Dataset Information: Land Cover	
Title	**Land Cover**
Abstract	The FAOSTAT **Land Cover** domain contains statistics of land cover area, aggregated at national level and by land cover category following the international land cover classification of the United Nations System of Environmental-Economic Accounting Central Framework (UN SEEA 2012). The FAOSTAT land cover data are compiled by national aggregation of geospatial information which is distributed *via* publicly available Global Land Cover mapping products.
Supplemental	The Land Cover domain of FAOSTAT Agri-Environmental Indicators disseminates land cover data (in 1000 ha) by country, year and FAOSTAT regional aggregations, for the following geospatial datasets: *1)* SEEA-CCI-LC, containing annual land cover area data for the period 1992–2020, was produced by the Catholic University of Louvain (UCLouvain) Geomatics as part of the Climate Change Initiative of the European Space Agency (version 2.0, CCI UCL Geomatics, 2017) and lately updated to version 2.1 under the European Copernicus program (2019); *2)* SEEA-MODIS, containing annual land cover area data for the period 2001–2021, derived from the MODIS Collection 6.1 Global Land Cover Classification Systems (LCCS) Land Cover Types product (MCD12Q1). The Land Cover Classification System (LCCS) land cover types and layers are used in the analysis; *3)* SEEA-CGLS land cover, containing annual land cover area for the period 2015—2019, derived from the annual land cover maps of the Copernicus Global Land Service (CGLS). *4)* WorldCover produced by the European Space Agency (ESA) and currently available for 2020 and 2021. FAOSTAT Agri-environmental Indicators are calculated by FAO and may not coincide with data that countries report to relevant international processes. The aim of this domain is to provide a global knowledge product for assessing regional and global land characterization and trends and in support of national data assurance/data quality processes.
International Standards	The FAOSTAT Land Cover domain is compliant with the System of Environmental-Economic Accounting in terms of: i) Definitions: It is consistent with definitions included in the SEEA CF (UN 2012) and SEEA AFF (FAO and UN, 2020), *Land Cover Chapters*; ii) Classifications: It follows the LCCS recommended in SEEA CF (Annex I B); iii) Applicability: Data can be used to compile relevant SEEA CF Tables. Land cover statistics are part of the Basic Set of Environmental Statistics of the UN Framework for the Development of Environmental Statistics (FDES, 2013).
Creation Date	2017
Last Update	2023
Data Type	Land, Land Cover
Category	Environment
Time Period	1992–2020 (SEEA-CCI-LC); 2001–2021 (SEEA-MODIS); 2015–2019 (SEEA-CGLS); WorldCover (2020–2021)
Periodicity	Annual
Geographical Coverage	World
Spatial Unit	In 2021, 198 countries and 42 territories
Language	Multilingual (EN, FR, ES)

Methodology and Quality Information:

Methods and processing

Overview

Land is a central component of economic-environmental accounting. As defined by the System of Environmental-Economic Accounting Central Framework (SEEA CF), land is *"a unique environmental asset that delineates the space in which economic activities and environmental processes take places and within which environmental assets and economic assets are located*" (UN, 2012). The land cover classification of the SEEA CF provides the international statistical standard needed to compile physical accounts for land cover. The SEEA Agriculture, Forestry and Fisheries SEEA-AFF (FAO and UN, 2020) applies the land cover classification of the SEEA CF. In physical terms, land comprises all of the individual features that cover the area within a country. Land cover refers to the observed physical and biological land cover of the Earth's surface, and includes natural vegetation and abiotic (non-living) surfaces (SEEA CF, 5.257). In the scope of the SEEA CF and SEEA AFF, land cover information is relevant for understanding the changing composition and condition of ecosystems, including agricultural and forest landscapes. A physical asset account for land cover with opening stocks, additions and reductions to stock, recording of net changes and closing stock is formulated in the SEEA AFF.

The FAOSTAT "Land Cover" domain disseminates country statistics of land cover as a public knowledge product and to support the preparation of physical asset accounts for land cover. The underlying information is derived from publicly available global land cover maps (GLC). The FAOSTAT Land Cover domain applies a common methodology to these GLC products, providing users with a globally consistent, harmonized dataset:

1) The land cover maps, hereinafter called *CCI-LC,* produced by the Catholic University of Louvain (UCLouvain) Geomatics as part of the Climate Change Initiative of the European Spatial Agency (version 2.0, CCI UCL Geomatics, 2017), with spatial resolution 300m. CCI-LC was updated to version 2.1 under the European Copernicus program (2019). Data are available from 1992 onwards;
2) The NASA MODIS Land Cover Collection 6.1 (MCD12Q1) available from 2001 onwards (Sulla-Menashe et al., 2019; Sulla-Menashe and Friedl, 2022). In particular, the Land Cover Classification System (LCCS) land cover types — spatial resolution 500m are used to generate SEEA-MODIS statistics of land cover.
3) The annual land cover maps which were produced under the European Copernicus Global Land Service (CGLS) (CGLS land cover, containing discrete land cover categorization for the period 2015–2019), with spatial resolution 100m (Buchhorn et al., 2020).
4) The ESA WorldCover maps—2020 v100 and 2021 v200 maps— (Zanaga et al., 2021; Zanaga et al., 2022) produced at 10m resolution.

The SEEA CF land cover classification includes 14 mutually exclusive and unambiguous land cover categories. The classification was developed by applying the UN Land Cover Classification System (LCCS) (Di Gregorio, 2005). The LCCS can be used to record in a standardized and harmonized way the biophysical characteristics of all areas of land within a given territory. The system is designed as a hierarchical classification that allows adjusting the thematic detail of the legend to the amount of information available in a standardised classification approach. It is applicable at all scales, independently of the method of observation, thus allowing cross-referencing of local and regional maps with continental and global maps. Table 1 shows the LCCS classifiers for the 14 land cover classes of the SEEA CF. The SEEA land cover classification is part of the FAO land cover (version 2 of the LCCS (Di Gregorio, 2005), which was used in this work for consistency with the original classifications of the four global land cover products.

Table 1. SEEA CF/AFF land cover classes and corresponding LCC classifiers*

Class value and label	Corresponding LCC classifiers
1 - Artificial surfaces (including urban and associated areas)	**B15**
Class 1 is composed of any type of areas with a predominant artificial surface. Any urban or related feature is included in this class, for example, urban parks (parks, parkland and laws). The class also includes industrial areas, and waste dump deposit and extraction sites.	
2 - Herbaceous crops	**A11 A3D1 // A3D3**
Class 2 is composed of a main layer of cultivated herbaceous plants (graminoids or forbs). It includes herbaceous crops used for hay. All the non-perennial crops that do not last for more than two growing seasons and crops like sugar cane, where the upper part of the plant is regularly harvested while the root system can remain for more than one year in the field, are included in this class.	
3 - Woody crops	**A11 A1D1 // A2D1 // A1D3 // A2D3**
Class 3 is composed of a main layer of permanent crops (trees or shrub crops) and includes all types of orchards and plantations (fruit trees, coffee and tea plantation, oil palms, rubber plantation, Christmas trees, etc.).	
4 - Multiple or layered crops	**A11 A1+A3 // A12A1 + A11A3**
Class 4 may include: a) two layers of different crops: a common case is the presence of one layer of woody crops (trees or shrubs) and another layer of herbaceous crop (e.g., typical coastal agriculture in Africa with herbaceous fields covered by palm trees). b) Class 4 may also include the presence of one important layer of natural vegetation (mainly trees) that covers one layer of cultivated crops (e.g. coffee plantations shadowed by natural trees in the equatorial area of Africa).	
5 - Grassland	**A12 A2A20**
Class 5 includes any geographical area dominated by natural herbaceous plants (grasslands, prairies, steppes and savannahs) with a cover of 10 per cent or more, irrespective of different human and/or animal activities, such as grazing or selective fire management. Woody plants (trees and/or shrubs) can be present, assuming their cover is less than 10 per cent.	
6 - Tree-covered areas	**A12 A3A20 // A24 A3A20-R1**
Class 6 includes any geographical area dominated by natural tree plants with a cover of 10 per cent or more. Other types of plants (shrubs and/or herbs) can be present, even with a density higher than that of trees. Areas planted with trees for afforestation purposes and forest plantations are included in this class. This class includes areas seasonally or permanently flooded with freshwater but excludes coastal mangroves (under class 7).	
7 - Mangroves	**A24 A1A20-R2 // A1A20-R3**
Class 7 includes any geographical area dominated by woody vegetation (trees and/or shrubs) with a cover of 10 per cent or more that is permanently or regularly flooded by salt and/or brackish water located in the coastal areas or in the deltas of rivers.	
8 - Shrub-covered areas	**A12 A4A20 // A24 A2A20-R1**
Class 8 includes any geographical area dominated by natural shrubs having a cover of 10 per cent or more. Trees can be present in scattered form if their cover is less than 10 per cent. Herbaceous plants can also be present at any density. The class includes shrub-covered areas permanently or regularly flooded by inland fresh water. It excludes shrubs flooded by salt or brackish water in coastal areas (under class 7).	
9 - Shrubs and/or herbaceous vegetation, aquatic or regularly flooded	**A24 A2A20-R1 // A4A16-R1**
Class 9 includes any geographical area dominated by natural herbaceous vegetation (cover of 10 per cent or more) that is permanently or regularly flooded by fresh or brackish water (swamps, marsh areas, etc.). Flooding must persist for at least two months per year to be considered regular. Woody vegetation (trees and/or shrubs) can be present if their cover is less than 10 per cent.	
10 - Sparsely natural vegetated areas	**A12 A2A14 // A1A14 // A7A14 // A24 A2A16 // A1A16 // A7A16**
Class 10 includes any geographical areas were the cover of natural vegetation is between 2 per cent and 10 per cent. This includes permanently or regularly flooded areas.	
11 - Terrestrial barren land	**B16 A1 / A4 / A2 / A6 B1 // B13**
Class 11 includes any geographical area dominated by natural abiotic surfaces (bare soil, sand, rocks, etc.) where the natural vegetation is absent or nearly absent (i.e. cover is less than 2 per cent). The class includes areas regularly flooded by inland water (lake shores, river banks, salt flats, etc.). It excludes coastal areas affected by the tidal movement of saltwater (under class 14).	
12 - Permanent snow and glaciers	**B28 A2B1 // A3B1 // B27 A2B1 // A3B1**

Class 12 includes any geographical area covered by snow or glaciers persistently for 10 months or more.	
13 - Inland water bodies	**A27 A1B1 // A3B2 // A28 A1B1 // A3B2**
Class 13 includes any geographical area covered for most of the year by inland water bodies. In some cases, the water can be frozen for part of the year (less than 10 months).	
14 - Coastal water bodies and intertidal areas	**B28 A1B3V5**
Class 14 is defined based on geographical features of the land in relation to the sea (coastal water bodies, i.e., lagoons and estuaries) and abiotic surfaces subject to water persistence (intertidal areas, i.e., coastal flats and coral reefs).	

* According to the syntax of the LCCS (Di Gregorio, 2005): a) Single slash (/) indicates that both classes A and B are present in the polygon (A/B), with the first code covering the majority of the polygon; b) The + sign indicates a vertical layering in the same spatial cartographic unit; c) Two slashes (//) indicate that there is uncertainty regarding the presence of the two classes. There is either class A OR class B present in the polygon (A//B); X stands for unspecified parameters.

Geoprocessing methods

MODIS-LCCS, CGLS and WorldCover data are directly accessed and processed within the Google Earth Engine (GEE) data catalog and platform. CCI-data are also processed in GEE after importing from the Copernicus data platform. For each land cover product, country area values for the different land cover classes were extracted using the FAO Global Administrative Unit Layer (GAUL National level – reference year 2014), also available within GEE. GAUL country codes are then mapped to country codes in FAOSTAT, taking into account the administrative changes that may have occurred during the data time series such as the splitting of Sudan, former to Sudan and South Sudan.

Mapping GLC maps to the SEEA land cover classification

1) MODIS-LCCS combined Land Cover Types

MODIS (Moderate Resolution Imaging Spectroradiometer) is a key instrument aboard the NASA Terra and Aqua satellites. A MODIS-derived land cover product, the Collection 6.1 MODIS Global Land Cover Type – MCD12Q1 – was used as a source of land cover information for the FAOSTAT Land Cover domain. The MODIS Collection 6.1 is composed of 8 distinct layers (Sulla-Menashe *et al.*, 2019; Sulla-Menashe and Friedl, 2022) including 3 land cover types based on the FAO LCCS that distinguish between land cover, land use and hydrologic state. We combined these LCCS land cover types to derive for each pixel in the yearly maps a mutually exclusive classification compliant with LCCS, hereinafter named MODIS-LCCS combined (see Tab. 2 below).

Table 2. MODIS-LCCS combined land cover type, class descriptions and corresponding LCCS classifiers

MODIS-LCCS COMBINED	
CLASS VALUE AND LABEL	**LCCS CLASSIFIERS***
1 – Barren	**B16 // A12 A2A14 // A12 A4A14**
At least 60% of area is non-vegetated barren (sand, rock, soil) or permanent snow/ice with less than 10% vegetation.	
2 – Permanent snow and ice	**B28 A2 // A3 // B27 A2 // A3s**
At least 60% of area is covered by snow and ice for at least 10 months of the year.	
3 – Water Bodies	**B28 A1B1 // B27 A1B1**
At least 60% of area is covered by permanent water bodies.	
9 – Urban and built up lands	**B15**
At least 30% of area is made up of impervious surfaces including building materials, asphalt, and vehicles.	

10 – Dense forest	**A12 A3A10B2XXD2E1 // A11 A1** **A12 A3A10B2XXD1E1 // A11 A1** **A12 A3A10B2XXD2E2 // A11 A1** **A12 A3A10B2XXD1E2 //A11 A1** **A12 A3A10B2Z5 // A11 A1**
*Tree cover >60% (canopy >2m**).** This class includes areas with forests dominated by Evergreen Needleleaf; Evergreen Broadleaf; Deciduous Needleleaf; Deciduous Broadleaf; or Mixed types. These correspond to classes 11 to 16 in MODIS LCCS Land Cover Type LC_Proportion1. The class may include tree crops.*	
20 – Open forest	**A12 A3A14 // A11 A1** **A12 A3A21 // A11 A1**
Tree cover 10-60% (canopy >2m). Class includes forest with open (30-60%) and sparse (10-30%), corresponding to classes 21 and 22 in MODIS LCCS Land Cover Type LC_Proportion1.	
25 – Forest / Cropland Mosaics	**A11 A3B2 // A12 A3** **A11 A3B4 // A12 A3**
Mosaics of small-scale cultivation 40-60% with >10% natural tree cover.	
27 – Woody Wetlands	**A24 A1A20**
Shrub and tree cover >10% (>1m). Permanently or seasonally inundated.	
30 – Natural Herbaceous	**A12 A2A20**
*Areas dominated by herbaceous annuals (<2m) with at least 10% cover**.** This class includes areas with Dense Herbaceous (cover at least 60%) or Sparse Herbaceous (10-60% cover) corresponding to classes 31 and 32 in MODIS LCCS Land Cover Type LC_Proportion1.*	
35 – Natural Herbaceous/Croplands Mosaics	**A11 A3 // A12 A2 / A12 A4**
Mosaics of small-scale cultivation 40-60% with natural shrub or herbaceous vegetation.	
36 – Herbaceous Croplands	**A11 A3**
Class dominated by herbaceous annuals (<2m), with at least 60% cover. Cultivated fraction >60%.	
40 – Shrublands	**A12 A4A10B1–B10 // A11 A2**
Shrub cover >60% (1-2m). This class includes Dense, Sparse and Shrublands / Grasslands Mosaics corresponding to classes 41, 42 and 43 in MODIS LCCS Land Cover Type LC_Proportion1. The class may include shrub crops.	
50 – Herbaceous Wetlands	**A24 A2A20C1**
Areas dominated by herbaceous annuals (<2m) >10% cover. Permanently or seasonally inundated.	

*For syntax of LCCS coding, please refer to note in Tab. 1.

Based on corresponding LCCS classifiers and following a mutually-exclusive approach, the land cover classes of the MODIS-LCCS combined images were mapped to the SEEA CF classes (Tab. 3). When instead, SEEA land cover class could not be univocally identified from the underlying set of MODIS classes, the area value of the SEEA land cover class is set to null. Hence, the total area of the available SEEA-MODIS classes may not correspond to actual country areas. The bridging between the two classifications resulted in a SEEA-compliant land cover annual dataset, available for FAOSTAT countries and territories and over the period 2001–2021 in this update.

Table 3. Mapping of the MODIS-LCCS combined land cover classes to the land cover classification of the SEEA

SEEA LAND COVER CLASSES CLASS VALUE AND LABEL	MAPPING FROM MODIS-LCCS COMBINED THROUGH CORRESPONDING LCC CLASSIFIERS
1 - Artificial surfaces (including urban and associated areas)	B15 [Class 9]
2 - Herbaceous crops	A11A3 [Equation 1: Class 36 + .6 (Class 25 + Class 35)]
3 - Woody crops	*Not mapped: not in scope of MODIS land cover types*
4 - Multiple or layered crops	*Not mapped: not in scope of MODIS land cover types*

5 - Grassland	A12A2A20 [Equation 2: Class 30 + .2(Class 35)]
6 - Tree-covered areas	A12A3 [Equation 3: Class 10 + Class 20 + .4 (Class 25)]
7 - Mangroves	A24A1A20 [Class 27] *with adjustments*
8 - Shrub-covered areas	A12A4 [Equation 4: Class 40 + .2(Class 35]
9 - Shrubs and/or herbaceous vegetation, aquatic or regularly flooded	A24A2A20 / A24A4A20 [Class 50] *with adjustments*
10 - Sparsely natural vegetated areas	*Not mapped: distinct classifiers not available in MODIS land cover types*
11 - Terrestrial barren land	B16 [Class 1]
12 - Permanent snow and glaciers	B28A2 B28A3 B27A2 B27A3 [Class 2]
13 - Inland water bodies	B27A1 B28A1 [Class 3]
14 - Coastal water bodies and intertidal areas	*Not mapped: not in scope of MODIS land cover types*

More in detail, the following rules are applied to the MODIS-LCCS combined maps:

The area values for the **SEEA class 1** "Artificial surfaces" are derived directly from the MODIS-LCCS combined class 9 "Urban and Built-up Lands".

The area values for the **SEEA class 2** "Herbaceous crops" are calculated as the sum of area values of class 36 "Herbaceous Croplands" plus 60 percent of the area from the mosaic classes 25 and 35 "Forest/Croplands" and "Natural Herbaceous/Croplands" respectively (Equation 1). Sixty percent is the maximum proportion of cultivated area in the cells of these mosaic classes according to MODIS-LCCS data description (Sulla-Menashe et al., 2019). This proportion is applied in the methodology to all countries indistinctly :

Eq. 1 $\textbf{SEEA class 2 "Herbaceous crops"}_{c,y}\ \textbf{(1000 ha)} = (\textit{MODIS-LCCS combined classes: } 36 + .6(\textit{class } 25 + \textit{class} 35))_{c,y};$

In MODIS land cover types, cropland only includes the herbaceous crops whereas the perennial woody crops area classified under natural tree or shrub vegetation types of land cover (Herold *et al*., 2008). This implies that primarily natural vegetated areas (LCC main classifier A12), may include cultivated and managed areas (LCC main classifier A11). This is the case for instance for classes 10, 20 and 40 in MODIS-LCCS combined maps (Tab. 2). For this reason, the **SEEA class 3** "Woody crops" could not be mapped from this land cover product. Likewise, data for the **SEEA class 4** "Multiple or layered crops" could not be derived from the MODIS-LCCS combined dataset.

The area values for the **SEEA class 5** "Grassland" are matched to values of the MODIS-LCCS combined class 40 "Natural Herbaceous" plus 20 percent of the area from mosaic class 35 "Natural herbaceous/Croplands". For the latter class, the part of natural vegetation is equally shared between natural herbaceous vegetation and shrubs based on the MODIS-LCCS description (Equation 2).

Eq. 2 $\textbf{SEEA class 5 "Grassland"}_{c,y}\ \textbf{(1000 ha)} = (\textit{MODIS-LCCS combined classes: } 30 + .2(\textit{class } 35))_{c,y};$

Values for the **SEEA class 6** "Tree-covered areas" are mapped from the sum of cells in MODIS-LCCS combined class 10 "Dense forest", class 20 "Open forest" plus 40 percent of the area from mosaic class 25 "Forest/Cropland" as in Equation 3:

Eq. 3 $\textbf{SEEA 6 "Tree-covered areas"}_{c,y}\ \textbf{(1000 ha)} = (\textit{MODIS-LCCS combined classes: } 10 + 20 + .4\ (\textit{class } 25))_{c,y};$

Area values for the **SEEA class 7** "Mangroves" are matched to LCCS classifiers of the MODIS-LCCS combined class 27 "Woody Wetlands". However, to account for the unique features and geographical distributions of these forests, values for this class are only populated from

class 27 for countries where FAO detected the presence of mangroves (FAO, 2007). In countries where there are both mangroves and other types of woody wetlands (e.g. riparian forest), this adjustment may lead to overestimate of the total area of mangroves.

Area values for **SEEA class 8** "Shrub-covered areas" are mapped from the sum of cells in MODIS-LCCS combined class 40 "Shrublands" plus twenty percent of the area from mosaic class 35 "Natural herbaceous/Croplands" as per Equation 4:

Eq. 4 $\textbf{SEEA 8 "Shrub-covered areas"}_{C,Y}\ \textbf{(1000 ha)} = (MODIS\text{-}LCCS\ combined\ classes:\ 40 + .2(class35))_{C,Y};$

Area values for the **SEEA class 9** "Shrub and/or herbaceous vegetation, aquatic or regularly flooded" are matched to classifiers of the MODIS-LCCS combined class 40 "Herbaceous Wetlands". Values of MODIS-LCCS combined class 27 "Woody wetlands" are also apportioned to this SEEA land cover category in all landlocked countries and in countries without mangroves (FAO, 2007). This adjustment may increase the woody component of this SEEA land cover class.

Distinct LCCS classifiers are not available in the MODIS-LCCS combined classes to derive information for the **SEEA class 10** "Sparsely naturally vegetated".

A direct mapping is made for SEEA classes 11 to 13. More specifically, area values for the **SEEA class 11** "Terrestrial barren land" are mapped from MODIS-LCCS class 1 "Barren"; the area values for the **SEEA class 12** "Permanent snow and glaciers" are directly mapped from MODIS-LCCS combined class 2 "Permanent snow and ice"; finally, the area values for **SEEA class 13** "Inland water bodies" are mapped directly from MODIS-LCCS combined class 3 "Water Bodies".

The MODIS-LCCS combined maps lacked LCCS classifiers to match the **SEEA class 14** "Coastal water bodies and intertidal areas".

2) Annual land cover maps from the ESA CCI initiative (CCI-LC)

Global land cover maps for the years 1992 to 2015 at 300m spatial resolution were first produced by the Catholic University of Louvain Geomatics center (UCL Geomatics, 2017) under the Climate Change Initiative (CCI) of the European Space Agency (ESA) and as part of the Land Cover CCI partnership. Since 2019, the process migrated under the framework of the European Copernicus Climate Change Service (C3S). Land cover maps that were released from 2016 onwards are nonetheless consistent with the earlier dates. A complete description of methods and satellite-sensors for this medium-resolution land cover product is available in the Land Cover CCI-Product User Guide v2.0 (released in April 2017 - UCL Geomatics, 2017) and in Li et al., 2018.

The original CCI-LC classification is based on the UN LCCS system v.2 (Di Gregorio, 2005), and composed of two levels of detail. "Level 1" is characterized by land cover classes for which the information is available and applicable at the global scale, thus allowing the CCI-LC maps to be globally consistent while "Level 2" represents information of increased thematic detail that is only partially (regionally) available. The derived SEEA-CCI land cover dataset in FAOSTAT combines spatially the information from these two levels (see Tab. 4 below). In preparation of the country aggregates, the area values from the second level are thus aggregated at higher hierarchical level (e.g. classes 11 and 12 to corresponding "level 1", class 10). Tab. 4 also shows the LCCS coding of the CCI-LC maps as reported in the UCL Geomatics reference publication (UCL Geomatics, 2017).

The annual maps of the CCI-LC are a consistent representation of the stable components of land cover. Derived information that is organized in physical asset accounts may provide indications on the net land cover change within countries.

Table 4. Level 1 of the CCI-LC classification, LCCS coding and class descriptions

CCI-LC	
CLASS VALUE AND LABEL– LEVEL 1	**LCCS CODING***
10 - Cropland, rainfed**	**A1XXXXXXD1 // A2XXXXXXD1 // A3XXXXXXD1**
Class 10 includes Rainfed tree crops // Rainfed shrub crops // Rainfed herbaceous crops	
20 - Cropland, irrigated or post-flooding	**A1XXXXXXD3 // A2XXXXXXD3 // A3XXXXXXD3 // A3XXXXXXD2**
Class 20 includes Irrigated tree crops // Irrigated shrub crops // Irrigated herbaceous crops // Post- flooding cultivation of herbaceous crops	
30 - Mosaic cropland (>50%) / natural vegetation (tree, shrub, herbaceous) <50%	**A11 / A12**
Class 30 includes mosaic of Cultivated and managed terrestrial areas and Natural and semi-natural primarily terrestrial vegetation	
40 - Mosaic natural vegetation (tree, shrub, herbaceous cover) (>50%) / cropland (<50%)	**A12 / A11**
Class 40 includes mosaic of Natural and semi-natural primarily terrestrial vegetation and Cultivated and managed terrestrial areas	
50 - Tree cover, broadleaved, evergreen, closed to open (>15%)	**A12 A3A20B2XXD1E1 // A3A20B2XXD1E2-E4**
Class 50 includes natural vegetation of Broadleaved evergreen closed to open trees or Broadleaved semi-deciduous closed to open trees	
60 - Tree cover, broadleaved, deciduous, closed to open (>15%)**	**A12 A3A20B2XXD1E2**
Class 60 includes natural vegetation of Broadleaved deciduous closed to open trees	
70 - Tree cover, needleleaved, evergreen, closed to open (>15%)**	**A12 A3A20B2XXD2E1**
Class 70 includes natural vegetation of Needleleaved, evergreen closed to open trees	
80 - Tree cover, needleleaved, deciduous, closed to open (>15%)**	**A12 A3A20B2XXD2E2**
Class 80 includes natural vegetation of Needleleaved, deciduous closed to open trees	
90 - Tree cover, mixed leaf type (broadleaved and needleleaved)	**A12 A3A20B2XXD1 / A3A20B2XXD2**
Class 90 includes natural vegetation of tree cover of mixed leaf type, Broadleaved closed to open trees and Needleleaved closed to open trees	
100 - Mosaic tree and shrub (>50%) / herbaceous cover (<50%)	**A12 A3A20 // A4A20 / A2A20**
Class 100 includes a mosaic of natural vegetation with prevailing woody vegetation: Closed to open trees or Closed to open shrubland (thicket) and Herbaceous closed to open vegetation	
110 - Mosaic herbaceous cover (>50%) / tree and shrub (<50%)	**A12 A2A20 / A3A20 // A4A20**
Class 110 includes a mosaic of natural vegetation with prevailing herbaceous vegetation: Herbaceous closed to open vegetation and Closed to open trees or Closed to open shrubland (thicket)	
120 – Shrubland**	**A12 A4A20**
Class 120 includes natural vegetation of Broadleaved closed to open shrubland (thicket)	
130 - Grassland	**A12 A2A20**
Class 130 includes natural vegetation of Herbaceous, closed to very open	
140 - Lichens and mosses	**A12 A7A20**
Class 140 includes vegetation of closed to open lichens/mosses	
150 - Sparse vegetation (tree, shrub, herbaceous cover) (<15%)**	**A12 A3A14 // A4A14 // A2A14**
Class 150 includes natural vegetation with sparse cover: Sparse trees or Herbaceous sparse vegetation or Sparse shrubs	
160 - Tree cover, flooded, fresh or brackish water	**A24 A3A20B2C1D1-R1 // A3A20B2C2D1-R1**
Class 160 includes natural and semi-natural aquatic vegetation with of predominant tree type: Closed to open (100-40%) broadleaved trees on temporarily flooded land, water quality: fresh water or Closed to open (100-40%) broadleaved trees on permanently flooded land, water quality: fresh water	
170 - Tree cover, flooded, saline water	**A24 A3A20B2C1D1-C5-R2 // A3A20B2C1D1-C5-R3**

Class 170 includes natural and semi-natural aquatic vegetation of predominant tree type in saline water: Closed to open (100-40%) broadleaved trees on permanently flooded land (with daily variations), water quality: saline water or Closed to open (100- 40%) broadleaved trees on permanently flooded land (with daily variations), water quality: brackish water or Closed to open (100-40%) semi-deciduous shrubland on permanently flooded land (with daily variations), water quality: saline water or Closed to open (100-40%) semi-deciduous shrubland on permanently flooded land (with daily variations), water quality: brackish water	
180 - Shrub or herbaceous cover, flooded, fresh/saline/brackish water	**A24 A4A20B3C1 // A4A20B3C2 // A4A20B3C3 // A2A20B4C1 // A2A20B4C2 // A2A20B4C3**
Class 180 includes natural and semi-natural aquatic vegetation of predominant shrub or herbaceous type in fresh, brackish or saline water quality: Closed to open shrubs on permanently flooded land or Closed to open herbaceous vegetation on permanently flooded land or Closed to open shrubs on temporarily flooded land or Closed to open herbaceous vegetation on temporarily flooded land or Closed to open shrubs on waterlogged soil or Closed to open herbaceous vegetation on waterlogged soil	
190 - Urban areas	**B15**
Class 190 includes Artificial surfaces and associated areas	
200 - Bare areas**	**B16 A1 // A2**
Class 200 includes Bare areas of either Consolidated or Unconsolidated Materials	
210 - Water bodies	**B28 A1B1 // B27 A1B1**
Class 210 includes Natural water bodies or Artificial water bodies	
220 - Permanent snow and ice	**B27 A2B1 // A3B1 // B28 A2B1 // A3B1**
Class 220 includes Natural Perennial snow or Perennial ice or Artificial Perennial snow or Perennial ice	

*For the syntax of LCCS coding please refer to the note in Table 1; **Land cover classes with "Level 2" of detail in the original legend (regional/locally available data).

The correspondence of LCC classifiers has guided, for each country and year in the available time series, the mapping and completion of the SEEA land cover classes from underlying CCI-LC information. Tab. 5 below summarizes calculations made for this part of the FAOSTAT land cover dataset.

Table 5. Mapping of the CCI-LC classes to the land cover classification of the SEEA

SEEA LAND COVER CLASSES CLASS VALUE AND NAME	MAPPING FROM CCI-LC THROUGH CORRESPONDING LCC CLASSIFIERS
1 - Artificial surfaces (including urban and associated areas)	B15 [.75(Class 190)]
2 - Herbaceous crops	A11A3 [mapping as in Equation 10]
3 - Woody crops	A11A1 A11A2 [mapping as in Equation 11]
4 - Multiple or layered crops	*Not mapped: not in scope of CCI-LC land cover types*
5 - Grassland	A12A2 [mapping as in Equation 12]
6 - Tree-covered areas	A12A3 [mapping as in Equation 13]
7 - Mangroves	A24A1 (woody vegetation) [Class 170]
8 - Shrub-covered areas	A12A4 [mapping as in Equation 14)]
9 - Shrubs and/or herbaceous vegetation, aquatic or regularly flooded	A24A4 A24A2 [Class 180]
10 - Sparsely natural vegetated areas	A12A1A14 A12A4A14 A12A2A14 [Class 150]
11 - Terrestrial barren land	B16A1(A2/A4/A6) [Class 200]
12 - Permanent snow and glaciers	B27A2B1 B27A3B1 B28A2B1 B28A3B1 [Class 220]
13 - Inland water bodies	B28A1B1 B27A1B1 [Class 210]
14 - Coastal water bodies and intertidal areas	*Not mapped: missing matching classifiers*

Also, based on exchanges with UCL Geomatics, the following operational choices for the interpretation and allocation of the areas of mosaic land cover classes were applied (Tab. 6).

Table 6. Allocation of the mosaic classes in the CCI-LC classification

CCI-LC MOSAIC CLASS VALUE AND NAME	DISTRIBUTION TO SEEA CLASSES (% OF THE MOSAIC AREA)
Mosaic with cultivated and natural vegetation	
30 - Mosaic cropland (>50%) / natural vegetation (tree, shrub, herbaceous) < 50%	**75%** to SEEA classes 2 + 3; **10%** to SEEA class 5; **10%** to SEEA class 6; **5%** to SEEA class 8;
40 - Mosaic natural vegetation (tree, shrub, herbaceous cover) (>50%) / cropland (< 50%)	**25%** to SEEA classes 2 + 3; **25%** to SEEA class 5; **25%** to SEEA class 6; **25%** to SEEA class 8;
Mosaic of different types of natural vegetation	
100 - Mosaic tree and shrub (>50%) / herbaceous cover (<50%)	**25%** to SEEA class 5; **35%** to SEEA class 6; **40%** to SEEA class 8;
110 - Mosaic herbaceous cover (>50%) / tree and shrub (<50%)	**75%** to SEEA class 5; **10%** to SEEA class 6; **15%** to SEEA class 8

For each country and year, the area values for the **SEEA class 1** "Artificial surfaces" are directly derived from the CCI-LC Class 190 "Urban areas". High-resolution data from the Global Human Settlement Layer that are aggregated to 300m through a majority resampling method, represent the main source of information for the class "Urban areas" in the CCI-LC maps. Urban is therefore represented at 300m with urban proportions varying between >50 percent and 100 percent. A middle point is applied in this methodology and the class is considered purely urban at 75 percent. The remaining 25 percent of the area of pixels in Class 190 is allocated to trees and to herbaceous vegetation, with shares of 15 percent and 10 percent, respectively.

Values for **SEEA class 2** "Herbaceous crops" and **SEEA class 3** "Woody crops" are computed as follows from CCI-LC data. Firstly, for each country and year in the time series, the area values of CCI-LC Classes 10, 11, 12 and 20 and values from mosaic Classes 30 and 40 – based on proportional allocations in Tab. 6 – are summed to derive the Total cropped area as in Equation 9. Based on detailed analysis of class homogeneity, UCL Geomatics suggested treating pixels of Class 10 and Class 20 as pure cropland at 95 percent. The remaining 5 percent of the area of these pixels was allocated to natural herbaceous vegetation (i.e. grassland). Secondly, because the original CCI-LC only contains partial information to characterize the "Herbaceous" and "Tree or shrub" crops, relevant country data from the FAOSTAT domain "Input/Land Use" are imported as proxy for the proportions of annual/herbaceous and woody/permanent crops. More specifically, information from the FAOSTAT domain "Land Use" is imported to derive: the share of the area used for "Arable land area" and the share of the area used for "Permanent crops". These proportions are then used in Equations 10 and 11 below to derive the area cropped with herbaceous (annual) crops (corresponding to the **SEEA class 2**) and the area cropped with woody (permanent) crops (corresponding to the **SEEA class 3**).

Eq. 9 $\textbf{Total cropland area}_{c,Y}\ \textbf{(1000 ha)} = (.95\%\ Class\ 10_{c,Y} + .95\%\ Class\ 20_{c,Y} + .75(Class\ 30_{c,Y}) + .25(Class\ 40_{c,Y}))$

Eq. 10 $\textbf{(CCI-LC\_SEEA 2) Areas covered with Herbaceous crops}_{c,Y}\ \textbf{(1000 ha)} = Total\ cropland\ area_{c,Y} * Share\ land\ used\ for\ arable\ land_{c,Y}$

Eq. 11 $\textbf{(CCI-LC\_SEEA 3) Areas covered with Woody crops}_{c,Y}\ \textbf{(1000 ha)} = Total\ cropland\ area_{c,Y} * Share\ land\ used\ for\ permanent\ crops_{c,Y}$

Insufficient information prevents deriving area values for the **SEEA class 4** "Multiple or layered crops". For this reason, it is assumed that the cultivated areas are entirely allocated to either the herbaceous (SEEA class 2) or the woody crops (SEEA class 3). This SEEA class thus has null values in the corresponding country dataset.

The area values for the **SEEA class 5** "Grassland" correspond to area values of the CCI-LC Class 130 "Grassland" summed to the areas allocated from mosaic Classes 30, 40 and 100, 110 (Tab. 6) and 140 as in Equation 12. The percentage of land cover was the main rationale for allocating the area values for the Class 140 "Lichens and mosses" under this category. The herbaceous vegetation cover that exists in urban and in cropped areas is also included in this class.

Eq. 12 (CCI-LC_SEEA 5) Areas covered with Grassland $_{c,y}$ **(1000 ha) =** $(Class\ 130_{c,y} + \text{Class}\ 140_{c,y} + .1(Class\ 30_{c,y}) + .25(Class\ 40_{c,y}) + .25(Class\ 100_{c,y}) + .75(Class\ 110_{c,y}) + .1(\text{Class}\ 190_{c,y}) + .05(\text{Class}\ 10) + .05(\text{Class}\ 20))$

The area values for the **SEEA class 6** "Tree-covered areas" correspond to area values of the forest classes in the CCI-LC legend (classes 50 to 90) summed to the areas allocated from mosaic Classes 30, 40 and 100, 110 (Tab. 6). In addition, based on the correspondence of the LCC classifiers A24A3 (for Trees under Natural and Semi-natural aquatic vegetation), the area values from CCI-LC class 160 are also added in Equation 13. The natural tree vegetation cover present in the urban areas is also included in this class.

Eq. 13 (CCI-LC_SEEA 6) Tree-covered Areas $_{c,y}$ **(1000 ha) =** $(Class\ 50_{c,y} + Class\ 60_{c,y} + Class\ 70_{c,y} + Class\ 80_{c,y} + Class\ 90_{c,y} + .10(Class\ 30_{c,y}) + .25(Class\ 40_{c,y}) + .40(Class\ 100_{c,y}) + .15(Class\ 110_{c,y}) + Class\ 160_{c,y}) + .15(\text{Class}\ 190_{c,y}))$

For each country and year, the area values for the **SEEA class 7** "Mangroves" are derived directly from the CCI-LC class 170 "Tree cover, flooded, saline water".

The area values for the **SEEA class 8** "Shrub-covered areas" correspond to area values of the CCI-LC class 120 "Shrubland" summed to the areas allocated from mosaic Classes 30, 40 and 100, 110 (Tab. 6) as shown in Equation 14 below.

Eq. 14 (CCI-LC_SEEA 8) Shrub-covered Areas $_{c,y}$ **(1000 ha) =** $(Class\ 120_{c,y} + .05(Class\ 30_{c,y}) + .25(Class\ 40_{c,y}) + .40(Class\ 100_{c,y}) + .15(Class\ 110_{c,y}) + .05(\text{Class}\ 10) + .05(\text{Class}\ 20))$

The area values for **SEEA class 9** "Shrubs and/or herbaceous vegetation, aquatic or regularly flooded" and **SEEA class 10** "Sparsely natural vegetated areas" are mapped without additional adjustments from the CCI-LC classes 180 and 150 respectively.

SEEA class 11 "Terrestrial barren land" is directly mapped from the CCI-LC class 200, which describes the bare areas.

SEEA class 12 "Permanent snow and glaciers" matched the classifiers of the CCI-LC class 220 that maps perennial snow and ice of both natural and artificial origin.

The area values for the **SEEA class 13** "Inland water bodies" are sourced from the CCI-LC class 210, which maps natural and artificial water bodies.

Finally, the CCI-LC products lacked LCCS classifiers that match the **SEEA class 14** "Coastal water bodies and intertidal areas." Hence, this class has null values in the corresponding country dataset.

3) Annual land cover maps from the Copernicus Global Land Service (CGLS)

The CGLS Land Cover product at 100 m spatial resolution provides a primary land cover legend with class definitions according to the Land Cover Classification System (LCCS) scheme. FAOSTAT land cover statistics use version 3 of the CGLS product which, compared

to earlier versions, increases the stability of the annual classifications and reduce the detection of spurious land cover change (Buchhorn et al., 2020). The discrete classification provides 23 land cover classes organized in three hierarchical levels with the third level recording additional thematic detail to distinguish the forest classes (e.g. open versus closed forest) (Tab. 7).

Table 7. CGLS land cover classification, LCCS coding and class descriptions

CGLS LAND COVER	
CLASS VALUE AND LABEL	**LCCS CODING**
20 - Shrubs	**A12A4A20B3(B9)**
These are woody perennial plants with persistent and woody stems and without any defined main stem being less than 5 m tall. The shrub foliage can be either evergreen or deciduous.	
30 – Herbaceous vegetation	**A12A2(A6)A20B4**
Plants without persistent stem or shoots above ground and lacking definite firm structure. Tree and shrub cover is less than 10 %.	
40 - Cultivated and managed vegetation/agriculture (cropland)	**A11A3**
Lands covered with temporary crops followed by harvest and a bare soil period (e.g., single and multiple cropping systems). Note that perennial woody crops will be classified as the appropriate forest or shrub land cover type.	
50 – Urban / Built up	**B15A1**
Land covered by buildings and other man-made structures	
60 – Bare / Sparse vegetation	**B16A1(A2)**
Lands with exposed soil, sand, or rocks and never has more than 10 % vegetated cover during any time of the year	
70 – Snow and Ice	**B28A2(A3)**
Lands under snow or ice cover throughout the year.	
80 – Permanent water bodies	**B28A1B1**
Lakes, reservoirs, and rivers. Can be either fresh or salt-water bodies.	
90 – Herbaceous wetland	**A24A2A20**
Lands with a permanent mixture of water and herbaceous or woody vegetation. The vegetation can be present in either salt, brackish, or fresh water.	
100 – Moss and lichen	**A12A7**
Moss and lichen	
111 – Closed forest, evergreen, needle leaf	**A12A3A10B2D2E1**
Tree canopy >70 %, almost all needle leaf trees remain green all year. Canopy is never without green foliage.	
112 - Closed forest, evergreen, broad leaf	**A12A3A10B2D1E1**
Tree canopy >70 %, almost all broadleaf trees remain green year round. Canopy is never without green foliage.	
113 - Closed forest, deciduous, needle leaf	**A12A3A10B2D2E2**
Tree canopy >70 %, consists of seasonal needle leaf tree communities with an annual cycle of leaf-on and leaf-off periods	
114 - Closed forest, deciduous, broad leaf	**A12A3A10B2D1E2**
Tree canopy >70 %, consists of seasonal broadleaf tree communities with an annual cycle of leaf-on and leaf-off periods.	
115 – Closed forest, mixed	**A12A3A10**
Closed forest, mixed of types	
116 – Closed forest, unknown	**A12A3A10**
Closed forest, not matching any of the other definitions	
121 - Open forest, evergreen, needle leaf	**A12A3A11B2D2E1**
Top layer- trees 15-70 % and second layer- mixed of shrubs and grassland, almost all needle leaf trees remain green all year. Canopy is never without green foliage.	

122 - Open forest, evergreen, broad leaf	**A12A3A11B2D1E1**
Top layer- trees 15-70 % and second layer- mixed of shrubs and grassland, almost all broadleaf trees remain green year round. Canopy is never without green foliage.	
123 – Open forest, deciduous, needle leaf	**A12A3A11B2D2E2**
Top layer- trees 15-70 % and second layer- mixed of shrubs and grassland, consists of seasonal needle leaf tree communities with an annual cycle of leaf-on and leaf-off periods	
124 – Open forest, deciduous broad leaf	**A12A3A11B2D1E2**
Top layer- trees 15-70 % and second layer- mixed of shrubs and grassland, consists of seasonal broadleaf tree communities with an annual cycle of leaf-on and leaf-off periods.	
125 – Open forest, mixed	**A12A3A12**
Open forest, mix of types	
126 – Open forest, unknown	**A12A3A12**
Open forest, not matching any of the other definitions.	
200 – Open sea	**B28A1B1**
Oceans, seas. Can be either fresh or salt-water bodies.	

Unlike the other products, the CGLS land cover also distinguishes a class for 'Open sea'. LCCS classifiers in the discrete CGLS categorization are however the same as class 80 "Water bodies" for lack of more specific classifiers in the LCCS system (Buchhorn et al., 2020).

LCCS classifiers in the CGLS land cover allowed for a direct mapping for most of the SEEA land cover categories without further adjustments (Tab. 8).

Table 8. Mapping of the CGLS classes to the land cover classification of the SEEA

SEEA LAND COVER CLASSES CLASS VALUE AND NAME	MAPPING FROM CGLS THROUGH CORRESPONDING LCC CLASSIFIERS
1 - Artificial surfaces (including urban and associated areas)	B15 [Class 50]
2 - Herbaceous crops	A11A3 [Class 40]
3 - Woody crops	*Not mapped: not in scope of CGLS land cover types*
4 - Multiple or layered crops	*Not mapped: not in scope of CGLS land cover types*
5 - Grassland	A12A2A20 [mapping as in Equation 15]
6 - Tree-covered areas	A12A3 [mapping as in Equation 16]
7 - Mangroves	*Not mapped: unique LCC classifiers not available*
8 - Shrub-covered areas	A12A4A20 [Class 20]
9 - Shrubs and/or herbaceous vegetation, aquatic or regularly flooded	A24A2A20 [Class 90]
10 - Sparsely natural vegetated areas	*Not mapped: unique LCC classifiers not available*
11 - Terrestrial barren land	B16A1(A2) [Class 60]
12 - Permanent snow and glaciers	B28A2(A3) [Class 70]
13 - Inland water bodies	B28A1B1 [Class 80]
14 - Coastal water bodies and intertidal areas	B28A1B1 [Class 200]

Data for **SEEA class 1** are directly derived from CGLS class 50. The areas of herbaceous crops, **SEEA 2**, are computed from CGLS values in class 40. However, as in the MODIS land cover, the woody crops are not mapped separately in the CGLS. Hence, SEEA categories of natural vegetation from the CGLS may contain areas of shrub and tree crops and values for **SEEA class 3** and **SEEA class 4** are unavailable from CGLS. **SEEA class 5** is populated from values of CGLS class 30. Likewise, values for **SEEA class 8** are directly sourced from CGLS class 20; values for **SEEA**

class 9 are derived from CGLS class 90; **SEEA class 11** is computed from values of CGLS class 60; **SEEA class 12** is sourced from the area values of class 70. Antarctica is not covered by CGLS maps in the GEE. The **SEEA class 13** is computed from CGLS values of class 80. The **SEEA class 14** of Coastal water bodies and intertidal areas was derived from the area values of CGLS class 200. CGLS represents the sole source of information for this category in the FAOSTAT dataset.

The **SEEA class 5** is populated from CGLS data by summing the areas of grassland (class 30) to the area of moss and lichens (class 100) as shown in the Equation 15.

Eq. 15 (CGLS_SEEA 5) Grassland Areas $_{c,y}$ **(1000 ha)** = *(Class 30 + Class 100).*

The **SEEA class 6** is computed from CGLS data by summing the areas of all forest categories as shown in the Equation 16.

Eq. 16 (CGLS_SEEA 6) Tree-covered Areas $_{c,y}$ **(1000 ha)** = *∑(Class 111:116, Class 121:126).*

The CGLS land cover does not contain unique LCC classifiers to distinguish SEEA class 7 'Mangroves' and SEEA class 10 'Sparsely vegetated areas'. Hence, values for these classes are not reported in the FAOSTAT land cover from CGLS data.

4) Annual land cover maps from the ESA WorldCover

The WorldCover land cover maps are produced at 10m resolution from Sentinel data. Data for 2020 and 2021 were generated with different algorithm versions (v100 and v200, respectively). For this reason, changes between the maps include both changes in real land cover and changes due to the used algorithms. The discrete classification consists of 11 land cover classes (Table 9).

Table 9. WorldCover land cover classification, LCCS coding and class descriptions

WORLDCOVER LAND COVER	
CLASS VALUE AND LABEL	**LCCS CODING**
10 – Tree Cover	**A12A3 // A11A1 A24A3C1(C2)-R1(R2)**
This class includes any geographic area dominated by trees with a cover of 10% or more. Other land cover classes (shrubs and/or herbs in the understorey, built-up, permanent water bodies, …) can be present below the canopy, even with a density higher than trees. Areas planted with trees for afforestation purposes and plantations (e.g. oil palm, olive trees) are included in this class. This class also includes tree covered areas seasonally or permanently flooded with fresh water except for mangroves.	
20 - Shrubland	**A12A4 // A11A2**
This class includes any geographic area dominated by natural shrubs having a cover of 10% or more. Shrubs are defined as woody perennial plants with persistent and woody stems and without any defined main stem being less than 5 m tall. Trees can be present in scattered form if their cover is less than 10%. Herbaceous plants can also be present at any density. The shrub foliage can be either evergreen or deciduous.	
30 – Grassland	**A12A2**
This class includes any geographic area dominated by natural herbaceous plants (Plants without persistent stem or shoots above ground and lacking definite firm structure): (grasslands, prairies, steppes, savannahs, pastures) with a cover of 10% or more, irrespective of different human and/or animal activities, such as: grazing, selective fire management etc. Woody plants (trees and/or shrubs) can be present assuming their cover is less than 10%. It may also contain uncultivated cropland areas (without harvest/ bare soil period) in the reference year.	
40 - Cropland	**A11A3(A4)(A5) // A23**
Land covered with annual cropland that is sowed/planted and harvestable at least once within the 12 months after the sowing/planting date. The annual cropland produces an herbaceous cover and is sometimes combined with some tree or woody vegetation. Note that perennial woody crops will be classified as the appropriate tree cover or shrub land cover type. Greenhouses are considered as built-up.	

50 – Built-up	**B15A1**
Land covered by buildings, roads and other man-made structures such as railroads. Buildings include both residential and industrial building. Urban green (parks, sport facilities) is not included in this class. Waste dump deposits and extraction sites are considered as bare.	
60 – Bare / Sparse vegetation	**B16A1(A2) // B15A2**
Lands with exposed soil, sand, or rocks and never has more than 10 % vegetated cover during any time of the year.	
70 – Snow and Ice	**B28A2(A3)**
This class includes any geographic area covered by snow or glaciers persistently.	
80 – Permanent water bodies	**B28A1(B1) // B27A1(B1)**
This class includes any geographic area covered for most of the year (more than 9 months) by water bodies: lakes, reservoirs, and rivers. Can be either fresh or salt-water bodies. In some cases the water can be frozen for part of the year (less than 9 months).	
90 – Herbaceous wetland	**A24A2**
Land dominated by natural herbaceous vegetation (cover of 10% or more) that is permanently or regularly flooded by fresh, brackish or salt water. It excludes unvegetated sediment (see 60), swamp forests (classified as tree cover) and mangroves see 95).	
95 - Mangroves	**A24A3C5-R3**
Taxonomically diverse, salt-tolerant tree and other plant species which thrive in intertidal zones of sheltered tropical shores, "overwash" islands, and estuaries.	
100 – Moss and lichen	**A12A7**
Land covered with lichens and/or mosses. Lichens are composite organisms formed from the symbiotic association of fungi and algae. Mosses contain photo-autotrophic land plants without true leaves, stems, roots but with leaf-and stemlike organs.	

LCCS classifiers in the WorldCover land cover allowed for a direct mapping for most of the SEEA land cover categories without further adjustments (Tab. 10).

Table 10. Mapping of the WorldCover classes to the land cover classification of the SEEA

SEEA LAND COVER CLASSES CLASS VALUE AND NAME	MAPPING FROM WORLDCOVER THROUGH CORRESPONDING LCC CLASSIFIERS
1 - Artificial surfaces (including urban and associated areas)	B15 [Class 50]
2 - Herbaceous crops	A11A3 [Class 40]
3 - Woody crops	*Not mapped: not in scope of WorldCover*
4 - Multiple or layered crops	*Not mapped: not in scope of WorldCover*
5 - Grassland	A12A2A20 [mapping as in Equation 15]
6 - Tree-covered areas	A12A3 [Class 10]
7 - Mangroves	A24 A1-R3 [Class 95]
8 - Shrub-covered areas	A12A4 [Class 20]
9 - Shrubs and/or herbaceous vegetation, aquatic or regularly flooded	A24A2 [Class 90]
10 - Sparsely natural vegetated areas	*Not mapped: unique LCC classifiers not available*
11 - Terrestrial barren land	B16A1(A2) [Class 60]
12 - Permanent snow and glaciers	B28A2(A3) [Class 70]
13 - Inland water bodies	B28A1(B1) // B27A1(B1) [Class 80]
14 - Coastal water bodies and intertidal areas	*Not mapped: missing matching classifiers*

Data for **SEEA class 1** are directly derived from WorldCover class 50. The areas of herbaceous crops, **SEEA 2**, are based on the WorldCover values in class 40. As observed for the MODIS and CGLS, the SEEA categories of natural vegetation from the WorldCover may contain areas of shrub and tree crops and values for **SEEA class 3** and **SEEA class 4** are unavailable from the WorldCover

classification. **SEEA class 5** is populated from values of class 30 and class 100 as in Equation 15 above. The **SEEA class 6** is directly populated with values of Class 10. Likewise, values for **SEEA class 7** are derived from the WorldCover class 95; values for **SEEA class 8** are populated from WorldCover class 20 and values for **SEEA class 9** are derived from the WorldCover class 90. **SEEA class 11** is computed from values of class 60; **SEEA class 12** is sourced from the area values of class 70. Antarctica is not covered by WorldCover maps in the GEE. The **SEEA class 13** is computed from WorldCover values of class 80.

WorldCover classification does not contain unique LCC classifiers to distinguish SEEA class 10 'Sparsely vegetated areas' and SEEA class 14 'Coastal water bodies and intertidal areas'. Hence, values for these classes are not reported in the FAOSTAT land cover from WorldCover data.

It should be noted that as result of the incomplete one-to-one correspondence between the original classifications of the four global land cover products to SEEA classes, country totals for from each GLC may not sum up to country totals from the FAOSTAT land area.

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Data Collection Method	Computed
Completeness	100%
Useful Links	http://unstats.un.org/unsd/envaccounting/seearev/ http://www.fao.org/economic/ess/environment/seea/en/ https://lpdaac.usgs.gov/products/mcd12q1v006/ http://maps.elie.ucl.ac.be/CCI/viewer/ https://www.esa-landcover-cci.org/?q=node/197 https://land.copernicus.eu/global/products/lc https://code.earthengine.google.com/

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