuracy is above the specified minimum (85 %). Primary CLC and CLCC data are in vector format with polygon topology. Derived products in raster format are also available. The seamless European CLC and CLCC time series data (CLC1990, CLC2000, CLC2006, CLC2012 and related CLCC data) are distributed in the standard European Coordinate Reference System defined by the European Terrestrial Reference System 1989 (ETRS89) datum and Lambert Azimuthal Equal Area (LAEA) projection (EPSG: 3035). Results of the CLC inventories can be downloaded from Copernicus Land site free of charge for all users.

CLC data can contribute to a wide range of studies with European coverage, e.g.: ecosystem mapping, modelling the impacts of climate change, landscape fragmentation by roads, abandonment of farmland and major structural changes in agriculture, urban sprawl, water management.

RELEASE LINEAGE:

Version 20

Release date: 19-12-2019 (see V20_1)

Main purpose of the release: Publication of the final, corrected CLC2018 data.

The 5th CLC inventory for the reference year of 2018 was produced under the Copernicus programme. It has the shortest production time in history of CLC updates (< 1 year). Sentinel 2 and Landsat 8 satellite provided information for CLC2018 database creation. In majority of countries a visual photointerpretation (CAPI) following uniform methodology (CLC2018 Technical Guidelines) was applied. In several countries (FI, IE, IS, NL, NO, PT, SE) a “semi-automated” methodology (country specific due to availability of national data) was utilized combining image processing, in-situ data integration and cartographic generalisation. Full bottom-up solution based on generalisation of high-resolution national land monitoring data was practised in DE and ES. Most of the QC was conducted in remote verifications. IT and ES were verified by regions. In producing the European products, a simplified border matching was applied (see Version 15).

Changes from previous main release (Version 18):

- Inclusion of clc2018 layers for all the EEA39 countries.
- Production of clc2018 for Faroe Islands.
- Revised clc2012 layers were made available for 38 countries (only original clc2012 layer included for FI). clc2012 layers have been replaced by revised clc2012 on land.copernicus.eu portal.
- Change in rasterization algorithm (using again CELL CENTRE method starting from V20b1)
- Change in naming convention - https://land.copernicus.eu/user-corner/technical-library/clc-file-naming-conventions-guide-v20_1

Known problems:

- Some redundant lines between neighbouring polygons with the same code are still present, but only as

result of persisting 'adaptive tilling' procedure (limitation of ESRI ArcGIS technology for large datasets).

- Polygons <25 ha can be present along national borders and along 'adaptive tilling' tiles boundaries.

Lineage of V20 sub-releases:

Version 20_1

Release date: 19-12-2019

Main purpose of the release: Maintenance / Correction of final CLC2018 data.

Changes from previous release (20):

- File naming conventions simplified and better described. New file naming convention has been introduced based on user feedback on version 20. Filename is composed of combination of information about update campaign, data theme and reference year and version specification (including release year and release number). See https://land.copernicus.eu/user-corner/technical-library/clc-file-naming-conventions-guide-v20_1
- The French DOMs are provided in separate databases (files both for vector and raster version of data).
- All raster layers are back in 8 bit GeoTIFF. Modification is introduced based on the user feedback on version 20. In order to keep 8 bit resolution for raster change layers, they are divided into two files - representing consumption (from) and formation (to) part of change.

See https://land.copernicus.eu/user-corner/technical-library/clc-country-coverage-1990-2018-v20_1 for full information about the coverage of this version.

Version 20

Release date: 1-05-2019

Main purpose of the release: Publication of the final, corrected CLC2018 data.

Changes from previous sub-release (20b2):

- clc2012, clc2018, cha1218 data for Turkey added
- clc2018 data for Faroe Islands (DK) added
- some mistakes and misinterpretation in database reported by users and NTs were repaired (FR and BE)

See <https://land.copernicus.eu/user-corner/technical-library/clc-country-coverage-v20/view> for full information about this version coverage

Version 20b2

Release date: 19-12-2018

Main purpose of the release: Publication of the pre-final CLC2018 data.

Changes from previous sub-release (20b1):

- Complete vector/raster time series (clc1990, clc2000, clc2006, clc2012, clc20108, cha9000, cha0006, cha0612, cha1218)
- clc2012, clc2018, cha1218 data for Italy added
- Coding for rasters changed - rasters contains directly CLC codes/changes values. So status rasters produced as 16-bit depth, change rasters produced as 32-bit depth

See <https://land.copernicus.eu/user-corner/technical-library/clc-country-coverage-v20b2/view> for full for full information about this version coverage

Version 20b1

Release date 16-11-2018

Main purpose of the release: First partial CLC2018 update data, new accounting layers preparation to support SOER2020

Only raster files (the same cha9000, cha0006, cha0612 files as V18_5_1 re-rasterized by CELL CENTRE method) and new CLC2012 and CLC2018 raster files were delivered.

Data for Italy and Turkey still missing

Version 18

Release date: 19-09-2016 (see V18_5_1)

Main purpose of the release: Publication of the final, corrected CLC2012 data.

The 4th CLC inventory for the reference year of 2012 was produced under the Copernicus Initial Operations (GIO). Two high-resolution satellite image coverages (IRS Resourcesat-1/2, SPOT-4/5, RapidEye constellation) taken in 2011-2012 provided multi-temporal information to support the update. Computer Assisted Photointerpretation (CAPI) was the prevailing methodology applied in interpreting of satellite images. FI, DE, IS, IE, NO, ES and SE applied a semi-automatic methodology. UK has turned from semiautomatic processing to CAPI because no national hi-res dataset was available for 2012. Most of the QC was conducted in remote verifications. IT and ES were verified by regions. In producing the European products, a simplified border matching was applied (see Version 15). Validation:

Changes from previous main release (Version 17):

- Inclusion of CLC2012 layers for all the EEA39 countries.
- Production of CLC2006 for Greece (in V18_3) and all CLCs for Channel Islands (V18_1).
- Revised CLC2000 and CLC2006 layers were made available (V18_5).
- Change in rasterization algorithm (V18_2).

Known problems:

- Some redundant lines between neighbouring polygons with the same code are still present, but only as result of persisting 'adaptive tilling' procedure (limitation of ESRI ArcGIS technology for large datasets).
- Polygons <25 ha can be present along national borders and along 'adaptive tilling' tiles boundaries.

Lineage of V18 sub-releases:

Version 18_5_1

Release date: 19-09-2016

Main purpose of the release: Maintenance / Correction of final CLC2012 data.

Changes from previous sub-release (V18_5):

- Mistakes reported by early-data adopters in CLC2012_ES and CLC2012_PL datasets were corrected.

Version 18_5

Release date: 19-02-2016

Main purpose of the release: Publication of final CLC2012 data.

Changes from previous sub-release (V18_4):

- CLC2012 data covering full ES and TR were integrated including updated version of Canary Islands (ES) data. Thus, CLC2012 fully covers the EEA39.
- CLC2000 and CLC2006 have been replaced by revised CLC2000 (in 27 countries) and revised CLC2006 (in 34 countries) under the same name (CLC2000, CLC2006). Revised CLC2000 is a by-product of CLC2006 change mapping. Similarly, revised CLC2006 is a by-product of CLC2012.

Note: In producing the revised CLC2000 and the revised CLC2006 datasets a simple border-harmonisation was applied: only polygons ≤ 0.1 ha were removed along the borders. Thus, difference in CLC codes can exist along country borders between V18_4 and V18_5 data.

See <https://land.copernicus.eu/user-corner/technical-library/clc-country-coverage-v18.5/view> for full information about this version coverage.

Version 18_4

Release date: 11-10-2015

Main purpose of the release: Maintenance / Increased European coverage of CLC2012 data.

Changes from previous sub-release (V18_3):

- CLC2012 European coverage has increased, but the coverage is still not full. 37 full countries of the EEA39 are included. The two missing countries, ES and TR are partially covered.
- Updated CLC2012 data for DE integrated, but still provisional (see notes below).

Notes:

- 1) CLC data for DE are provisional and may contain topological errors and sliver polygons (i.e. polygons under 0.1 ha). Because of this reason sea buffer around DE is not finally harmonized.
- 2) Because of the partial delivery for Turkey the sea buffer around the country is not fully harmonized.
See <https://land.copernicus.eu/user-corner/technical-library/clc-country-coverage-v18.4/view> for full information about this version coverage.

Version 18_3

Release date: 31-07-2015

Main purpose of the release: Maintenance / Increased European coverage of CLC2012 data.

Changes from previous sub-release (V18_2):

- CLC2012 European coverage has increased and includes 37 full countries of the EEA39 and an additional partial delivery for TR. Not covered countries: ES (full) and TR (75% of country).
- CLC2012 for the French DOM (Guiana, Guadeloupe, Martinique, Mayotte and Réunion) integrated as delivered. No verification was implemented on these areas.
- CLC2012 data for DE integrated, but still provisional (see notes below).
- CLC2006 data included for GR. Thus, CLC2006 data are completed for all EEA39 countries.

Notes:

1) CLC data for DE are provisional and may contain topological errors and sliver polygons. Because of this reason the sea buffer around DE is not fully harmonized.

2) Because of the partial delivery for Turkey the sea buffer around the country is not fully harmonized.

See <https://land.copernicus.eu/user-corner/technical-library/clc-country-coverage-v18.3/view> for full information about this version coverage.

Version 18_2

Release date: 01-06-2015

Main purpose of the release: Maintenance of initial European coverage of CLC2012 data.

Changes from previous sub-release (V18_1):

- Corrections of V18_1 data based on recommendations from ETC-ULS semantic checking.
- Vector to raster conversion (all raster layers): "cell centre" method has been changed to "maximum combined area" method.

See <https://land.copernicus.eu/user-corner/technical-library/clc-country-coverage-v18.2/view> for full information about this version coverage.

Version 18_1

Release date: 08-05-2015

Main purpose of the release: Publication of initial version for European coverage of CLC2012 data.

Changes from previous release (V17):

- CLC2012 and CLCC(2006, 2012) European coverages include 31 countries of the EEA39. Missing CLC2012 data: AL, DE, ES, FR, GR, SE, TR and XK.
- The full CLC and CLCC data time series (from 1990 to 2006) has been included for Channel Islands: Guernsey and Jersey.

See <https://land.copernicus.eu/user-corner/technical-library/clc-country-coverage-v18.1/view> for full information about this version coverage.

Version 17

Release date: 02-12-2013

Main purpose of the release: Maintenance / Increased European coverage of CLC time series data.

Changes from previous release (V16):

- Full CLC and CLCC data time series (from CLC1990 to CLC2006 including all CLCC datasets) has been included for the Autonomous Region of the Azores (PT).

See <https://land.copernicus.eu/user-corner/technical-library/clc-country-coverage-v17> for full information about this version coverage.

Version 16

Release date: 15-04-2012

Main purpose: Maintenance / Increased and improved European coverage of CLC time series data.

Changes from previous release (V15):

- CLC1990 coverage: TR has been delivered CLC1990 and CLCC(1990,2000) data. Still missing CLC1990 data: AL, BA, CH, CY, FI, IS, MK, NO, SE, UK and the XK.
- CLC2000_revised layer covering 27 countries was included (CLC2000 data revised during production of CLC2006).
- Shift in MT geographic position has been corrected. All CLC layers for MT have been re-projected.
- A few coding inconsistencies were corrected.

See <https://land.copernicus.eu/user-corner/technical-library/clc-country-coverage-v16> for full information about this version coverage.

Version 15 (V5)

Release date: 20-07-2011

Main purpose: Publication of final CLC2006 data.

The 3rd CLC inventory for the reference year of 2006 was produced under GMES Fast Track Service on Land Monitoring. The CLCC database was considered as the primary product, and a uniform change mapping methodology was agreed. Dual date satellite imagery (SPOT-4/5 and IRS P6) taken in 2005-2007 provided enhanced change mapping capabilities. Some of the countries newly entering CLC have produced CLC2000 datasets also during the project time frame. Scanned topographic maps and digital aerial ortho-imagery have become commonly available. CAPI was the prevailing method applied in interpreting of satellite images. Nevertheless, FI, IS, NO, SE and the UK applied a semiautomatic methodology. Most of the European QC was conducted by visiting national teams (see Version 2). In some cases, remote verification was applied (without mission to countries). ES and IT were verified by regions.

Changes from previous release (V14 (V4)):

- CLC2006 data covering Great Britain (part of UK) and TR were delivered. Thus, CLC2006 European coverage includes 38 countries of the EEA39. Still missing CLC2006 data for Greece.
- A simplified border matching was applied for countries new in CLC: XK, NO, CH and Turkey: 1) <25 ha polygons along the borders are not removed systematically; 2) sliver-like polygons (area < cca. 5 ha) are generalised to largest or thematically most similar neighbour.
- For the rest of CLC2006 countries a simple border-matching was applied. Code differences along two sides of borders are not changed. Only polygons with area ≤ 0,1 ha (sliver polygons) are eliminated.
- Data dissemination: CLC data become freely accessible from EEA to any person or legal entity.

See <https://land.copernicus.eu/user-corner/technical-library/clc-country-coverage-v15> for full information about this version coverage. CHECK pdf

Version 14 (V4)

Release date: 25-10-2010

Main purpose: Maintenance / Increased European coverage of CLC2006 and CLC2000 data.

Changes from previous release (V13 (V3)):

- CLC2006 European coverage includes 37 full countries of EEA39. New data for Northern Ireland (part of the UK), Madeira Islands (part of PT), CH, IS and TR were added to CLC2006 data. Still missing CLC2006: GR and the UK (except Northern Ireland).
- New data for Madeira Islands (PT), CH and IS were added into the European CLC2000 coverage, which includes already the EE39. However, CLCC(1990,2000) is available for 28 countries only.
- New data for Madeira Islands (PT) were added into CLC1990 and CLCC(1990,2000). Still missing CLC1990 data: AL, BA, CH, CY, FI, IS, MK, NO, SE, TR, UK and XK.

The seamless European database has been further improved addressing feedback from EEA on V13 (V3):

- No-data buffer (code 999) outside of valid data area was deleted.
- Small gaps identified in V13 were corrected by tolerance adaptation in ArcGIS v10 geodatabase.
- Remaining neighbour polygons with the same code were resolved by additional dissolve operation.

See <https://land.copernicus.eu/user-corner/technical-library/clc-country-coverage-v14> for full information about this version coverage.

Version 13 (V3)

Release date: 02/2010

Main purpose: Publication of initial European coverage of CLC2006 data.

Changes from previous release (V2):

- Version numbering was changed to harmonise vector data (V3) and derived raster data (V13) releases.
- First seamless release in ESRI Geodatabase format.
- Initial coverage of CLC2006 including 35 countries and Northern Ireland (part of the UK). Missing countries in CLC2006: GR, CH, TR and the UK (except Northern Ireland).
- Two updates added to CLC2000: a new version for NO and the first CLC dataset for TR.
- Sea buffer around land has been introduced (15 km as proxy to 12 nautical miles sea zone).

Version 2

Release date: 09/2009

Main purpose: Publication of final CLC2000 coverages.

The 2nd CLC inventory for the reference year of 2000 (CLC2000) was carried out in the frames of I&CLC2000 project. A single date Landsat-7 ETM satellite imagery taken in 1999-2001 was provided by JRC. The technology of drawing the interpretation on transparencies was discarded and replaced by CAPI (computer-assisted photo-interpretation). Prior to mapping changes CLC1990 data had to be corrected: 1) bulk geometric mistakes removed and residual geometric errors >100 m and coding mistakes were corrected; 2) polygons smaller than the 25 ha MMU were generalised. European QC was conducted by visiting national teams (usually at the start and towards the end of the project). Computer-assisted verification has provided written, geo-located explanations regarding the mistakes and supported harmonized production of the database all over Europe.

Changes from previous release (V1):

- It was to deliver a single seamless layer, but was not feasible in ESRI environment. Therefore, seamless ESRI ArcInfo Librarian map tiles were produced again (but free of tiling artefacts reported in V1).
- New country deliveries integrated into European CLC2000 ME, RS (incl. XK), IS and NO. Simple harmonization along national borders of these countries was done (small artefacts cleaned only).
- CLC2000 data for MT have been updated to reflect changed geometry in CLC2006 delivery.
- The dissemination and use of products was defined in an agreement between the EEA, the EC and the participating countries.

Version 1

Release date: 08/2005

Main purpose: Publication of initial European coverage of CLC2000 and CLCC(1990,2000) data.

Changes from previous release (V0):

- The first consolidated version of European CLC data have been produced as integrated and harmonised seamless layer in ESRI ArcInfo Workstation Librarian map tiles.
- The production of the first CLCC database has started, but no consolidated methodology was available.
- Initial CLC2000 coverage included 32 countries: AL, AT, BE, BA, BG, CY, CZ, DE, DK, EE, ES, FI, FR, GR, HR, HU, IE, IT, LV, LI, LT, LU, MK, MT, NL, PL, PT, RO, SI, SK, SE and the UK. Missing countries in CLC2000: CH, IS, ME, NO, RS (including XK) and TR.
- CLC1990 for most of the countries has been replaced by revised CLC1990. Some additional countries have produced CLC1990. Still missing in CLC1990 European coverage: CY, LI, MT, SE and UK.
- Full harmonization (visual re-interpretation by keeping the 25 ha MMU) inside a 5-km wide strip along national borders was done including 32 countries for CLC2000 and 24 countries for CLCC(1990,2000).
- Semi-automatic harmonisation of 2-km wide strip along national borders was done for CLC1990.
- Vector to raster conversion: "cell centre" method was applied.
- The 25 ha MMU is considered as hard limit. Polygons <25 ha were generalised.
- Dual ownership of CLC and CLCC data (EEA and the country) was introduced.

Version 0

Release dates: up to 12/2000

Main purpose: Distribution of country-level CLC1990 data and creation of European raster products.
The period of the first CLC inventory was rather long (1985-1996) and 1990 is considered as reference year.
CLC1990 data delivered by countries became part of GISCO database. Releases were provided bi-annually.
Following political changes in Central and Eastern Europe 10 additional countries joined. The methodology was visual photointerpretation by drawing the CLC map on transparency, placed on top of satellite image hardcopy at scale 1:100.000.

- CLC1990 vector and raster data were initially available for 12 countries: AT, BE, DE, DK, ES, FR, GR, IE, IT, LU, NL and PT. Raster only data were available for FI and UK.
- The EC Phare programme supported the implementation of CLC1990 in 11 countries of Central and Eastern Europe between 1992 and 1998: BG, CZ and SK, EE, LV, LT, HU, PL, RO and SI.
- Integrated European vector dataset was available as ESRI ArcInfo Librarian and derived raster products as ESRI grids in 100m and 250m resolution.
- Data dissemination policy was unclear.

Annex

EEA39 countries	ISO code
Albania	AL
Austria	AT
Belgium	BE
Bosnia and Herzegovina	BA
Bulgaria	BG
Croatia	HR
Cyprus	CY
Czech Republic	CZ
Denmark	DK
Estonia	EE
Finland	FI
France	FR
Germany	DE
Greece	GR
Hungary	HU
Iceland	IS
Ireland	IE
Italy	IT
Kosovo	XK
Latvia	LV
Liechtenstein	LI
Lithuania	LT
Luxembourg	LU
North Macedonia ¹	MK
Malta	MT
Montenegro	ME
Netherlands	NL

Norway	NO
Poland	PL
Portugal	PT
Romania	RO
Serbia	RS
Slovakia	SK
Slovenia	SI
Spain	ES
Sweden	SE
Switzerland	CH
Turkey	TR
United Kingdom	UK

Note: ¹ From February 2019, previously the Former Yugoslav Republic of Macedonia (FYROM)